Nitrogen

The 1992 growing season was the fifth year PFI cooperators used the late spring soil nitrate test to set nitrogen rates for corn. The late spring, or "pre-sidedress," test is taken when the crop is 6-12 inches tall at the whorl and leads to a recommendation for a rate of nitrogen sidedress, usually at last cultivation. Corn growers who do not sidedress can use the test to see "how they did" with N fertilization. Producers who do sidedress can be conservative with early N applications, assured that any shortfall will be detected in time to make up the difference.

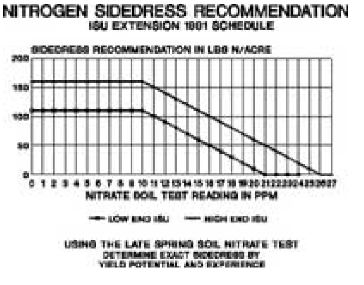
Anhydrous being applied to a spring field

How has the test worked? By now PFI members have used the test in dry years and wet - and in 1992, which was both dry and wet. In the dry years, the test found plenty of nitrate nitrogen in the soil, and recommendations were for little or no additional N. In wet years like 1990, the late spring test generally found very little nitrate N and recommended higher sidedress rates. But in every year there have been exceptions to the trends - high readings in wet years and low readings in dry - and the late spring soil nitrate test has been useful in detecting those exceptional fields.

Some limitations of the late spring test have come to light in PFI trials. These limits are connected to conditions in which biological release of soil nitrate nitrogen from the soil is delayed until after the test. For example, cooperator **Tom Frantzen**, Alta Vista, notices that his Protivin soils warm very slowly in the spring. In corn following alfalfa, the test recommended Frantzen apply 110-160 lbs N sidedress in 1991. But the yield with this rate was no better than with no sidedress at all, which would not be unexpected in corn following alfalfa.

PFI cooperators have often pushed the test beyond specifications by sidedressing less nitrogen than recommended (see this year's results), particularly where there is slow-release livestock manure or green manure in the system that may not be completely accounted for by the test. They have usually "gotten away with it," but not always. For every grower, that experimentation is part of becoming familiar with how the test works on their own operation.

Using the late spring soil nitrate test determine exact sidedress by yield potential and experience
Fig 3. Sidedress recomendations for the late spring soil nitrate test.



If ever there was a year to double-cross the late spring test, it was 1992. With the dry spring, soil nitrate levels in eight PFI nitrogen rate trials averaged 20 ppm (parts per million), nearly enough to recommend no sidedressing at all (see Figure 3). Then, just about the time the crop was too tall to sidedress anyway, the rains arrived. In July and August, many farmers received an amount that would be considered a year's supply in some places. This could have invalidated the test in two ways: 1) much of the free soil nitrate nitrogen measured by the test must have been leached out of the root zone or turned into gas through denitrification; 2) the tremendous crop produced by the moisture placed a high demand on the soil for nitrogen.

Table 1 shows three trials that used the late spring test to determine the N rate for the "low rate" treatment. These are the three trials by **Stock**, **Hartsock**, and **Natvig**, where the "test rate" in the table is the same as the "low rate" sidedressed. (**Jeff Olson's** trial has to be discounted because the anhydrous sidedress burned the crop.) One of these three, **Mike Natvig's** trial, was the first ever to record a statistically significant yield loss at a rate of N determined by the test. It was only a 3.6 bushel loss, but it was unlikely that it was due to chance. After figuring in the cost of an extra 65 lbs of 28% N, Mike lost only an estimated $0.42 per acre at the low rate compared to the high N rate. Averaging over the three trials, the low rates of nitrogen were $4.26 more profitable than the high rates.

Since Mike Natvig's trial was the only one with a statistically significant yield difference ("*"), economics for the other trials are based on input costs alone, for an overall savings of $7.60 in the low rates. But what if you assume that all those nonsignificant yield differences are also real? Averaging all the trials, there was a 2.4 bushel higher yield at the high rate, which averaged 46 lbs N higher inputs. At $1.93 per bushel, 2.4 bushels is worth $4.63. In order for the additional 46 lbs N to have paid for itself even to the break-even point, the nitrogen would have to cost no more than $0.10 per lb.