farmdoc DAILY

Department of Agricultural and Consumer Economics, University of Illinois Urbana-Champaign

More about the Historic Pattern of U.S Winter Wheat Yields

Scott Irwin and Darrel Good

Department of Agricultural and Consumer Economics
University of Illinois

February 24, 2012

***farmdoc daily* (2):37**

Recommended citation format: Irwin, S. and D. Good. "More about the Historic Pattern of U.S Winter Wheat Yields." *farmdoc daily* (2):37, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, February 24, 2012.

Permalink: http://farmdocdaily.illinois.edu/2012/02/more-about-the-historic-patter.html

In yesterday's post we examined the history of average U.S. winter wheat yields in search of any patterns that might be helpful in anticipating the average yield for 2012. We expand that analysis here in recognition that, unlike corn and soybeans, winter wheat consists of several classes of wheat. The USDA reports winter wheat production in four classes–hard red, soft red, hard white, and soft white. An estimate of the percentage distribution of production by class in each state and an estimate of state average yield of all classes are made, but an estimate of U.S. average yield by class is not provided. Here we select representative states to illustrate the historical yield pattern of hard red winter (HRW) and soft red winter (SRW) wheat. Kansas is selected for HRW wheat since it is the largest producer of that class of wheat and 98 percent of the production in the state is HRW. The selection of a representative state for SRW wheat is more difficult because that class of wheat is produced in relatively small quantities in a large number of states in the eastern U.S. Here we use Ohio as a representative state since that state is among the largest producers and 100 percent of the wheat there is SRW. The state average yields for those two states for 1960 through 2011 are shown in Figures 1 and 2.

Figure 1. Kansas Average Winter Wheat Yield, 1960-2011

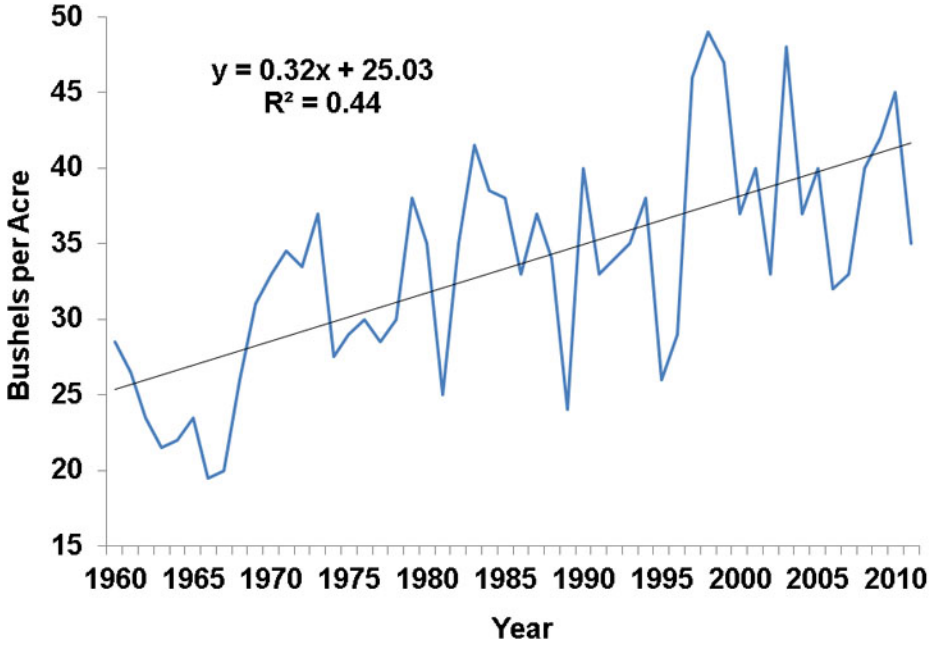
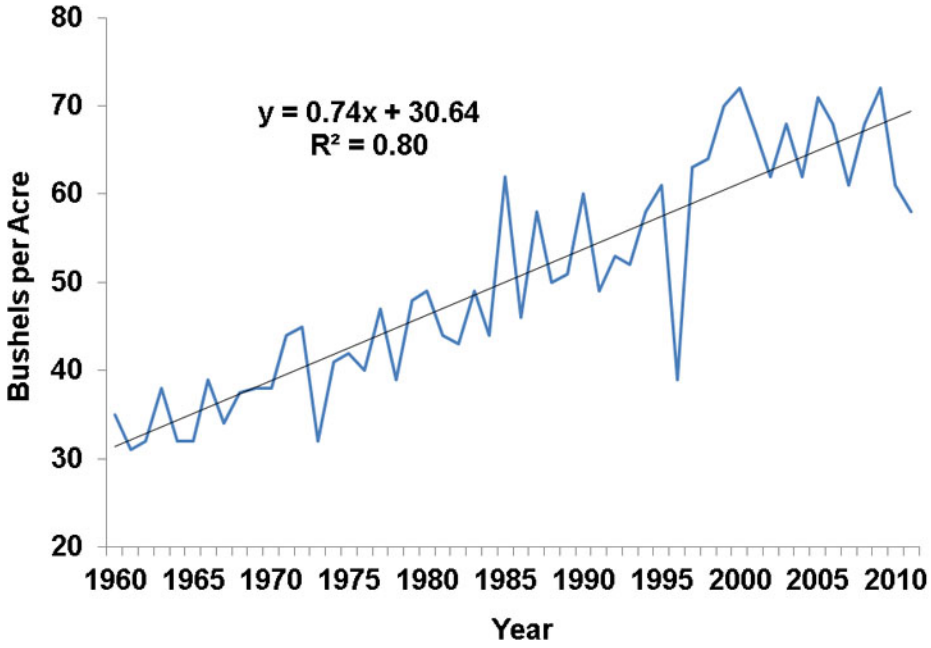


