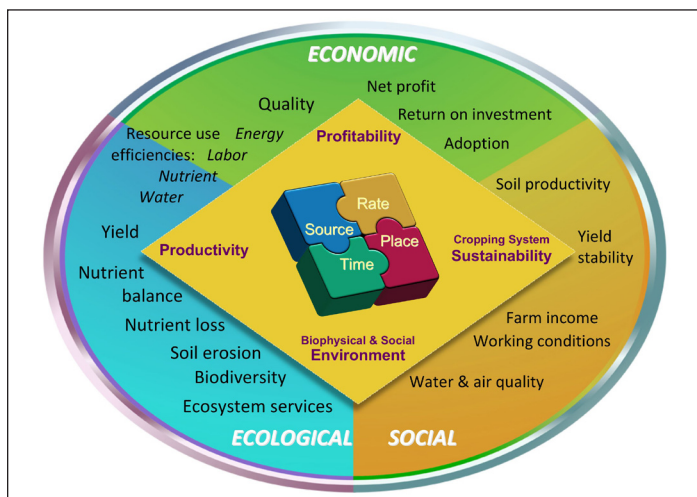




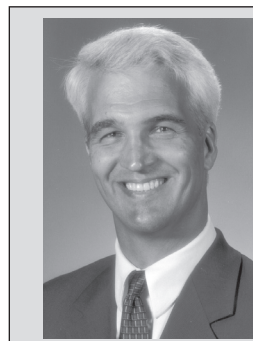
## Stretching Your Fertilizer Dollar

**A**S WE FACE an uncertain future relative to fertilizer prices, it is good to review the decision-making process we go through when making purchasing decisions. A farmer's immediate concern is how much of each nutrient to buy and whether each purchased pound of nutrient will provide short-term, long-term, or minimal value in return. Additional decisions then have to be considered based on whether the fertilizer should be purchased with credit or immediately paid in cash and the economic risks associated with either option.

The economically optimal rate (EOR) is simply the amount of fertilizer needed to maximize net returns from the nutrients. While the EOR for fertilization is easy to explain, it is very difficult to achieve in the field. Since there is considerable variability experienced in many fields and during the growing season, predicting the correct EOR each year is not easy. Achieving the EOR is made more difficult because much of the fertilizer is applied before the plants begin to grow and crop yields are influenced by unpredictable weather and environmental factors. Microeconomic models are frequently used to help eliminate some of the uncertainty, but they can have significant bias depending on the accuracy of the underlying assumptions. This short review of some important concepts will help with the decision-making process and help clear up confusion regarding some common economic terms.



Fertilizer should be managed with appropriate management practices to get the maximum benefit. This includes applying nutrients in the right source at the right rate, the right time, and the right place. The success of these management practices can have significant impact on the larger economic, ecological, and social surroundings.



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### Net Return

One of the easiest things to measure is the amount of money left after the crops are sold and the bills are paid. But calculating how to maximize this net return is not always so easy. In theory, the net return is greatest when the value of the additional crop yield from additional fertilizer is greater or equal to the cost of that additional fertilizer.

In practice, it is difficult to precisely predict this point since changing prices, unpredictable weather, and other fluctuating market conditions bring a degree of uncertainty each year. The closer a grower can get to the maximum net return, the lower the cost per unit of production (lower cost per bushel for example), even though the cost of the inputs may increase. This is because the fixed costs associated with growing a crop, such as land costs, irrigation expenses, and taxes, are spread out over more production and greater yield.

### Value/Cost Ratio

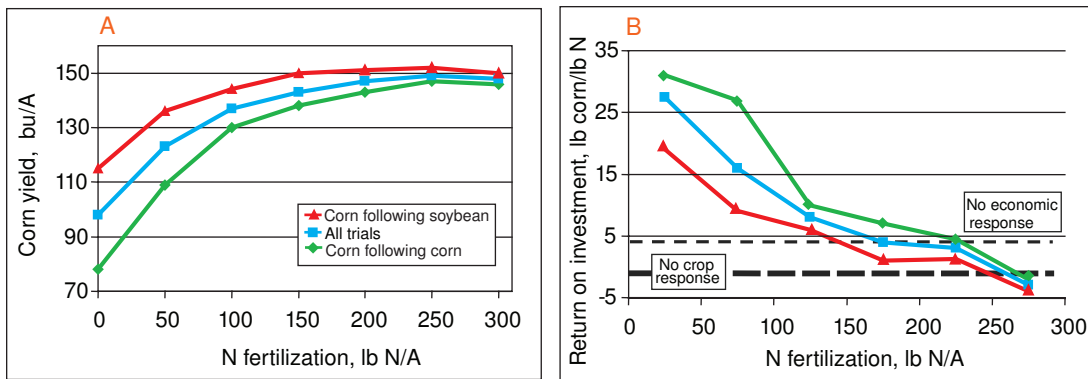
The ratio of the crop value compared with the cost of the inputs (V/C) is often calculated to predict potential profitability. This number represents the value of the increased crop compared with the additional fertilizer required to produce it.

