MAKE RATIONAL DECISIONS ABOUT PHOSPORUS AND POTASSIUM MANAGEMENT WITH UNFAVORABLE CROP PRICES

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Crop prices have been declining and there is considerable uncertainty about the future. Phosphorus (P) and potassium (K) fertilizer prices have remained approximately constant or have declined slightly. Therefore, producers are thinking of reducing application rates. There are a few things to consider when making decisions with unfavorable crop/fertilizer price ratios.

1. Reducing fertilization rates across all conditions is not a rational or good management decision. Don't cut rates in low-testing soils, where yield increases and profits from fertilization are very likely even with unfavorable prices. However, you should not fertilize high-testing soils.

Soil testing is not a perfect diagnostic tool but is very useful, and compared to the overall costs of production has become less expensive in recent years and its use is even more relevant with unfavorable crop prices. Iowa field research results have been used to develop soil sampling guidelines for P, K, and other nutrients in extension publication PM-287 (Take a Good Sample to Help Make Good Decisions) and P and K soil-test interpretations in publication PM 1688 (A General Guide for Crop Nutrient and Limestone Recommendations in Iowa).

Crop yield increases from P and K fertilization are large and highly likely in very low and low-testing soils, but the size and likelihood of yield response decreases as soil-test values increase and yield increase becomes very unlikely in high-testing soils. Figure 1 shows, as an example, how profits from P fertilization relate to soil-test P levels. Very large and likely benefits in soils testing very low (due to large yield increase) decrease sharply as soil-test levels increase to the optimum level (due to low or no yield increase), which is the level recommended to be maintained by application based on crop removal.

If your economic condition is particularly bad, are unsure concerning field tenure, or the unfavorable prices continue, you can temporarily reduce the removal-based rate to maintain optimum soil-test levels or apply only starter. This may increase profits in the short-term, but higher rates will be needed in the future because soil-test values will decline.

However, the key issue that applies to many Iowa producers is that there is no rational reason to maintain higher than optimum soil-test levels. For P soil tests with corn and soybean, for example, the optimum interpretation category is 16 to 20 ppm for the Bray-1 and colorimetric Melhich-3 methods, 26 to 35 ppm for the Mehlich-ICP method, and 10-13 ppm for the Olsen method. The optimum interpretation category for K by both the ammonium-acetate and Mehlich-3 methods is 161 to 200 ppm for testing laboratory dried soil samples and 86 to 120 for the field-moist or slurry laboratory sample processing procedures (see publication PM 1688).

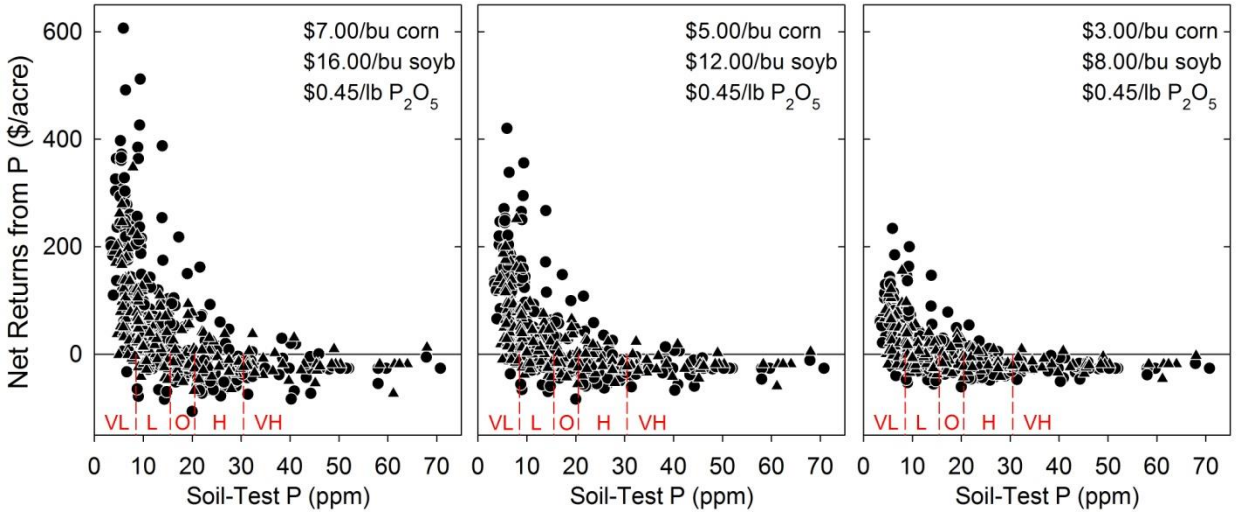

Figure 1. Net returns to P fertilization for different soil-test P levels (Bray-1) in Iowa soils assuming the shown grain and P fertilizer prices. Interpretation categories Very Low, Low, Optimum, High, and Very High are from ISU Extension publication PM 1688.

