

Nutrient Considerations for Low Corn Prices

By T. Scott Murrell

Corn prices are low and many producers are asking tough questions about their nutrient management programs.

Maintaining grain yield and revenue with lower fertilizer bills is possible, but you need to consider all the science.

Account for Nutrient Supplies Already in the Soil

It is important to take advantage of the nutrient-supplying power that exists within individual fields. Soil test results provide the best guidance for deciding which nutrients should be applied and how much of them to use. If soil test levels of P and K are high, there is little chance that an economic response to these nutrients will occur in the year of application. In such cases, producers can take advantage of existing soil nutrient supplies. However, this approach must be done with the understanding that supplies will need to be replenished later to avoid future nutrient deficiencies and associated revenue losses.

Taking N credits for previous crops is an important part of buying only what is needed. Many people also forget that with some crops, such as alfalfa, lower N application rates may be justified for crops planted up to 2 years after termination of the stand (Yost et al., 2014a, b).

An often overlooked, but effective tool is the soil nitrate test. This test helps producers account for the nitrate already present in their soils. If levels are high enough, freshly applied N rates can be reduced, or in some cases, omitted. This test is particularly useful where manure applications have been made, previous crop yields were poor, or climatic conditions are dry.

Account for Nutrient Supplies on the Farm or Nearby

If there is access to manure, use it as effectively as possible. Also, be sure that you know the nutrient content of the manure and the rate at which manure is applied, so you can calculate how much of each nutrient is being put on. If you have previously felt that spreader calibration and manure testing were too time consuming or too expensive to deal with, this may be the year to reconsider. If manure application equipment is dated, it may be time to run the numbers and see if updated equipment capable of applying lower, agronomic rates can be justified. In some cases, manure application rates can be cut in half and still meet crop needs, allowing manure to be a nutrient source on more acres.

Time Nutrient Applications for Highest Efficiency

Spring fertilizer applications provide N at a time closer to crop need, reducing the chances for loss. However, spring applications can also carry higher logistical risks, since conditions are typically wetter than in the fall and time is more limited. In some areas, fall N applications can be effective if they are made when soil temperatures drop below 50°F (10°C) and remain there. Nitrification inhibitors can also reduce or eliminate N losses from fall to spring.

Splitting the total N application across various times in the



iStock/BanksPhotos

Banded fertilizer applications placed near the seed provide critical early season access even in soils with moderate to high P fertility status.

season can sometimes increase N recovery by the crop. Several options exist. For example, a pre-plant application combined with a second application during early vegetative growth stages is an often-used split.

Whenever possible, manure applications should be made close to the time of crop need, such as the spring.

Place Nutrients for Greatest Efficiency

Banded nutrient applications generally provide higher first-year recovery of applied P and K than do broadcast applications. Consequently, some universities suggest rate reductions when nutrients are applied in this manner. If short-term economic decisions dictate banding P and K at rates less than those of crop removal, producers and advisers may want to build in a plan for replenishing soil nutrient supplies in the future, when economic conditions improve. In fields with low soil P concentrations but longer-term management strategies, a combination of a banded application with a broadcast application may have the best chance for maximizing yields (Anghinoni and Barber, 1980). Fertilizer bands placed near the seed provide early season access to nutrients, while overall higher fertility levels in the bulk soil provide access to the larger root system later in the season.

Use the Most Effective Fertilizer Technologies Available

Fertilizer technologies have come a long way with nitrification inhibitors, slow-release fertilizers, and other innovations.

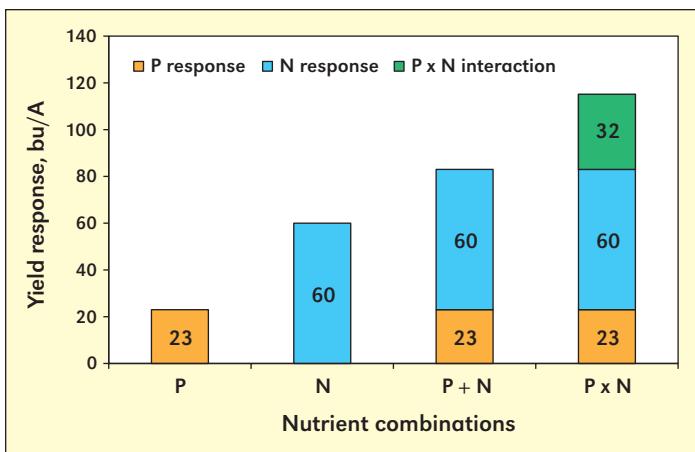


Figure 1. Corn response to N alone at 161 lb N/A (N), P alone at 40 lb P₂O₅/A (P), and both N and P applied (P x N). The sum of the responses to the N and P (P + N) was calculated by adding the individual effects (Schlegel et al., 1996).

fication inhibitors, urease inhibitors, and controlled-release fertilizers being just some of the options available. Be sure to understand these products thoroughly and examine university research that tests their efficacy. There are situations where these products provide an advantage. Know the conditions under which they have the best chances of making a difference.

