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## 2009 Soybean Yield Prospects Improving

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The purpose of this brief is to update our previous evaluation of yield potential for soybeans in Illinois, Indiana, and Iowa in 2009. (Irwin, Good, and Tannura, 2009). This update makes use of a crop weather model that estimates the impact of technology (trend), state average monthly weather variables, and portion of the crop planted late on state average yield. Previously, that model was used to evaluate 2009 yield potential based on planting progress, state average precipitation through June 2009, and alternative 2009 July-August weather scenarios. This update incorporates preliminary state average precipitation and temperature for July and alternative weather scenarios for August 2009.<sup>1</sup> The yield forecasts for the three states are then used to project the U.S. average yield. Trend yields for 2009 for each of the three states and the U.S. are also presented. It should be noted at the outset that average July temperatures for 2009 were well below the coldest July in the sample of historical observations used to

estimate the crop weather model.<sup>2</sup> This may reduce the ability of the model to accurately reflect the impact of July 2009 temperature on yield potential.

In addition to yield projections based on the crop weather model, U.S. yield projections are made based on a crop condition model that regresses time (trend), the percent of the crop planted after May 30<sup>th</sup>, and the sum of the percentage of the crop rated good or excellent by the USDA in the final *Crop Progress* report of the season over 1986-2008 on U.S. average yields. Please note the addition of the late planted variable to the crop condition model used previously. This variable has a small negative coefficient, but is not statistically significant. The forecasts are little changed from the previous model. The model is specified as:

$$\text{U.S. soybean yield} = 21.5971 + 0.4239 \text{ X Time} - 0.0068 \text{ X percent planted after May 30}^{\text{th}} + 0.1912 \text{ X percent rated good or excellent}$$

This model explained 92 percent of the variation in U.S. average soybean yields over 1986-2008. Alternative yield projections using this model are made

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<sup>1</sup> All monthly weather observations were obtained from the National Climatic Data Center (<http://www.ncdc.noaa.gov/oa/ncdc.html>). The values are preliminary and are not finalized by the NCDC for one to two years after release. The observations will change once final data are analyzed.

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<sup>2</sup> Over 1960-2008, the time period used to estimate the crop weather models, the coolest average July temperature was 72.0, 71.2, and 68.5 degrees in Illinois, Indiana, and Iowa, respectively. This compares to 70.3, 69.4, and 68.0 degrees in July 2009.

based on alternative condition ratings at the end of the season.

Finally, alternative U.S. yield forecasts are used to project the potential size of the 2009 soybean harvest based on the USDA's forecast of harvested acreage in the August *Crop Production* report. That report indicated that 76.767 million acres of soybeans will be harvested in 2009.

Results of the alternative yield and production forecasts are presented in Tables 1 and 2. Actual yields and the 2009 trend yield calculation for each state are presented in Figure 1. In addition, the estimated impact of the late planting variable and the impact of each of the weather variables to date on the deviation from the 2009 trend yield in each of the three states are presented in Figure 2.

In Table 1, three alternative forecasts are made using the crop weather model. Each forecast incorporates actual observations through July and alternative forecasts for August weather—average, poor, and good. (See Irwin, Good, and Tannura (2009) for the definition of average, poor, and good). Soybean yield forecasts based on the crop weather model are all higher than the forecasts made last month. This follows from the results in Figure 2, illustrating the positive impact of July precipitation and temperature on yield prospects.

In Table 2, four alternative forecasts are made using the crop condition model. The first is based on the most recent crop condition ratings. As of August 9, 2009, 66 percent of the crop was rated in good or excellent condition. Alternative forecasts are based on the average crop condition rating at the end of the growing season over 1986-2008, the average of the five lowest crop condition ratings, and the average of the five highest crop condition ratings.

The two models and various scenarios result in a wide range in the U.S. yield forecasts. Forecasts based on the crop

weather model are slightly higher than the forecasts from the crop condition model for all three scenarios of average, poor, and good.

