

FERTILIZER DECISIONS IN 2009
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Abstract

The dynamic conditions of crop production today increase the importance of measurement-based decision making rather than automatically doing what has always been done. Site-specific application of the 4R strategy of applying the right source, at the right rate, at the right time, and in the right place is an approach that can help manage risk and improve efficiency and returns. Price ratios can be a useful tool in assessing the impact of market conditions on optimum rates.

Introduction

The context of fertilizer decisions today is one of change, perhaps greater and more diverse change than most of us have ever experienced. Market volatility for both inputs and crops, a global food crisis, generally higher input costs, the global financial crisis, climate change, changes in crop genetics, anticipation of intensification of environmental policies, and advances in and adoption of sensing and application technology, enhanced efficiency fertilizers, and other advanced technologies all contribute to what Dan Frieberg has termed an “agronomic perfect storm”. One implication of this change induced perfect storm is that future management decisions may need to be more measurement based than historical. Past performance of a practice in a region may not reflect future performance due to changes in genetics, climate, economics and perhaps objectives.

Results and Discussion

A site-specific approach to efficient fertilizer management is called for following the “4R” strategy of applying the right source, at the right rate, at the right time and in the right place for the crop, field or field zone, and nutrient. The increased risk of today’s market offers greater justification for investing in determination of the 4Rs ... in precision input application, enhanced efficiency products, guidance systems, soil testing and plant analysis, soil or crop imaging and sensing, on-farm strip trials, omission plots, ramps and stamps, and other forms of decision support.

Recent market volatility has caused increased interest in determining the influence of fertilizer prices on “right rate”. A useful means of evaluating the impact of market conditions on short-term optimum fertilizer rates is through price ratios. In this approach, crop currency is used to express fertilizer costs. The lbs of cotton required to purchase a lb of fertilizer based on current or anticipated market conditions when the purchase or sale is made is determined. If the price ratio remains constant, the economic option nutrient rate remains constant. Since fertilizer and crop prices often track together, price ratios will usually be less variable than either fertilizer or crop prices. In fact, nitrogen (N), phosphorus (P), and potassium (K) to cotton price ratios have been relatively flat from the 1960s through 2000 (**Figure 1**). A price spike occurred in 2001 followed by a steep decline after which the ratios for all three nutrients have trended higher. Since April of 2008, market conditions have changed considerably. The table inserted in Figure 1 shows the range of price ratios resulting when cotton is \$0.50/lb and fertilizer costs vary from \$0.30 to \$0.75/lb. Fertilizer prices above \$0.50/lb nutrient would send the ratios off the chart to levels never before experienced.

So, the next question is what impact these increasing price ratios have on optimum fertilizer rates. Two markedly different examples are offered in **Table 1** using data from cotton experiments where multiple rates of N fertilizer had been applied generating a response curve where the impact of price ratio changes could be determined on optimum rate. These extreme increases in price ratios significantly decreased optimum rates but the largest differences were between the two sites. This illustrates the importance of employing the site-specific approach to fertilizer management described earlier where appropriate tools are applied to assess the nutrient needs of each crop in each field or field zone.

Expanding the discussion beyond N, the relatively high percent of soil samples across the Cotton Belt that require annual P or K fertilization to avoid profit loss (Fixen et al., 2006) indicate that balanced fertility remains one of the most important factors affecting fertilizer effectiveness and the performance of other inputs. When nutrient access or capital is limited some of all nutrients that are in short supply in the soil should be applied. Much of the nutrient should be applied to more responsive areas but some of the nutrient should be applied to less responsive areas as

well since most of the response occurs to the first few units. However, rate reductions due to high price ratios are justified in these less responsive areas. Rate reductions are generally not justified in highly responsive areas even with rather high price ratios.

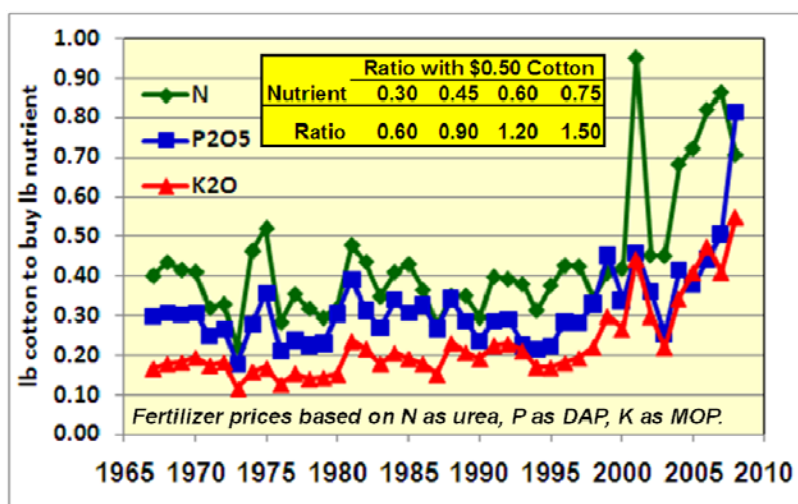


Figure 1. Cotton to fertilizer price ratios from 1967 through April of 2008 (Cotton price data source: USDA Historical Track Records; Fertilizer price data source: USDA-ERS Data Sets – U.S. Fertilizer Use and Price.)

Table 1. Effect of price ratio on optimum N rate in two cotton studies (calculated from Phillips et al., 2008).

Site	Price ratio, lb cotton to buy lb of N				
	0.6	0.8	1.0	1.2	1.4
	Optimum N, lb/A				
1	88	85	80	76	72
2	158	154	151	147	143

Site 1: Rainfed cotton on a Decatur Silty Clay Loam in Alabama.

Site 2: Irrigated cotton on a Sharkey Silty Clay in Arkansas.

Key practices of the 4R strategy include the following:

- **Right rate**
 - Use **crop/fertilizer price ratios** to consider prices, but realize they are only one of many factors influencing rate decisions
 - Assess **soil nutrient supply** – soil testing, omission plots, etc.
 - Assess **plant demand** – yield goal, sensors, etc.
 - Account for **all nutrient sources** – manure, crop credits, irrigation water, etc.
 - Consider **nutrient removal**, budgets, impact on soil resource (future costs)
 - Provide **balanced fertility**
- **Right time & source** (synchrony between supply and demand)
 - Split applications (N); Foliar application
 - Enhanced efficiency fertilizers
- **Right place**
 - Band, broadcast, fertigation, foliar, etc.
 - Limit off-field transport

Summary

In summary, be site-specific and analytical when making decisions with a focus on efficiency and consideration given to new technologies. Base decisions on measurements whenever possible. Remember that best management

practices (BMPs) ensuring right source, rate, time, and place offer a means of managing risk and improving efficiency and returns.

References

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