Managing Fertilizer Price Risk

Overview of Risk Management Strategies

Agricultural producers are subject to a wide range of risks including production risk, price risks of both outputs and inputs and risks from government policy and regulations. Risks are inherent to agricultural production and to any business operations. Managing risks involves identifying and prioritizing risks, determining your “risk appetite” and ability to absorb risk and employing strategies to reduce risk. The major strategies for managing risks are avoiding risks, reducing or sharing the risks or accepting the risk as an acceptable part of doing business. Strategies for reducing or sharing risk involve diversification, hedging, or insurance. Most of these strategies can be applied to reducing fertilizer price risk.

Diversification is the simple concept of not having all of your eggs in one basket. Having a mix of crop or livestock activities or spreading purchases or sales throughout the year are obvious examples of diversification. Hedging strategies reduce the exposure to downside risk, while sacrificing opportunities for gain. The mechanics may involve purchasing or selling contracts on the futures market or making forward purchases or sales to lock in on a price. Hedging is essentially paying someone else to take the risks inherent to price volatility. In addition, while hedging can result in lower prices if the market prices are higher than expected, it can also result in costs higher than the market, if the market falls.

Purchasing insurance is another strategy to reduce downside risk. Purchasing insurance essentially allows you to accept a sure loss that is small (you pay a premium) to avoid the possibility of a large loss in the future. Farmers can purchase crop insurance and there are many forms of business insurance available. In addition, some financial derivatives such as options, which gives the holder the right (but not the obligation) to purchase or sell something at a specified price in the future, can serve as a form of insurance.

Fertilizer Price Risk

Fertilizer accounts for a significant portion of total operating costs averaging around 30 percent for winter wheat production, 20 percent grain sorghum and up to 40 percent for intensive corn production. If fertilizer price volatility could be completely eliminated the result would be roughly two-thirds as effective as eliminating yield variability in terms of overall risk reduction. In the past, U.S. fertilizer prices have tended to move somewhat in tandem with crop prices. Because U.S. fertilizer markets are increasingly impacted by global supply and demand factors, high fertilizer prices can occur even when U.S. crop prices are relatively soft. This scenario of low crop prices coupled with high fertilizer prices would stress farm profits. Farms with higher than average fertilizer usage or a limited ability to rotate to less fertilizer-intensive crops would be particularly vulnerable.

Forward Pricing Strategies

Fertilizer price risk management strategies using futures or over the counter (OTC) derivatives are limited. Fertilizer contracts on the Chicago Mercantile Exchange were discontinued due to a lack of liquidity while transactions on the Direct Hedge Exchange, based in Switzerland, has a 5,000 ton contract size for fertilizer that is not workable for many retailers, much less producers. OTC strategies require relationships with a brokerage firm or OTC derivatve provider and the expertise to manage the required transactions. Basis risk, the difference between the closing future market contract price and the farm level price for fertilizer, can also be substantial. In the absence of futures market tools, opportunities for locking in fertilizer prices involve forward contracting or pre-purchasing fertilizer with a local fertilizer dealer.

Historically, fertilizer dealers have attempted to forecast producer demand and have purchased and inventoried fertilizer with no off-setting purchase commitment from the producer. Because much of the U.S. fertilizer supply is imported, retailers must buy six to nine months in advance with...
no opportunity to hedge. This exposes the dealer to the risk that they will inventory product only to have prices fall during the application season and be forced to drop prices to meet those of competing suppliers. In recent years, price swings within the year have been much higher than dealer handling margins. Many dealers examined their risk exposure and increased efforts to offer producers forward contracting or pre-purchasing opportunities. Opportunities for forward pricing obviously vary across dealers and product form.

Because forward contract and pre-purchase opportunities vary among fertilizer dealers it is difficult to directly research their effectiveness as a risk reduction tool. However, forward contract opportunities usually reflect the dealer’s opportunity to purchase and warehouse fertilizer prior to the application season. Under this assumption, the effectiveness of forward contracting can be inferred from cash purchase and storage strategies. Research at Oklahoma State University examined optimal fertilizer purchasing and warehousing strategies for fertilizer dealers. This research which was based on 17 years of fertilizer weekly price data (adjusted for storage and interest) at central Oklahoma fertilizer terminals, determined the impact of price and year-to-year price variability of purchasing and warehousing fertilizer at specified dates during the year.

