Selling Nutrient Inputs in Today's Market

Potash & Phosphate Institute

When crop prices hit the floor, it's human nature to look for ways to cut costs. However, cutting back in the wrong places can do more damage than good if the cuts hurt yield or quality. Finding costs to cut takes knowledge and an understanding of the impact each input has upon production levels and profitability. To properly evaluate your fertility program, you need knowledge of what that fertilizer is doing for your crop, your production levels, and your profitability. There's an old saying that no one ever saved themselves rich. Proper fertilization is an investment in your operation. It's a well-known fact that yields are what cover the costs of production. Let's be sure this fall that we are planning for higher profits.

This fall is a good time to review what several studies tell us about the characteristics of the most profitable farmers. In a recent four-year Iowa study (**Figure 1**) higher yields accounted for 67 percent of the difference in profitability between high and low profit soybean farmers while cost reduction accounted for only 21 percent. University studies in Kansas and Minnesota showed that the most profitable farmers grew higher yields, had lower costs, adopted technology faster, and spent more time gathering information, analyzing choices, planning activities, and evaluating results. In all these studies, marketing was not a factor that allowed a farmer to distinguish himself or herself from other farmers. That does not mean marketing isn't important, just that the low profit farmers were doing about as good a job in pricing their grain as the top profit farmers.

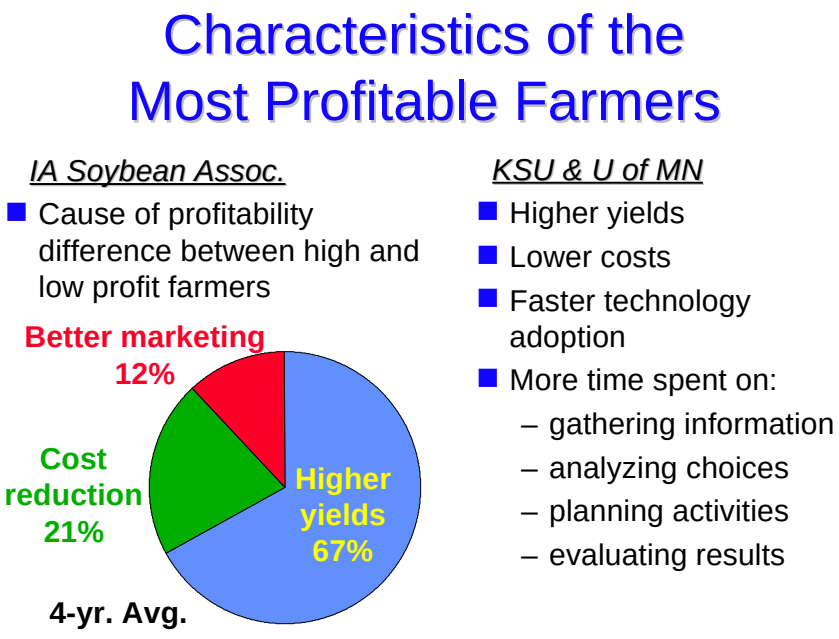

Figure 1. Results of profitability studies that identify factors separating higher profit farmers from lower profit ones (Murrell, 1998; Kastens et al., 1999).

What do all these studies have in common? Higher yields. As one economist from Minnesota once said, higher yields translate directly to higher profits. All of us want more money coming in. For many of us, the only way to get that extra cash is to increase our yields. That's a principle that is true regardless of crop price.

The profitability studies we just considered demonstrate that to be more profitable, we need to spend more time on planning and proper management. A little time spent thinking can save a lot of time and money spent recovering from a bad decision. As a well-known agronomist from Indiana has said, "every problem I have seen this year has resulted from someone forgetting at least one basic agronomic principle." Statements like that show the importance of careful and well-informed planning. Let's see how each of these pieces of information can help us manage our nutrients in a more profitable manner.

