RISK MANAGEMENT ISSUES FOR NEW COTTON PRODUCERS: A TEXAS EXAMPLE Jason L. Johnson Texas AgriLife Extension Stephenville, TX Rob J. Hogan Texas AgriLife Extension Fort Stockton, TX

Abstract

High cotton prices essentially limit or remove the price safety net historically provided through the Farm Bill. Through a well-designed synthesis of crop insurance policy selection and pre-harvest marketing strategies, a better safety net can readily be created by traditional cotton producers (in traditional cotton production areas). However, many of these strategies commit a specified level of production - an issue of uncertainty for dryland producers where cotton production is a relatively new enterprise. In addition, the insured level of production which can safely be marketed is limited by guarantees provided through the various crop insurance products. Many new cotton producers find themselves operating with a safety net that is uncertain (if not insufficient). Without an established average production history (APH), the variable T-yield procedure used for crop insurance provides insufficient coverage to offer substantive price and/or production risk protection to cotton producers in new or intermittent cotton production counties.

This economic analysis focuses on the situation faced by new cotton producers in several counties in west central Texas. In order for cotton production to thrive in this area (and others facing a similar predicament), the price and production risk concerns must be addressed. This economic investigation examines the relative merits of the crop insurance products and marketing strategies for producers interested in adding cotton as a new productive enterprise. It also examines the strategies that producers and landowners have used in this region during the transition period needed to establish a viable crop production history.

Introduction

In 2010, Texas cotton producers insured 5.4 million acres (USDA-RMA, 2011a). In 2011, Texas ranked second only to Kansas in the number of crop insurance policies sold (185,279 policies) and accounted for about 9 percent of all policies sold in the United States. Texas cotton producers, in particular, accounted for over 48 percent of all the cotton insurance policies sold in the United States, and approximately 86% of all indemnities paid to U.S. cotton producers went to Texas cotton farmers in 2011 (USDA-RMA, 2011b). These figures indicate that Texas cotton producers rely heavily on crop insurance as a risk management tool.

The presence of relatively high cotton prices and prospects for profitable cotton production have resulted in Texas cotton production expanding into non-traditional production areas. One such area is the contiguous Texas region comprised of Brown, Callahan, Comanche, Erath and Eastland counties. This area is located between the Southern Rolling Plains and Blackland regions of central Texas; two areas that have traditionally produced large acreages of cotton. Agricultural production in the five counties which comprise the study area have historically been devoted to beef cattle, dairy cattle, and forage hay production. USDA Farm Service Agency certified cotton acreage in these counties increased from 530.7 acres in 2009 to 15,863.1 acres in 2011 (USDA-FSA, 2011). Approximately 23 percent of this acreage was declared as irrigated or having the potential to support irrigated cropping activity.

The establishment of cotton production in a new region with new cotton producers brings several challenges associated with risk management. With no historical yield history, new producers must transition into cotton production. Further, in non-traditional production areas, well-established county level yield data is also difficult to determine. This region provides a case study for the challenges facing a new cotton production region. For 2011, each of these counties was assigned transition yields (T-yields) of 277 pounds of lint for both irrigated and dryland production acre.

The purpose of this study is to investigate the considerations and tradeoffs involved in managing risk while transitioning into cotton production. This basic attitude toward risk is known as a risk preference and is unique to each individual producer. Many things, including the financial position of the producer and exposure to other risks,

may influence a person's risk preferences. However, optimal risk management strategies will logically be determined in large part by the rules governing production risk and price risk management alternatives. The alternatives available through crop insurance contain several distinctly different considerations when applied to a new crop in a new production area.

Much of the research conducted on the crop insurance has examined participation rates and factors influencing changes in the level of participation (Knight and Coble 1997; Coble, et al. 1997; Goodwin and Kastens 1993). More recent studies have analyzed choices among crop insurance products and coverage levels (Makki and Somwaru 2001; Changnon 2002; Barry, et al. 2002; Claassen, Lubowski and Roberts 2005; Babcock and Hart 2005; Shaik, Coble and Knight 2005). Additional areas of research inquiry regarding crop insurance have addressed vulnerabilities for potential fraud or abuse (Rejesus and Lovell 2003); modified producer behavior with crop insurance participation (Just, et al. 1999; Roberts, et al. 2007;) and the producer welfare benefits of yield guarantees (Adhikari, et al. 2010).