2. Use a good soil sampling method and variable-rate technology to vary, as needed, the P and K application rate within fields.

Use of variable-rate P and K fertilization is a good option to improve P and K management in fields that have significant variation in soil-test or yield levels. This technology can be used to target applications to the most deficient field areas to get the highest possible return when price ratios are unfavorable and also to improve maintenance fertilization by considering yield variability. Yield maps from the past two to four years (not just the last one) should be used together with soil-test values to help define P and K application rates. Research suggests that either grid sampling or zone sampling methods are superior to the classic sampling by soil type method (see publication PM 287 concerning sampling methods). With variable-rate application, the key is to follow the soil-test interpretations.

3. Banding of P and K before planting or with the planter does not reduce the application rate needed to optimize crop yield no matter the tillage system.

Research in Iowa soils and other soils of the humid Corn Belt has shown that banding of P and K fertilizer seldom is more efficient than broadcasting, even with no-till management. Therefore, cutting the fertilizer rate for low-testing soils when banding is used will increase the risk of yield loss and may reduce profits from crop production, and future fertilization need will increase. Figure 2 shows typical results for no-till corn yield response to broadcast or planter-band P as an example, because this is the crop and nutrient some producers believe a band application could be more effective.

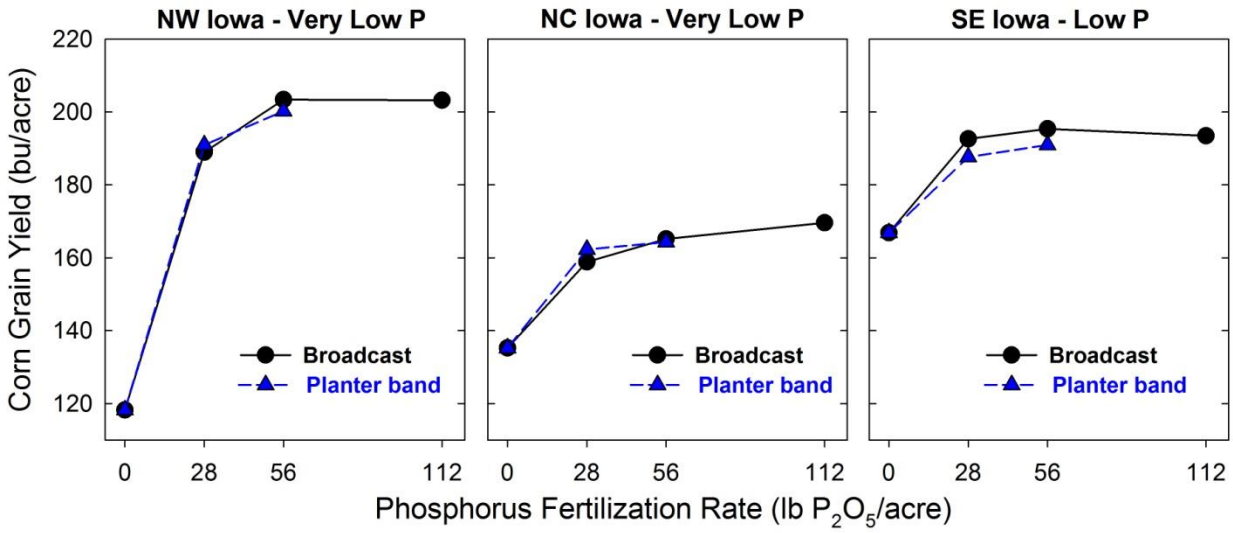

Figure 2. No-till corn response to broadcast or planter-band P placement at three Iowa low-testing fields.

Deep placement of K fertilizer (about 5 to 6 inches deep) often is beneficial in ridge-till and sometimes in no-till or strip-till, but reducing the application rate is not recommended. In some conditions, starter P applied to the corn seed furrow or beside the seed can complement a primary broadcast application. This happens mainly when applying the P and K rate for one crop year in soils testing extremely low and/or with a thick residue cover or cool or wet soil in spring.

4. Give credit to P and K in animal manures.

Iowa research has shown that manures are excellent P and K sources, when used in conjunction with manure analysis and careful application methods. The research results have been used to develop manure nutrient management guidelines in extension publication PMR 1003 (Using Manure Nutrients for Crop Production). The K availability of all animal manures is 90 to 100 % compared to fertilizer (and assuming otherwise similar conditions), whereas the P availability varies from 60 to 100% according to the type of manure.