Integrating Crop Insurance and Marketing Decisions

Producers often hear Extension economists and other market advisors talk about the importance of a marketing plan. It is a good idea to think about how a crop will be marketed before the crop is actually produced.

When most people think about a marketing plan, they think first about when and how to price the crop. Too often, the central goal of a producer's marketing plan is to pick the highest price. However, the effective management of price risk should be the central goal of producer marketing plans. Common price risk management tools such as forward contracts, futures contracts, and/or options on futures contracts generally figure prominently in these plans. This is entirely appropriate, as risk management strategies employing these tools have proven effective for countless producers over many years.

It is possible, however, that producers may not always give enough consideration to how their choice of crop insurance products fits into their marketing plan. Traditional yield insurance, such as the Yield Protection (YP) insurance plan, is rightly viewed as a means of dealing with the risk of production losses. The impact of a YP insurance plan on a producer's marketing plan, while potentially important, is fairly straightforward. With the widespread availability of insurance plans like Revenue Protection (RP) and Revenue Protection with Harvest Price Exclusion (RP–HPE), which include some price risk as well as production risk protection, the question of how best to integrate such products with the marketing plan becomes more complex.

Crop Yield Insurance

The YP insurance plan is geared solely toward compensating producers for production losses. The characteristics of this type of insurance protection can have an important influence on a producer's marketing decisions. To illustrate why this is so, consider the example of a producer who forward contracts a portion of his expected production.

Suppose, for example, that a Mississippi cotton producer—anticipating a 1,000-pound yield on 500 acres of cotton—forward contracts to sell 300,000 pounds of that production (600 pounds per acre that equals 60 percent of total expected production) for $0.80 per pound. Now suppose that, at harvest time, an extended period of unusually wet weather occurs in this producer's area, devastating the cotton crop. Instead of the expected 1,000-pound yield, the producer realizes a 500-pound yield (250,000 pounds on 500 acres). In this case, the producer does not have enough cotton to deliver against the forward contract. He must pay market price for the additional 50,000 pounds of cotton necessary to fulfill the forward contract requirements. If, for example, at harvest time the market price has risen to $0.85 per pound, the producer must pay $42,500 to make up for the shortfall in contracted production. This 300,000-pound forward contract would result in realized revenue of $197,500 compared with the expected revenue of $240,000 when the contract was made. Due to the production shortfall, the average price for the 300,000-pound contract is $0.6583 per pound versus the expected price of $0.80 per pound.

This example illustrates the adverse effect that production losses can have on the outcome of a forward contract arrangement. The potential for such losses to occur may act as an impediment to the use of forward pricing by producers. The availability of YP insurance can reduce the adverse financial impact of such production losses and make contracting a more attractive marketing alternative.

Consider how the outcome of the situation described above would be different for a producer with a YP policy at the 65/100 level (insuring 65 percent of the producer's APH yield and 100 percent of the price established by Risk Management Agency). If the established cotton price insured with the YP policy were $0.78 per pound, the producer would receive the following indemnity:

1) (100% × $0.78) × ((65% × 1,000) – 500) = $117.00/acre,

given that 650 pounds per acre were insured (65% × 1,000) but only 500 pounds were harvested. This equates to a total indemnity of $58,500 on 500 acres. With the indemnity provided by the YP coverage, the producer is able to cover some or all of the cost associated with

forward pricing when experiencing a production shortfall. In this case, prorating 60 percent of the total indemnity (share of expected production contracted) would result in total revenue of $232,600 (cash sales of $197,500 plus prorated indemnity of $35,100), or a realized net price of $0.775 per pound on the 300,000-pound contract.

The availability of insurance provides a means of offsetting at least a portion of the value of production losses and can make forward pricing a less risky prospect. It is also important to note that this observation holds true for other methods of forward pricing besides just cash forward contracting. A producer hedging with futures or options is also at risk of realizing lower than expected returns due to production risk.

