

Understanding Cotton Producer's Crop Insurance Choices Under the 2014 Farm Bill

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Abstract

The 2014 Farm Bill adds the Stacked Income Protection Plan (STAX) and the Supplemental Coverage Option (SCO) to the suite of insurance choices for producers in 2015. Unlike other crops with the ARC and PLC programs, cotton only has access to crop insurance under the new Farm Bill. Therefore, the crop insurance choices that farmers make will constitute the only government safety net for farm income. The overall objective of this research is to understand the impact of the new crop insurance policy options for cotton on farmer decisions regarding risk management strategies. A mail survey was conducted in February 2015, at the time when farmers were making insurance purchase decisions. Our results suggest that cotton farmers are taking benefits of 2014 Farm Bill, which enables them to take separate dry land and irrigated insurance policies.

Key words: 2014 Farm Bill, SCO Endorsement, STAX, Cotton, Crop Insurance

Introduction

Crop insurance in the U.S. has evolved over time. The most recent changes in federal crop insurance programs were enacted in the 2014 Farm Bill. Farmers purchase crop insurance to mitigate the effects of low yields or revenue resulting from natural events such as hail or drought, or significant price declines. Therefore, farmers have to be knowledgeable about modifications to crop insurance programs in order to effectively manage risk. The 2014 Farm Bill is being fully implemented in 2015 and cotton producers have made their crop insurance decisions for their 2015 crop as of this writing.

The 2014 Farm Bill significantly changed the Title I commodity programs and shallow loss insurance programs were added to the federal crop insurance program (Title XI). The Title I programs include Price Loss Coverage (PLC) and the Agricultural Risk Coverage (ARC) program. But, as a result of the World Trade Organization (WTO) ruling against the United States on cotton, that crop is excluded from participation in the Title I programs. The Title XI program were expanded to include a shallow loss program called the Supplemental Coverage Option (SCO) for all Title I crops and cotton, and the Stacked Income Protection Plan (STAX) was made available exclusively for cotton.

The SCO is a continuous shallow and deep loss insurance product. That is, the SCO is an added endorsement on the underlying Common Crop Insurance Policy (CCIP) purchased by the farmer. The SCO provides area-triggered loss coverage with liability based on the individual actual production history (APH) yield for the insured unit. The covered range is from 86% of the area expected yield or revenue down to the purchased

level of the CCIP. The premium subsidy on the SCO is 65%. STAX, by contrast, is a stand-alone policy that does not require the purchase of an underlying policy. Unlike SCO, STAX liability is based on the county average yield, not the insured unit level APH. The coverage range on STAX is from 70-90% with an 80% premium subsidy. However, STAX coverage cannot overlap with the farmer's CCIP. These new shallow loss programs offer an opportunity for farmer's to purchase highly subsidized insurance that covers part of the deductible on the CCIP. Therefore, taking this coverage may influence the coverage level chosen on the CHIP.

Previously, farmers could not purchase insurance products by type and practice. The 2014 Farm Bill has changed that allowing farmers to purchase different insurance products and coverage choices by type and practice. This change allows cotton farmers to choose different insurance products and coverage levels for dry land and irrigated cotton, which could make significant differences to the cotton farmer's decision-making behaviors to manage their risk.

Because of these major changes to the crop insurance program and their potential effects on behavior, the objective of this study is to understand the impact of new crop insurance policy options for cotton on farmer's decision regarding risk management strategies. This study examines differences in coverage level (change from previous year) to understand the impact of the policy on farmer insurance choices.

Key prior studies have used simulation approaches to examine the potential costs/benefits of insurance choices (Bulut and Collins, 2013; Dismukes et al., 2013; Luitel, Knight, and Hudson, 2015), but none have directly addressed farmer choices by observation of planned or actual decisions. Directly surveying farmers regarding planned insurance purchases, the present study has the advantage of being able to capture other intervening factors not captured in simulation studies of pure expected utility.

Data and Methods

A mail survey was conducted among Texas cotton farmers in February 2015, at the time when farmers were making insurance purchase decisions (the sales closing date for cotton in Texas is March 15). Conducting the survey at this time gives opportunity to better estimate farmer's behavior specific to crop insurance decisions. A sample of 4,000 cotton farmers was randomly selected from the subscribers to Cotton Growers Magazine¹. The survey package contained a recruitment letter, information sheet, questionnaire, and a postage paid return envelope. The estimated time to complete the survey was no longer than 20 minutes and the survey was conducted preserving the privacy and voluntary participation of the farmers. After two weeks from the day the survey was sent, a reminder notice was sent to increase response. Questions included in the questionnaire were about the cotton farmers insurance decision made in 2014 and possible insurance products they planned to purchase for 2015. Some questions were about general information regarding their farm financial structure and farm characteristics.

