# Conservation Programs: Will Grain Production Reclaim Acres in the South?

## Daniel R. Petrolia* and Gregory A. Ibendahl

A state-level analysis of the Re-enrollment and Extension (REX) program on southern states indicates a positive relationship between percentage of tree acreage and Conservation Reserve Program (CRP) re-enrollment for states in which conservation acreage is dominated by trees. However, the relationship depends on crop mix where CRP acreage is dominated by grass. County-level analysis suggests that states will differ in how quickly they opt out of CRP. Of the states examined, Arkansas is the most likely to move land to corn, with Mississippi the least likely. Arkansas and Kentucky will switch to soybean first, followed by Mississippi and Georgia.

*Key Words:* Conservation Reserve Program (CRP), corn, land use change, Re-enrollment and Extension Program (REX), soybean

**JEL Classifications:** Q15, Q18, Q21, Q24

Given the recent spike in commodity prices and a surge in ethanol and biodiesel demand, there is concern that there will be a mass exodus of land from the Conservation Reserve Program (CRP) back into production. Holders of CRP contracts who are considering returning these acres to production have two choices: either do not renew expiring contracts or break nonexpiring contracts. Breaking a CRP contract requires producers to repay all payments, so the cost would become prohibitively more expensive year after year. Thus, it is highly unlikely that producers would choose to take land back out of CRP unless it was in the first year or so after signup. Expiring CRP contracts face no such penalty, so this is the most likely CRP land to be converted back into production. In this paper, we present first a state-level overview of CRP land, focusing on the effect of the recent Re-enrollment and Extension Program (REX) on expiring acres in the south and, second, a county-level analysis of producers' decisions not to renew their CRP contracts. What follows first, however, is a brief overview of the CRP.

The CRP was established by the Food Security Act of 1985 to encourage owners of highly erodible land to remove it from production. In exchange for annual rental payments and cost-share assistance, landowners agree to establish and maintain an approved permanent cover on enrolled acreage for 10 to 15 years. The 1985 Act directed the USDA to enroll between 40 and 45 million acres by 1990 (although it actually enrolled only 32 million by that year) with a primary goal of reducing soil erosion on highly erodible cropland (FSA 2007). Because this program removes acreage from production, it also functions as an indirect price support by limiting supply. For these reasons, the CRP is the rare policy on which both producers and conservationists can agree.

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Subsequent legislation has since extended, expanded, and modified the program. CRP contracts now extend to at least 2010, and the acreage cap is set at 39.2 million acres (enrollment as of 2006 was 36 million). Additionally, the program now addresses concerns beyond soil erosion. Eligible land now includes that which could reduce on-site or off-site water quality threats. Rental payment caps are now based on soil-specific productivity-based rental rates, and an environmental benefits index (EBI) was adopted to rank offers. The EBI was revised to explicitly include a wildlife benefits component, which was given equal weight with soil erosion and water quality benefits. Limited forage harvesting is now allowed, and practices eligible under marginal pasture criteria, which have no cropping requirements, were expanded to permit appropriate vegetative covers in addition to trees (FSA 2007).

Additional acreage is allowed on a continuous, noncompetitive basis for implementation of selected practices such as filter strips and riparian buffers. In 1997, acres were added to the program via the Conservation Reserve Enhancement Program (CREP), which authorized state-federal conservation partnerships that address community-specific concerns. In 2000, signing and practice incentives were established to further enhance continuous enrollment, including CREP. Finally, the FY 2001 Agriculture Appropriations Act established the Farmable Wetlands Program (FWP) as part of the CRP, providing for noncompetitive enrollment of up to 1 million acres under continuous sign-up provisions and incentives. Currently, there are 3.6 million nongeneral sign-up acres (9.9% of total CRP acres); thus, general sign-up acreage accounts for the lion's share of the program's total acreage (FSA 2007).

## Re-enrollment and Extension Program

### General Trends

Even before the surge in commodity prices, there was concern about what to do about a large number of CRP contracts (on 16 mil-

lion acres) expiring in 2007. In response, the Farm Service Agency (FSA) implemented the REX program for acres set to expire between 2007 and 2010. FSA divided expiring contracts into five categories on the basis of EBI score. Those in the highest category were offered new 10- or 15-year contracts (therefore putting some acreage under contract all the way out to 2025); for those in the second highest category, 5-year contracts; third, 4 years; fourth, 3 years; and fifth, 2 years.

It just so happened that they acted early in 2006, before the surge in crop prices at year's end, and most of the landowners offered re-enrollment took it. Of the 28.5 million acres set to expire by 2010, 27.8 million were offered the deal, and 23.9 million accepted it, 13.9 million of which was set to expire in 2007 alone (FSA 2006, 2007). Thus, essentially by accident, the REX program preempted the very likely scenario of a (at least short-term) program disaster in which roughly half of the total CRP acres could exit the program for greener pastures. Instead, cumulative enrollment (general sign-up) will be at 92% of the current level of 32.4 million acres after 2007, and at 88% after 2008. States particularly affected by REX include Colorado, Kansas, Montana, North Dakota, and Texas, where the number of acres set to expire in 2007 was reduced by at least 1 million each. Figure 1 shows the shift in distribution of expiring acres for the United States as a whole; the figure also shows another effect of the REX program: expiring acreage is not only pushed out a little further into the future, but now the distribution of expiring acreage is more evenly distributed. Prior to REX, expiring acreage progressed as follows: 16 million in 2007, 6 million in 2008, 4 million in 2009, 2 million in 2010, 200,000 in 2011, and 700,000 in 2012. Now, the number of expiring acres over this time period will increase gradually, from 2.5 million in 2007 to 5.5 million in 2012 (FSA 2006, 2007).

What is the story for southern states? For our purposes here, we will define the "south" as 14 states: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South
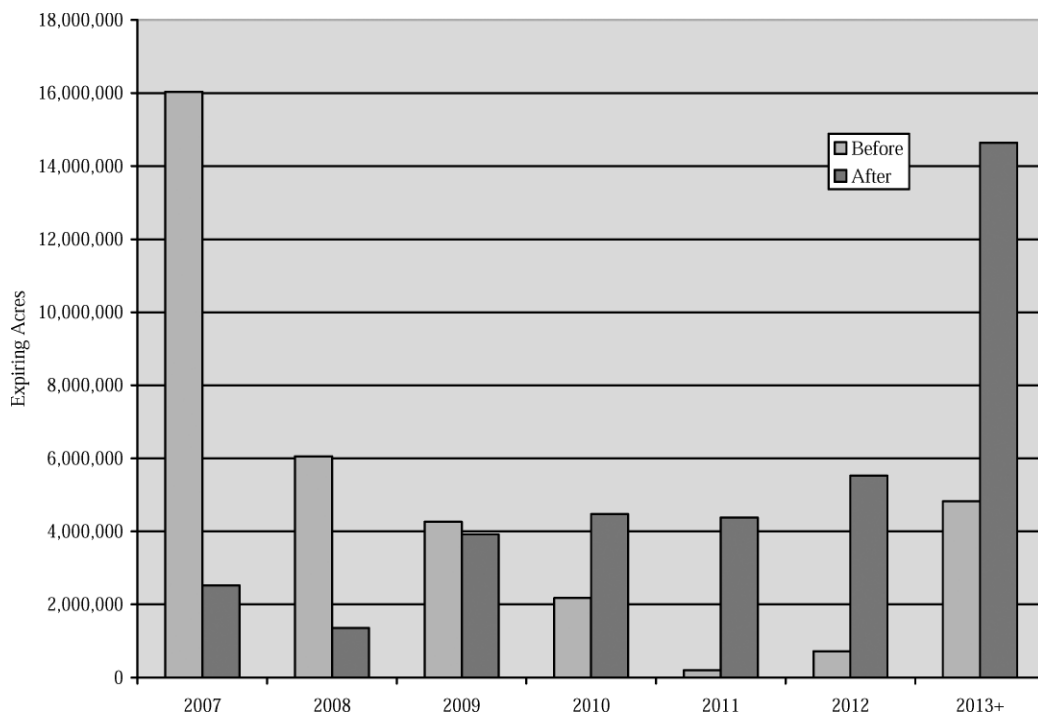
**Figure 1.** Expiring CRP Acreage before and after REX Program for the United States