The first thing we must understand is that in tough economic times, fertilizer is not a dessert that our crops really don't need. It's a part of their main course. Crops simply must be fed properly to help them yield all they can. In North America, fertilizers contribute a third or more to total crop yield, and soil test summary data show that almost one out of every two fields tested in North America are medium or below in P or K. That means there are a lot of hungry crops out there that need to be fed.

So how important is fertilizer for our 2000 crop? What impact does it have on production levels? Data from several states shows that not fertilizing soils that need extra nutrients can decrease your yields from a few percent to over 80%. That's quite a range. How is your fertility program doing? Do you have fields or areas within fields that are capable of producing higher yields and higher income?

All of us are looking for the fat to cut this year. One of the ways we can do this is to identify fields or areas within fields that need fertilizer and those that don't. How do we find these areas? Simple - we test the soil. Yes, you say, but that costs money. Your right, but let's look at how much. Let's use a conservative estimate that for a 160 acre field, you might apply 100 lb N/A and 20 lb P_2O_5/A. At current market prices, that fertilizer may cost you something like $3300 for the field. A single soil test may cost anywhere from $10-$30, depending on how many analyses you have run. Spending $30 to figure out where best to spend $3300 just makes good sense. And the information in that soil test is good for more than one year. It also helps in the long term determine how effective our fertility program is. If soil test levels decline over time, we are underfertilizing. If they climb over time, we may be over-fertilizing, depending on the soil test level. Without soil testing, you can easily wind up putting fertilizer where it is not needed and not putting it where it is needed. This gets back to the need for careful planning - making sure that we use our precious resources efficiently.

But just having the records is not enough. They must be interpreted properly. **Table 1** shows typical characteristics associated with soil test categories. Since these can vary among labs and states, it is important to know the definitions or characteristics being used by your specific laboratory.

Table 1. Typical interpretations of soil test categories.

Category	Management Implications
Low	In most years, substantial yield loss will occur if fertilizer is not applied.
Medium	Optimum yields are dependent on annual application of rates at least equivalent to crop removal. Yields will usually be reduced if fertilize is not applied each year.
High	Many agronomists target this category as ideal. Skipping a fertilizer application in a given year will result in soil test decline but will not usually cause large yield reductions. Exceptions do occur.
Very High	Response to generally not expected except to starter fertilizer and in reduced tillage on some soils.

So how does soil testing help us stack the deck in our favor for next year? Soil test results help us understand the kinds of risks we face. It must be stated at the outset that predictions of the impacts of fertilization for any one year have considerable uncertainty associated with them because they are just one of many factors that determine fertilizer need in that year. Therefore, soil test interpretation is not black and white, but it is a necessary part of our decision process. **Figure 2** shows that generally, as soil test levels climb, the risk of not recovering fertilizer costs in the year of application increases while the risk of soil fertility being yield-limiting decreases. At intermediate soil test levels, a "gray zone" exists where management decisions are greatly influenced by how the individual wants to manage these opposing risks. Sufficiency approaches are more conservative, maintain lower soil test levels, and have a greater risk of fertility limiting yield. Build approaches usually build to and maintain a soil test level where the risk of fertility being limiting is quite low while the risk of not recovering fertilizer cost in the first year is high. Individual farmers must determine their own risk management approach. Operating capital and land tenure impact decisions.

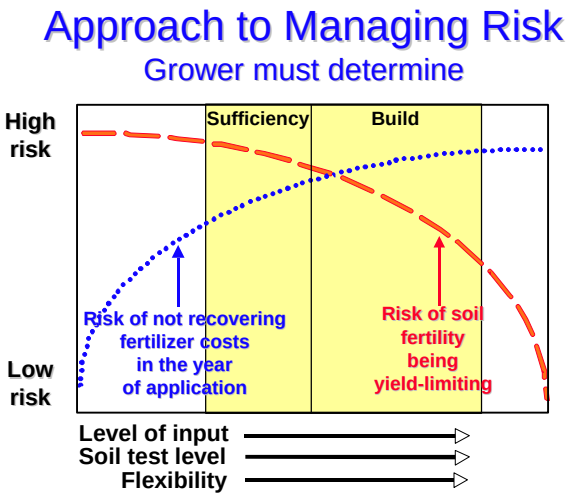

Figure 2. Risks incurred at various soil test levels (D. Leikam, personal communication).