Risk Management Tools Offered Through Crop Insurance

Starting in the fall of 2010, RMA combined Actual Production History (APH), Income Protection (IP), Revenue Assurance (RA) and Crop Revenue Coverage (CRC) into a single Common Crop Insurance Policy (CCIP). CCIP provides three types of coverages that include Yield Protection (YP), Revenue Protection (RP), and Revenue Protection with the Harvest Price Exclusion (RP-HPE). The yield protection under CCIP is the same in all three contracts, YP, RP, and RP-HPE. Most of the CCIP premium pays for the yield protection share of the contract. Because the yield guarantees are the same, then the harvest price and revenue endorsements cover he price risk to create revenue products. The harvest price endorsement is a yield adjusted Asian call option and the revenue endorsement is a yield adjusted Asian put option. In short, the price that is used to value insured cotton is based on the average of futures prices at defined periods of the year. The three product choices vary in cost as they provide differing levels of protection.

Yield Protection (YP) provides protection against a loss in yield due to unavoidable, naturally occurring events. YP guarantees a production yield based on the individual producer's APH. A price for YP is established according to the crop's applicable commodity board of trade/exchange as defined in the Commodity Exchange Price Provisions (CEPP). The projected price is used to determine the yield protection guarantee, premium, any replant payment or prevented planting payment, and to value the production to count. An indemnity is due when the value of the production to count is less than the yield protection guarantee.

Revenue Protection (RP) provides protection against a loss of revenue caused by price increase or decrease, low yields or a combination of both. This coverage guarantees an amount based on the individual producer's APH and the greater of the projected price or harvest price. Both the projected price and harvest price are established according to the crop's applicable commodity board of trade/exchange as defined in the CEPP. While the revenue protection guarantee may increase, the premium will not. The projected price is used to calculate the premium and replant payment or prevented planting payment. An indemnity is due when the calculated revenue (production to count multiplied by the greater of projected price or harvest price) is less than the revenue protection guarantee for the crop acreage.

Revenue Protection with the Harvest Price Exclusion (RP-HPE) is similar to RP, however the RP-HPE coverage provides protection against loss of revenue caused by price decrease, low yields or a combination of both. Unlike RP, the revenue protection guarantee for RP-HPE is based on the projected price only and does not increase based on a harvest price. An indemnity is due when the calculated revenue (production to count multiplied by the projected price) is less than the revenue protection guarantee for the crop acreage.

A Group Risk Plan (GRP) and Group Risk Income Protection (GRIP) plan are also available, but rarely chosen. These policies provide coverage based on the experience of the county rather than the individual farm. Since the plan is based on the county yields (and revenue in the case of GRIP), the insured may have a loss in revenue on their farm and not receive payment under these policies. As a consequence, these policies are only suggested for farms with an exceptionally strong financial position.

Actual Production History and Transitional Yields

Actual production history (APH) refers to a producer's historic yields. APH is used to determine the level of coverage that a producer will be able to purchase. APH can be established using the simple average of four to ten consecutive years of yield information. Years prior to any missing yield observations cannot be considered in establishing APH unless there is no yield information because the crop was not planted in a given year.

If a producer does not have yield data for four years because of missing production records, transition yields (Tyields) can be used to establish an APH for insurance purposes. Each county has a T-yield that is based on historical average county yields. A producer who does not have yield data will be assigned some fraction of the county Tyield. The amount of the T-yield assigned depends on the amount of yield data that is available for the unit. If the producer has no yield data, the assigned yield will be 65 percent of the county T-yield for all four missing years. If the producer has three years of data, 100 percent of the county T-yield will be assigned for the missing year in calculating APH. Exceptions are made for new farmers or for a farmer who has never planted the crop to be insured. They are permitted to use 100 percent of the T-yield in establishing their APH yield average.

Given the options available to new cotton producers, they face the decision about what coverage levels and products to select in order to build an effective risk management program. Obviously, selecting a coverage level involves weighing a tradeoff between a higher level of protection and a higher total premium. Additionally, the decision may be influenced by the portion of the premium that is subsidized. The higher the coverage level, the lower the amount that is subsidized by USDA. Since premiums are designed to be actuarially fair, the higher indemnity payments associated with higher coverage levels should be just about completely offset by the higher premiums that must be paid. The decision of what coverage level to select thus comes down mostly to an individual producer's risk tolerance, and the coverage level that provides an acceptable level of protection relative to their expected cost of production.

Methods

As available crop insurance options have increased, selecting the appropriate coverage has become a more complicated process. The prevalence of crop insurance participation and the existence of multiple selection criteria also make understanding participant decisions more difficult. This study relies on a historical comparison of crop insurance product selections to identify those choices made by traditional established cotton producers and those producers in the new production area defined as Brown, Callahan, Comanche, Eastland, and Erath counties.