Figure 2. Ohio Average Winter Wheat Yield, 1960-2011



The yield patterns result in the following observations and thoughts:

1. Winter wheat yields in both states have trended higher since 1960. We find that a linear trend is the best fit to actual average yields over that period and that yields have increased at a rate of 0.32 bushel per acre per year in Kansas and 0.74 bushels per acre per year in Ohio. There have been periods in both states when it appeared that yields were plateauing, but these periods have not persisted. The trend yield in Kansas is slightly smaller and the trend yield in Ohio is considerably larger than the national average trend for all classes, estimated at 0.4 bushels per acre per year.
2. There has been substantial deviation from the trend yield in individual years in both states (Figures 3 and 4). Over the 52 year period, the average yield in Kansas was above the trend yield in 46 percent of the years and below the trend in 54 percent of the years. For Ohio, the average yield

was above trend in 48 percent of the years and below trend in 52 percent of the years. Since all deviations from a linear trend must sum to zero, this means that in the years with an above trend yield the deviations were on average slightly larger than the deviations in the more frequent years when yields were below trend. Specifically, the average deviation above trend was 4.8 bushels in Kansas and 4.4 bushels in Ohio, while the average deviation below trend was 4.1 bushels in both states. The largest deviation above trend was 11.5 bushels (1998) in Kansas and 12 bushels (1985) in Ohio. The largest deviation below trend was 10.6 bushels (1989 and 1995) in Kansas and 19.2 bushels (1996) in Ohio. As expected, the magnitude of average deviations and the magnitude of extreme deviations were larger than for U.S. average winter wheat yields.