Carolina, Tennessee, Texas, and Virginia. For the south as a whole, 4.8 million acres were set to expire in 2007; now, only 688,000 will. In 2008, 1.7 million were set to expire but, now, only 283,000. Figure 2 shows the change in the distribution of expiring acres for the south over the coming years. The story is much the same at the state level. For example, in Texas, expiring 2007 acreage plummets from over 2 million to just 152,000, whereas in Mississippi, the drop is from 419,000 to 78,000. For 2008, expiring acreage drops from over 1 million to 118,000 in Texas (see Figure 3), and from 71,000 to 20,000 in Mississippi (see Figure 4). These figures indicate that the REX program will have had a huge effect in terms of keeping expiring CRP acreage out of production for at least several more years. Because relatively little acreage will leave CRP in general, it is safe to assume that even less will leave that is suitable for grain production.

*A Closer Look at the South*

Although the above data show that most land in CRP will remain in the program, it is still interesting to examine what might be driving the relative differences in re-enrollment levels at the state level across the south. Data were collected on the conservation practices installed on CRP acreage as of FY 2006 at the state level (FSA 2007). We condensed a total of 31 conservation practice categories into six for our purposes: grass, trees, wetlands, wildlife habitat, riparian buffer, and other. Across all 14 southern states, the grass category dominates, containing 73% of total CRP acreage; trees is the second largest category with 19.3%. The remaining categories contain a combined total of 8%. On the basis of these percentages, we focused on the two dominant categories: grass and trees.

Figure 5 shows the percentage of enrolled acreage classified as grass versus the percentage of 2007 expiring acreage that was re-enrolled for each southern state. The figure indicates that the states fall into three distinct groups: high grass with low re-enrollment, high grass with high re-enrollment, and low grass with moderate re-enrollment. Let us first look at the high-grass groups. These two groups separate geographically, with Tennes-
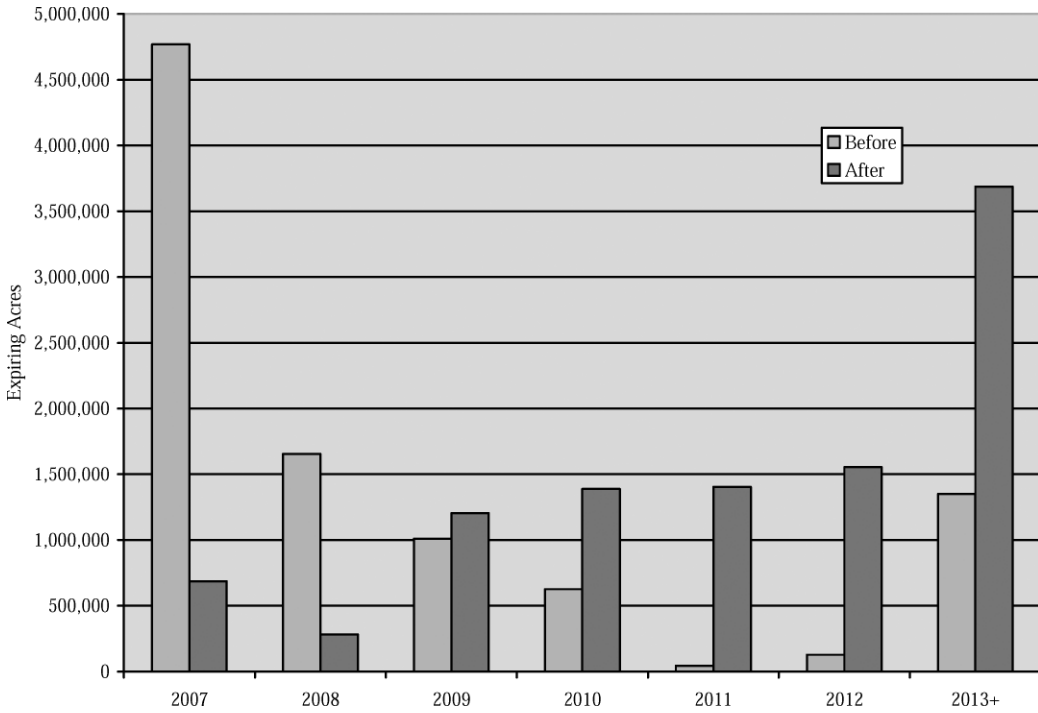
**Figure 2.** Expiring CRP Acreage before and after REX Program for the South

see and Kentucky re-enrolling the lowest percentage of expiring acreage and Missouri, Oklahoma, and Texas re-enrolling the highest percentage. This geographical grouping also suggests that crop production might partially explain the choice to re-enroll. CRP acreage in Oklahoma and Texas is concentrated in the panhandles, where the dominant crops are
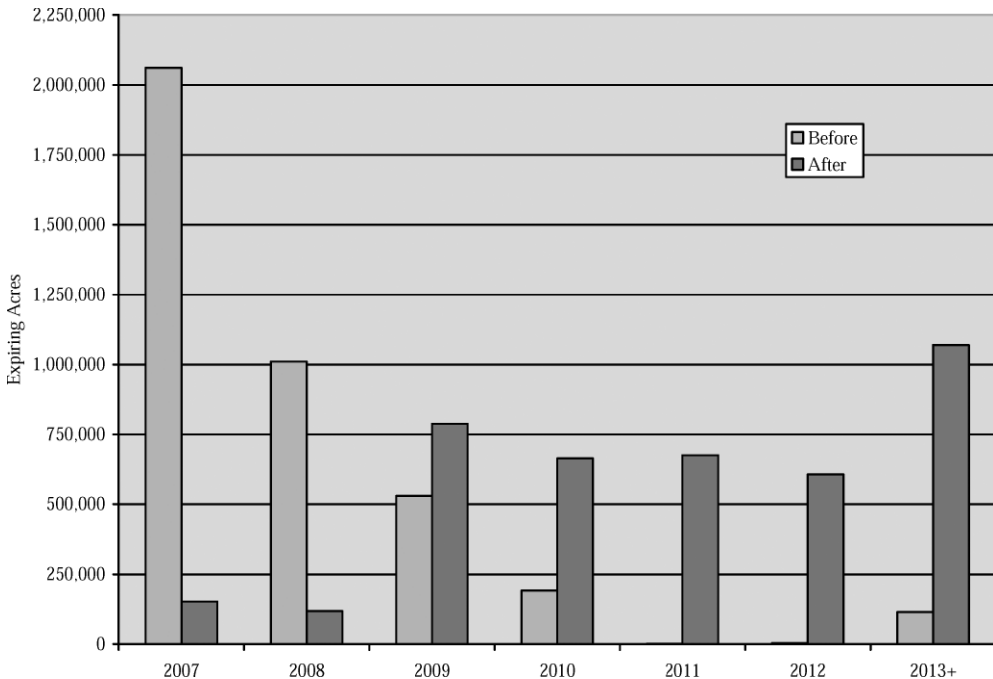


