NITROGEN LOSS – SPRING 2013

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Dry soils across Iowa from deficit precipitation following the drought in 2012 have changed to excess wetness this spring. Unfortunately, precipitation to replenish subsoil moisture has been much more than needed. As I wrote in an ICM News article earlier this spring, one downside to the excess precipitation has been movement of carryover nitrate deeper into the profile, and to tile lines resulting in high nitrate-N concentrations in surface waters. This means there is less nitrate-N carryover to be utilized by 2013 crops, although as noted in the previous article, not all of the carryover N moved below the three-foot depth.

As in past wet springs, excess wetness can lead to loss of N applied for the current corn crop and result in greater than normal N response. I wrote several ICM News articles in the spring of 2008 and 2011 covering several aspects about N transformations in soil, N loss potential, and estimating need for additional N application. Links to those articles are listed here.

http://www.extension.iastate.edu/CropNews/2008/0610JohnSawyer1.htm
http://www.extension.iastate.edu/CropNews/2011/0613sawyer4.htm
http://www.extension.iastate.edu/CropNews/2011/0613sawyer3.htm
http://www.extension.iastate.edu/CropNews/2011/0613sawyer2.htm
http://www.extension.iastate.edu/CropNews/2011/0613sawyer1.htm

A web-based program to estimate sidedress N application for corn is currently being promoted across the Corn Belt, called Adapt-N. It was developed at Cornell University in New York and is a combination of models that simulate soil N processes, influence of precipitation, and corn N uptake. It has also recently been promoted as a way estimate N losses from fall applied N. My evaluation the last three years indicates the program consistently and significantly underestimates needed N application (compared to economic optimal N rates at response trials). This brings into question if the program has been adequately calibrated and tested with Midwest conditions. If you try the program this spring, be cautious, and consider use on only a limited trial basis.

The spring this year has been cold. Nitrification and denitrification are slow in cold soils, which will decrease potential for loss of applied N. But cold temperatures will not slow leaching of nitrate present in the soil. With slow conversion of ammonium to nitrate, there should be less loss of applied N – especially for recently applied ammonium fertilizers, such as anhydrous ammonia. Nitrification will also be less for applications such as late fall applied anhydrous ammonia and inclusion of a nitrification inhibitor. Early fall applied N, such as liquid manure, would have significant conversion to nitrate last fall. The nitrate component of UAN solution (28 or 32 percent N) is immediately subject to loss, and the nitrification rate of urea and ammonium in UAN will be more rapid than anhydrous ammonia. Therefore, loss potential is greater with such applications.

An aspect of this spring that is somewhat different from past wet springs is the late corn planting and slow growth. From my observations in north central Iowa, the corn crop at this time is the smallest I remember in the 2000's. Corn N demand has been very low so far, and for late planted fields, season-long demand may be less due to lower productivity.

When warm, wet soils provide a good environment for microbial mineralization, the conversion of organic N to ammonium. Ammonium will accumulate under anaerobic conditions. While corn may die in ponded field areas, if replanted, the accumulated ammonium will supply crop-available N and perhaps an amount adequate to meet crop needs.

For corn fields with intended sidedress or split/sidedress N application, major loss conditions this spring have been avoided. For fields that had fall or early spring N applied, a visual way to check if corn will respond to additional N is to apply sidedress N fertilizer strips as soon as possible across several fields and watch the corn response. This can give a visual clue to potential for more N need and provide reference areas for mid-vegetative stage crop greenness measurement or canopy sensing.