Knowing the soil test level is just the beginning in determining fertilizer need for a given field. Recent studies show that the amount of soil test variability within a field is nearly as important as the level indicated by the composite sample. The greater the variability, the more the composite sample tends to underestimate the actual fertilizer need of the field. Fertilizer or manure history is important. If use on a field has been curtailed for several years, it is a better candidate for fertilization this year. We now know that crop varieties can differ substantially in responsiveness to nutrients and that no-till or ridge-till systems can have increased K needs compared to conventional systems. Soil physical properties can exert a large impact on fertilizer needs. Excessive water as a result of poor soil internal drainage can increase crop input needs either directly or indirectly due to the development of compaction. For example, the large yield responses to nitrogen (N) and phosphorus (P) on the west side of the 30-acre field depicted in **Figure 3** are believed to be due to drainage problems and associated compaction.

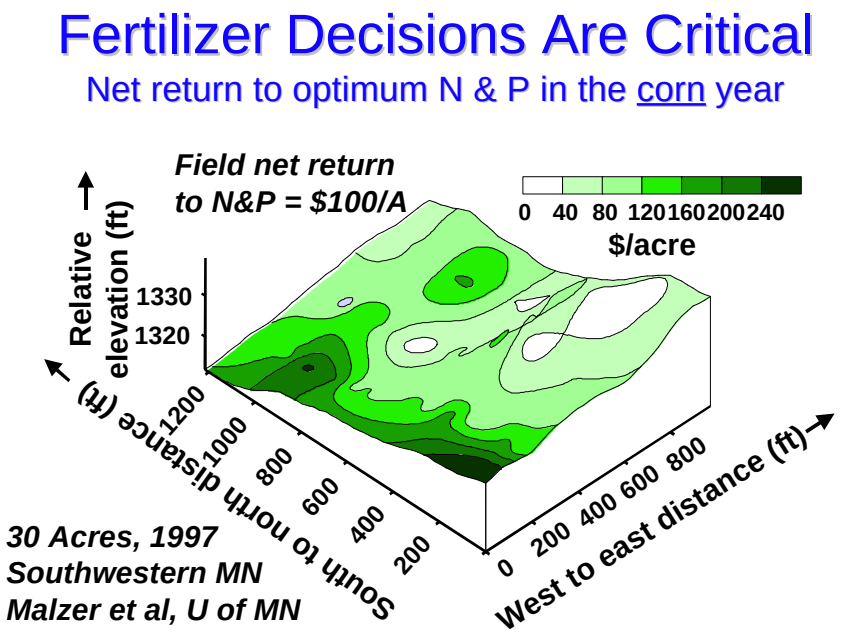

Figure 3. Net returns to optimum nitrogen and phosphorus additions. Prices used in calculating returns: $0.16/lb of N; $0.26/lb P_2O_5 amortized over 2 years ($0.13/lb P_2O_5 /yr); $2.50/bu corn; $6.00/bu soybeans. No other costs were assumed. Responses were based on replicated N and P rates applied in strips across the field (Malzer et al., 1999).

The on-going study depicted here vividly illustrates the critical role fertilizers play in today's production fields. Measured yield increases to optimum levels of N and P resulted in net returns to fertilizer ranging from $8/A to $246 per acre and showed that an average net return of $100 per acre was possible with the right nutrient management decisions. Having a better idea of the areas in the field most responsive to fertilizer can help you in tough economic times. There are good reasons to study fertilizer needs within all fields because of what's at stake … profitability.

Most fields aren't uniform. They vary in soil test levels, yields, weed pressures - you name it, they vary. To find where best to put that fertilizer dollar, we need to have a better idea of what is going on at a smaller scale. That doesn't mean that you have to immediately go to a small sampling grid. It does mean, however, that a few samples taken from a field are probably better than one.