Referring to the previous example, suppose that instead of entering into a forward contact, the producer took a slightly more aggressive marketing approach and sold seven Intercontinental Exchange (ICE) December cotton futures contracts at $0.845 per pound, thereby hedging 70 percent of expected production. Adjusted for an expected basis[1] of $0.015 per pound (MSU, 2013), the expected cash price would be $0.83 per pound at harvest. Again, if actual production came in at 500 pounds per acre on 500 acres, the outcome of the forward pricing strategy would be adversely affected by the production losses.

This is best illustrated by calculating the net price received by the producer considering income and losses in both futures and cash markets, assuming the December cotton futures were at $0.895 per pound at harvest. At harvest, the producer sells 250,000 pounds of cotton for $0.895 per pound in the cash market, generating total cash revenue of $212,500. In the futures market, the producer buys back the seven futures contracts (350,000 pounds) at a loss of $0.05 ($0.845–$0.895 = -$0.05) per pound totaling -$17,500. The net cash revenue in this case is $220,000 [($0.89–$0.015) × 250,000 pounds], which then must be adjusted by the gain/loss on the futures hedge ($220,000–$17,500) that results in a net revenue of $204,500. The realized price is $0.584[2] per pound on the 350,000-pound hedged position compared with the expected price of $0.83 per pound. Adjusting the return on the hedged position by 70 percent of the total indemnity would result in a realized price of $0.701 per pound on the 350,000-pound hedged position.

The important thing to note here is that, because of the production loss, the producer ends up with a larger position in the futures market than in the cash market; therefore, the losses on the futures position are not entirely offset by gains in the value of cotton in the cash market. Compared to the previous example, the indemnity from a YP 65/100 policy offsets less of the effect of the production loss.

The general conclusion to be drawn from the preceding examples is that, by mitigating the impact of production losses, yield insurance may allow producers to be more aggressive in forward pricing their crop. This is because the costs associated with a production shortfall will be offset, at least to some degree, by an indemnity from the crop insurance.

Revenue Insurance

Revenue insurance products protect not only against variation in yield but also against changes in market prices. With these types of crop insurance policies, a level of revenue is guaranteed instead of a level of yield. The most popular revenue insurance plan for cotton is Revenue Protection (RP), while participation in Revenue Protection with Harvest Price Exclusion (RP-HPE) is much lower.

With RP coverage, a producer selects a revenue coverage level from 50 percent to 85 percent. The amount of revenue guaranteed under the policy is determined as follows:

2) APH yield × coverage level × higher of base price or harvest price.

Base price is determined before planting as the average daily closing price of the December cotton contract on the ICE from January 15 through February 14. Harvest price is calculated as the average daily closing price of the December cotton contract on the ICE during the month of November. The producer receives an indemnity when actual yield times harvest price is less than the revenue guarantee as calculated in equation 2. RP-HPE functions very much like an RP policy. With RP-HPE, the level of coverage is fixed when the policy is purchased. The revenue guarantee does not increase if prices increase during the growing season, but the premium costs are lower.

[1]Basis is the difference between the local cash market price and the futures price. The basis in this example is computed by subtracting the 2001–2013 average December futures contract month closings in October from the daily spot cash prices reported in October. Sources: Agricultural Marketing Service, Market News, USDA.

[2]The $0.584 includes the total hedged production level of 350,000 pounds. The net revenue of $204,500 divided by the actual production of 250,000 pounds generates a realized cash price of $0.818 per pound.

The main thing to note about revenue policies is that they include protection not only against production losses but also, to some degree, against falling prices. If revenue declines below the guaranteed level, the producer will receive an indemnity—whether the decline in revenue is due to production losses, market losses, or some combination of the two. Furthermore, the USDA subsidizes this price risk protection.