This comparison reviews the crop insurance product selections for the period 2007 through 2011. Although crop insurance product offerings were changed during this period, the comparison between yield protection (only) and combined price and yield protection products remains relevant. This study period also provides a contrast in the cotton price environment with 2007 through 2009 largely characterized by a cotton price that fluctuated around loan rate levels, while 2010 and 2011 provided cotton prices substantially above loan rate levels. Producer risk management response to this phenomenon is also insightful.

Data for this comparison were obtained from detailed information included in the USDA-RMA's Summary of Business Application. This application was run to identify the crop insurance policy selections for all Texas cotton producers and for a subset that included cotton producers in the five county study area for 2007 though 2011.

Results

Table 1 reports the cotton insurance policy types selected by all producers in Texas as well as a breakout of the selections chosen by producers in the five county study area for 2007 through 2010. In addition, loss ratios (indemnity payments/premiums) are reported to indicate the varying degree of indemnity payment success achieved with the alternative policy types in a given year.

During this period all Texas producers displayed a strong tendency to select the combined production and price risk management products offered through Crop Revenue Coverage (CRC) over the yield only protection offered with APH coverage. The lone exception was 2009, a year in which cotton prices during the crop insurance selection period hovered around loan rate levels. Presumably, producers with accurate APH values decided that the price risk component of cotton insurance was not worth the additional premium.

For producers in the study area, a continual migration from the yield only APH protection towards the combined yield and price protection coverage. This likely reflects two developments. Initially, new producers in this area are assigned the relatively low T-yield value for APH coverage which carries with it a relatively low level of protection regardless of the crop insurance product chosen. The data suggests that producers minimize their expense on crop insurance until the effects of their production get averaged into their APH and crop insurance offers a more effective safety net. Eventually, the yield and price protection products become more attractive toward providing a revenue safety net, especially if coverage permits the producer's cost of production to be largely protected.

Based on this data and the loss ratios by year, there is no trend to suggest that produces in the study area systematically benefitted from crop insurance differently than the broader population of all Texas producers. Any differences between groups can be explained solely by their differential selection between the APH and CRC policy types.

			2008		200	9	2010		
Texas	Premium	Loss	Premium	Loss	Premium	Loss	Premium	Loss	
Policy Type	Dollars	Ratio	Dollars	Ratio	Dollars	Ratio	Dollars	Ratio	
APH	17.02%	0.22	12.79%	1.56	79.02%	1.59	11.54%	0.16	
CRC	82.48%	0.28	87.02%	1.57	20.86%	0.85	88.43%	0.28	
GRP/GRIP	0.50%	0.00	0.19%	1.57	0.12%	0.93	0.03%	0.00	
Total		0.27		1.57		1.44		0.27	
			2008		2009		2010		
Study Area	Premium	Loss	Premium	Loss	Premium	Loss	Premium	Loss	
Policy Type	Dollars	Ratio	Dollars	Ratio	Dollars	Ratio	Dollars	Ratio	
APH	100.00%	0.46	57.67%	0.61	26.59%	0.00	9.14%	0.96	
CRC	0.00%	0.00	42.33%	1.38	73.41%	2.77	90.86%	0.04	
Total		0.46		0.93		2.04		0.12	

Table 1. Cotton insurance	policy selection	n for Texas and f	five county study a	rea, 2007-2010.
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Table 2 presents the cotton insurance policy types selected by all producers in Texas as well as a breakout of the selections chosen by producers in the five county study area for 2011. The loss ratio metric reported is preliminary (as of December 2011) since additional claims may to be added as the production season concludes. This data suggests that differences in crop insurance policy selection between all Texas producers and those in the study area continue to converge. The historically high and volatile prices of cotton, especially during the insurance selection period, provided sufficient incentive for most producers to address revenue risk (combined yield and price risks) with the RP products.

Table 2.	Cotton	insurance	policy	selection	for	Texas and	five	countv	study	v area.	2011.	
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Texas Policy Type	Premium Dollars	Preliminary Loss Ratio		
YP	13.63%	1.90		
RPHPE	0.80%	1.58		
RP	85.52%	2.14		
GRIP	0.05%	0.00		
Total		2.10		
Study Area Policy Type	Premium Dollars	Preliminary Loss Ratio		
YP	7.30%	2.11		
RP	92.70%	1.15		
Total		1.22		

Table 3 presents the cotton insurance policies selected, coverage guarantees, premium schedules, enrollment selection, and preliminary loss ratios for the five county study area in 2011. For 2011 cotton, the "projected price" for insured cotton for the counties in the study area was \$1.23 per pound. Per acreage guarantees provided with RP have a + symbol to indicate that the reported guarantees are minimum levels and were subject to increases if harvest prices exceeded the projected price. The differences in costs between the YP and RP products reflects the premium for the yield adjusted Asian call option associate with the harvest price option.

