IMPACTS OF INCLUDING COTTONSEED PRODUCTION IN THE REVENUE STREAM FOR CALCULATING CROP INSURANCE COVERAGE FOR PRODUCERS IN THE LOWER COASTAL BEND OF TEXAS

Lawrence L. Falconer
Texas AgriLife Extension Service
Corpus Christi, TX
Luis Ribera
Texas AgriLife Extension Service
Weslaco, TX
Dan D. Fromme
Texas AgriLife Extension Service
Corpus Christi, TX

Abstract

This study consists of an analysis of how inclusion of cottonseed values into crop insurance APH calculations would change premiums and expected coverage levels for cotton producers in the Coastal Bend of Texas. This study includes simulated results based on county average yield data for four counties, two located in the Lower Coastal Bend of Texas (Nueces and San Patricio) and two located in the Upper Coastal Bend of Texas (Matagorda and Wharton). Preliminary analysis suggests that by adjusting APH yields for cottonseed values, the increase in expected indemnities would exceed increased outlays for premiums by ratios ranging from a low of 10.7:1 to a high of 50.8:1 for different selected yield guarantees.

Introduction

The relative price of cottonseed to cotton lint has increased sharply since 2004 (Table 1.). This increase implies that cotton producers are not able to insure an increasingly important part of their revenue stream. Because of increasing cost of production for cotton in the Coastal Bend of Texas, producers are finding it necessary to acquire increasing amounts of credit for their operations. It would be helpful in acquiring credit if producers could insure a larger percentage of the total revenue stream from their cotton production by including cottonseed values in yield guarantee calculations.

Table 1. Cottonseed Prices and Cotton Lint Prices for the Texas Coastal Bend Harvest Season (August, September, and October) and Seed to Lint Price Percentage Calculated at 1.6 Pounds of Seed to 1 Pound of Lint (TASS-USDA).

Year	Seed/$ Ton	Lint/$ Lb.	Seed to Lint %
2004	$ 94.67	$ 0.49	15%
2005	$ 99.67	$ 0.44	18%
2006	$ 102.00	$ 0.45	18%
2007	$ 139.00	$ 0.48	23%
2008	$ 248.00	$ 0.64	31%

Methods and Procedures

County average yield per harvested acre data was collected for Nueces, San Patricio, Matagorda and Wharton counties in Texas for 10 years beginning in 1998 and ending in 2007. APH yields were calculated for each county, utilizing the 60% T-yield substitution option. An alternative set of APH yields were calculated for each county by adjusting the county average yields upward based on a lint equivalent value for seed production. The lint yield equivalent was calculated by: (1) estimating the seed yield as 1.6 times the lint yield (2) estimating the seed value per acre by multiplying the seed price by the estimated seed yield (3) dividing the estimated seed value per acre by the established RMA lint price per pound. Crop insurance premiums for APH policies at the 65%/100%, 70%/100% and 75%/100% options were calculated for the APH and the cottonseed adjusted APH for each county (RMA-USDA). A multivariate empirical (MVE) distribution of yields was estimated and used to simulate these variables. A MVE distribution has been shown to appropriately correlate random variables based on their historical correlation

(Richardson et al., 2008). Additionally, the MVE is a closed form distribution, which eliminates the possibility of values exceeding reasonable values observed in history, i.e. negative yields and prices. County average yields are the stochastic variable in the model. The model was simulated for 100 iterations to determine the expected differences in indemnities at various yield levels guarantees for each county based on the APH and the cottonseed adjusted APH yields.

The model for calculating the expected indemnity differentials per acre is

$$Z(i,p) = \begin{cases} AI(p) - I(p), if\ Y(i) < G(p) \\ 0, if\ Y(i) => G(p) \end{cases}$$

Where:
Z(i,p) is the difference between the adjusted indemnity and the "normal" indemnity for policy *p* for iteration *i*,
AI(p) is the adjusted indemnity for policy *p*,
I(p) is the "normal" indemnity for policy *p*,
Y(i) is the county average yield drawn for iteration *i*,
G(p) is the yield guarantee for policy *p*.