We often don't think too much about the fertilizer needs of the soybean crop in the standard corn/soybean rotation of the Midwest. However, results from the Minnesota study (**Figure 4**) show that soybean response to P applied for the corn crop was substantial and exceeded 20 bu/A in some parts of the field.

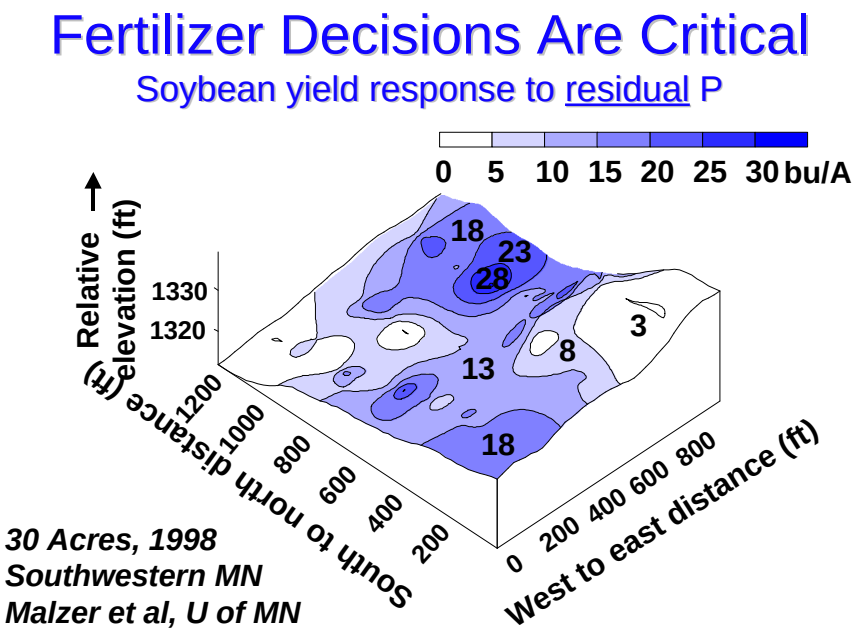

Figure 4. Soybean yield response to optimum residual phosphorus rates (Malzer et al., 1999).

Fertilizer decisions are critical and, as the return data in **Figure 5** show for the soybean crop, not only impact this year's crops, but the profitability of crops to come. Growers that fertilize every other year need to remember that the decisions they make this year can significantly impact both corn and soybean crops. These data also indicate that sound P and K management programs recognize the fertility needs of the whole rotation as well as the specific crop to be grown next year.

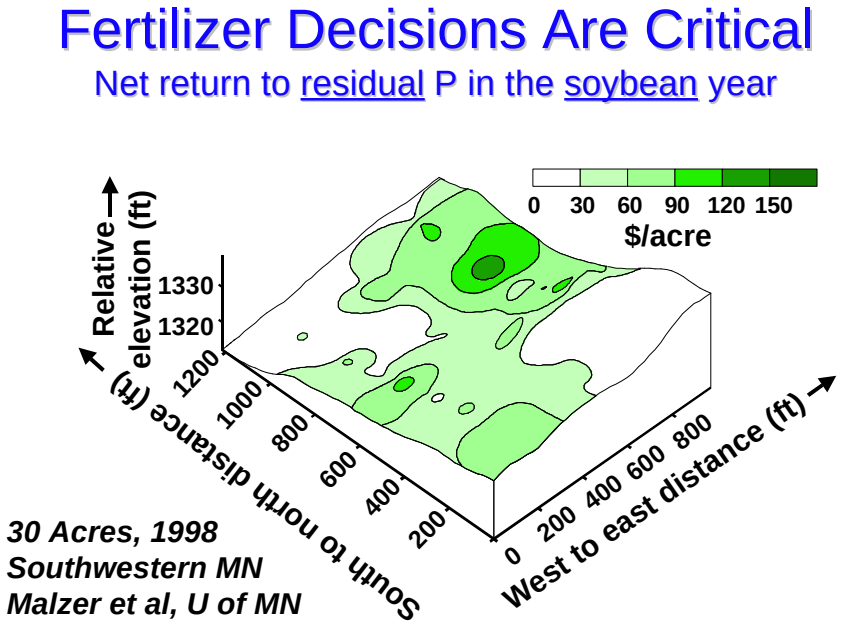

Figure 5. Net return to optimum residual phosphorus fertilization (Malzer et al., 1999).

