



Weekly Farm Economics: The Geography of High Corn Yields

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From 2013 to 2018, U.S. corn yields have been above trend yields an average of 8.2 bushels per year. Yield experience has varied across the U.S. The best yield experience occurred in states east of the Mississippi River. Several western states had yields that averaged below trend. Above trend yields have differential impacts on farm income, with higher yielding areas benefiting in higher income. Whether these above trend yields continue is an open question.

Above Trend Yields for the United States

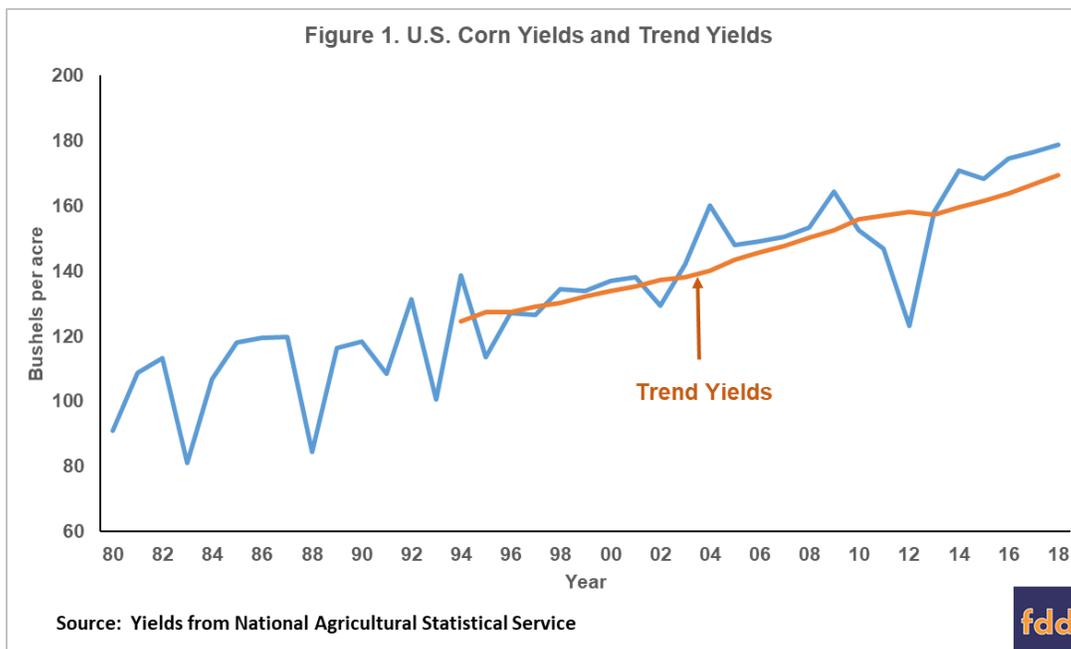
The National Agricultural Statistical Service (NASS) reported the 2018 average U.S. corn yield at 178.9 bushels per acre, the highest yield on record. The 2018 yield surpassed the last record yield set in 2017 of 176.6 bushels per acre.

Figure 1 shows U.S. corn yields reported by NASS from 1980 to 2018. Figure 1 also shows trend yields. In this article, a trend yield is calculated from a linear regression using the previous 40 years of yields. The 1995 trend yield is based on the forty U.S. yields from 1955 to 1994. The 1996 yield uses data from 1956 to 1995, and so on. This procedure causes each year's trend yield to be based on the same length of time series. It also allows the value of the trend yield to react to changes in yields.

The 2018 trend yield is 169.3 bushels per acre (see Figure 1). This trend yield is a good expectation of the 2018 yield before the growing season has occurred. Moreover, if 2018 could be repeated many time with different growing conditions, the average of the repeated yields would be close to 169.3 bushels per acre. In 2018, the actual yield was 178.9 bushels per acre, 9.6 bushels above trend.

Since the drought of 2012, all actual yields have been above trend yields. In 2013, the actual yield was barely above trend. Actual yield was 158.1 bushels per acre, 0.7 bushels above the trend yield of 157.4 bushels per acre. Since 2013, all actual yields have been significantly above trend: 11.5 bushels in 2014, 6.7 bushels in 2015, 10.6 bushels in 2015, 10.0 bushels in 2017, and 9.6 bushels in 2018. From 2013 to 2018, yield-from-trend averaged 8.2 bushels per acre.

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So far, there have been six years with above trend yields from 2013 to 2018. This six-year length of time without a yield below trend is not unusual. A series of seven years occurred from 2003 to 2009. Since 1995, actual corn yields in the U.S. usually are above trend, with a few years of below trend yields. When yields are below trend, the actual yield can be well below trend, as occurred in 2012 when the actual yield of 123.1 bushels per acre was 35.3 bushels below the trend yield of 158.3 bushels per acre.

