FERTILIZER MANAGEMENT: NEW ECONOMICS, NEW PRACTICES?

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Fertilizer prices are at or near record highs. In addition, prices, particularly for nitrogen (N), will likely be volatile through spring. In the current high cost environment, how can, or should, fertilizer management be changed to maximize economic returns? The objective of this paper is to briefly outline how to assess fertilizer management practices to ensure profitability.

The first step is to start with a current (less than 4 years old) soil test. The soil test will allow you to prioritize lime, phosphorus (P), and potassium (K) applications. Remember liming is the cornerstone of a good soil fertility program. If the soil pH is below the target pH of the most sensitive crop in the rotation, then fertilizer dollars should be allocated first to lime. The reason for this is that if the pH is less than ideal, additions of other nutrients will not be used efficiently.

Once pH is taken care of the P and K needs can be assessed. Current (mid-December 2009) potash prices average about $880/ton, which translates to $0.73/lb K_2O. For soils testing very high or very high in K, consider eliminating or reducing potash applications. Remember that corn silage and alfalfa remove large quantities of K and soil test K levels may move into the optimum range before the next scheduled soil sampling. Current phosphate prices are more than $900/ton of MAP or DAP which translates into very expensive phosphate fertilizer (if $0.50/lb N, then more than $0.75/lb P_2O_5). Thus, on soils testing over optimum for P it would be prudent to eliminate P fertilizer applications because the probability of a response is quite small and the fertilizer is very expensive. When soils test optimum for P or K, apply near recommended rates. For soils testing below optimum in P or K, reduce application rates to the rate recommended for optimum testing soils. Manure is an excellent nutrient source and where nutrient management plans allow, use manure to meet all or part of the P and K nutrient needs.

For corn grown on soils testing over optimum for P, a small response to starter fertilizer can often be obtained. Many starter fertilizers are extremely expensive today; thus the practice of using starter fertilizer on corn regardless of soil test P levels needs to be assessed. The response of corn grain yield to starter fertilizer on high P testing soils was evaluated on 100 sites throughout Wisconsin from 1995-1997 (Bundy and Andraski, 1999). These data can be used to determine the probability of an economic return on starter fertilizer. First the cost of starter fertilizer must be divided by a price of corn to determine the minimum yield increase per acre needed to pay for the starter fertilizer. The probability of obtaining the necessary minimum yield increase is shown in Table 1. As an example, if starter fertilizer costs $50/acre and corn is $4.15/bu, then a yield increase of at least 12 bu/acre is needed to pay for the starter fertilizer. Based on the 100 site-years of data, there is only a 6% chance of obtaining at least a 12 bu/acre yield increase. Thus, in this situation using starter fertilizer on high P testing soils may not be in the best economic interest of the grower. Please note, for soils testing optimum or lower, starter fertilizer remains an excellent way to supply needed nutrients.

Table 1. Probability of a minimum increase in corn grain yield when starter fertilizer is applied to high P testing soils (Bundy and Andraski, 1999).

Yield increase of at least	Probability of minimum yield increase
bu/acre	%
4	49
6	34
8	18
10	10
12	6
16	5
20	3

Nitrogen application rates for corn can be reduced by using the MRTN approach to selecting a N rate (Laboski et al., 2006). For all crops remember to subtract all manure and legume credits from your targeted N rate to obtain the amount of fertilizer needed. If you are in doubt about the amount of N to credit for corn, use a pre-sidedress nitrate test to confirm manure and forage legume credits.

In addition to selecting an economical N rate, it is important to make sure that N is used efficiently by the crop and is not lost. A quick reminder of a few best management practices for N is:

1) Use sidedress applications on sandy soils
2) Sidedress applications on silt loam soils that tend to be wet may reduce the potential for denitrification.
3) Nitrification inhibitors may be beneficial for preplant N applications particularly on soils that tend to be wet.
4) Urea should be incorporated into the soil within about 24 hr either mechanically or by 0.1-0.2” of rainfall/irrigation. If incorporation is not possible and rain is not imminent, consider using a urease inhibitor
5) Control weeds no later than weed height of 4” to increase N use efficiency in corn.

References

Bundy, L.G., and T.W. Andraski. 1999. Site-specific factors affecting corn response to starter fertilizer. J. Prod. Agric. 12:664-670.

Laboski, C.A.M., J.B. Peters, and L.G. Bundy. 2006. Nutrient application guidelines for field, vegetable, and fruit crops in Wisconsin. UWEX Pub. A2809, Univ. of Wisconsin-Extension, Madison, WI.