The research examined the optimal purchase dates (dates minimizing year-to-year price variation) relative to purchases during the peak application seasons for three types of fertilizer urea, UAN (urea ammonium nitrate) and DAP (Diammonium phosphate). The application periods were split between early February and early August. In simple terms, the research examined the effectiveness of taking advantage of seasonal trends to reduce price risk.

Table 1 provides a summary of the results. Spring was the least favorable period to purchase fertilizer with the most favorable times (depending on the specific fertilizer product) being either mid-summer or late fall. Purchasing outside of the peak application periods had a moderate impact on average price (3 percent to 4 percent) and a substantial impact (17 percent to 54 percent) on the year-to-year variation in prices. The intuition behind these results is straightforward. Fertilizer prices, like crop prices, respond to supply and demand conditions. However, because of the lengthy supply chain, fertilizer availability and price during peak application periods is a function of the dealer’s accuracy in forecasting and pre-positioning product. More extreme price movements occur during these time periods.

**Table 1. Optimal Cash Purchase Strategies for Fertilizer in Central Oklahoma.**

<table>
<thead>
<tr>
<th>Product</th>
<th>Optimal Purchase Date</th>
<th>Worst Purchase Date</th>
<th>Average Price Reduction</th>
<th>Risk Reduction</th>
<th>Price Difference Best to Worst</th>
<th>Risk Difference Best to Worst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>1st week in July</td>
<td>4th week in March</td>
<td>5%</td>
<td>17%</td>
<td>7%</td>
<td>55%</td>
</tr>
<tr>
<td>UAN</td>
<td>1st week of November</td>
<td>2nd week in July</td>
<td>7%</td>
<td>23%</td>
<td>14%</td>
<td>55%</td>
</tr>
<tr>
<td>DAP</td>
<td>2nd week in April</td>
<td>3rd week in March</td>
<td>4%</td>
<td>57%</td>
<td>16%</td>
<td>65%</td>
</tr>
</tbody>
</table>

This cash market data suggests that strategies of routinely lock-
timing (pre-plant versus top dress) and with forward pricing strategies. Opportunities to forward price often vary across product form.

Fertilizer applications can also be shifted within the production year (pre-plant versus top dress) and to some extent between years. Applying the entire nitrogen needs of a crop at the time of planting may allow a producer to use a less expensive form of fertilizer such as anhydrous ammonia. Disadvantage of this method include the inability to gauge the crop potential at the time of application and the possibility of nitrogen loss. Split applications of nitrogen increase nitrogen use efficiency and allow the producer to adjust application to reflect growth and yield potential. Splitting fertilizer applications between pre-plant and top-dress also decreases price risk since purchases are diversified across the market year.

In many situations producers also have the potential to shift fertilizer application between production years. The science behind fertilizer recommendations is a complex subject, but basically involves predictions of obtaining a response to additional fertilizer and the economically optimal rate given the predicted response using prevailing prices for fertilizer and crop. Philosophies about soil test recommendations vary. Some focus on minimizing the possibility of yield loss from under fertilization in the short run, while others consider the additional amounts needed to increase or maintain the soil at optimal levels over time. Most represent a balance of these approaches. These philosophies also vary across nutrients. Soils can generally be managed for maintenance, buildup or draw down of P and K while nitrogen must be more closely balanced with current crop needs.

While maintaining soil fertilizer at the optimal levels is, in general, a good practice, fertilizer rates on soils indicated to have moderate to optimal levels of nutrients can generally be decreased with a low probability of a yield loss. This is because the recommended rate was designed to maintain the soil test value. Fertilizing below the recommended rate may be a valid strategy when the fertilizer/grain price ratio is higher than usual, when land tenure is uncertain or when fertilizer prices appear to be a function of short-run supply chain issues. The fertilizer reduction is temporary since higher application rates will be needed in the future. During periods of rapidly rising fertilizer prices it can be advisable to work with a crop consultant to determine how prices have impacted the optimal level and the likelihood that rates could be temporarily reduced without a yield impact.

Summary

Structural changes in the U.S. fertilizer supply chain have increased the opportunity for price volatility. Strategies for managing fertilizer price risk include forward contracting or pre-pricing with a local fertilizer dealer, diversifying across less fertilizer intensive crops, using alternative product forms and shifting application within or between crop years.
The Oklahoma Cooperative Extension Service

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The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

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• The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
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