¹ This is a commercial subscription list, so some unknown percentages of these subscriptions were not cotton farmers. We oversampled the list for this reason in order to insure a viable number of responses. Therefore, traditional measures of response rate are not particularly useful on assessing survey success.

This study was designed to evaluate the impact of cotton crop insurance options from 2014 Farm Bill on farmer's decisions. Because the Farm Bill allowed separation of coverage by practice, one logical question is whether farmers will increase or decrease coverage levels for different practices in 2015 versus their common coverage level decision in 2014. The dry land and irrigated cotton can be treated as different farm products having different risk characteristics as they have different per acre yields and costs of production. The coverage level choice can be different for these two products.

The analysis for differences in coverage level was conducted using ordinary least square regression methods (Equation 1). The difference in coverage level of 2014 and 2015 (2014 coverage level minus 2015 coverage level) was the dependent variable. Independent variables were percentage of irrigated acres, choice of insurance type in 2014, choice of enterprise unit, expected price, expected yield, shallow loss insurance decision, source of information for insurance decision, and percentage of income from non-farm sources.

Δ coverage level (2014 – 2015)

$$= \beta_0 + \beta_1 * \% IA + \beta_2 * D_{RP2014} + \beta_3 * D_{Ent} + \beta_4 * E_{Price} + \beta_5 * E_{Yield} + \beta_6 * D_{sl} + \beta_5 * D_{Agent} + \beta_5 * \%NF \dots \dots \dots (1)$$

The percentage of irrigated cotton acre (% IA) was calculated from total cropland acres. Most of the farmers purchase revenue insurance (73%). Therefore, choice of insurance in 2014 was defined as a dummy variable, where $D_{RP2014} = 1$, if the farmer

choose revenue protection insurance in 2014. Choice of enterprise unit was defined as a dummy variable, where $D_{Ent} = 1$, if the farmer intended to choose enterprise unit insurance in 2015. Expected price (E_{Price}) and expected yield (E_{Yield}) were based on a subjective elicitation using a three-point estimation method (Davidson and Cooper, 1976). We calculated expected price assuming a log normal distribution, using the price expectations information provided by farmer. Similarly, we calculated expected irrigated farm yield assuming a beta distribution, using the yield expectations information provided by farmer. The farmer choice for any shallow loss insurance (SCO or STAX) was defined as a dummy variable, where $D_{sl} = 1$, if the farmer anticipated purchasing STAX or SCO in 2015. Farmers receive information about insurance policies from the Farm Service Agency (FSA) office, crop insurance agents, extension offices, online sources, private contacts, etc. Most of the farmer's indicated that their primary source of information regarding crop insurance is their insurance agent (89%). Therefore, the choice of their primary source of crop insurance information was defined as a dummy variable, where $D_{Agent} = 1$, if the primary source of crop insurance information was the insurance agent. And, farmers were asked to state their percentage non-farm income ($\%NF$) in the questionnaire.

Results

The Risk Management Agency (RMA) only reports insurance information for 155 of 254 counties of Texas. We received usable response from 49 counties. Among those, 33 counties have irrigated cotton acres and 45 have dry land acres. The survey resulted in 170 usable responses. There were 107 irrigated farms and 156 dry land farms. Among the

respondents, 97% were male. The average amount of farming experience was 32 years. Of the respondents, 42% completed some college or undergraduate degree, while 23% of the respondents have less than high school or high school level of education. The total market value of assets in the farming operation was \$2,000,000 to \$4,999,999 for 29% of the respondents, while 24%, and 22% have \$1,000,000 to \$1,999,999, and \$500,000 to \$999,999, respectively. There is considerable heterogeneity among the respondents regarding borrowed percentage, non-farm income, and acres of irrigated and dry land cotton. On average, total dollars invested in the farm operation with borrowing was 45% with a standard deviation of 38%. Similarly, non-farm income of the household, on average, was 25% with a standard deviation of 26%. On average, irrigated cotton farm acres were 439 acres with a standard deviation of 626. Likewise, dry land cotton farm averaged was 803 acres with a standard deviation of 868.

