**Does Crop Insurance Reduce the Need for Cash Reserves in Savings Accounts?**

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**Background:**

A wide variety of risk management tools are currently available for agricultural producers to assist them in mitigating uncertain circumstances arising in production and in commodity markets. One of the most fundamental and traditional risk management tools is a savings account. Cash reserves in savings provide a safety net for producers, allowing financial obligations and living expenses to be met when unexpected shortfalls in income occur. Crop insurance is another risk management tool, ranging from basic, total disaster coverage to sophisticated revenue based policies that rely on fluctuations in commodities futures markets. Traditionally, Multiple Peril Crop Insurance (MPCI) protecting against losses in yield due to weather, disease, and other perils have been commonly purchased; however, revenue-based insurance programs such as Crop Revenue Coverage (CRC) and Revenue Assurance (RA) have gained in popularity in recent years, becoming the standard product purchased in many production regions of the country. As crop insurance products have improved, savings accounts, while still necessary, may not have to be maintained at the levels once required to bridge the gap when shortfalls occur.

The objective of this study is to evaluate the levels of savings necessary to maintain target ending cash reserve numbers for producers using alternative crop insurance products. A simulation model is utilized to evaluate representative farms under a base scenario with no coverage and two crop insurance product alternatives, MPCI and CRC.

**Data and Methods:**

This study utilizes primary representative farm data in conjunction with a whole farm simulation model to examine the effects of various crop insurance products on the required size of a risk management savings account to maintain ending cash reserves in 2015 at a specified level.  The representative farms were initially created through a focus group interview process and are maintained and updated through return visits every two to three years.  Twelve representative farms located in major production regions throughout the Southern United States were analyzed assuming three alternative crop insurance scenarios.  The representative farms are classified by commodity predominantly grown, indicating the primary source of income for each respective farm.  This study analyzes impacts on four representative feedgrain and oilseed farms (located in Texas, South Carolina, Tennessee, and Louisiana), four cotton farms (North Carolina, Georgia, Alabama, and Texas), and four rice farms (Missouri, Arkansas, Louisiana, and Texas). Detailed characteristics of the farms are available in the December 2009 AFPC Baseline Working Paper (AFPC 2009), and summarized attributes are provided in Appendix Table 1. Also available in the AFPC Working Paper are FAPRI-Missouri preliminary January 2010 average annual projected commodity prices, national average interest rates, rates of change for input prices, and rates of change for U.S. land values utilized in the model.  A farm level simulation model (FLIPSIM) developed by Richardson and Nixon (1986) at Texas A&M University is used to analyze the representative farms under various crop insurance scenarios. The FLIPSIM model uses a multivariate empirical probability distribution for simulating stochastic yields and prices described by Richardson, Klose, and Gray (2000).

Three basic assumptions on all representative farms used throughout the study are:  (1) long-term and intermediate-term debt beginning in 2008 is 20 percent of beginning asset value for all farms, (2) the provisions of the 2008 farm bill are assumed to continue throughout the projection period, and (3) crop mixes and land tenure are held constant throughout the study period.  All twelve representative farms will be analyzed under the following scenarios:

- **No Insurance –** Farms assumed to purchase no crop insurance

- **MPCI –** Farms purchase Multiple Peril Crop Insurance covering 65 percent of Actual Production History Yield (APH) and 100 percent price election
- **CRC –** Assumes farms purchase 70 percent Crop Revenue Coverage insurance

Each alternative crop insurance scenario was simulated 100 iterations over a 2008 to 2015 study period, and averages of output variables associated with these simulated outcomes are reported.

The methodology used is a multiple year stochastic simulation model with an optimal control algorithm to stochastically estimate the minimum net income adjustment (NIA) to ensure no change in nominal ending cash reserves by 2015. The present value of the average annual NIA is the amount of savings a farm would require in 2008 to ensure no change in ending cash in 2015.

