



Uncertainty About 2016 U.S. Average Corn and Soybean Yields Persists

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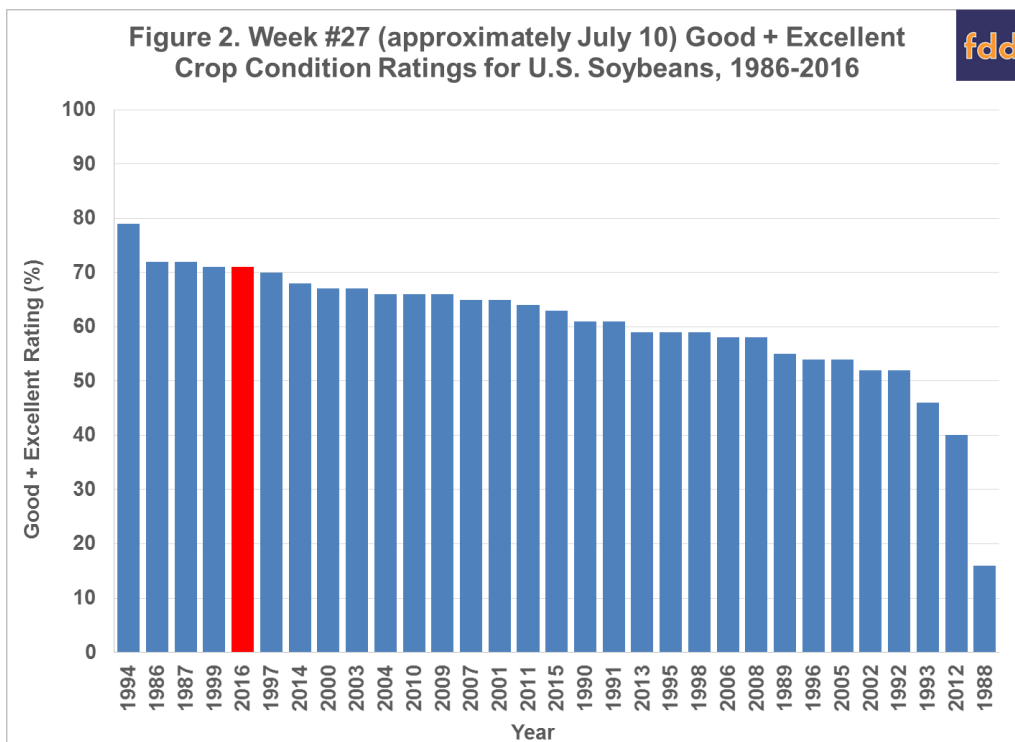
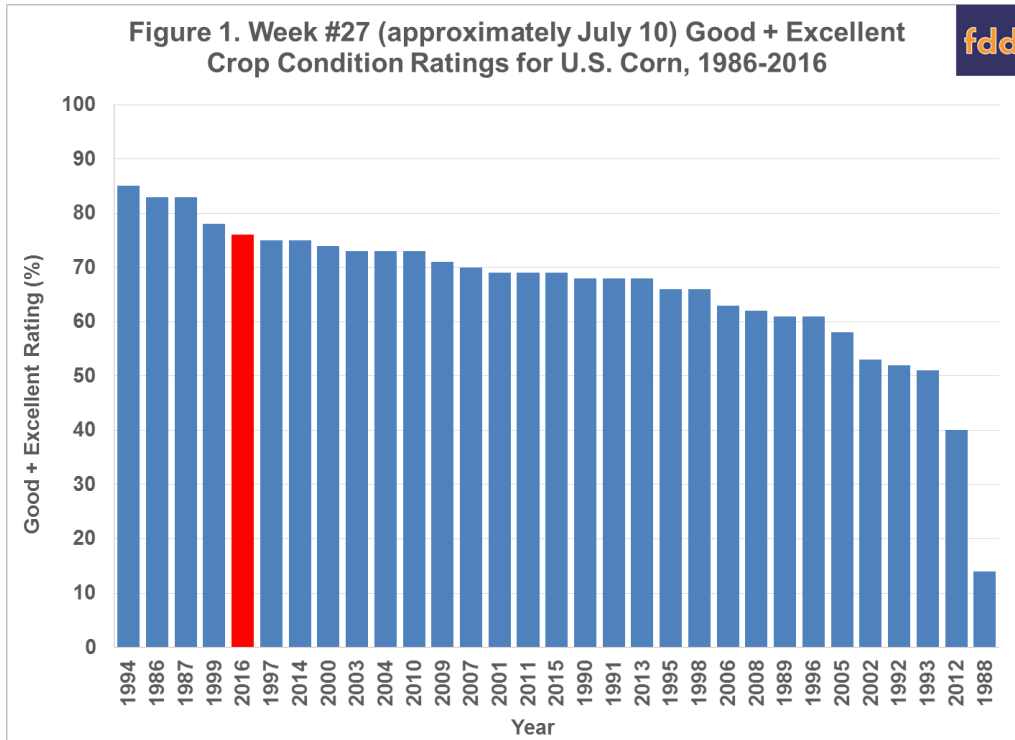
Expectations about the likely U.S. average corn and soybean yields at any point in the growing season are influenced by a number of factors. These include the trend in historical average yields, the timeliness of planting in the current year, weather conditions to date in the current year, and weather forecasts for the remainder of growing season. In addition, the USDA's weekly ratings of crop conditions (percent of the acreage rated very poor, poor, fair, good, and excellent) reported in the [Crop Progress](#) report quantify the current overall health of the crop and are widely used to form expectations about yield potential (e.g., *farmdoc daily*, [July 19, 2011](#); [August 4, 2011](#); [September 9, 2011](#); Lehecka, 2014). In particular, the combined percentage of the crop rated good (yield prospects are normal) and excellent (yield prospects are above normal) at any point in the growing season is commonly used to quantify average yield expectations. Condition ratings for corn and soybeans so far in 2016 have been at historically high levels and this has been an important factor in moving yield expectations higher and prices lower. What has received less attention is the question of how well condition ratings at this point in the growing season correlate with final U.S. average yields. Put differently, what degree of uncertainty should be attached to yield forecasts based on the present high crop conditions? We investigate this issue in today's article for current crop condition ratings as well as those during the remainder of the summer.

