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2009 Corn Yield Prospects Continue to Improve

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The purpose of this brief is to update our previous evaluation of yield potential for corn in Illinois, Indiana, and Iowa in 2009. (Irwin, Good, and Tannura, 2009b). 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 2009.¹ 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.² 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 20th, 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. The model is specified as:

$$\begin{aligned} \text{U.S. corn yield} = & 66.3855 + 2.2851 \\ & \text{X Time} - 0.179 \text{ X percent planted} \\ & \text{after May 20}^{\text{th}} + 0.6207 \text{ X percent} \\ & \text{rated good or excellent} \end{aligned}$$

This model explained 97 percent of the variation in U.S. average corn yields over 1986-2008. Alternative yield projections using this model are made based on crop condition ratings as of August 9 and alternative condition ratings at the end of the season.

¹ 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.

² 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.

Finally, alternative U.S. yield forecasts are used to project the potential size of the 2009 corn harvest based on the USDA's forecast of acreage harvested for grain in the August *Crop Production* report. That report indicated that 80.007 million acres of corn will be harvested for grain 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 (2009a) for the definition of average, poor, and good). Corn yield forecasts based on the crop weather model are all substantially 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, 68 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 higher than the forecasts from the crop condition model for all three

scenarios of average, poor, and good. This is a reversal from last month when the crop condition model forecast higher yields.

U.S. corn yield forecasts range from 142.4 to 171.7 bushel. As a result, production forecasts are also in a wide range, from 11.394 billion to 13.739 billion bushels. The average forecast of the two models is 160.1 bushels for the average scenario, 150.5 for the poor weather scenario, and 169.2 bushels for the good weather scenario, suggesting a potential crop between 12.041 billion and 13.537 billion bushels. The composite forecast (simple average) of the crop weather model assuming average August weather and the crop condition model based on current crop conditions is 161.7 bushels and may be a reasonable expectation for 2009 yield at this time. A yield at that level would produce a crop of 12.937 billion bushels. By comparison, the USDA's August *Crop Production* report forecast the 2009 yield at 159.5 bushels and production at 12.761 billion bushels.

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. corn 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 9.1 bushels (5.5%). A one-standard error range based on this estimate is 156.2 to 174.4 bushels.³ While there is still a considerable amount of uncertainty in crop weather model forecasts, the uncertainty in USDA August yield forecasts is likely just as high if not higher. The standard error of USDA August corn forecasts over 1990-2008 was 5.9%. Finally, forecast standard errors were not computed for the crop conditions model

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

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 corn 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.

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Irwin, S., D. Good, and M. Tannura, "Early Prospects for 2009 Corn Yields in Illinois, Indiana, and Iowa." Marketing and Outlook Brief 2009-01, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, June 2009a. Available online:

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Table 1. Alternative Crop Weather Model Forecasts of 2009 Corn Yield in Illinois, Indiana, Iowa, and 2009 U.S. Corn Yield and Production

	Trend Model	Weather Scenario		
		Average August	Poor August	Good August
Panel A. State Yield Forecasts				
Illinois (bu./acre)	166.3	172.6	164.2	180.6
Indiana (bu./acre)	156.8	167.3	160.0	174.1
Iowa (bu./acre)	167.9	194.8	188.1	201.1
3-State Average (bu./acre)	NA	181.2	173.7	188.2
Panel B. U.S. Forecasts				
Yield (bu./acre)	154.9	165.3	158.5	171.7
Standard Error (bu./acre)	NA	9.1	NA	NA
One Standard Error Range (bu./acre)	NA	156.2-174.4	NA	NA
Production (mil.bu.)	12,389	13,225	12,680	13,739
Standard Error (mil.bu.)	NA	731	NA	NA
One Standard Error Range (mil. bu)	NA	12,493-13,956	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 80.0 million harvested acres, also drawn from USDA's August 2009 *Crop Production* report.

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

	Ratings Scenario			
	Aug 9th	Average	Poor	Good
Yield (bu./acre)	158.2	154.9	142.4	166.6
Production (mil.bu.)	12,655	12,397	11,394	13,330

Notes: U.S. production forecasts for 2009 assume 80.0 million harvested acres, which is drawn from USDA's August 2009 *Crop Production* report.