**Results:**

The farms begin the 2008 study period with no cash reserves. Table 1 displays the NIA necessary under each scenario to end the period with the same ending cash in 2015. A positive number indicates additional cash reserves would be necessary to prevent the farm from ending the period with negative cash reserves. Negative numbers indicate a farm is in a favorable liquidity condition throughout the projection period and indicates the reduction in savings in 2008 that would allow the farm to still end 2015 with a zero cash balance. Table 2 provides the base NIA number under **No Insurance** and the net decrease (or increase) in 2008 that purchasing **MPCI** and **CRC** allows (or requires).

Under the **MPCI** alternative, four farms (TNG2750, SCG3500, TXR3000, and MOWR4000) are able to reduce their initial savings required, compared to the **No Insurance** option. The South Carolina grain farm (SCG3500) is able to reduce the cash reserves required by approximately $70,800, the greatest reduction by any of the four farms. Seven of the twelve farms (TXPG2500, LAG2640, TXEC5000, ALC3000, NCC1500, LASR1200, and ARSR3240) are made worse off by purchasing **MPCI** at 65 percent yield coverage as indicated by their needing to increase their 2008 savings amount. The TXEC5000 farm, a Texas cotton farm located East of Lubbock, is most negatively impacted by purchasing **MPCI** as it must increase 2008 savings by $183,000. The Northeast Arkansas farm (ARNC5000) is essentially indifferent between not purchasing crop insurance and purchasing **MPCI**. Five of the seven farms hurt by purchasing **MPCI** insurance are predominantly irrigated farms, typically facing less yield risk than those producing on non-irrigated land. The other two farms are southeast cotton farms that have relatively less yield variability in their actual production histories.

Purchasing **CRC**, although more expensive upfront, reduces the amount of cash necessary to be held in savings to bridge shortfalls and maintain liquidity for many producers, as this coverage mitigates both production and market risk. The **CRC** scenario reduces the savings required for five representative farms (TNG2750, TXPG2500, ARNC5000, ALC3000, and NCC1500) or allows cash reserves to build for six representative farms (SCG3500, LAG2640, TXEC5000, TXR3000, LASR1200, and MOWR4000) examined in this study. The only farm to not prefer this scenario is the 3,240 acre rice farm in Stuttgart, Arkansas (ARSR3240).

All representative farms in this study end the period more favorably under the **CRC** option versus the **MPCI** scenario. Six farms are able to reduce the amount of cash necessary in savings and five farms are able to build increased cash reserves under the **CRC** option. The remaining representative farm (LAG) actually switches from requiring $102,900 in savings under the **MPCI** scenario to building an additional $341,400 under the **CRC** scenario.

**Discussion:**

Producers in different regions and those producing various commodities face unique circumstances and challenges in the environment of uncertain production and market conditions. Farms in regions with less historical yield variability typically can carry lower cash reserves (savings) to maintain wealth and cash flows than farms operating in historically riskier environments. Differences in savings account balances required for most irrigated farms is heavily dependent on price risk mitigation, as much of the yield risk is managed through the application of irrigation water.

One-third of the representative farms included in this study benefit from the purchase of a crop insurance product protecting against yield loss (MPCI) to the extent that they can maintain lower cash reserves. Eleven of twelve representative farms examined benefit from more sophisticated crop insurance products mitigating yield and market risk (CRC) because they can carry even smaller cash reserves. Projections for commodity prices drive the outcomes to a great degree for all scenarios, so it is important to note that different price paths could yield a different overall story.

As producers rely more on crop insurance and less on savings accounts to survive in income shortfalls, they can now utilize cash reserves held as a safety net for more immediate needs. This money may be now utilized to reduce debt, reinvest in the farm, and increase overall size and scope through acquiring land and other capital purchases. Additionally, released cash reserves may be utilized to complete overdue improvements and updates to current assets. Finally, a higher standard of living may be realized, as released cash reserves can be used to cover living expenses or set aside for future retirement. Future research will expand on this study, as farm specific insurance products and coverage levels that provide the best risk mitigation for a given premium level are determined.