Results and Discussion

The APH and cottonseed adjusted APH yields that were calculated for the 2008 crop year based on the 10 year history of county average yields per harvested acre are shown in Table 2. The calculated APH yields for dryland cotton production in the Upper Coastal Bend of Texas counties showed a difference of 5 pounds per acre between Matagorda and Wharton County, while the calculated APH yields for the Lower Coastal Bend of Texas showed a difference of 76 pounds per acre between San Patricio and Nueces County. As shown in Table 2, the differences between the APH and cottonseed adjusted APH yields ranged from a high of 99 pounds per acre in San Patricio County, to a low of 90 pounds per acre in Nueces County.

Table 2. APH and Cottonseed Adjusted APH Yields in Pounds per Acre Based on a 10 Year History of County Average Yields per Harvested Acre for Counties in the Upper and Lower Texas Coastal Bend.

County	APH	Adjusted APH	Difference
Matagorda	656	747	91
Nueces	623	713	90
San Patricio	699	798	99
Wharton	661	754	93

Estimated premiums for 65%, 70% and 75% yield guarantee levels were obtained from the Risk Management Agency Premium Calculator website for each county. The estimated premiums for both the APH adjusted APH levels obtained from the website are shown in Table 3.

Table 3. Estimated APH and Cottonseed Adjusted APH Premiums at Selected Yield Guarantee Levels (Source: RMA-USDA).

	Estimated Premium/ $ acre	
Policy	APH	Adjusted APH
Matagorda 65/100	$ 19.05	$ 19.31
Matagorda 70/100	$ 23.02	$ 23.32
Matagorda 75/100	$ 30.37	$ 30.77
Nueces 65/100	$ 13.17	$ 13.32
Nueces 70/100	$ 16.11	$ 16.31
Nueces 75/100	$ 21.50	$ 21.78
San Patricio 65/100	$ 9.36	$ 9.72
San Patricio 70/100	$ 11.57	$ 12.02
San Patricio 75/100	$ 15.55	$ 16.15
Wharton 65/100	$ 11.43	$ 11.79
Wharton 70/100	$ 14.05	$ 14.49
Wharton 75/100	$ 18.81	$ 19.43

Simulation analysis was used to evaluate the likelihood of indemnity is being paid to the producer for each of the four counties. The cumulative distribution functions obtained from the simulation analysis on the four county yields series is shown below in Figure 1.

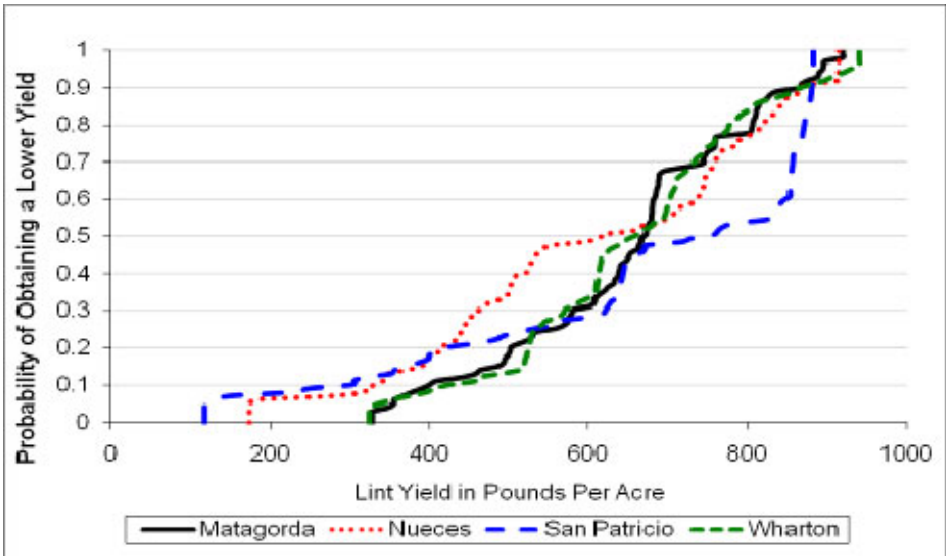

Figure 1.Cumulative Distributions for Matagorda, Nueces, San Patricio and Wharton County Yields.

