Odds of an ACRE Payment for Corn and Soybean Farmers

Bruce A. Babcock

Iowa State University, babcock@iastate.edu

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The recent sharp drop in commodity prices has increased producer interest in the new farm bill program called ACRE (Average Crop Revenue Election). If the prices currently indicated by the futures markets for the 2009 crop actually materialize, then corn, soybean, and wheat farmers have a good chance of receiving substantial ACRE payments. Farmers have until August 14 to enroll in ACRE so there is still time for farmers to determine if ACRE is better for them than traditional farm programs.

Farmers who sign up for ACRE are not eligible for countercyclical payments, receive 20 percent lower direct payments, and receive a lower loan rate. Enrollment is through the 2012 crop year. Because payments from both ACRE and traditional farm programs depend on the level of future prices and yields, it is impossible to say with certainty that one program or the other will generate more payments. However, looking at different yield and price scenarios can help farmers make a judgment about the odds that enrolling in ACRE will provide fruitful returns. A close look at the Iowa situation shows how this can be done.

The yield used to set the 2009 ACRE state guarantees equals the average of the state average yield per planted acre from 2004 through 2008 with the highest and lowest yields eliminated from the average. Table 1 provides the five-year history for Iowa and the subsequent ACRE yield.

The 2009 ACRE guarantees for Iowa equal 90 percent of the product of the ACRE yield and the ACRE price. For corn this amounts to $650.16 per acre. For soybeans the state guarantee is $456.77 per acre. Farmers who sign up for ACRE will receive a payment if the product of the 2009 actual yield per planted acre and the 2009/10 season average price falls below these levels. The amount of the per acre payment is capped at 25 percent of these guarantees and the per acre payment is made on 83.3 percent of planted acres. Farm payments are calculated by multiplying the state ACRE payment by the ratio of farm yields to the ACRE yield. Total farm payments are also subject to a $65,000 payment limit plus the 20 percent decrease in direct payments. If the farm is at the $40,000 direct payment limit, the effective ACRE payment limit is therefore $73,000.

### Table 1. Data used to calculate Iowa ACRE yields

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres Planted* (million)</th>
<th>Production (million bu)</th>
<th>Yield** (bu/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Corn</td>
<td>Soybeans</td>
<td>Corn</td>
</tr>
<tr>
<td>2004</td>
<td>12.40</td>
<td>10.20</td>
<td>2,244</td>
</tr>
<tr>
<td>2005</td>
<td>12.53</td>
<td>10.05</td>
<td>2,163</td>
</tr>
<tr>
<td>2006</td>
<td>12.36</td>
<td>10.15</td>
<td>2,050</td>
</tr>
<tr>
<td>2007</td>
<td>13.90</td>
<td>8.65</td>
<td>2,377</td>
</tr>
<tr>
<td>2008</td>
<td>12.81</td>
<td>9.75</td>
<td>2,189</td>
</tr>
<tr>
<td>ACRE Yield</td>
<td></td>
<td></td>
<td>172</td>
</tr>
</tbody>
</table>

Source: Data are from the National Agricultural Statistics Service.

*Acres planted equals harvested acres plus failed acres as measured by the Farm Service Agency (FSA).

**FSA rounds soybean yields to the nearest half bushel and corn yields to the nearest bushel.
To see that ACRE has the potential to generate substantial payments, Figures 1 and 2 show what ACRE payments would be for alternative state average yields if the 2009/10 marketing year prices turn out to be $3.25 for corn and $8.56 for soybeans. As shown, if yields are equal to the ACRE yield calculated in Table 1, then corn ACRE payments would be almost $75 per planted acre for corn and about $22 per acre for soybeans. These estimated payments account for payments being made on only 83.3 percent of planted acres. State average corn yields would have to exceed 200 bu/ac to receive no ACRE payment with a $3.25 price. Soybean yields would have to exceed 54 bu/ac for ACRE payments to drop to zero with a price of $8.56. ACRE can generate a maximum of more than $135 per acre for corn and $95 per acre for soybeans.

A limitation in Figures 1 and 2 is that they do not reflect the probability of yield outcomes or uncertainty about prices. An early July forecast of Iowa yields and national prices can provide an estimate of the odds of receiving an ACRE payment in 2009. Given the late signup date for ACRE, farmers can update these estimates in early August before making a final decision.

Calculating the Odds
As of the second week of July, Iowa crops are off to a great start, with 82 percent of corn and 80 percent of soybeans rated good to excellent. This is higher than any crop has been rated at this point in the growing season since 2003, when both crops received the same rating. Of course a good early-July crop rating does not guarantee a good crop. The 2003 soybean crop was a disaster because of a late drought and associated pest damage. And the state-average corn yield in 2003 was 2.5 percent below trend. But a good rating in July does tilt the odds in favor of a good crop, particularly if soil moisture is plentiful, as it is this year.