Fall is also a good time to remember that a chain is no stronger than its weakest link. If any nutrient or other growth factor is insufficient, it can influence the effectiveness of many other growth factors. For example, in an Ohio study, inadequate K markedly impacted the response to N (**Figure 6**). With near optimum soil test K, the optimum N rate was 100 lb/A less than with the lower soil test level, and net returns to N more than doubled. Balanced nutrition, where all crop nutrient needs are met, prevents weak leaks from causing failure of the crop production chain. Balanced nutrition increases the efficiency of N use and reduces the potential for N loss to ground or surface water. At the highest K level in this study, over 3/4 of the applied N ended up in the plant at the optimum N rate of 180 lb/A (**Figure 7**).

With the intense environmental scrutiny given agriculture today, we cannot afford to let easily controlled factors, such as low K supply, reduce N efficiency and increase potential for loss. This study demonstrates that appropriate practices can produce agronomic, economic, and environmental benefits.

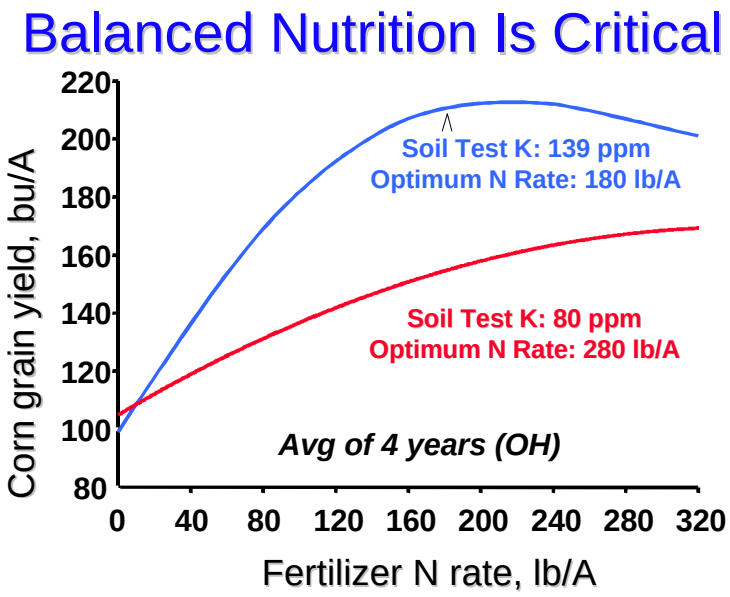

Figure 6. Influence of potassium soil test level upon grain yield response to fertilizer nitrogen (Johnson et al., 1997).