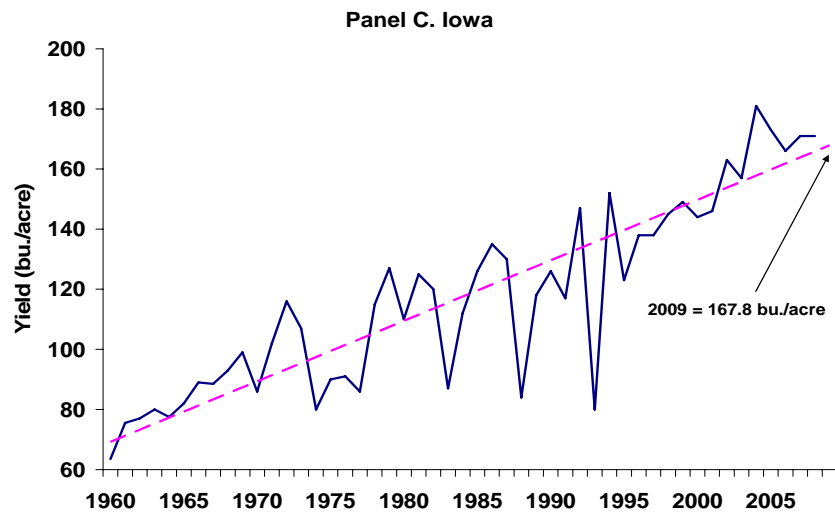
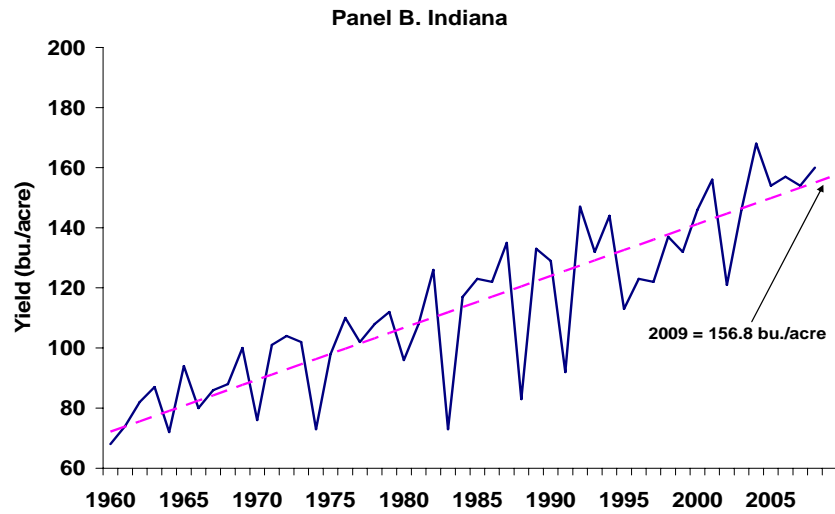
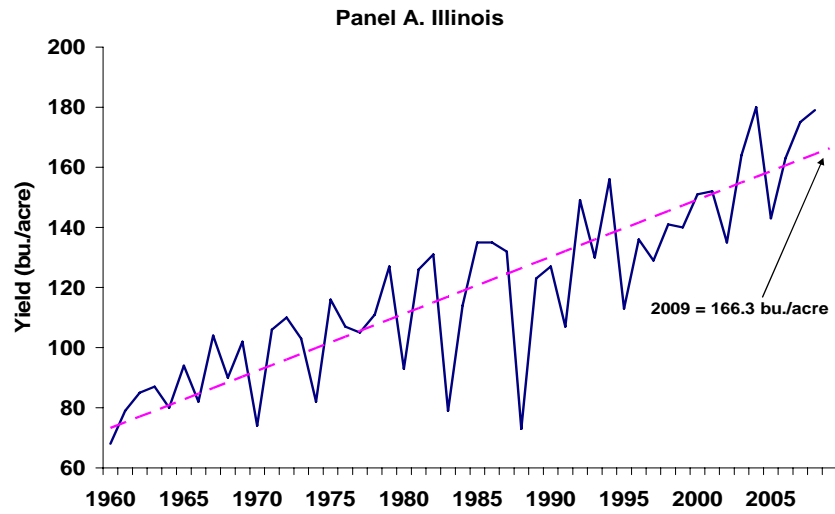


