Fundamentals of Fertilizer Economics Emphasized

Record high fertilizer prices are causing many producers to ask: "Can I afford to fertilize?" And, record high crop prices beg the question: "Can I afford not to fertilize?" Answers to such questions are complex and should be based on an understanding of sound economics and associated risks. Fertilizer prices are not expected to decrease in the near future because the supply/demand market is so tight. Current fertilizer prices are related to increased demand caused by an increasing global need for more food and a more diverse diet, escalating energy prices, rising transportation costs, a weak U.S. dollar, and increased crop production required to produce biofuels. Fertilizer is a world market commodity subject to global market forces, volatility, and risks.

Growing a crop always carries some risks…some related to weather and some to the market…but with today's input prices the investment in a crop is greater than ever before and so is the risk. But, similar to any investment, increasing risk also provides the potential for higher returns, particularly with recent strong crop prices, which are not expected to decline substantially in the near future. The world's grain stocks to use ratio is at its lowest level in the last 35 years and consumption has exceeded grain and oilseed production in 8 of the last 9 years.

Farmers cannot afford to use nutrients inefficiently. They must do all in their power to manage fertilizers properly to minimize risk and to maximize potential returns. The risk of applying too little fertilizer and producing a sub-optimal crop and not capitalizing on high crop prices or the risk of applying too much fertilizer and incurring unnecessary costs must both be considered. This issue of *Better Crops with Plant Food* will review some of the basics of fertilizer economics in North America and around the world and will reinforce some of the principles of fertilizer management designed to help ensure nutrient use is efficient and also effective in accomplishing the multiple objectives of crop system management. BC

NORTH AMERICA

Principles of Allocating Funds across Nutrients

By T. Scott Murrell and Tom W. Bruulsema

When funds are limited, farmers and advisers should be familiar with the basic principles of crop response. This article discusses general concepts that guide fertilizer investment decisions for one or two nutrients.

The situation: A farmer does not have enough money to purchase all of the supplemental nutrients needed by crops on the farm. He or she asks for guidance on how best to spend the money that is available. The challenge is to combine nutrients to reap the maximum possible benefit from their application, recognizing that when all needed nutrients cannot be purchased, overall production and profit will be compromised.

Allocating Funds to One Nutrient

Let's first consider the case where one nutrient is needed, but the total recommended quantity cannot be afforded. To reduce the total fertilizer bill, we need to allocate fertilizer to where it is needed most in the field. Areas of greatest need are those where crop responses are expected to be the largest. **Figure 1** demonstrates the concept. In this figure, the large curve on the left is a conceptual model of crop response to soil nutrient supply. As the soil supply of a nutrient increases, crop yield increases until the soil becomes sufficient. Beyond this sufficient level, yield does not increase.

Next we examine how a crop is expected to respond to nutrient additions for each of the three soil nutrient supplies. These three expected responses are shown on the right side of the figure.

The top graph (A) shows that when a soil has a low supply of a nutrient, the yield attained with no additional supplement (where the curve intersects the vertical axis) is low (the same as point A on the larger graph to the left). However, adding more of the nutrient results in a large crop response. Because the response is so great, the short-term economically optimum rate (EOR) does not change much as prices vary, shown in the shaded area under the curve.

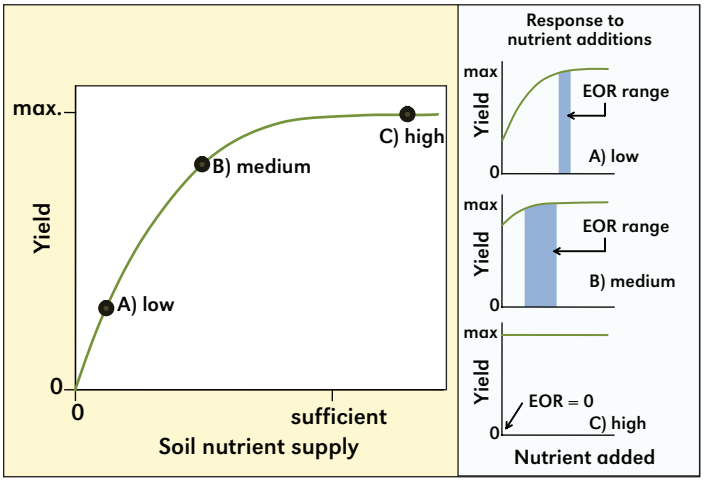

Figure 1. A conceptual model of crop response to soil nutrient supply. Also shown are model crop responses to nutrient additions for A) low, B) medium, and C) high soil nutrient supplies. The shaded areas below the curves in A) and B) show the range in short-tem economically optimum rates (EOR) based on various crop and nutrient prices.

Abbreviations and notes for this article: N = nitrogen; P = phosphorus; K = potassium; EOR = economically optimum rate.