Table 1. Descriptive statistics of the variables used in the analysis for irrigated farm operators

Variables	N	Mean	Std Dev	Minimum	Maximum
Coverage level difference (2014-2015)	107	-0.23	6.23	-20.00	25.00
% Irrigated cotton acres	107	34.12	24.44	2.07	100.00
Dummy RP 2014	107	0.73	0.45	0	1.00
Dummy enterprise unit	99	0.28	0.45	0	1.00
Expected Price	107	63.41	3.76	54.50	78.75
Expected irrigated yield	107	1197.16	320.82	500.00	2250.00
Dummy shallow loss	107	0.33	0.47	0	1.00
Dummy insurance agent	107	0.89	0.32	0	1.00
Non-Farm Income %	107	21	26	0	100.00

According to the survey data (Table 1) among the irrigated cotton farmers, the difference in coverage level from 2014 to 2015 is -0.23, suggesting that on average irrigated cotton farmers will purchase higher coverage level in 2015. Respondents reported an expected yield of 1197 pounds per acre for irrigated cotton. Similarly, 89% of the irrigated cotton farmer's primary source of crop insurance information is from the insurance agent. Approximately 73% of the irrigated cotton farmers bought revenue protection in 2014.

The results of Ordinary Least Square (OLS) regression estimation on difference in coverage level due to new farm policies focusing on irrigated cotton are shown in Table 2. The R^2 of the model is 29%. Except choice of additional shallow loss insurance variable, all parameters are statistically significant at the 90% level or better.

Table 2. OLS regression estimates for difference in coverage level between 2014 and 2015 for irrigated cotton farms.

Variable Names	DF	Estimate	Standard Error	t Value	Approx Pr > t
Intercept	1	-34.629	10.661	-3.25	0.0012
% of irrigated cotton acres	1	-0.045	0.023	-1.93	0.0534
Dummy RP 2014	1	2.543	1.248	2.04	0.0417
Dummy enterprise unit	1	5.107	1.249	4.09	<0.0001
Expected price	1	0.374	0.153	2.44	0.0146
Expected irrigated yield	1	0.005	0.002	3.16	0.0016
Dummy shallow loss insurance	1	-1.207	1.170	-1.03	0.3021
Dummy insurance agent	1	4.380	1.898	2.31	0.0210
Non-farm income %	1	-0.045	0.021	-2.14	0.0327

According to the regression results, the signs on the parameters for percentage of irrigated cotton acres in 2015 and non-farm income percentage indicates that an increase in those variables is associated with a higher 2015 coverage level relative to 2014 (a large negative change). For a one-unit increase in non-farm income percentage, there is an associated 0.045 unit decrease in difference in coverage level. Similarly, with a one-unit increase in percentage of irrigated cotton acres, there is an associated 0.04 unit decrease in difference in coverage level. Again, the individual parameter estimate suggest the effects of both of these variables correspond to larger negative differences in coverage level between 2014 and 2015, leading to relatively higher coverage level in 2015 for irrigated cotton.

On the other hand, the signs on the parameters for revenue protection as an insurance choice in 2014, choice of enterprise unit insurance in 2015, expected cotton price for 2015, expected farm irrigated yield for 2015, and insurance agent as their primary source of information about crop insurance suggest a smaller negative difference between 2014 and 2015, indicating a decrease in coverage level of 2015 relative to 2014. A one-unit increase in the expected price of cotton in 2015 or a one-unit increase in expected yield of irrigated cotton in 2015 would increase the difference in coverage level by 0.375 and 0.005 units respectively. Higher expected yields and expected prices also lead to decreases in coverage level in 2015 for irrigated cotton. Again, the individual parameter estimates suggest the effect of those variables correspond to smaller negative

differences in coverage level between 2014 and 2015, leading to relatively lower coverage level in 2015 for irrigated cotton.

The individual parameter estimates of different variables have different effects on coverage level choice for irrigated cotton in 2015 relative to 2014. The combined effect of all the parameter estimates, using average value for all continuous variables provides the overview of the regression model on coverage level choice for irrigated cotton in 2015 relative to 2014. This will also identify the specific effect of a dummy variable used in the overall model. A farmer choosing revenue protection in 2014, enterprise unit, shallow loss insurance, and the insurance agent as their primary source of information, on average had a 3.41 unit increase in the difference in coverage level between years, suggesting that on average irrigated cotton farmers purchased higher coverage levels in 2014. While, on the other hand, the farmer not choosing revenue protection in 2014, enterprise unit, shallow loss insurance, and the insurance agent as their primary source of information, on average had a 7.41 unit decrease in their difference in coverage level between years, suggesting that on average irrigated cotton farmers will purchase higher coverage in 2015. The parameter estimate for choosing revenue protection in 2014 is 2.54, however the combined effect for choosing revenue protection in 2014 and holding other dummy variables at zero, on average had a 4.87 unit decrease in their difference in coverage level between years, suggesting that on average irrigated cotton farmer will purchase higher coverage levels in 2015.