Figure 1. Actual and Trend Corn Yield in Illinois, Indiana, and Iowa, 1960-2008

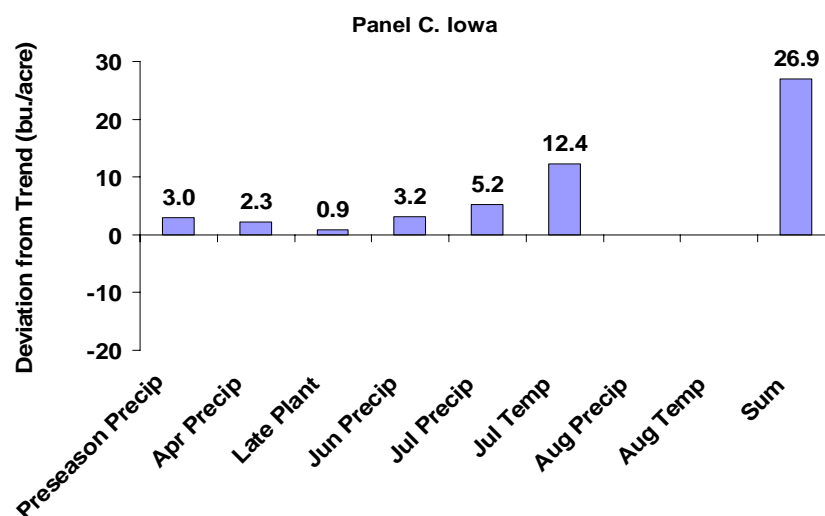
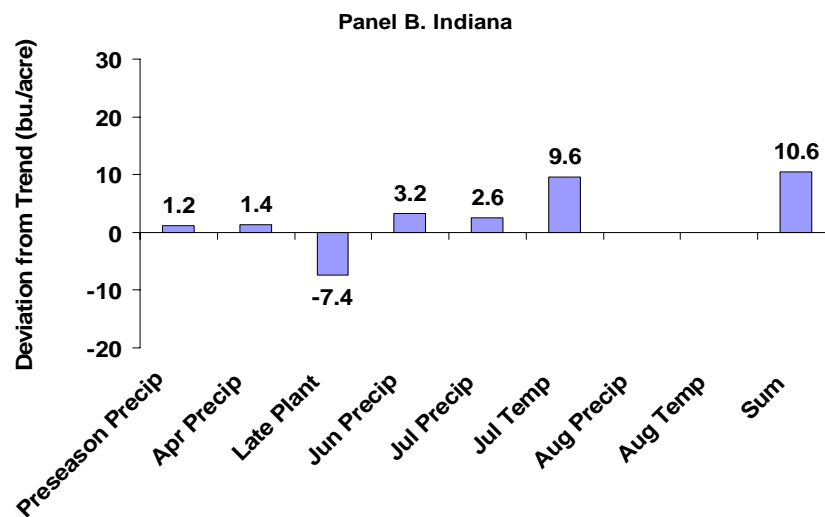
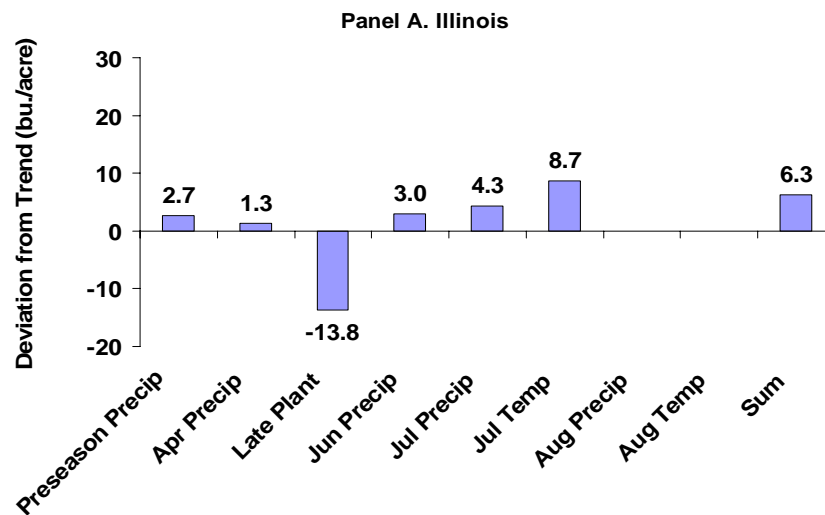


Figure 2. Estimated Impact of Monthly Weather and Late Planting Variables on Deviation from Trend Corn Yield in Illinois, Indiana, and Iowa in 2009