This number can sometimes be misleading when viewed alone. For example, the V/C ratio is generally highest when the first increment of fertilizer is applied (at the lower part of the yield response curve), even though this is not an economic range of production. Looking only at the V/C ratio also ignores the long-term benefits of building soil fertility in the field.

### Fertilizer/Crop Price Ratio

The price of fertilizer needs to be compared with the likely price of the crop to determine if it is a wise invest-

Abbreviations and notes: P = phosphorus; K = potassium.



**Figure 1.** The graph at left (A) shows results of 54 separate experiments measuring the response of corn to added N fertilizer following corn or following soybean in rotation. These types of response data allow the economics of fertilization to be calculated as the return on investment (or the discrete marginal product) where additional fertilization is no longer profitable (B, right). These relationships change each year depending on crop prices and fertilizer costs. Data from P.M. Kyverryga et al. 2007. Alternative benchmarks for economically optimal rates of nitrogen fertilization for corn. *Agron. J.* 99:1057-1065.

ment. Higher fertilizer prices or lower crop prices can cause growers to decide to cut nutrient purchases. It is tempting for some farmers to rush to make large reductions in nutrient use as fertilizer prices increase, but the price of the crop has a much larger influence on overall profitability than the price of fertilizer. A large yield reduction from inadequate fertilization is generally a poor economic trade off.

### Return on Investment

Whenever money or resources are invested in the farming operation, the return on investment (ROI) is a measure of how much profit or savings are realized from the activity. The overall ROI is used to evaluate how well a decision benefits the overall operation. The ROI may be used to measure progress towards long-term goals as well as immediate profits or cost savings. The ROI of many individual purchased inputs is often measured after a single growing season. Economists often refer to this as the marginal product. The return for each pound of added fertilizer is called the discrete marginal product (Figure 1).

### Time Value of Money

It is well known that money available at the present time is worth more than the same amount in the future, due to its potential earning capacity. This common principle states that if an asset will appreciate, any amount of money is worth more the sooner it is received. For example, since money in the bank will earn interest, \$100 invested today would be worth \$105 in one year (at 5% interest). Therefore it is preferable to receive \$100 today than \$100 in the future.

Another way to look at the time value of money is when a grower predicts whether the investment of today's dollars is better spent on needed nutrients today or to delay the purchase in hopes that the invested money will appreciate more quickly than the future price of fertilizer. Some nutrients (like P and K) remain in the soil for many years, continuing to provide crop nutrition long after the initial application is made, serving as a long-term reservoir.

**Applying fertilizer at the most economic rate does not guarantee a profitable crop.** Profit is determined by the

making decisions about the investment of available capital. It may be wise in some circumstances to place orders for fertilizer with an eye on taxes, too.

Some producers are inclined to try short cuts to the well-established principles of plant nutrition. Essential plant nutrients are called "essential" because there is an absolute requirement for them in order for plants to survive. There are many techniques that can help growers get the maximum benefit from fertilizers, but these must be done thoughtfully and deliberately. If the soil has been analyzed and found to already contain adequate concentrations of nutrients, no additional fertilizer may be required for a period of time. The careful monitoring of soil nutrient concentrations allows this to be done without reducing crop yields.

As fertilizer prices increase, there seems to be a proliferation of new "wonder products" that claim to reduce or virtually eliminate the need for added nutrients. Many of these products are not field tested or independently evaluated. Often where there is inadequate field testing, there is a potential for dishonesty and misrepresentation. Where dishonest practices occur, there is the possibility for the reputation of the honest dealer to be damaged, too.

George Akerloff won the Nobel Prize in economics by explaining how the lack of solid information in the marketplace and the presence of ineffective products reduce the reputation and viability of even the good companies. It does not take an economist to know that you should find a trusted agronomist or consultant with whom you can establish a long-term relationship... someone who will tell you the truth in both the good and the lean years.

Use sound financial and scientific principles in making future decisions on how to nourish your crops. Use fertilizers as an essential input to improve your bottom line and maintain your financial security. ■

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