## References


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Table 1. Present Value of Net Income Adjustments Necessary to Yield a Zero Ending Cash Balance in 2015 for AFPC Representative Farms.

| | No Insurance | MPCI | CRC |
|---|---|---|---|
| | ---------------------------------------------- | $1,000 | ---------------------------------------------- |
| Feedgrain/Oilseed | | | |
| TNG2750 | 342.6 | 321.3 | 85.2 |
| SCG3500 | -336.9 | -407.7 | -885.1 |
| TXPG2500 | 384.5 | 490.8 | 20.0 |
| LAG2640 | -66.3 | 102.9 | -341.4 |
| | | | |
| Cotton | | | |
| TXEC5000 | -190.2 | -7.2 | -497.1 |
| ARNC5000 | 3,323.8 | 3,323.4 | 2,160.6 |
| ALC3000 | 1,106.4 | 1,124.4 | 650.3 |
| NCC1500 | 962.4 | 979.0 | 878.4 |
| | | | |
| Rice | | | |
| TXR3000 | -1,038.1 | -1,063.4 | -1,488.3 |
| LASR1200 | -606.9 | -602.6 | -798.1 |
| ARSR3240 | 54.1 | 89.6 | 83.1 |
| MOWR4000 | -720.9 | -788.9 | -1,527.2 |

Table 2. Present Value of Net Income Adjustments for No Insurance Scenario and Change is Savings Resulting from Alternative Crop Insurance Scenarios.

| | No Insurance NIA | MPCI Δ In Savings | CRC Δ In Savings |
|---|---|---|---|
| | | ------$1,000------ | |
| Feedgrain/Oilseed | | | |
| TNG2750 | 342.6 | -21.4 | -257.4 |
| SCG3500 | -336.9 | -70.8 | -548.2 |
| TXPG2500 | 384.5 | 106.3 | -364.5 |
| LAG2640 | -66.3 | 169.2 | -275.1 |
| Cotton | | | |
| TXEC5000 | -190.2 | 183.0 | -306.9 |
| ARNC5000 | 3,323.8 | -0.4 | -1,163.2 |
| ALC3000 | 1,106.4 | 18.1 | -456.1 |
| NCC1500 | 962.4 | 16.6 | -84.0 |
| Rice | | | |
| TXR3000 | -1,038.1 | -25.3 | -450.2 |
| LASR1200 | -606.9 | 4.3 | -191.2 |
| ARSR3240 | 54.1 | 35.5 | 29.0 |
| MOWR4000 | -720.9 | -68.0 | -806.3 |

Appendix Table A1. Characteristics of AFPC Representative Farms.

| | |
|---|---|
| Feedgrain/Oilseed | |
| TNG2750 | Western Tennessee dryland farm grows corn, wheat, full-season and double-cropped soybeans. |
| SCG3500 | South Carolina dryland grain farm that produces corn, wheat, and full-season and double-cropped soybeans. |
| TXPG2500 | Texas Panhandle grain farm that annually plants irrigated and dryland wheat, irrigated corn, irrigated cotton, and dryland grain sorghum. |
| LAG2640 | Northern Louisiana diversified farm grows a mix of dryland and irrigated cotton, corn, and soybeans. |
| Cotton | |
| TXEC5000 | Texas (Eastern Caprock) cotton farm grows irrigated and dryland cotton and grain sorghum along with dryland wheat. |
| ARNC5000 | Northeast Arkansas cotton farm grows irrigated and dryland cotton. |
| ALC3000 | Northern Alabama cotton farm plants irrigated and dryland cotton and corn along with dryland soybeans. |
| NCC1500 | North Carolina dryland cotton farm produces cotton, wheat, and soybeans. |
| Rice | |
| TXR3000 | Texas rice farm produces first crop and ratoon crop long-grain rice. |
| LASR1200 | Southern Louisiana rice farm grows long-grain rice, crawfish, and dryland soybeans. |
| ARSR3240 | Stuttgart, Arkansas area rice farm grows long-grain rice, wheat, and soybeans. |
| MOWR4000 | Missouri Bootheel rice farm grows long-grain rice and soybeans. |