U.S. soybean yield forecasts range from 39.0 to 45.6 bushel. As a result, production forecasts are also in a wide range, from 2.995 billion to 3.498 billion bushels. The average forecast of the two models is 42.9 bushels for the average scenario, 40.2 for the poor weather scenario, and 45.3 bushels for the good weather scenario, suggesting a potential crop between 3.086 billion and 3.478 billion bushels. The composite forecast of the crop weather model assuming average August weather and the crop condition model based on current crop conditions is 43.9 bushels and may be a reasonable expectation for 2009 yield at this time. A yield at that level would produce a crop of 3.370 billion bushels. By comparison, the USDA's August *Crop Production* report forecast the 2009 yield at 41.7 bushels and production at 3.199

A formal estimate of the uncertainty in crop weather model forecasts is also provided in Table 1. The standard error is based on an out-of-sample simulation of forecast errors over 1990-2008. In essence, the same procedure used here to generate the crop weather model forecast of U.S. soybean yield for 2009 was applied to each of the previous 19 years. The resulting series of forecast errors was then used to compute the forecast standard error, estimated to be 3.9 bushels (9%). A one-standard error range based on this estimate is 39.7 to 47.5 bushels.<sup>3</sup> There is still a considerable amount of uncertainty in crop weather model forecasts of soybean yield, as there is with USDA August yield forecasts. However, the standard error of USDA August soybean forecasts over 1990-2008 was smaller at 6.6%. Finally, forecast standard errors were not computed for the

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<sup>3</sup> More technically, a one-standard error range should contain the actual yield about two-thirds of the time.

crop conditions model because of data limitations. A reasonable assumption is that the forecast standard error would be in the range of the standard error for the crop weather model.

We will update the 2009 soybean yield and production forecasts in early September. Actual August precipitation and temperature along with updated crop condition ratings will be used to make the updated forecasts

## **REFERENCE**

Irwin, S., D. Good, and M. Tannura, "Early Prospects for 2009 Soybean Yields in Illinois, Indiana, and Iowa." Marketing and Outlook Brief 2009-02, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, June 2009. Available online: [http://www.farmdoc.uiuc.edu/marketing/mobr/mobr\\_09-02/mobr\\_09-02.pdf](http://www.farmdoc.uiuc.edu/marketing/mobr/mobr_09-02/mobr_09-02.pdf).

**Table 1. Alternative Forecasts of 2009 Soybean Yield in Illinois, Indiana, Iowa, and 2009 U.S. Soybean Yield and Production**