Similarly, the parameter estimate for insuring at the enterprise unit level in 2015 is 5.11, however the combined effect for choosing enterprise unit in 2015 and holding

other dummy variables at zero, on average had a, 2.3 unit decrease in their difference in coverage level between years, suggesting that on average irrigated cotton farmer will purchase higher coverage level in 2015. Likewise, The parameter estimate for irrigated cotton farmers who reported their primary source of information about crop insurance as insurance agents is 4.38, however the combined effect for, irrigated cotton farmers who reported their primary source of information about crop insurance as insurance agents and holding other dummy variables at zero, on average had a, 3.03 unit decrease in their difference in coverage level between years, suggesting that on average irrigated cotton farmer will purchase coverage level in 2015.

Discussion

The above model was only able to describe the difference in coverage levels from 2014 to 2015 for irrigated cotton. The model was not able to describe the difference in coverage level choice from 2014 to 2015 in dry land cotton. In 2014 cotton farmers had to combine their insurance for both dry land and irrigated acres. In 2015, the farmers got the advantage of choosing separate insurance and coverage levels for irrigated and dry land cotton. The yield of dry land cotton farms has higher variance and mostly depends upon weather conditions. The cotton farmers in 2014 may have chosen their insurance and coverage level based on their dry land yield uncertainty. According to the survey, differences in coverage level between 2014 and 2015 are, on average, 0.48 for dry land while and -0.23 for irrigated cotton. For dry land cotton, this indicates a decrease in coverage level of 2015 relative to 2014 and for irrigated cotton an increase in coverage level in 2015 relative to 2014. This suggests that, there is an upward trend in coverage

level in irrigated cotton, while, downward trend of coverage level in dry land cotton across the years.

The irrigated cotton farmers increased their coverage level in 2015 when they increased the percentage of irrigated cotton acres, non-farm income percentage, choice of revenue protection in 2014, choice of enterprise unit in 2015, and choice of insurance agent as their primary source of insurance information. Further, increasing the acres also increased the variability on yield. To cover the uncertainty in benefits, the farmers increase the coverage level when they increase their irrigated acres.

When we look at the parameter estimates individually, there effect is different in relative coverage level across the years. Farmers taking revenue protection in 2014 for all cotton decreased their irrigated cotton coverage level in 2015. This may be explained as the irrigated yields have less variance and less dependence upon weather conditions compared to dry land cotton. Currently, farmers can purchase enterprise unit insurance separately and also at a higher subsidized rate. This leads to increased incentive to take enterprise unit insurance in current policy. With higher subsidy, farmers could take lower coverage on irrigated cotton and higher coverage on dry land cotton, to manage the production risk within their budget. Similarly, when farmers have higher expected price or/and higher expected yield they expect to get similar benefit with a lower coverage level. Cotton producers who have higher non-farm income can take a higher coverage level indicating higher risk aversion characteristics of the farmer. The cotton farmers decided their optimal coverage level by considering all these factors.

Conclusion and future work

The introduction of the shallow loss insurance policies (either SCO or separate STAX) and the ability to separate crop insurance by practice and type has had significant impact on risk management strategies for cotton farmers. The distinct insurance policies for irrigated and dry land cotton have made it more attractive for farmers to take enterprise unit insurance. The higher subsidies may also guide farmers towards choosing enterprise unit insurance. As the results suggested, some factors are guiding irrigated cotton producers to decreasing their coverage level; however, the combined impact from the model suggests that the farmers are increasing coverage levels in 2015 relative to 2014.

Further study is needed to understand the broader impact on the decision-making process and behaviors of cotton farmers from these new policies. In this paper we looked at factors affecting the difference in coverage level due to the new policies. The next step of this study is to identify the factors influencing choice of shallow loss insurance. Further, to understand the risk management strategies and decision-making process of cotton farmers, we will look into factors leading to the 2014 and 2015 insurance decision separately.

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