Figure 3. Deviation from Trend in Kansas Average Winter Wheat Yield, 1960-2011

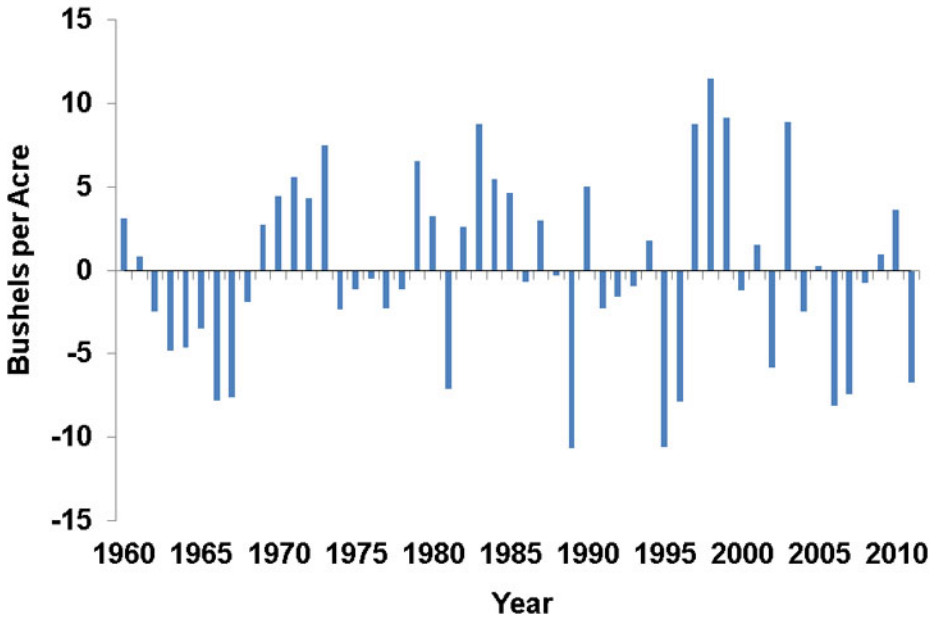
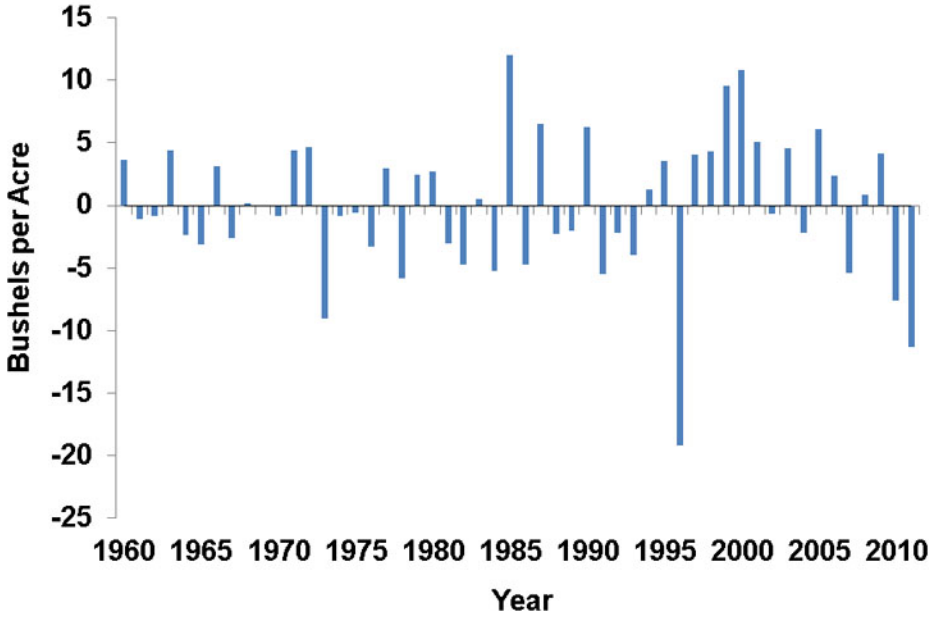


Figure 4. Deviation from Trend in Ohio Average Winter Wheat Yield, 1960-2011



3. The percentage split between above and below trend yields is a general statement that applies to

any year in the sample. A different, but related, question is whether there is a marked correlation between deviations from year-to-year. In other words, is there a tendency towards continuation or reversal of deviations? There is, in fact, a modest tendency for the yield deviation in one year to persist in the following year. The correlation is 0.45 for Kansas and 0.40 for Ohio (correlations can vary between -1 and +1, with zero indicating no relationship). The correlation for each state is slightly larger than the correlation for the U.S as a whole (0.31). It is not clear if the correlation is simply a chance result or if it reflects some form of carryover in growing conditions from year-to-year.

4. The correlation discussed above is based on comparing deviations in pairs of adjacent years. It is also interesting to examine whether longer "runs" in the deviations occur. For Kansas, there were 6 single year runs with positive deviations and 6 single year runs of negative deviations. This simply means that a positive deviation was followed by a negative deviation and vice versa in these 12 years. The longest run of negative yield deviations was 7 years (1962-1968), but there were also one run of 5 years (1974-1978). Positive deviations had runs of 5 years (1969-1973) and 4 years (1982-1985). For Ohio, there were 10 single year runs with positive deviations and 8 single year runs of negative deviations. The longest run of negative yield deviations was 4 years (1973-1976). Positive deviations had one run of 5 years (1997-2001). The pattern of runs for Kansas has been reasonably similar to the pattern for the U.S. as a whole, while the pattern in Ohio has been dominated by one and two year runs.

Summary

Based on data from 1960-2011, we estimate the trend winter wheat yield in 2012 to be 42 bushels per acre in Kansas and 70 bushels per acre in Ohio. For any particular year, including 2012, odds slightly favor a yield below trend in both states. More specific expectations about the 2012 average yield will unfold as the crop comes out of dormancy and spring weather prospects emerge. The USDA will release the first yield forecast on May 10th.