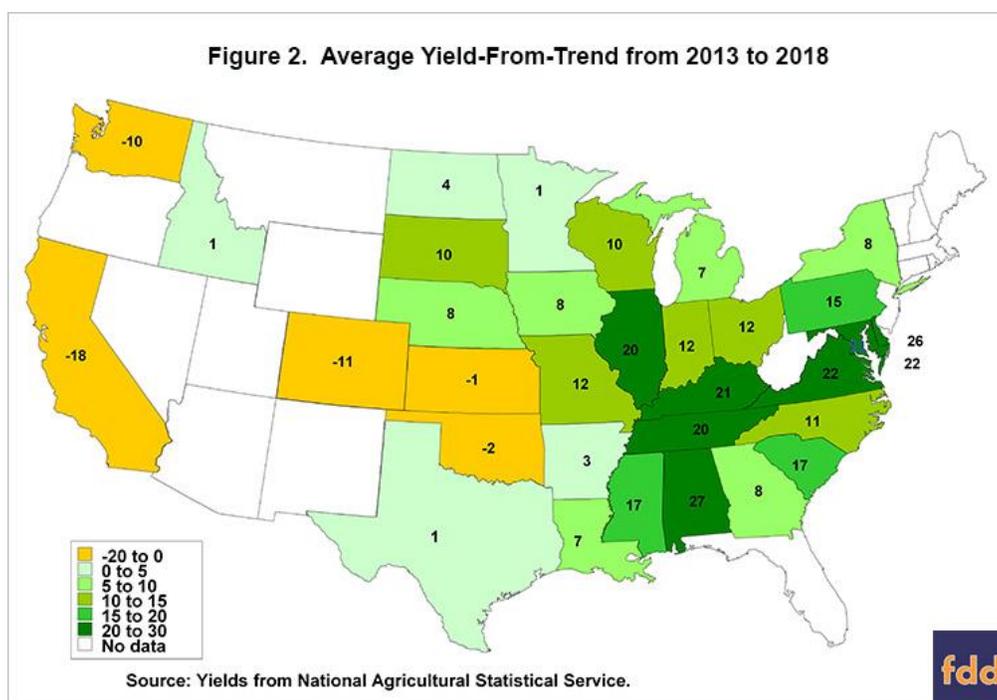
Geographical Variations

Not all regions necessarily shared in above trend yields from 2013 to 2018. To evaluate geographical variability, a similar analysis as described in the previous section for U.S. yields was conducted for each state for which sufficient yield data exists. For each state, trend yields were calculated for each year from 2013 to 2018. Then the differences between actual yields and trend yields were calculated for each year. Finally, the average yield-from-trend from 2013 to 2018 was calculated for each state.

There were large variations in yields-from-trend by state (see Figure 2). Seven states had actual yields-from-trend that averaged at least 20 bushels per acre: Alabama averaged 27 bushels-from-trend, Delaware averaged 26 bushels above trend, Virginia and Maryland averaged 22 bushels above trend, Kentucky averaged 21 bushels above trend, and Illinois and Tennessee averaged 20 bushels above trend. All these states were continuous to one another in an area east of the Mississippi River. The center of the region appears to be in the middle part of eastern United States.

Several states averaged negative yields-from-trend (See Figure 2). California averaged -18 bushels, Colorado averaged -11 bushels, Washington average -10 bushels, Oklahoma averaged -2 bushels, and Kansas averaged -1 bushel. All of these states are west of the Mississippi River.

All states in the Corn Belt had positive yields-above-trend (see Figure 2). However, there were large differences. Illinois had the best experience with an average of 20 bushels above trend. The next highest states had 12 bushels above trend: Ohio and Indiana.



Commentary

The geographical patterns of average yield-from-trends raise intriguing questions. Why has a contiguous range of states in the eastern U.S. had better yield performance than other areas of the country? Why has Illinois performed so much better than its neighboring states in the Corn Belt? And why are western states not having the same above trend performance as many states east of the Mississippi River. Further analyses evaluating the impacts of growing condition on yields may answer some of the questions listed above.

The above analysis presents some questions particularly for states in which yields were significantly above trend. Above-trend yields have been a large contributor to net incomes. At this point, the best explanation is that growing conditions have been good in these middle-eastern U.S. states. These weather conditions could change in the future leading to lower yields, lower incomes, and more financial stress.

A similar analysis to the one above is available for soybeans in a [December 11, 2018 farmdoc daily](#) article.

YouTube Video: Discussion and graphs associated with this article at: <https://youtu.be/wxw2Fr5G0Oo>

Reference

Schnitkey, G. "[The Geography of Exceptional Soybean Yields.](#)" *farmdoc daily* (8):226, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, December 11, 2018.