Manage Nutrition for Profit Advantage

Prices Change – Balanced Fertility Needs Remain the Same

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Fertilizer price has been an issue of concern for some time now. Consequently, PPI has published several items over the past few years addressing the impact of fertilizer price on optimal rates of fertilization. This brief article will provide some recently updated information on this issue—with particular focus on nitrogen (N) fertilization as it is affected by crop and fertilizer price—and on the importance of balanced fertility in optimizing nutrient use and recovery.

At the time this article is being prepared, winter wheat price has taken an upturn. Considering this, fertilization of winter wheat will be an especially important consideration this fall. Long-term futures prices for corn also hit a record high. A reevaluation of the impact of N fertilizer price and crop price on optimal rates of N fertilization is therefore in order.

Economists at Kansas State University recently published an article and spread-sheet addressing the modification of yield-goal based fertilizer recommendations to reflect price (Kastens et al., 2005. >article<, >spreadsheet<). Mathematical functions were developed using historical N trial data from western and north central Kansas involving wheat, corn, and grain sorghum. Their work is detailed and extensive…its entirety is far beyond the scope of this article, thus links are provided above for those interested in further exploration.

Figures 1 and 2 show the impact of N fertilizer price and wheat and corn price on recommended N rate for specific yield goals for each crop. Both crop and fertilizer price affect optimal N rate at a given yield goal. Yield goal is defined here as the expected yield (over many years) when N fertilizer is not a limiting factor.

For wheat (60 bu/A yield goal) at $0.45/lb N the recommended rate ranged from 67 to 77 lb/A over a range of crop prices from $3.00 to $4.50/bu. With the same wheat at $4.00/bu the rate ranged from 74 to 85 lb/A over a range of fertilizer prices from $0.45 to 0.25/lb N. **For corn (180 bu/A yield goal) at $0.45/lb N the recommended rate ranged from 171 to 188 lb/A as crop prices increased from $2.00 to $2.75/bu.** With corn at $2.50/bu, the rate ranged from 183 to 205 lb/A over a range of fertilizer prices from $0.45 to 0.25/lb N. Notice in both of these figures that the space between the bars narrows as crop price increases. Of course, this means that as crop price increases the impact of fertilizer price diminishes.

Recommendations provided by Ohio State University's "Nitrogen Rate Calculator for Corn" show a very similar response to price changes. For corn following corn, optimum N rate changes from 167 lb/A to 206 lb/A over the same range of corn and N prices as above. With the lower N rate, probability of achieving 95% of maximum yield declines to 71%.

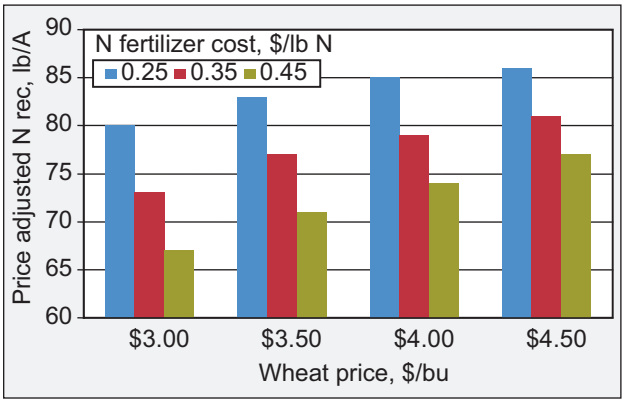

Figure 1. Estimated impact of wheat price and N fertilizer cost on recommended rate of N fertilization of winter wheat in Kansas. Assumes 60 bu/A yield goal, 40 lb NO_3-N per 2 ft. depth (5 ppm), and 2% organic matter (after Kastens et al., 2005).

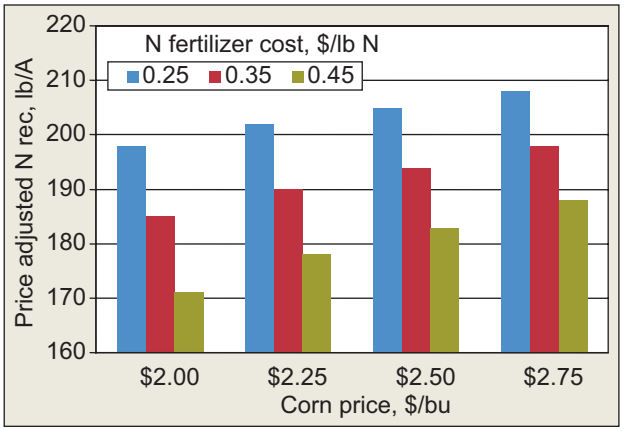

Figure 2. Estimated impact of corn price and N fertilizer cost on recommended rate of N fertilization of corn in Kansas. Assumes 180 bu/A yield goal, 40 lb NO_3-N per 2 ft. depth (5 ppm), and 2% organic matter (after Kastens et al., 2005).

For corn grown in Ontario, Canada, current recommendations are in general a little lower than those shown in **Figure 2**, but similar changes in prices produce similar changes in optimum N rates. Rates for Ontario can be calculated using software provided at www.gocorn.net/. Weather variability can confound the prediction of optimum rates. Several retailers in Ontario are involved in on-farm trials to validate the recommendations, making use of PPI's Crop Nutrient Response Tool.

Providing balanced crop nutrition is essential to producing optimum yields and maximizing the use efficiency of nutrients, water, and other inputs. A long-term irrigated corn study in western Kansas continues to illustrate the importance of this point and the consequences of balanced fertilization. With the support of PPI/FAR, soil samples were recently collected and analyzed from this study from the surface to 48 in. deep. **Figure 3** shows the effect of yearly P application on soil nitrate-N (NO_3-N) levels across depth increments after 45 years of continuous corn (1961 to 2006) where each year N fertilizer was applied at a rate of 160 lb/A. Notice that there is little difference in NO_3-N levels near the surface (0 to 6 in.) between the zero phosphorus (P) control and the 40 lb P_2O_5/A/year rate. However, below 6 in. there are dramatic differences between the two P treatments. The balance between N and P fertilization has increased yield, improved fertilizer N recovery, and substantially reduced residual soil NO_3^-.

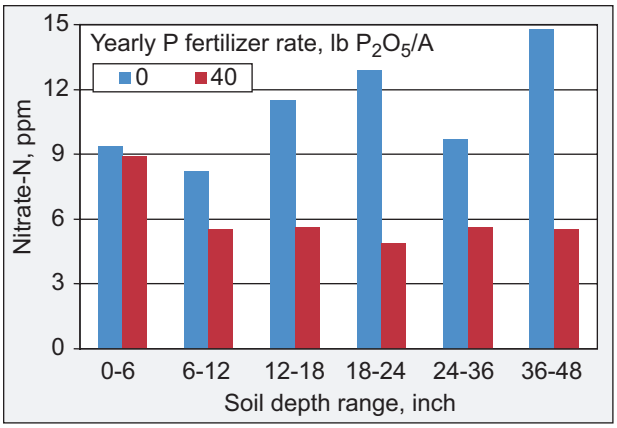

Figure 3. Effect of yearly P fertilization on residual soil NO_3-N after 45 years (1961-2006) of corn production (160 lb N/A/year applied).

Crop production conditions have certainly changed over the past few years and will continue to change as we move forward. Sometimes the more dramatic changes, especially the negative ones, can produce a measure of shock and consternation. We must remember though, one of the things that doesn't change is the crop's need for adequate and balanced fertility. ■

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