Analysis

Crop condition ratings for the major corn and soybean producing states have been reported in the current form since 1986, although the number and make-up of the states included in the report has changed somewhat over time as production areas have expanded or contracted. For the current growing season, weekly crop condition ratings were first reported for the 18 major producing states for the week ended May 29 for corn and for the week ended June 5 for soybeans. The most recent ratings were for the week ended July 10, the 27th week of the calendar year. The percent of the crops rated in good or excellent condition at the end of the 27th week of the calendar year since 1986 is shown in descending order in Figure 1 for corn and Figure 2 for soybeans. As of July 10, 2016, 76 percent of the crop was rated in good or excellent condition, 10 points above the average of the previous 30 years and the fifth largest percentage for the 27th week of the year for the 31-year period. For soybeans, 71 percent of the crop was rated in good or excellent condition, also 10 points above the average of the previous 30 years and tied

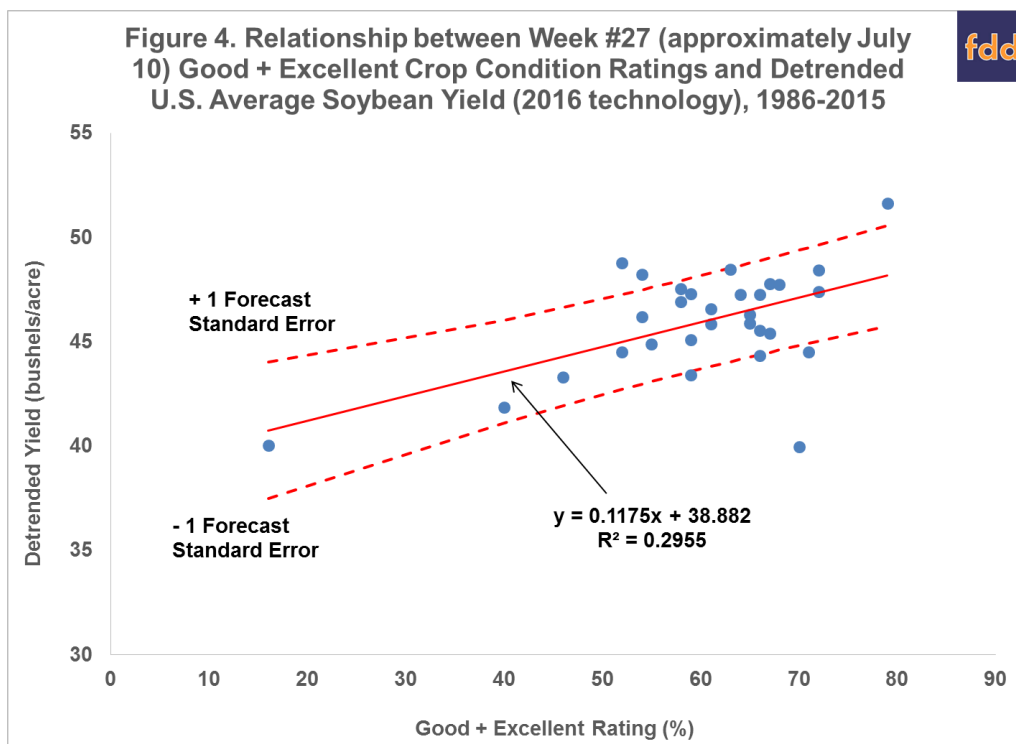
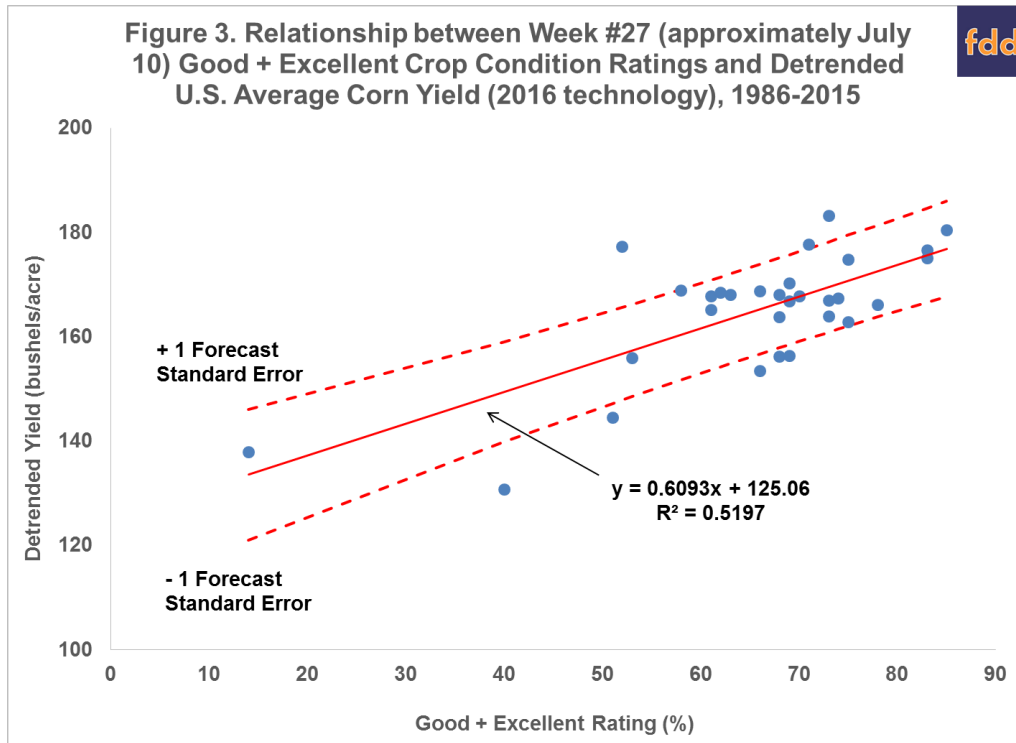
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for fourth largest percentage for the 27th week of the year for the 31-year period. These high ratings pointed in the direction of high corn and soybean yield potential.



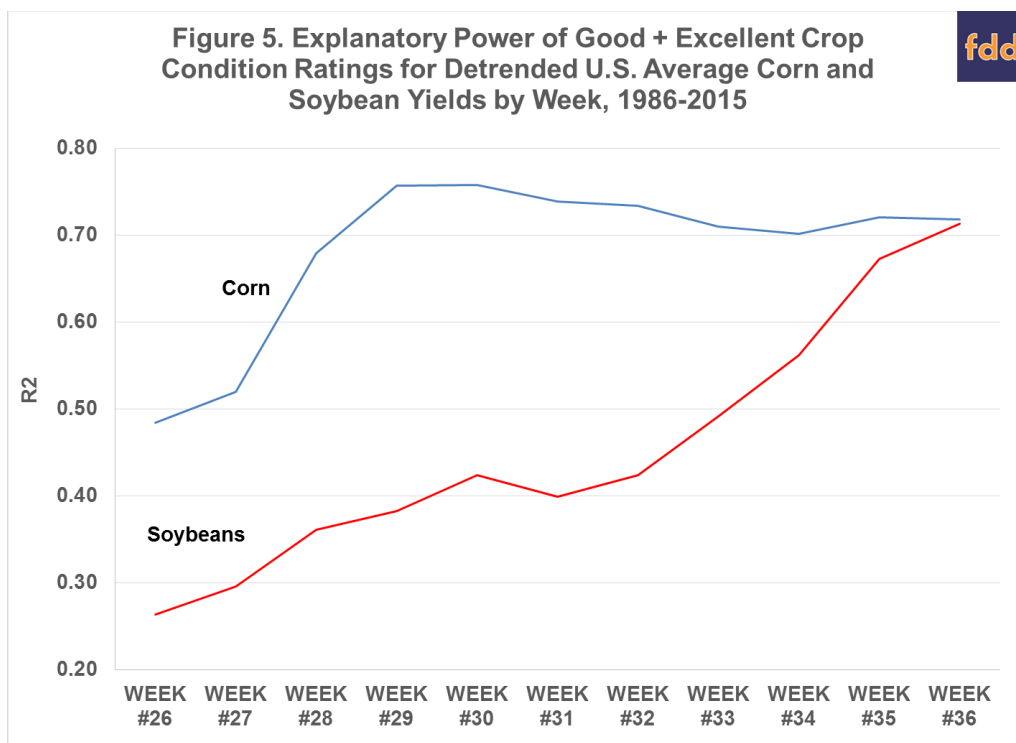
The obvious question, then, is how well do crop condition ratings at the end of the 27th week of the calendar year correlate to final U.S. average yields estimated by the USDA? Those relationships are presented in Figure 3 for corn and Figure 4 for soybeans. Since the U.S. average yields of both crops have trended higher over time, yields in those figures are de-trended linearly to reflect equivalent yields based on 2016 production technology. There is clearly a positive relationship between the percentage of the crop in good or excellent condition in early July and the U.S. average yield. For corn, the slope of the fitted relationship between condition ratings and de-trended yield indicates that, on average, a one