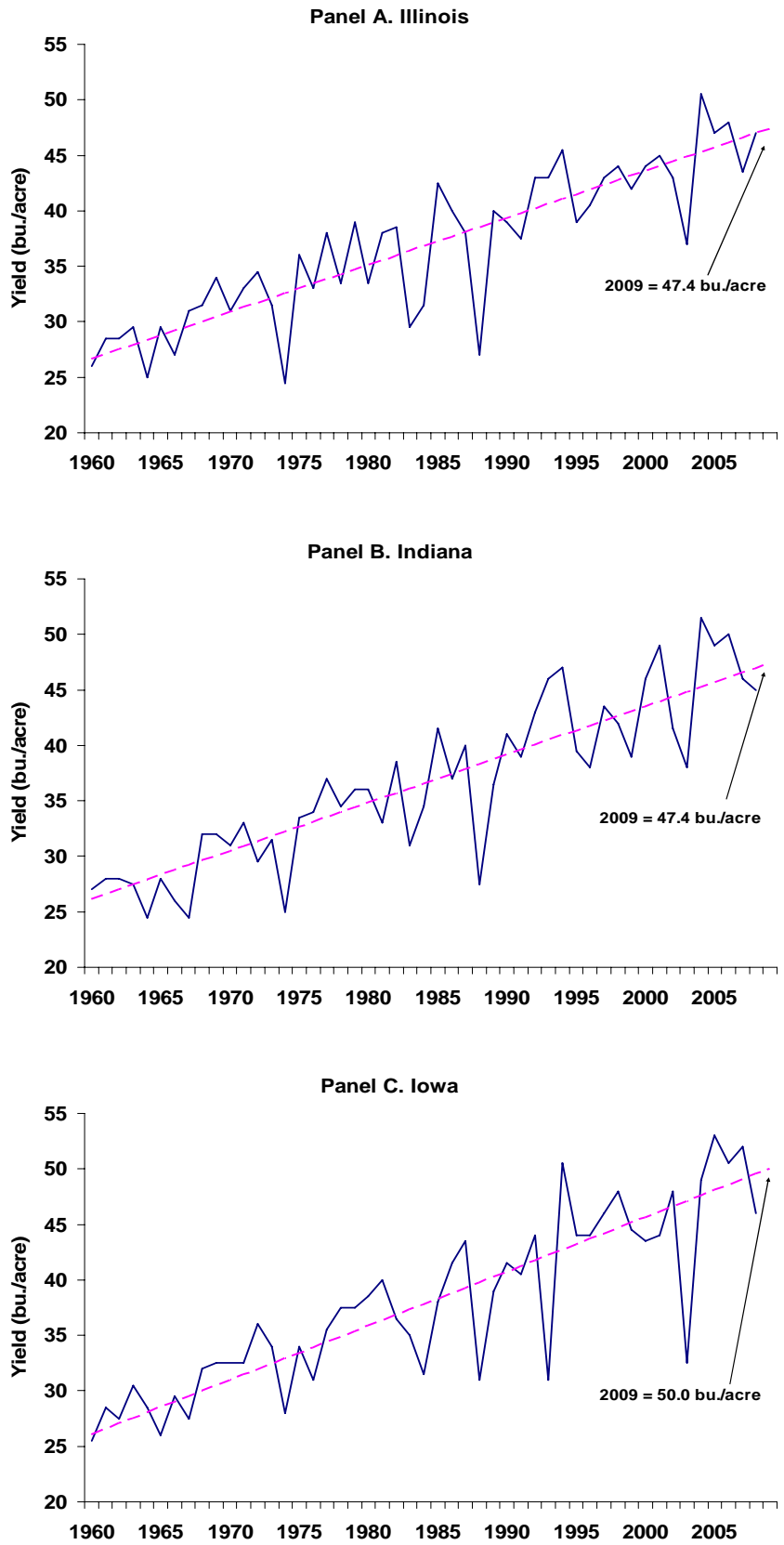
	Trend	August Weather		
		Average	Poor	Good
<b>Panel A. State Yield Forecasts</b>				
Illinois (bu./acre)	47.4	47.1	44.7	49.6
Indiana (bu./acre)	47.4	48.3	46.4	49.9
Iowa (bu./acre)	50.0	55.0	51.8	57.4
3-State Average (bu./acre)	NA	50.5	47.9	52.8
<b>Panel B. U.S. Forecasts</b>				
Yield (bu./acre)	42.2	43.6	41.4	45.6
Standard Error (bu./acre)	NA	3.9	NA	NA
One Standard Error Range (bu./acre)	NA	39.7-47.5	NA	NA
Production (mil.bu.)	3,240	3,350	3,175	3,498
Standard Error (mil.bu.)	NA	300	NA	NA
One Standard Error Range (mil. bu.)	NA	3,050-3,650	NA	NA

Notes: NA denotes 'not applicable.' See the text for a detailed explanation of each state yield forecast. The 3-state average forecasts are weighted by harvested acreage for each state as reported in USDA's August 2009 *Crop Production* report. U.S. production forecasts for 2009 assume 76.8 million harvested acres, also drawn from USDA's August 2009 *Crop Production* report.