**Figure 3.** Expiring CRP Acreage before and after REX Program for Texas
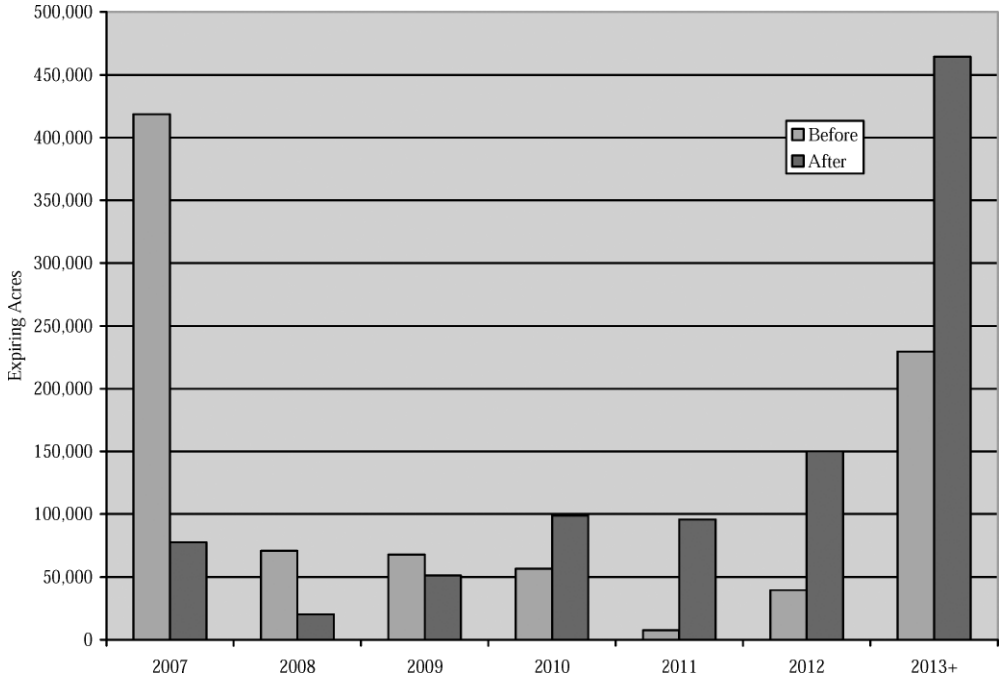
**Figure 4.** Expiring CRP Acreage before and after REX Program for Mississippi

wheat and cotton, and corn and soybean play a very minor role. On the other hand, CRP-heavy regions in Kentucky and Tennessee (almost all in the westernmost regions) are dominated by soybean and corn production (as well as cotton in Tennessee).

Part of the explanation could be price expectations: producers of corn and soybean could have been more optimistic about future prices relative to wheat and cotton producers given the expected growth in demand for corn and soybean as biofuel feedstocks. (Recall that the REX program was implemented before $4 corn.) Additionally, part of the explanation might be attributed to the technological changes that have occurred in soybean pro-
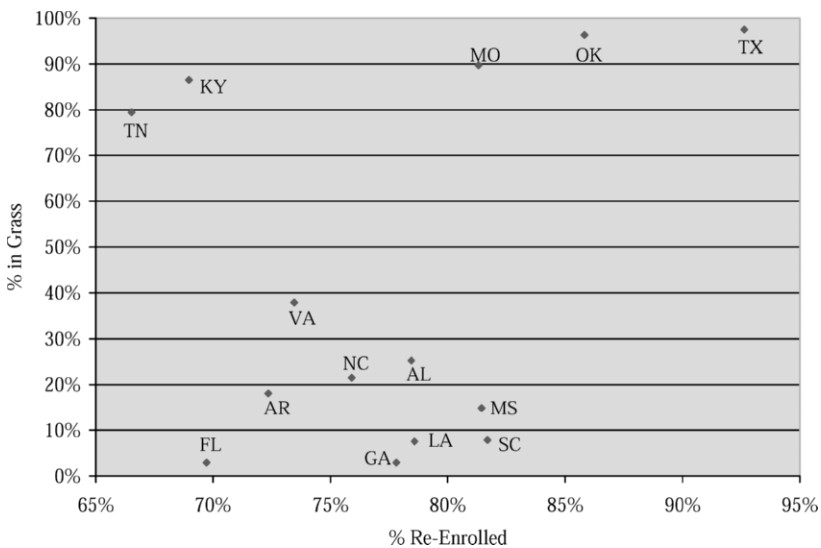


**Figure 5.** Percentage of 2007 Expiring CRP Acreage Re-enrolled Via REX Versus Percentage of Total CRP Acreage in Grass Conservation Practice

duction and, to a lesser extent, corn production, over the past two decades that may have changed what was originally marginal land when these CRP contracts were signed into profitable crop acreage today. Such changes cannot be said about wheat production, which has seen very little technological change over the same time period. Although the CRP-heavy regions in Missouri are dominated by soybean and corn, it does not follow the same trend as Kentucky and Tennessee: 81% of expiring 2006 CRP acreage re-enrolled; however, Missouri does have the lowest re-enrollment rate and the lowest percentage of CRP land in grass when compared with Oklahoma and Texas. As in other matters, Missouri seems to take the middle position.

To better analyze the low-grass group, we turn to Figure 6, which plots share of CRP land in trees versus percentage of 2007 expiring CRP acreage that was re-enrolled in each state. Ignoring the western high-grass group (Missouri, Oklahoma, and Texas) and Florida (which has fewer than 85,000 CRP acres), the figure indicates a positive relationship between percentage of CRP land in trees to percentage of acreage re-enrolled. This simply indicates that the more trees there are in CRP, the more of that state's acres will remain in CRP. In short, results indicate that states with more trees in CRP tend to keep more acreage enrolled, and those with mostly grass are more likely to opt out if their crop choice is soybean and corn, but less likely if it is wheat or cotton.

## County-level Analysis

### Methods

In this section, we undertake a more detailed county-level analysis to estimate the likelihood of producers not renewing their CRP contracts. We focus on five counties each in four states (Mississippi, Arkansas, Georgia, and Kentucky). The analysis here only looks at land that would require no preparation to convert back to production (i.e., grassland CRP). CRP land in trees would require removal of the trees to plant the land back

to crops. Although the timber would provide revenue, this revenue would also be available in a continuation of CRP. Converting CRP land with trees back to crop production would add a cost for stump removal. This cost would not be necessary if the land was kept in CRP (because after timber harvest, new trees would be planted around the old tree stumps).