To illustrate, let's return to the example of the producer raising 500 acres of cotton with an APH of 1,000 pounds per acre. If this producer purchases an RP policy with 75 percent coverage, the producer's revenue guarantee (on a per-acre basis) will be

3) (1,000 × $0.78) × 0.75 = $585.

Suppose that the producer experiences significant drought-related losses so that actual production is only 500 pounds per acre. At the same time, suppose that the harvest price of cotton increases to $0.89 per pound. With this increase in harvest price, the producer's final guarantee under the terms of the RP coverage is

4) (1,000 × $0.89) × 0.75 = $667.50/acre.

The producer will receive an indemnity, which is calculated as follows:

5) $667.50 – (500 × $0.89) = $222.50/acre.

With RP-HPE, the indemnity received would be:

6) $585 – (500 × 0.78) = $195.00/acre.

Revenue Insurance and Marketing Decisions

The relevant marketing question for a producer who has purchased revenue insurance is how much, if any, additional price protection is needed. We can define different levels of price protection using hedge ratios. A hedge ratio is a number indicating what percentage of a producer's expected production should be hedged with a futures market position (using either futures contracts or options on futures contracts). The optimal hedge ratio reveals the amount of hedging that a decision-maker would prefer, considering not only the level of returns available but also the variability of those returns.

A study investigating the interaction between crop insurance design and futures market hedging provides some useful insight for producers in integrating crop insurance and marketing decisions. This research indicates that a higher level of hedging is typically optimal with yield insurance than with any type of revenue insurance product. This makes sense because yield insurance provides no price protection at all. Thus, whatever the desired level of price protection, it must be obtained from some other source.

For revenue insurance products, the optimal hedge ratio for products with a fixed coverage level—such as RP-HPE—is considerably lower than for revenue insurance products that allow the revenue guarantee to increase—such as RP. Also, as the selected coverage level increases, the optimal hedge ratio for a revenue product with a fixed coverage level decreases. By contrast, for a product with upside price protection like RP, the optimal hedge ratio increases at higher coverage levels.

A study of a representative Mississippi Delta cotton farm scenario suggests the following post-stand establishment hedge ratio levels:

- 40–50 percent hedge ratio with low RP crop insurance coverage (50–70 percent)
- 50–60 percent hedge ratio with higher RP crop insurance coverage (75–85 percent)
- With YP or RP-HPE, increase the hedge ratio 10 percent
- With STAX, lower the hedge ratio 10–15 percent

Note that farms may vary from these results, and you can typically assume hedge ratios will increase as the crop yield becomes more certain during the growing season.

Marketing Pools and the Choice of Insurance Product

Marketing pools are a very popular way for producers to market cotton. Typically, producers will commit their cotton (or a portion of their cotton) to a pool before planting season. Most producers who send cotton to the pool let the pool handle all of the marketing. Marketing managers for the pool are able to make use of all available marketing tools. Given that the pricing—and price risk management—on cotton placed in the pool is being handled professionally by a third party, the producer probably has less need for dealing with price risk using an insurance product. For this reason, for cotton going into a pool, yield insurance would seem to make more sense than revenue insurance. As the work mentioned above shows, however, using revenue insurance with upside price potential does not tend to greatly affect the optimal amount of hedging compared to yield insurance, so these products may also be appropriate on cotton going into a pool. Revenue products with a fixed revenue guarantee make less sense for cotton going into a pool since the price protection afforded by the insurance is likely redundant given the pricing and price risk management activities being carried out by the pool managers.

Conclusions

Producers need to consider the interrelationship between crop insurance and marketing decisions. Specific marketing plans may differ in terms of the tools used and in terms of the timing of pricing decisions. Crop insurance should be considered an element of an overall marketing plan. In this context, it is important that the characteristics of a given crop insurance product be compatible with the other elements of the marketing plan.

Cotton Incorporated funded the research for this project and publication.

Cotton Incorporated

Publication 2917 (POD-09-18)

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Produced by Agricultural Communications.

Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. GARY B. JACKSON, Director