Allocate Money to the Right Nutrients

In times like these, many emphasize that N needs must come first. Before jumping to this conclusion, soil test levels of a field or field area must be examined. In the worst case, it may be found that N, P and K are all in short supply. When this happens, crop response to any single nutrient will be limited if only that nutrient is applied. When P levels are low, the plant has a reduced supply of stored energy. Without enough energy, the plant is not effective in absorbing limited soil N, P or K supplies. In these cases, if recommended rates of each nutrient cannot be afforded, it is best to band at least low rates of P and K near the seed as part of the N fertilization program. This balanced approach will maximize the effectiveness of all applied nutrients.

Two examples of balanced nutrition are in **Figures 1** and **2**. The first example (**Figure 1**) comes from a 30-year study examining the interaction of P and N (Schlegel et al., 1996). Corn yield response to a combination of P and N (P x N) was greater than to applications of either P or N alone. The interactive effect was also larger than the sum of the individual effects (P + N). Similarly, increasing soil test K and fertilizing with N produced the greatest yield response (Johnson et al., 1997).

Prioritize Fields and Areas within Fields

Allocating nutrient funds across the farm should be based not only on soil tests, but also on economic evaluations of each field or field area. What is the break-even cost of production for each field in a farming operation? Which fields consistently make money, which ones are hit or miss, and which ones are just a drag on the business? Spending time looking at how fields have performed over time may help farmers and advisers focus resources on the moneymakers. The goal of such an analysis is to ensure that consistently profitable fields have the

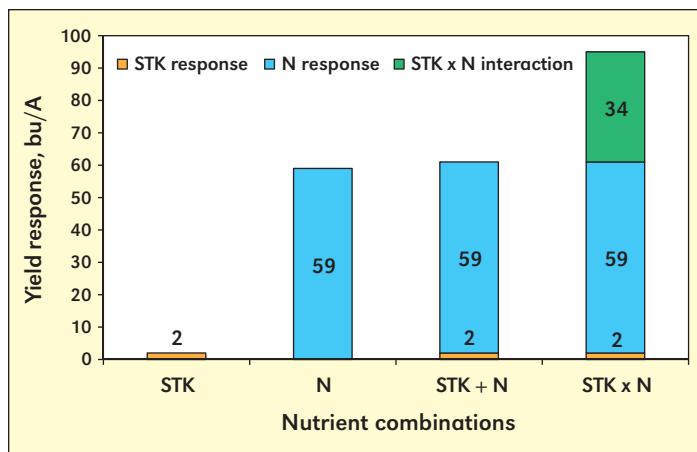


Figure 2. Corn response to increasing soil test K from 80 to 116 ppm (STK), applying 240 lb N/A (N) or increasing soil test K and applying N (STK x N). The sum of the responses to STK and N (STK + N) was calculated by adding the individual effects (Johnson et al., 1997).

nutrients they need to maintain production and revenue levels. With precision agriculture, this evaluation can be brought to a higher level of resolution, extending the concepts to areas within a field, rather than the entire field.

Examine Yield Goals

Since many nutrient recommendations are based on yield expectations, setting realistic yield goals is important. One way to set realistic expectations is to look back at previous years' performance to get an idea of what typically happens, given specific levels of crop stress. Averages of several years of yields are often useful in setting goals.

Re-examine the Basis for Nutrient Recommendations

Are nutrient recommendations based on the best science available? University research and publications set the standard for science-based nutrient management decisions. How do currently used recommendations compare to these? If modifications or different approaches are being used, is there good information behind them? It may be time to look at the scientific guideposts, like university guidelines, to see how current management practices compare.

Summary

When funds are limited and crop prices are low, it is critical that nutrients be used as effectively as possible. Effective use is possible only when informed decisions are made. Keeping soil test information up-to-date, identifying profitable fields or field areas, using all nutrient sources available, and generally adopting 4R nutrient management practices founded on proven scientific principles ensure the greatest chances for success. 

Dr. Murrell is a Director, IPNI North America Program, West Lafayette, IN, USA; E-mail: smurrell@ipni.net

References

- Anghinoni, I. and S.A. Barber. 1980. *Soil Sci. Soc. Am. J.* 44:1016-1020.
- Johnson, J.W., T.S. Murrell, and H.E. Reetz. *Better Crops* 81(2):3-5.
- Schlegel, A.J., K.C. Dhuyvetter, J.L. Havlin. 1996. *J. Prod. Agric.* 9:114-118.
- Yost, M.A., M.P. Russelle, and J.A. Coulter. 2014a. *Agron. J.* 106:645-658.
- Yost, M.A., T.F. Morris, M.P. Russelle, and J.A. Coulter. 2014b. *Agron. J.* 106:659-669.