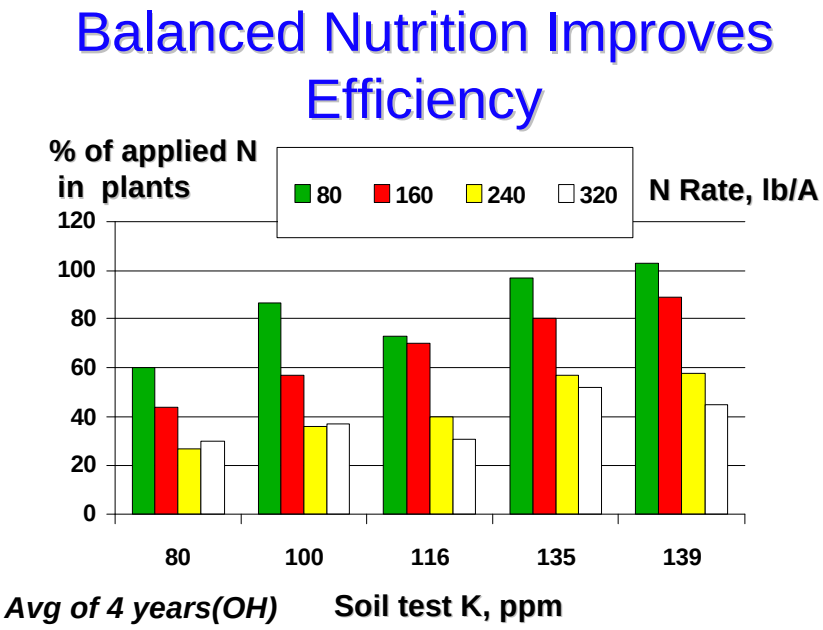

Figure 7. Influence of potassium soil test level upon nitrogen utilization by corn (Johnson et al., 1997).

Knowledge of the actual impact of market conditions on optimum fertilizer rates is particularly relevant to fertilizer decisions this fall. Yield response data can be used to illustrate the rather minor impact even large swings in crop or fertilizer prices have on optimum rates of needed fertilizer. The cause of this minimal effect is primarily the rapid decline in yield that usually occurs when rates are reduced below optimum. The tendency for fertilizer prices to be lower when crop prices are lower contributes to the buffering of optimum rates against market conditions. For example, **Table 2** shows that the optimum N rate with corn at $3.00/bu and N at $0.24/lb was 176 lb/A. With corn at $2.00/bu and N at $0.18/lb, the optimum N rate stays nearly constant at 174 lb/A.

Table 2. Impacts of corn price and fertilizer price on optimum rates (Potash & Phosphate Institute, 1999).

Fertilizer cost		Corn price, $/bu		
		2.00	2.50	3.00
	$/lb	Optimum rate, lb/A		
N	0.12	182	189	192
	0.18	174	180	184
	0.24	166	172	176
P_2O_5	0.20	40	44	47
	0.25	36	41	44
K_2O	0.09	125	135	145
	0.13	105	115	125

It's easy to lose sight of long term goals when making short term decisions driven by current market factors. It is important to remember those long term goals and why they were established in the first place. At times, the long term goal may need to be set aside temporarily, but the farmer should be aware of that detour and its consequences. For example, one of the advantages to maintaining high soil test levels is the greater flexibility possible during difficult times. However, if one taps that reservoir by skipping applications for a few consecutive years, soils may no longer test in the high range, yields will likely begin falling along with income, and as the income drops, so does the ability to rebuild levels … a downward spiral.

In tough economic times, it is important to implement basic agronomic principles. We simply don't have as much room for error. If we cut back on fertilizer in areas where it is needed, we can drastically reduce our yields – a costly mistake. This year, identifying areas that have a good chance of responding to fertilizer inputs will be critical to our success. To do this will require careful measurements and thoughtful, well-informed interpretations of our results. Proper investments, both in time and money, will make us competitive this year and in the future.

References

Johnson, J.W., T.S. Murrell, and H.F. Reetz Jr. 1997. Balanced fertility management: A key to nutrient use efficiency. Better Crops 81(2):3-5 (Available online with updates at http://www.ppi-far.org/PPIArea/periodicals/bc/index.htm).

Kastens, T., K. Olson, M. Stewart, and S. Murrell. 1999. Identifying profitable practices. Available online with updates at http://www.ppi-far.org/PPIArea/hot_topics/low_crop_prices.htm).

Malzer, G.L., D.J. Mulla, and T.S. Murrell. 1999. Getting specific with site-specific nutrient management. Site-Specific Management Guideline 23. Potash & Phosphate Institute, Norcross, GA (Available online with updates at http://www.farmresearch.com/SSMG/forward.htm).

Murrell, T.S. 1998. P and K build crop profits: high yields mean high profits. Northcentral News & Views, June 1998. Potash & Phosphate Institute, Norcross, GA (available online with updates at http://www.ppi-far.org/PPIArea/periodicals/nv/index.htm).

Potash & Phosphate Institute. 1999. Soil fertility manual. Potash & Phosphate Institute, Norcross, GA.