The analysis in this paper focuses on examining the net income provided by a return to crop production versus the yearly CRP payment. Different levels of net income certainty are examined to determine when a risk-averse producer might switch CRP land back to crop production. For this paper, two crops are examined: corn and soybean. These two crops have experienced rapid price increases over the last year and would be strong crop candidates if crop production were resumed.

The five counties chosen in each of the four states have the most CRP acres in each respective state. The counties for Mississippi are Panola, Yazoo, Noxubee, Madison, and Chickasaw. The counties for Arkansas are White, Prairie, Jefferson, Lonoke, and Chicot. The counties for Georgia are Terrell, Sumter, Dooly, Early, and Laurens. The counties for Kentucky are Graves, Christian, Crittenden, Caldwell, and Webster. Historical corn and soybean yields in each county from 1990 to 2006 are used in the simulation. To simulate the yields, a deterministic base yield is needed. The base yield in each county for each crop is estimated from a linear regression of yields. Thus, the base yield is the expected crop yield for 2007.

The use of the county average yield as a base yield probably results in the use of a higher yield than the land actually enrolled. CRP land in a county is probably the least productive land. However, this yield advantage for the simulation is counterbalanced by not including any government payments in the simulation for land returning to production. This government payment for restored CRP land is likely to be small because the land with the lowest government payment would be enrolled first. Thus, base acres of crops with low expected government payments, such as
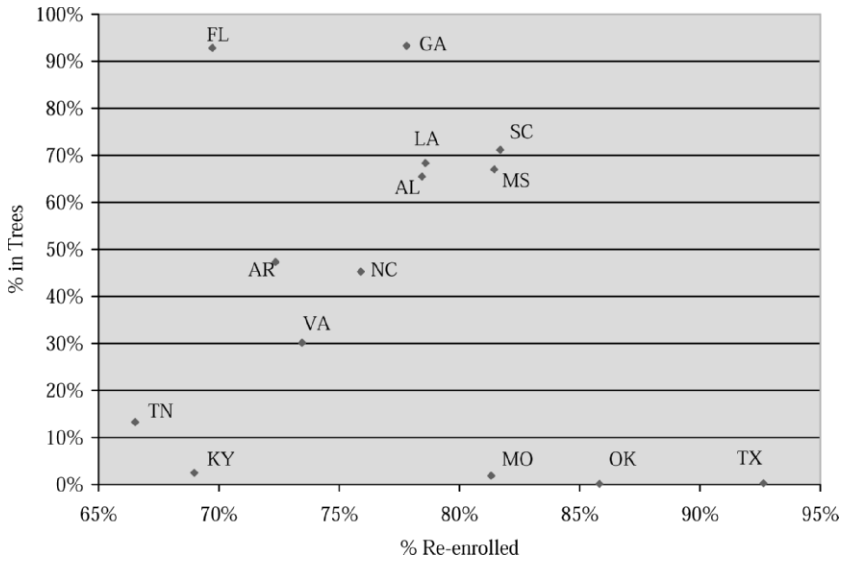
**Figure 6.** Percentage of 2007 Expiring CRP Acreage Re-enrolled Via REX Versus Percentage of Total CRP Acreage in Tree Conservation Practice

oats, barely, or soybean, would have been the first farm acres enrolled.

Simulations were run for each state separately. However, within each state, the counties and the crops within each county were all correlated by use of a multivariate empirical distribution (i.e., 10 data series within a county to simulate together). The end result

of the yield simulation was a set of 10 crop yields (five corn and five soybean) for a given county that were correctly correlated on the basis of historical correlations.

Prices were assumed to be independent of yields and were also stochastic. Because the objective was to determine when producers might pull land out of CRP, a range of
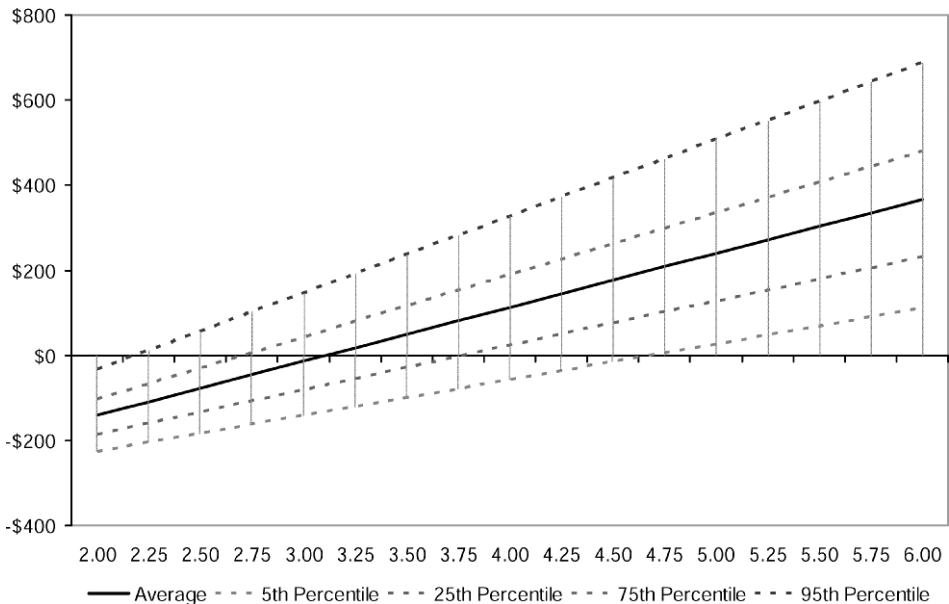


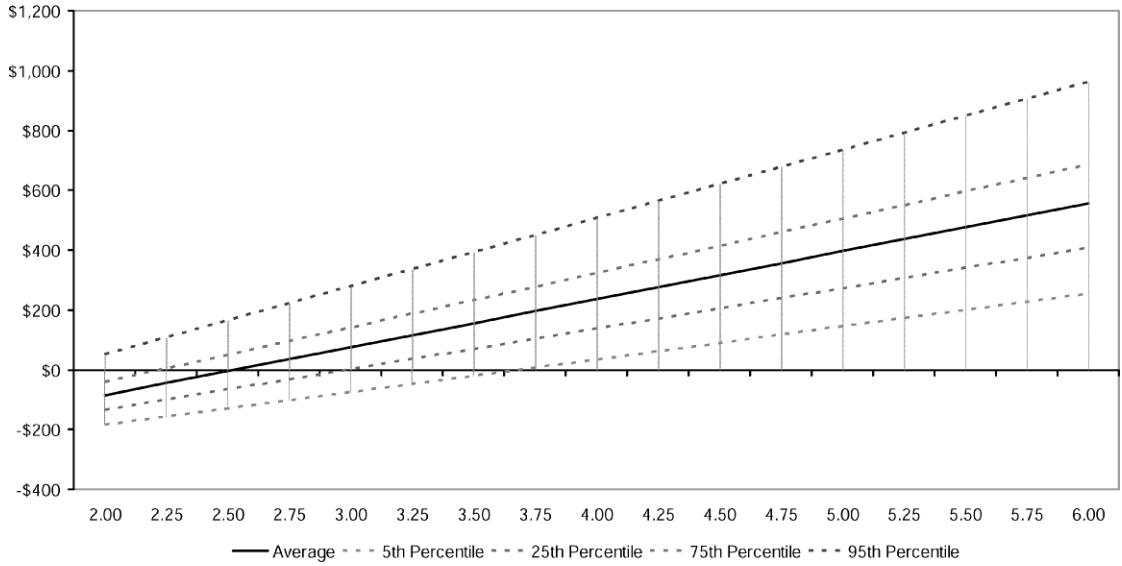**Figure 7.** Mississippi Corn—Dollars above CRP

**Figure 8.**   Arkansas Corn—Dollars above CRP

expected crop prices was used. That is, for a given expected price, we can estimate the stochastic net income at that price point and determine how likely producers are to move their land out of CRP. As higher levels of expected prices are examined, more producers should be expected to move their land back into production.

