



FLUID FACTS

NFSA AGRONOMIC NEWSLETTER Overcome Spring Nitrogen Loss

Too much or too little! There never seems to be the "right" amount of rain. After a dry year, you would think a little rain would be appreciated! However, spring rains can play havoc with soil nitrogen balance by removing available forms through leaching, erosion or denitrification. Although it is difficult to gauge the amount lost, here are some rules of thumb to determine if sidedressing is appropriate for your fields.

Excessive soil moisture conditions have raised concern about the amount of nitrogen (N) that may have been lost from fertilized fields. A number of interrelated factors influence N loss including: 1) when and in what form N was applied, 2) amount of leaching, 3) amount of denitrification, and 4) amount of topsoil eroded by flowing water.

Time of Application. Since nitrate (NO_3^-) is the form most susceptible to loss, determine that portion of the applied N that was in the NO_3^- form when the soil became excessively wet. Nitrate levels will vary with the nitrate/ammonium (NH_4^+) ratio of the N fertilizer applied, soil conversion rates of NH_4^+ to NO_3^- , and amount of time after application until soils became saturated. With soil temperatures above 55°F , conversion of NH_4^+ to NO_3^- is rapid enough to contribute to significant losses within 3 to 6 days of soil saturation.

Based on selected research and field information, Table 1 provides an estimate of the percent nitrogen in NO_3^- form present after application of several N sources. Once the amount of nitrified N has been determined, estimate the amount of NO_3^- that may have been leached or denitrified.

Leaching. Because NO_3^- -N is very soluble, it will move with or slightly behind the wetting front as water moves into and down through the soil.

On silty and clay textured soils, an inch of water can penetrate down to about 5 or 6 inches. Assuming 6 inches of rainfall entered the soil, most of the NO_3^- carried by the water will be within 3 feet of the surface.

On highly porous sandy soils, however, an inch of water can carry NO_3^- about 1 foot. In the absence of a shallow water table or restrictive (compacted) soil layer, many field crops have roots which can extend down 6 feet in sandy soils by late season. So, less than 5 inches of rain moving into the soil may not move NO_3^- below the rooting zone.

If higher rainfall amounts have removed much of the NO_3^- from the rooting zone, apply sidedress N to replace lost NO_3^- .

Table 1

----- Fertilizer N -----		Time of	Weeks after N Application		
Source	% NO ₃ ⁻	Application	before Soil Saturation		
			4+	2-4	0-2
			Estimated % N in NO ₃ ⁻ form		
UAN	25	Spring	70-95	50-70	25-50
Anhydrous Ammonia	0				
without inhibitor		Fall	85-90		
		Spring	50-75	25-50	0-25
with inhibitor		Fall	65-75		
		Spring	40-60	10-40	0-10
Urea	0	Spring	60-85	40-60	0-40
Ammonium Nitrate	50	Spring	80-100	65-80	50-65

Sources: University of Illinois and Farmland Industries



Denitrification. On silt loam or finer textured soils, denitrification is the likely pathway of NO_3^- loss in waterlogged soils. The amount of denitrification depends on soil temperature and how long the soil is saturated.

When soils are saturated for 3 to 4 days with soil temperatures above 55°F, 25 to 40 percent of the NO_3^- -N may be lost even if water is ponded only for a few hours. Losses of 50 to 60 percent of NO_3^- can be expected if saturated conditions are prolonged to 6 days, and it is safe to assume most of the NO_3^- -N is lost after 10 days of excessively wet soil conditions at these temperatures.

Supplementing N. Before applying supplemental N, accurately assess the crop stand remaining and consider expected yield. Remember, replanted or delayed planted crops will usually have a reduced yield potential.

According to Iowa State University (ISU) research, there is a direct relationship between soil NO_3^- concentrations in the surface foot of soil in late spring and relative yields for corn. Soil NO_3^- testing procedures developed by ISU may provide some guidance for estimating sidedress N applications after preplant N has been lost due to excessively wet conditions.

Based on the determination of remaining NO_3^- levels in the upper 12 inches of soil when corn is 6 to 12 inches tall, sidedress N recommendations can be made based on a percentage of normal application rates, found in Table 2, for revised yield estimates.

Table 2

NO_3^- -N ppm	Percent of Recommended N Application for Revised Yield Goal
<10	100
11-12	80
13-15	60
16-18	40
19-20	20
>21	0

Source: Iowa State University

This preliminary information is still being studied in research trials, but this test offers a tool for estimating sidedress N needs.

Pasture Recommendations. Flooded pastures also suffer diminished N fertility due to leaching and denitrification. Monitor regrowth after flooding conditions subside and apply supplemental N after the ground can be worked without compaction by application equipment.

Avoid economic losses by matching supplemental N with crop needs, but avoid potential environmental contamination through over-application. Where N losses have occurred, weigh the risk of yield loss if N is not applied against the expense if unnecessary N is applied.