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Are We Underestimating Corn Production Potential?

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Are We Underestimating Corn Production Potential?

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As Figure 1 shows, the 2004 and 2005 corn crops in Iowa are the two highest yielding corn crops the state has ever seen. But producers had questions about both crops going into harvest. Precipitation was below average over both growing seasons and the 2004 and 2005 summers were at the extremes for temperature. In fact, since 1993, Iowa corn yields have not fallen below 120 bushels per acre. For the last eight years (counting 2005), state-average corn yields have exceeded 140 bushels per acre. While Iowa has not experienced a statewide drought or weather disaster over this period, the weather conditions have not been what is typically considered ideal for crop production.

Figure 2 shows Iowa corn yields per planted acre over the 1980 to 2005 crop years. The graph highlights the significant yield declines in the drought years of 1983 and 1988 and during the 1993 floods, but it also shows the amazing yield run since 1993, topped by last year’s record. Using this period to estimate a linear yield trend for Iowa corn (the black line), we see trend yields growing by 2.38 bushels per planted acre per year. But this estimate of trend includes the three disaster years and assumes that yield growth has been constant over the entire period. To create a better trend yield estimate, we remove the three disaster years from the yield trend estimation and allow the trend yield growth rate to vary over different periods within the 1980-2005 timeframe. For each year between 1982 and 2001 (which we call the break-point year), we estimate a trend yield equation that has a different trend yield growth rate for the period 1980 to break-point year than for the period break-point year to 2005. The trend estimate is also required to give the same trend estimate for the break-point year under both trend lines (that is, the trend yield estimate for the break-point year is the same under the 1980 to break-point year trend and the break-point year to 2005 trend). From the various estimates using the Iowa corn yield data, we see a break point in 1994. The “adjusted trend” (the gray line) in Figure 2 shows the new trend estimate with the 1994 break point. Trend yield growth was 1.11 bushels per planted acre from 1980 to 1994 but jumped to 3.43 bushels per planted acre from 1994 to 2005. This trend shows that corn production potential in Iowa may have been underestimated over the last few years.

Under the linear trend, the trend yield for 2006 is 159.9 bushels per planted acre. This would grow to 181.3 bushels per planted acre.
Figure 2. Corn yields per planted acres and trend estimates, 1980-2005

Figure 3. The percentage of Iowa corn that is genetically modified

Per planted acre in 2015. Under the break-point trend, the trend yield for 2006 is 169.1 bushels per planted acre, 9.2 bushels per acre higher. The 2015 trend yield is 200.0 bushels per planted acre, roughly 10 percent higher. The 1994 break point in corn yield trend seems to be related to technological improvements in corn production. Seed companies have significantly invested in creating higher-yielding corn varieties over the past 25 years. The introduction of these new varieties and of genetically modified corn in 1996 represented a major technological change in corn production, and this change may be the main driver of the sizable trend yield growth rate we see since 1994. Figure 3 shows the adoption of genetically modified corn in Iowa. In 2000, 30 percent of all Iowa corn was genetically modified. By 2005, that percentage had doubled. The continuing growth in the adoption of genetically modified corn and the accompanying growth in trend corn yields point to a future of increasing supplies of Iowa corn to fuel the budding ethanol industry in Iowa, to feed Iowa livestock, and to export to other markets.