

Fall Soil Sampling for Nitrate-N

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Harvest is ramping up and it is time to plan fall nitrogen applications. In western Minnesota, soil sampling for nitrate-N is the best prediction tool for nitrogen fertilizer needs. Several concerns need to be addressed to get an accurate nitrate-N sample.

Sampling depth depends on the crop for which the soil sample is being used to make N recommendations. For corn and small grains, University of Minnesota recommends a soil sample to a depth of two feet. The recommendation for sugar beet is four feet. The depth reflects the improved ability to predict the N needs for each crop.

The time when a soil sample is taken in the fall is even more important. Soil samples should not be taken when the soil temperatures at the four to six inch depth are greater than 50 degrees. This normally occurs in mid-October in central Minnesota and the last week of October on the Iowa-Minnesota border. The conversion of organic nitrogen to nitrate-N is still occurring at a significant rate when soil temperature are greater than 50 degrees. Studies indicate that the conversion process actually does not stop until the soil temperature is 43 degrees. This conversion is called mineralization. The soil nitrate-N content from a sample taken in September will usually be less than the soil nitrate-N content from a soil sample taken in mid-October. The recommendation from the sample taken too early will be greater than what the crop needs. This creates an extra expense for the grower for unneeded N fertilizer for corn and small grains and in the case of sugar beet, a reduction in quality and a resultant reduction in income. This fall, the conversion of organic N to nitrate-N is a concern due to significant cost of nutrients and obtaining a valid soil test to optimize plant growth. Weather conditions in September and October can greatly influence the rate of mineralization this fall. This makes results from early soil samples less accurate.

In the drier climates of the Great Plains, substantial changes in soil nitrate-N over the summer and fall have been documented. Research in Nebraska and Colorado indicate that the changes can be reliably predicted and thus the soil sample results can be adjusted for an early sampling date. The reliability of these results is caused by the lower rainfall that occurs in the Great Plains and the lower organic matter contents of the soils. In more humid climates, the results can not be adjusted reliably. In 2002 two soil sampling studies were conducted with the objective of understanding the effect of sampling date on soil nitrate-N. Figure 1. contains results from a study conducted in Northwestern Minnesota in cooperation with Minnesota Extension Service Educators. Six different fields representing several tillage systems and previous crops were sampled to a depth of two feet between early August and late October. The soil samples were taken from the same location in the fields each time and analyzed for nitrate-N. There were no consistent trends in the nitrate-N content over time with some of the changes in nitrate-N between sampling dates as large as 75 pounds per acre.

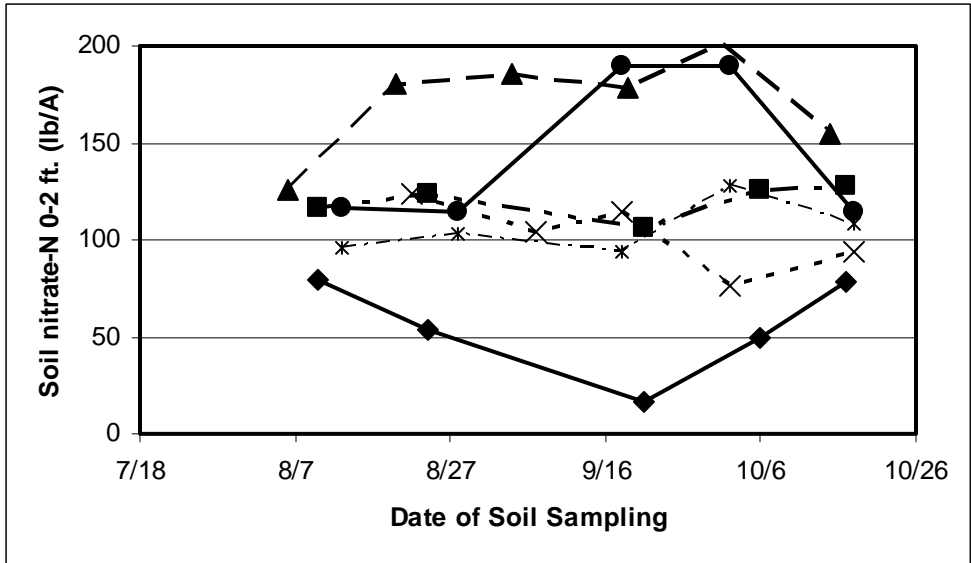


Figure 1. Soil nitrate-N contents overtime from soil samples taken to a depth of two feet from Northwestern Minnesota.

Figure 2. contains soil nitrate-N measurements for soil samples taken to a depth of two feet in Fall 2002 from Sibley, Renville, and Chippewa Counties. This study was conducted in cooperation with Southern Minnesota Beet Sugar Cooperative. The previous crop in all but one site was sweet corn. The changes in soil nitrate-N contents included both increases and decreases ranging from 0 to 100 pounds nitrate-N per acre.

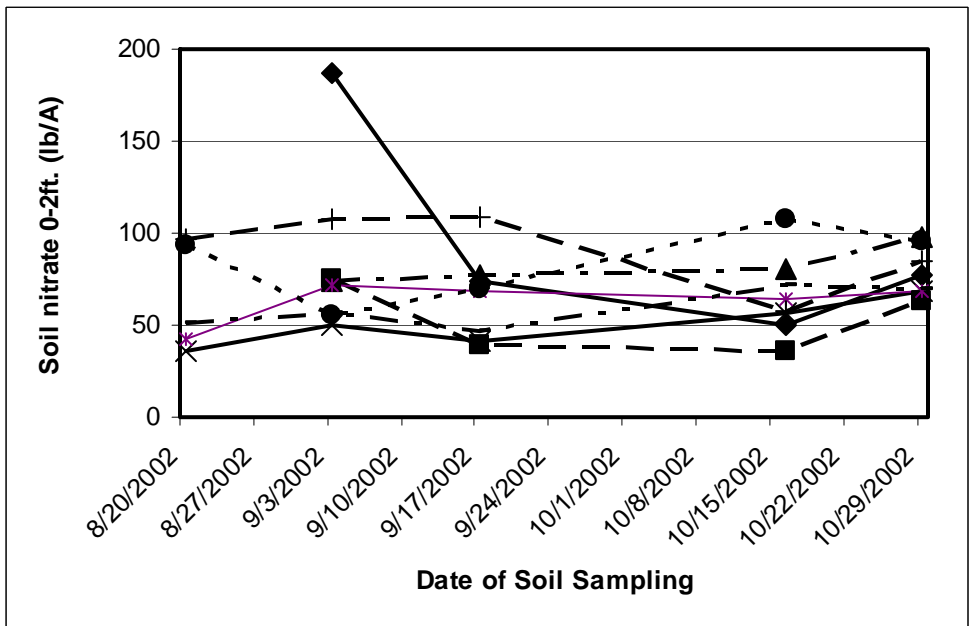


Figure 2. Soil nitrate-N contents overtime from soil samples taken to a depth of two feet from Sibley, Renville, and Chippewa County.

In view of the information presented above, a soil sample for nitrate-N should be taken after the soil temperatures are less than 50 degrees at the 4 to 6 inch depth. Results taken before that time can not be reliably adjusted.