In this study, a range of corn prices from $2 to $6 per bushel was examined. The soybean prices examined varied from $5 to $13 per bushel. To make prices stochastic at each expected price point, a LOGINV Excel function was used. This function takes the natural log of prices and uses the NORMINV function to include variability on the basis of the standard deviation of a normal distribution. For the prices here, the standard deviation (or Beta) of the log of prices was assumed to be 0.2.
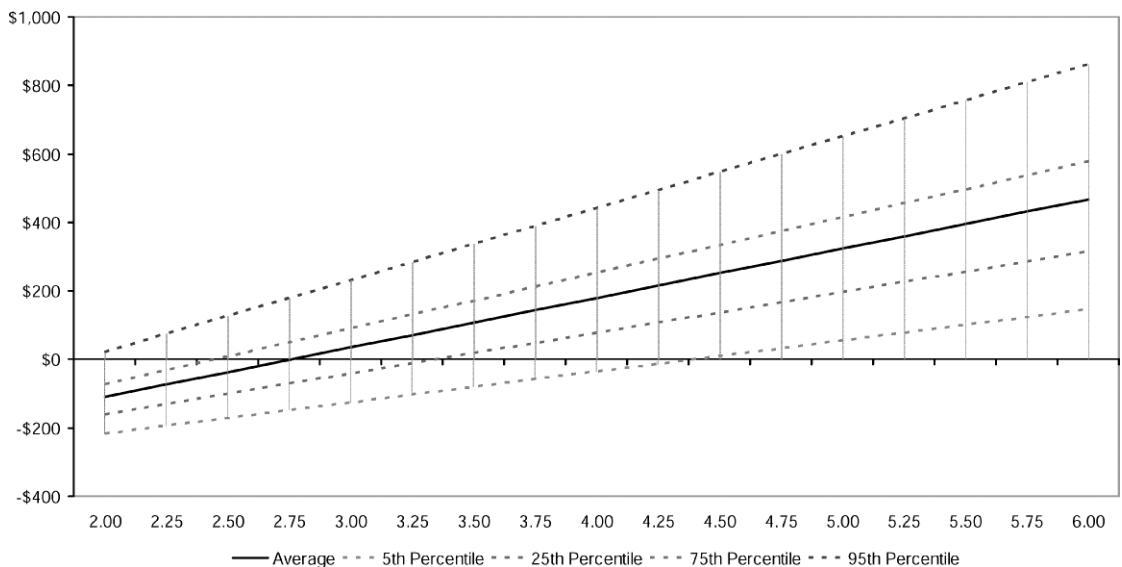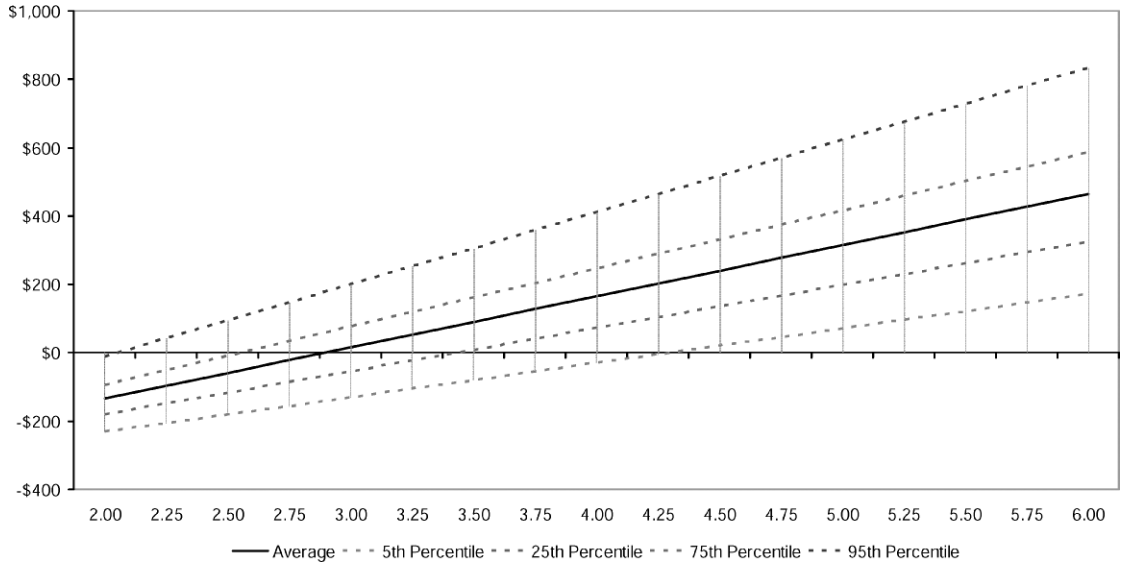


**Figure 9.**   Georgia Corn—Dollars above CRP

**Figure 10.** Kentucky Corn—Dollars above CRP

The simulation looked at the net income above the CRP payment. The procedure worked by taking the simulated yield times the simulated price at each price point for each crop and in each county. This simulated gross income had the budget expense and the CRP payment for a county subtracted out to give a net income per county per crop. This net income was the gain (or loss) from taking the land out of CRP and putting it back into crop production for that particular crop.