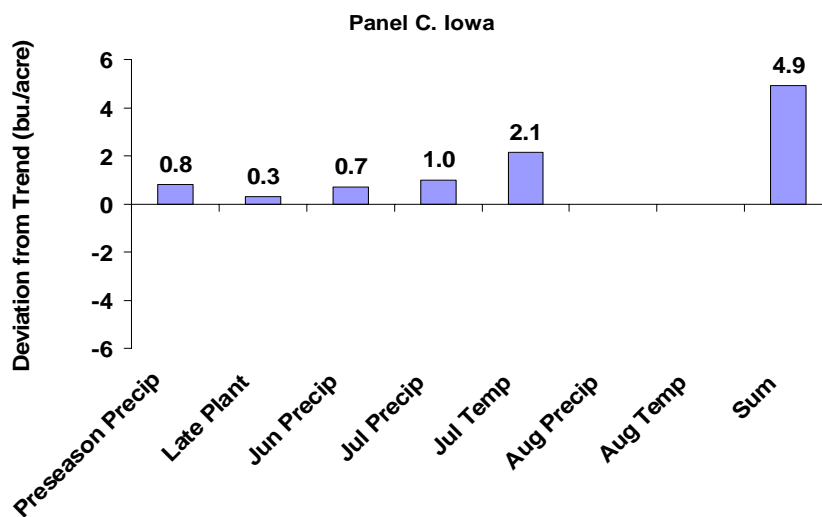
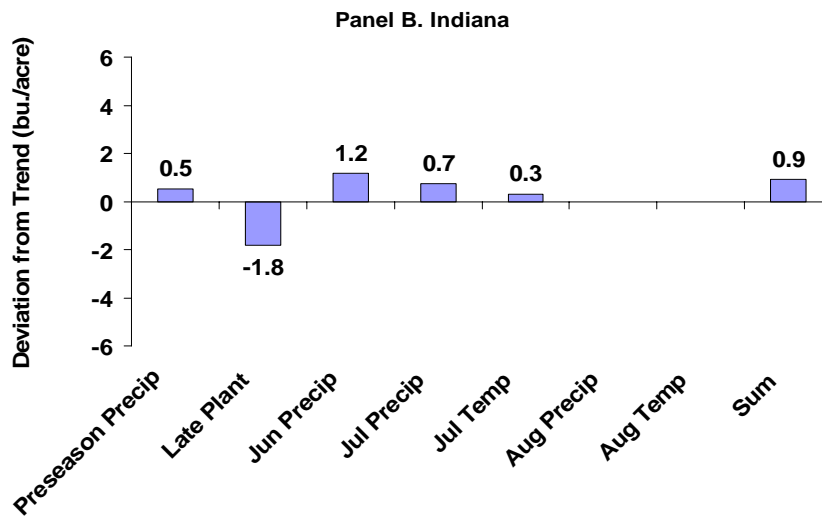
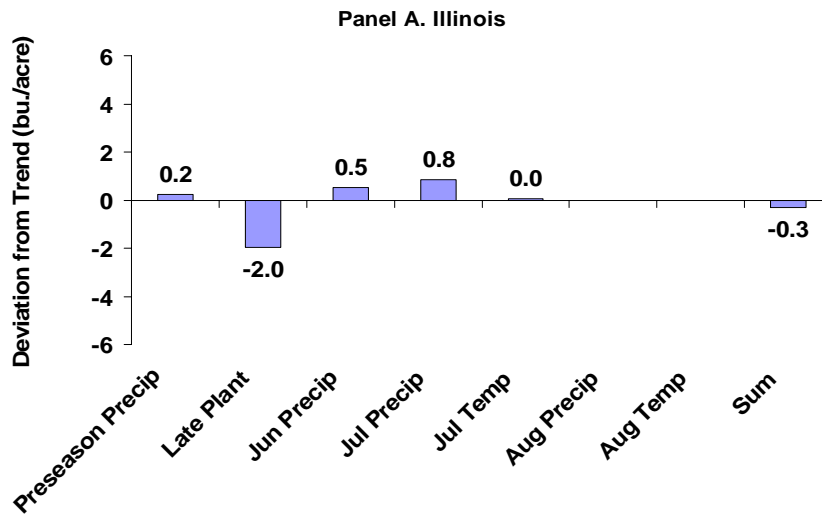
**Table 2. Alternative Crop Conditions Model Forecasts of 2009 U.S. Soybean Yield and Production**

	Ratings Scenario			
	Aug 9th	Average	Poor	Good
Yield (bu./acre)	44.1	42.1	39.0	44.9
Production (mil.bu.)	3,389	3,233	2,995	3,447

Notes: U.S. production forecasts for 2009 assume 76.8 million harvested acres, which is drawn from USDA's August 2009 *Crop Production* report.



**Figure 1. Actual and Trend Soybean Yield in Illinois, Indiana, and Iowa, 1960-2008**



**Figure 2. Estimated Impact of Monthly Weather and Late Planting Variables on Deviation from Trend Soybean Yield in Illinois, Indiana, and Iowa in 2009**