Detailed data from 2011 enrollment by cotton producers in the study period shows continued migration into the combined yield and price protection products. The effective ratio shows the impact of the federal subsidy reduction as higher levels of protection were selected. The historically high prices and volatility resulted in some very high insurance premiums. Part of this is simply the higher value of cotton being insured. For revenue products, the higher volatility also greatly increased the premium for these products, however the high projected values of the crop, combined with high input prices provided sufficient justification for selecting the higher levels of protection.

Study Area Policy Selection	Per Acre Coverage Guarantee	Per Acre Premium	Effective Ratio	Per Acre Effective Guarantee	Enrollment Premium Dollars	Preliminary Loss Ratio
YP 50	\$170.97	\$7.07	4.1%	\$163.90	3.27%	2.14
YP 65	\$221.40	\$13.45	6.1%	\$207.95	4.03%	2.08
RP 50	\$170.97+	\$9.24 \$11.18	5.4%	\$161.73* \$175.78*	12.36%	1.00
RP 33	\$180.90+	\$11.18 \$12.74	Katio\$1/3	\$1/3./8 [*]	14.7870	0.04
KP 60	\$204.18+	\$13.74	0./%	\$190.44*	45./5%	1.03
RP 65	\$221.40+	\$16.61	7.5%	\$204.79*	4.76%	2.37
RP 70	\$238.62+	\$20.66	8.7%	\$217.94*	17.04%	0.15
Total					100.00%	1.22

 Table 3. Cotton insurance policy selection, insurance premiums, per acre guarantees, and enrollment selection for five county study area, 2011.

Summary

Crop insurance represents an important risk management tool for cotton producers. However, the decision regarding what type of crop insurance policy and what level of coverage to purchase can be quite complex. It is important for producers to carefully evaluate their coverage needs both in terms of yield protection and price protection. The price protection component available through crop insurance can be replaced with marketing tools such as forward contracting, selling at harvest, marketing loan programs, use of marketing pools, and/or use of futures and options hedging strategies. Many of these strategies require a commitment of a specified level of production which might be less daunting to producers with a documented history of production. However, for new producers many of these tools become complicating forces of risk, relying on an uncertain level of production that is based on intentions lacking a track record of production history.

Because risk tolerance is an individual attribute, there are very few universal truths about crop insurance selection. In fact, with the correct level of hedging, a producer can end up equally well off with any type of insurance product. This comparison does highlight a couple of responses that seem to define a transition path for new cotton producers in new production regions. Initially, the T-yields assigned to new cotton producers tend to support the selection of the yield protection alternative as a cheaper means of establishing APH over time. As APH increases and coverage guarantees from insurance become more viable, producers in this study showed a tendency to migrate toward higher coverage levels and revenue products. For producers possessing the ability to irrigate cotton in a region where there was no difference in the initial T-yield assignments, yield protection products make more sense until more appropriate APH levels can be proven. Even during this transition process, producers have displayed the preference to purchase high levels of insurance when the coverage guarantee provided sufficient levels to cover their cost of production. The more recent cotton production environments of 2010 and 2011 have resulted in a widespread adoption of the revenue coverage insurance products by all producers. This likely reflects the one-stop shop approach to dealing with historically high prices with unprecedented volatility.

This evaluation also identified some issues that are applicable for all cotton producers - new or established. The vield protection products guarantee a coverage level with approved cotton production valued at projected price levels with only yield loss triggering an indemnity payment. If this projected price at the time of enrollment is around the marketing loan rate, then the downside price protection provided by the revenue products is redundant and could reasonably be ignored. In addition, marketing practices that relied heavily on marketing pools might also favor selection of the yield protection products as price protection could be assumed to be provided through a properly managed marketing pool. The revenue protection with the harvest price exclusion is equivalent to yield protection with an adjusted Asian put option. If projected cotton prices are sufficiently high at enrollment and the producer is willing to secure higher prices (if they occur) with other marketing practices, then this product makes sense. Finally, yield protection with the harvest price option is equivalent to yield protection with both an adjusted Asian put and call option. In this regard, this product represents a base level of protection that can only increase if the value of the crop becomes more valuable. This is extremely valuable to producers who employ aggressive preharvest marketing practices. Fortunately, the current crop insurance program provides the opportunity for producers to engage in market arbitrage. The difference in premiums and coverage guarantees between the YP, RP-HPE, and RP products reflect the implicit values assigned to the various yield adjusted Asian puts and/or calls that they include. Derivative (i.e. options) markets price these products in the open market on a daily basis providing all of the information that a producer needs to evaluate the price of the desired protection they choose from two sources: the federally subsidized crop insurance program or open financial markets.