In the simulations, only the yields and the crop prices were made stochastic. Other inputs, such as fuel and fertilizer, would also contribute to income variability. However, these inputs were held constant during the analysis. Adding more stochastic elements would require the use of correlated data,
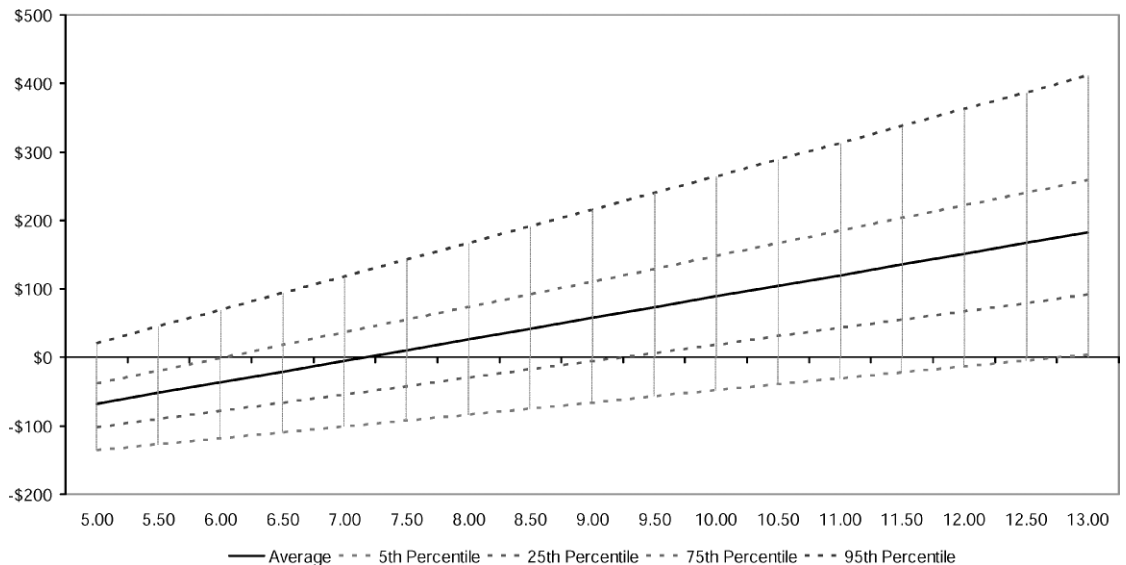


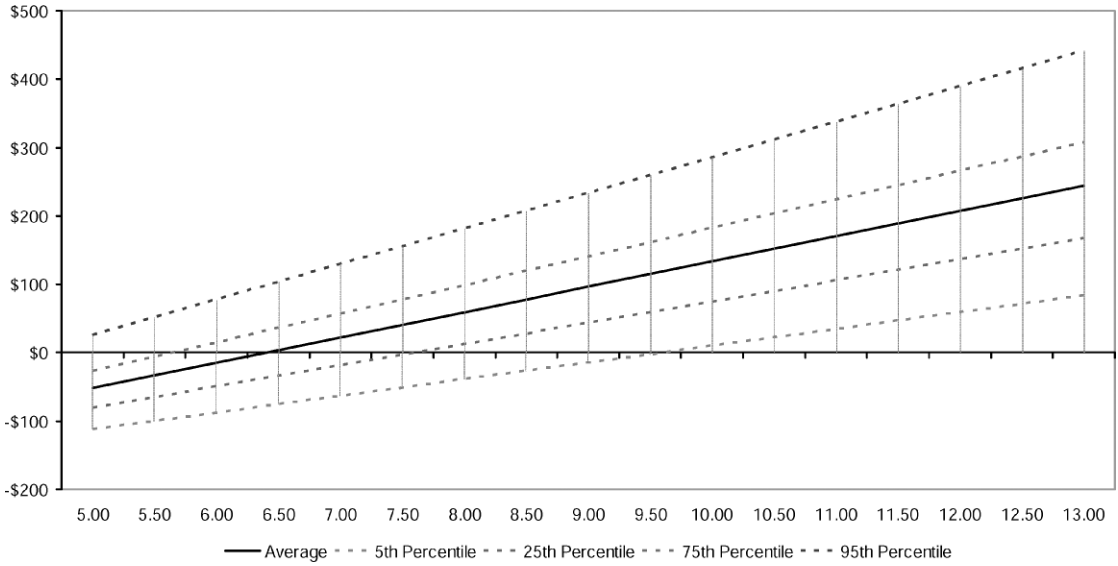**Figure 11.** Mississippi Soybeans—Dollars above CRP

**Figure 12.** Arkansas Soybeans—Dollars above CRP

which would greatly complicate the analysis but would not add much more to the findings.

These simulated results were averaged across counties within a state to produce a net benefit for removing land out of CRP at each price point. The five counties were weighted by the number of CRP acres in a particular county relative to the total CRP acres in all five counties.

*Results*

Figures 7 through 10 show the net returns from taking land out of CRP and putting it into corn production for the four states in this study. The horizontal axis shows the different expected corn prices, and the vertical axis shows the dollar gain from switching out of CRP to corn production. The five lines on the
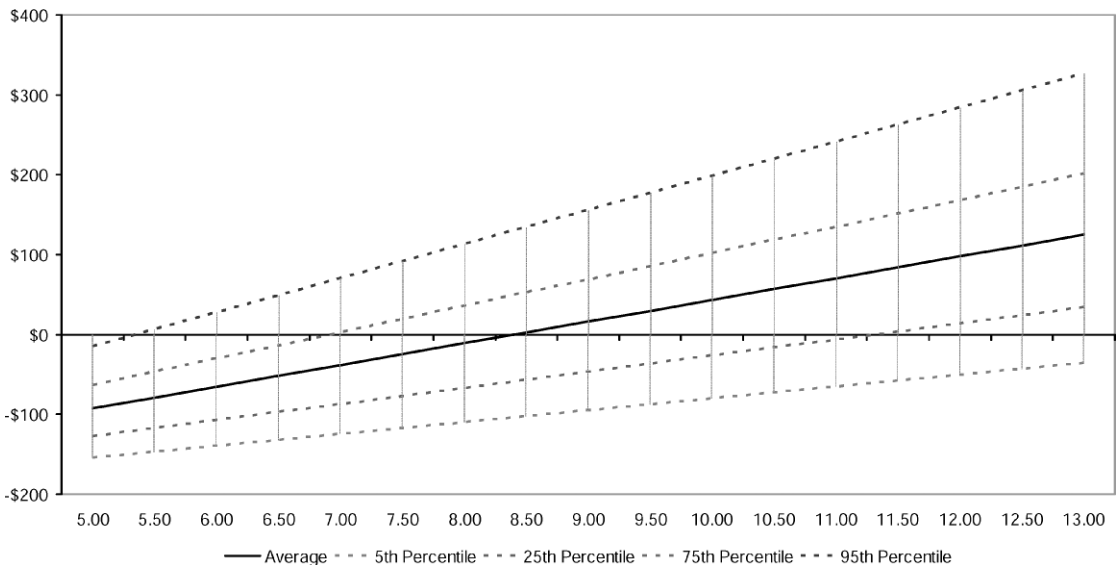