Iowa trend yields per planted acre (with a linear trend from 1980 to 2008) are 172 bu/ac for corn and 49 bu/ac for soybeans. The largest trend-adjusted yield per planted acre for corn since 1980 is 193 bu/ac which occurred in 2004. For soybeans, 1994 was the best year, with a technology-adjusted yield of 57 bu/ac. For corn, the probability of below-trend yields is minimal because of the great start to the crop and abundant-to-surplus soil moisture throughout the state. So a reasonable lower bound on yield may be 12 bushels below trend yield for 2009, or 160 bu/ac. For soybeans, dry weather and an outbreak of pests in August could still cause problems, but it looks like El Niño conditions are returning, which, combined with abundant soil moisture, suggests that a repeat of 2003 is extremely unlikely. A reasonable lower bound on 2009 yields may be eight bushels below trend, or 40 bu/ac.

We can then construct a probability distribution of yields given...
these upper and lower bounds if we set the expected yield for 2009 at 180 bu/ac for corn and 53 bu/ac for soybeans. Figures 3 and 4 present the resulting probability distribution of Iowa corn and soybean yields for 2009 as of the second week of July. The figures show the probability that 2009 yields will be less than or equal to any yield on the horizontal axis. Thus, for example, there is a 10 percent chance that Iowa corn yields will be less than 170 bu/ac, which means that there is a 90 percent chance that yields will be greater than 170 bu/ac.

The next step is to figure out how much price uncertainty exists in the market. We can find this by looking at the price of put and call options on the Chicago Mercantile Exchange. The price of a put option for December corn and November soybeans gives a good indication: the higher the price of the option, the greater the uncertainty. And finally, the correlation between Iowa yields and the season-average price needs to be accounted for. Market prices already reflect the likelihood of a bumper crop for both corn and soybeans. If yields turn out to be lower than expected, prices will tend to be higher than current levels. If growing conditions improve even more, then we should see additional price weakness.

Combining the yield variability shown in Figures 3 and 4 and the price variability revealed by the price of put options with a reasonable degree of negative correlation results in the distribution of state revenue for Iowa corn and soybeans. These distributions are shown in Figures 5 and 6 on page 10. The figures show the probability that state revenue will be less than or equal to any given level. They also show the revenue levels that will trigger ACRE payments. For corn, there is a 78 percent chance that Iowa farmers who sign up for ACRE will receive a payment. For soybeans, there is a 55 percent chance. Thus, the odds are good for both crops that ACRE will pay out in 2009.

With a bit more calculation, the data shown in Figures 5 and 6 can also be used to estimate the average size of the payment from ACRE. For corn, when ACRE pays out, the average payment is about $80. For soybeans, the average payout is $40 per acre. Multiplying these average payouts by the probability of a payout results in the overall expected or average payout. For corn, farmers should expect to see about $62 per planted acre. For soybeans, the expected payout is about $22 per acre.

Iowa farmers must give up 20 percent of their direct payments to participate in ACRE. Across corn and soybeans, this amounts to about $4.40 per planted acre. Weighting the corn and soybean expected ACRE payments by 2009 planted acreage gives an overall expected ACRE payment across corn and soybeans for 2009 of $45, which is 10 times as large as what farmers are being asked to give up in direct payments. This suggests that the high odds of receiving an ACRE payment in 2009 can compensate farm-
ers for their loss in direct payments over the life of the farm bill.

What Should Farmers Do?
The signup rules for ACRE allow farmers to wait until August 14 to decide whether ACRE makes sense for them. By the first week of August, farmers will have more information about 2009/10 marketing year prices, the condition of the 2009 crop, and final ACRE guarantee levels. Therefore, they will have more information about the potential size of ACRE payments. If corn prices stay in the low $3.00 range and soybean prices stay below $8.50, then ACRE becomes even more of a sure bet than is indicated by the early July calculations. If for some reason corn and soybean prices increase dramatically and crop conditions do not deteriorate, then perhaps waiting until next year would be a better bet.

Producers who do not want to wait until August to enroll in ACRE can rest reassured that if market prices unexpectedly increase and no ACRE payment is triggered in 2009, this increase in market price will provide them with a high guarantee for their 2010 crops because the 2010 guarantee will be based on market prices received in the 2008/09 and 2009/10 marketing years. Odds are good that in at least one year over the next four, Iowa farmers will receive more in ACRE payments than they will give up in direct payments over the life of the farm bill.