The goal of any crop insurance policy selection should be to purchase a policy that provides adequate coverage that is cost effective and that integrates well with the other management strategies and objectives of the operation. The transition into cotton production entails the building of an APH over time, therefore the crop insurance policy selection is strongly influenced by the transitioning levels of APH which determine coverage. The optimal choice of a crop insurance product demands equal evaluation of the policy's guarantees and costs. Identifying opportunities to cover the expected cost of production is one of the basic objectives combined with adequately addressing the operator's risk tolerance concerns. As future crop insurance rules and products change, federal subsidy levels are altered, and new U.S. Farm Bill policy provisions are introduced risk management for agricultural producers will continue to be an evolving practice.

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References

Adhikari, S., T.O. Knight, and E.J. Belasco. "Yield Guarantees and the Producer Welfare Benefits of Crop Insurance." Selected paper presented at the American and Applied Economics Association annual meeting, Denver, CO., July 25-27, 2010.

Babcock, B. A., and C. E. Hart. "Influence of the Premium Subsidy on Farmers' Crop Insurance Coverage Decisions." Working Paper 05-WP 393, Center for Agricultural and Rural Development, Iowa State University, Ames, April 1, 2005.

Barry, P. J., P. N. Ellinger, G. D. Schnitkey, B. J. Sherrick, and B. C. Wansink. "The Crop Insurance Market: Producer Preferences and Product Attributes." Study conducted under a cooperative agreement with the Economic Research Service of the U.S. Department of Agriculture, 2002.

Changnon, S. A. "Impacts of the Midwestern Drought Forecasts of 2000." *Journal of Applied Meteorology* 41 (2002): 1042-1052.

Claassen, R., R. N. Lubowski, and M. J. Roberts. "Extent, Location, and Characteristics of Land Cropped Due to Insurance Subsidies." Selected paper presented at the American Agricultural Economics Association annual meeting, Providence, R.I., July 24-27, 2005.

Coble, K. H., T. O. Knight, R. D. Pope, and J. R. Williams. "An Expected-Indemnity Approach to the Measurement of Moral Hazard in Crop Insurance." *American Journal of Agricultural Economics* 79 (1997): 216-226.

Goodwin, B. K., and T. L. Kastens. "Adverse Selection, Disaster Relief, and the Demand for Multiple Peril Crop Insurance." Contract report for the Federal Crop Insurance Corporation, May, 1993.

Just, R., L. Calvin, and J. Quiggin. "Adverse Selection in Crop Insurance: Actuarial and Asymmetric Information Incentives." *American Journal of Agricultural Economics* 81(November 1999): 834-849.

Knight, T. O., and K. H. Coble. "Survey of U.S. Multiple Peril Crop Insurance Literature since 1980." *Review of Agricultural Economics* 19(1997): 128-156.

Makki, S. S., and A. Somwaru. "Farmers' Participation in Crop Insurance Markets: Creating the Right Incentives." *American Journal of Agricultural Economics* 83 (2001): 662-667.

Roberts, M.J., E. O'Donoghue, and N. Key. "Does Crop Insurance Affect Crop Yields?" Selected paper presented at the American Agricultural Economics Association annual meeting, Portland OR, July 29-Aug. 1, 2007.

Shaik, S., K.H. Coble, and T.O. Knight. "Revenue Crop Insurance Demand." Selected paper presented at the American Agricultural Economics Association annual meeting, Providence, R.I., July24-27, 2005.

USDA-Farm Service Agency (FSA). 2011. "Crop Acreage Data Reported to FSA." http://www.fsa.usda.gov/FSA/webapp?area=newsroom&subject=landing&topic=foi-er-fri-cad (accessed December 5, 2011)

USDA-Risk Management Agency (RMA). 2011a. "2010 Texas Crop Insurance Profile." http://www.rma.usda.gov/pubs/2011/stateprofiles/texas10.pdf (accessed November 16, 2011).

USDA-Risk Management Agency (RMA). 2011b. "National Summary of Business Report." http://www3.rma.usda.gov/apps/sob (accessed December 6, 2011).