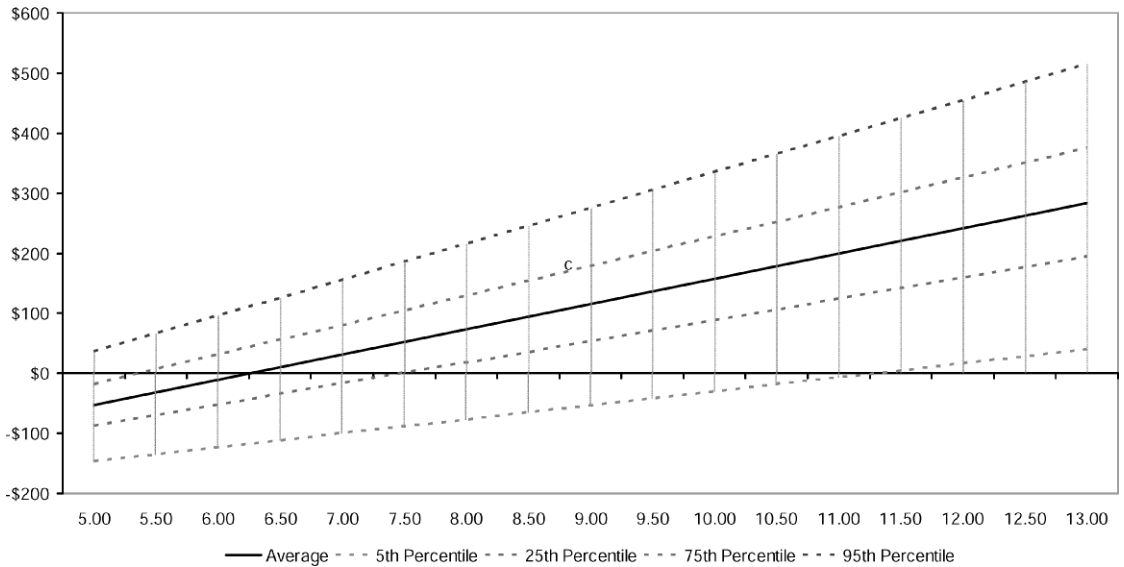**Figure 13.** Georgia Soybeans—Dollars above CRP

**Figure 14.** Kentucky Soybeans—Dollars above CRP

graph show how stochastic yields and prices affect net income. The middle line is the average net returns from the simulation and is basically what the results would show without any stochastic elements. The top line (95th percentile) is the net return line, wherein 5% of the returns are above the line and 95% are below the line.

Risk-averse producers would look at a percentile line below the average line (49th percentile or lower) to determine whether a given expected price would make them switch their CRP acres into corn. The more risk-averse they are, the smaller the percentile line they would use to make a land use decision. The more the chosen percentile line decreases (using a lower percentile line on the graph), the greater the expected corn price needed to get a producer to switch acres out of CRP.
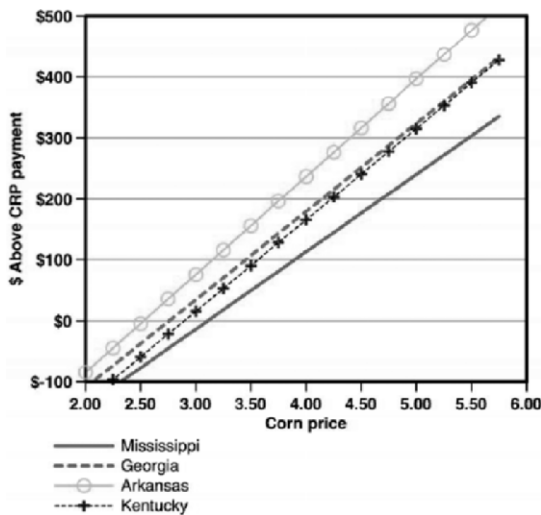


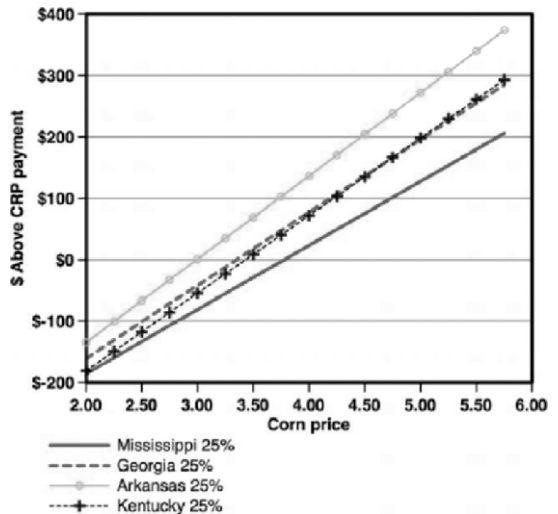**Figure 15.** Median Gain from Moving Land out of CRP and into Corn



**Figure 16.** 25th Percentile Level of Gain from Moving Land out of CRP into Corn
Note: This is the Corn Price Needed to Achieve the Level of Payment 75% of the Time
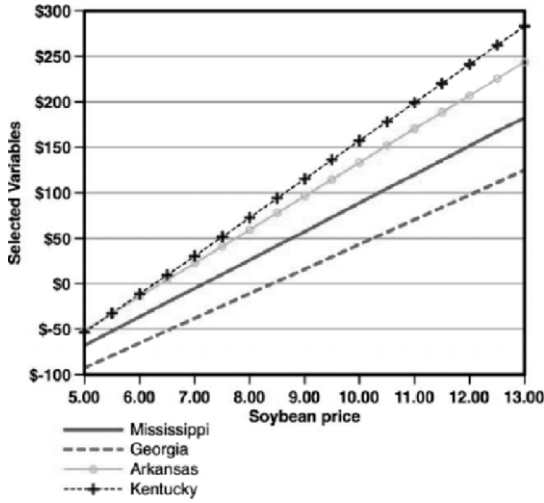
**Figure 17.** Median Gain from Moving Land out of CRP and Into Soybeans

For example, by Figure 7 (Mississippi corn), a risk-neutral producer (using the average line on the graph) would need an expected corn price of $3.00 each year to consider switching CRP land into corn production. A moderately risk-averse producer using the 25th percentile line would need a corn price near $3.75. Finally, a highly risk averse
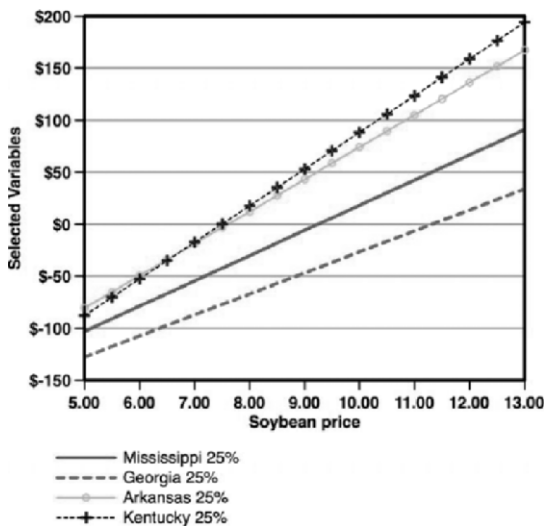


**Figure 18.** 25th Percentile Level of Gain from Moving Land out of CRP into Soybeans Note: This is the Soybean Price Needed to Achieve the Level of Payment 75% of the Time

producer using the 5th percentile line would need a corn price near $4.50.

Figures 11 through 14 show similar results for soybean in the four states. The main difference between the corn graphs and the soybean graphs is the expected price range. Expected corn prices range from $2.00 to $6.00 and simulations were run on $0.25 intervals. Soybeans, by contrast, have a larger spread of $5.00 to $13.00. Therefore, prices were only simulated every $0.50.

Figures 15 through 18 show a comparison among the four states. Figures 15 and 16 are for corn and Figures 17 and 18 are for soybean. In addition, Figures 15 and 17 are based on median gains and would correspond to a risk-neutral producer. Figures 16 and 18 are based on the 25th percentile and correspond to a risk-averse producer.

The graphs indicate that examining a median income line versus a 25th percentile line does not really alter the state ranking very much. These graphs look very similar (Figure 15 compared with Figure 16, Figure 17 compared with Figure 18). The 25th percentile line simply lowers the net income for an expected crop price when compared with the average line.