The results of the simulation analysis indicate that the probability of receiving an indemnity at the 65% coverage level ranges from a low of 11% in Wharton County to a high of 21% in San Patricio County, with the probability of receiving an indemnity being higher in the Lower Coastal Bend than in the Upper Coastal Bend. This would be expected under dryland production systems, given the expected distribution of rainfall in the area. Because the study did not have access to actual cottonseed yield data, a constant of 1.6 pounds of seed per pound of lint was used to calculate the estimated cottonseed yields. This results in the difference in per acre indemnities between the "normal" and adjusted APH being the same for each time an indemnity is triggered for any selected policy. This is a weakness in the study, and a need for further investigation.

As shown in Table 4, the expected increase in indemnities would exceed increased outlays for premiums by ratios ranging from a low of 10.7:1 to a high of 50.8:1. As seen in Table 4 the comparison between the mean indemnity difference and the difference in premiums for each policy that at any level a producer would select to purchase crop insurance for cotton production in the Texas Coastal Bend, it would be to their advantage to opt for a policy that included an adjusted APH.

Table 3. Probability of Indemnity at Alternative Yield Coverage Levels, and Differences in Mean Indemnities, Indemnities and Premium Levels for Four Texas Coastal Bend Counties.

			Difference in $/Acre		
Policy	Probability of Indemnity	Mean Indemnity	Indemnity	Premium	Mean Indemnity/ Premium
Matagorda 65/100	12%	$ 4.83	$ 40.22	$ 0.26	18.6 : 1
Matagorda 70/100	14%	$ 6.06	$ 43.32	$ 0.30	20.2 : 1
Matagorda 75/100	16%	$ 7.43	$ 46.41	$ 0.40	18.6 : 1
Nueces 65/100	19%	$ 7.56	$ 39.78	$ 0.15	50.4 : 1
Nueces 70/100	23%	$ 9.85	$ 42.84	$ 0.20	49.3 : 1
Nueces 75/100	31%	$ 14.23	$ 45.90	$ 0.28	50.8 : 1
San Patricio 65/100	21%	$ 9.19	$ 43.76	$ 0.36	25.5 : 1
San Patricio 70/100	23%	$ 10.84	$ 47.12	$ 0.45	24.1 : 1
San Patricio 75/100	25%	$ 12.62	$ 50.49	$ 0.60	21.0 : 1
Wharton 65/100	11%	$ 4.52	$ 41.11	$ 0.36	12.6 : 1
Wharton 70/100	13%	$ 5.75	$ 44.27	$ 0.44	13.1 : 1
Wharton 75/100	14%	$ 6.64	$ 47.43	$ 0.62	10.7 : 1

Given these results, it appears that more work would be justified to obtain data on actual cottonseed yields and prices to generate actual values for cottonseed production that could be used to adjust APH yields. In addition, this study implicitly assumes that for actuarial purposes that cottonseed prices will track closely with the RMA established prices in the APH policy. A more detailed treatment would need to include an actuarial study on the cottonseed adjusted APH yields.

References

Richardson, J. W., K. Schumann and P. Feldman. “SIMETAR, Simulation for Excel to Analyze Risk”. Simetar, Inc. College Station, Texas. July 2008.

RMA-USDA. “Premium Calculation Online Tool”. Available: http://www.rma.usda.gov/tools/premcalc.html .
TASS-USDA. “Texas Agricultural Facts”. , various issues. Available: http://www.nass.usda.gov/Statistics_by_State/Texas/Publications/Agricultural_Facts/index.asp .