percentage point increase (decrease) in the percentage of the crop rated in good or excellent condition at the end of the 27th week of the year was associated with a yield increase (decrease) of about 0.61 bushels. For soybeans, a one percentage point increase (decrease) in the condition ratings was associated with a de-trended yield increase (decrease) of about 0.12 bushel. With 76 percent of the corn crop and 71 percent of the soybean crop rated in good or excellent condition as of July 10, the fitted relationships between condition ratings and average yield point to 2016 average yields of 171.4 bushels for corn and 47.2 bushels for soybeans.



While the relationship between crop condition ratings and yield is positive, as expected, there has also been a lot of variation in the relationship between crop condition ratings in early July and average yields over the past 30 years. More formally, ratings at the end of the 27th week only explain about 52 percent of the variation in de-trended corn yields and 30 percent of the variation in de-trended soybean yields. Based on the historical deviations between the predicted and actual average yields, we calculated predicted yields within one standard (forecast) error of the mean yield prediction. The one standard error of predicted yields is indicated by the band around the fitted line in Figures 3 and 4. Yield forecasts within one standard error for 2016 range from 162.6 to 180.1 bushels for corn and from 44.9 to 49.5 bushels for soybeans. That is, we can be about 68 percent confident that the U.S. average corn yield will be within plus or minus nine bushels of the mean forecast of 171.4 bushels and the U.S. average soybean yield will be within plus or minus 2.3 bushels of the mean forecast of the mean forecast of 47.2 bushels. Two-standard deviation bands would be associated with 95 percent confidence and would be quite wide. The magnitude of forecast ranges suggests that there is still a lot of uncertainty about the magnitude of U.S. average corn and soybean yields in 2016.

As indicated earlier, crop condition ratings at the end of the 27th calendar week explained only about 52 percent of the variation in de-trended annual U.S. average corn yields and 30 percent of the annual variation in U.S. average soybean yields over 1986-2015. It would be reasonable to expect that weekly crop condition ratings provide for a more accurate forecast of U.S. average yields as the growing season progresses. We examined the historical explanatory power (R²) of crop condition ratings for calendar weeks 26 through 36 (late June to early September) for the period 1986 through 2015. As shown in Figure 5, the explanatory power of crop condition ratings for corn improved sharply in weeks 28 and 29. That improvement is consistent with the importance of July weather (reflected in crop condition ratings) for corn yields. However, ratings explained a maximum of 76 percent of the annual variation in corn yields. The explanatory power of crop condition ratings for soybeans increased gradually over the entire period, but did not reach 70 percent until late August. Again, this pattern is consistent with the importance of August weather conditions for soybean yields. Finally, it is interesting to observe that crop condition ratings at the end of the summer growing season still leave unexplained 25-30 percent of the variation in final yields.



Implications

It appears that beginning in late June this year, corn and soybean prices began reflecting yield expectations near those implied by crop condition ratings—around 170 bushels for corn and 47 bushels for soybeans. With so much of the growing season remaining, however, the markets may have underestimated the magnitude of yield uncertainty, even with generally favorable growing conditions continuing

into mid-July. The current forecast is for an extended period of temperatures that average well above normal over a large portion of the corn and soybean production region along with below-average rainfall. That forecast points to declining crop condition ratings and lower yield expectations. Whether or not the forecast verifies, it is a reminder that for corn and soybean yields, it is not over until it is over.

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