For corn, Mississippi would need the highest expected price in order to move CRP land into corn production. Arkansas needs the lowest expected corn price, with Kentucky and Georgia very close together and in between Mississippi and Arkansas. At the 25th percentile income line, Mississippi would need corn at $3.75 to switch CRP land into production. Georgia and Arkansas would need $3.50 corn, and Arkansas would need $3.00 corn.

For soybean, Georgia would need the highest expected price in order to move CRP land into soybean production. Kentucky and Arkansas would need the lowest expected soybean price, with Mississippi between the two extremes. At the 25th percentile income line, Georgia would need soybean at $11.50 to switch CRP land into production. Mississippi would need $9.50 soybean, and both Kentucky and Arkansas would need $7.50 soybean.

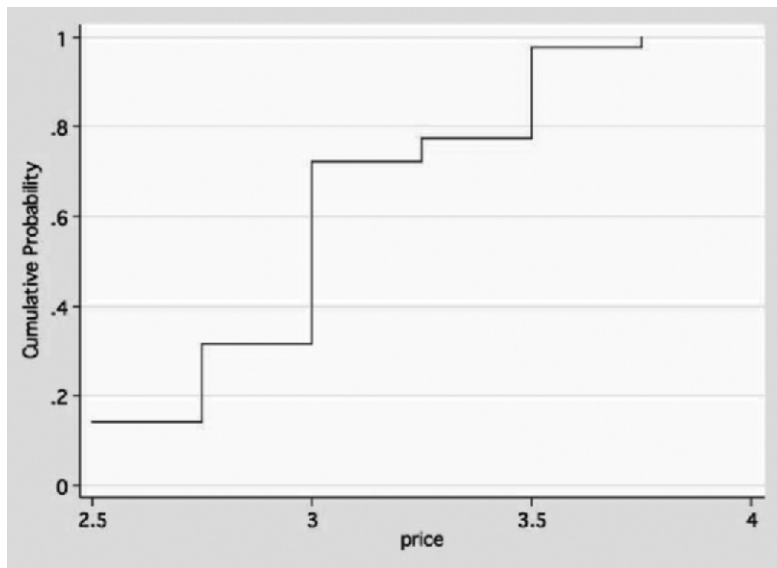These results imply that Arkansas and Kentucky are probably the most likely to

**Figure 19.** CDF of Mean Price to Switch to Corn (at County Level for Selected Counties)

move land out of CRP, whereas Mississippi and Georgia are the least likely. The price needed to move land into corn is much closer together for the four states than the price needed for soybean.

Figures 19 and 20 present the results of how CRP land would move into crop production when looking at all 20 counties at once. These two graphs are similar to the analysis done by Secchi and Babcock looking at land movement out of CRP at various prices. Here, the 20 counties were individually examined to determine at what price the land switch occurs. The weighted CRP acres were used to develop the cumulative probability.

For corn, $3 seems to be an important price because more than 75% of the land moved into production by that point (from a
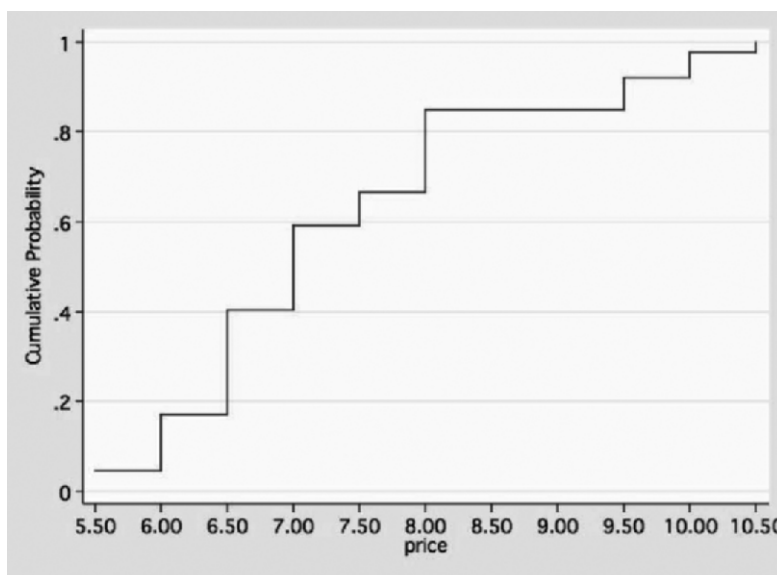


**Figure 20.** CDF of Mean Price to Switch to Soybeans (at County Level for Selected Counties)

cumulative probability of 0.35 to 0.75). For soybean, the price jumps are more gradual and more spread out. At $8 soybean, more than 80% of CRP land would switch. Keep in mind, though, that Figures 19 and 20 are based on median prices, and as a result, the CDF for risk-averse producers would be scaled upward.

## Conclusions

Switching land out of CRP and into crop production is certainly a real possibility. Both the initial state-level and more detailed county-level analyses point to the same conclusions. First, the state-level analysis indicates that there is a clear and positive relationship between the percentage of tree acreage and re-enrollment in CRP for states in which conservation acreage is dominated by trees. On the other hand, the relationship depends on crop mix in states in which CRP acreage is dominated by grass. Results indicate that CRP land in the western-most states, where the dominant CRP land use is grass and the dominant crop mix is wheat and cotton, tends to remain enrolled in conservation. In the grass-dominant states to the east, however, where the dominant crop mix is corn and soybean, relatively more land opts out of conservation and into production. Among the latter group, Kentucky and Tennessee lead the pack in opting out of CRP, followed by Arkansas, with Mississippi and South Carolina having the lowest number of acres opt out. These results are consistent with the results of the county-level analysis, which focused on corn and soybean production in four of the eastern states. Kentucky and Arkansas are more likely to consider it than are Mississippi and Georgia.

For Kentucky and Arkansas, a corn price of $3.00 to $3.50 and a soybean price of $7.50 are needed. Both of these grain prices have been recently available to farmers. However, farmers have to count on these prices each year. CRP contracts are multiyear, and any comparison would need to have equal years of crop production versus CRP. Given that the recent level of grain prices is fairly new, it might not be realistic to count on these current price levels remaining where they are.

Finally, there are two key thoughts to take away from this analysis. The first is that although current corn and soybean prices are high enough to tempt producers in many areas to make the switch from CRP to grain production, it is not universal. Our analysis showed that some grassland CRP will likely remain in CRP despite current price levels. States such as Mississippi and Georgia require such a high price for risk-averse producers that even current grain prices are not high enough to make the switch. Even though our analysis was only a sample of four states, the rest of the southern states are probably similar.

The second is that with the 2006 REX program, the lion's share of CRP acreage in the south, and across the nation, will remain in CRP for the next several years; thus, the acreage that does exit the program will be marginal. The REX program also buys CRP some time, allowing grain markets to make longer term adjustments to greater dependence on corn and other crops for energy production and allowing CRP contract holders a few more price observations before making long-term land use decisions. Furthermore, with the more balanced redistribution of expiring acreage over the coming years, there should not be another year, like 2007, where roughly half of all general sign-up acreage could potentially exit the program all at once.

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