Kansas Wheat Yield Outlook for 2018

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Introduction

As of March 5, 2018, wheat in the state was rated as 15% very poor, 35% poor, 37% fair, 12% good, and 1% excellent. Is this an indication that we are going to have poor wheat yields? Predicting yields for wheat can be difficult as the crop often does better than it looks in the field and can improve quickly with timely rains. Still, the poor current condition of the crop has to have producers anxious about final yields. This article examines the relationship between crop condition and final yield in an effort to provide some guidance about what final yields producers might realisticly expect.

Background

Wheat yields in the state have been slowly increasing over time. As indicated in Figure 1, yields in 1970 were around 30 bushels per acre. Today, average state yields are around 40 bushels per acre. Figure 1 shows the wheat yield on both a planted acre and harvested acre basis. Also included in Figure 1 is the estimated trend line yield. This trend yield line shows that wheat yields have been increasing slightly less than a quarter bushel per acre per year. As might be expected, the yield per harvested acre is higher than the yield per planted acre because the acres that are not harvested tend to be the worst looking wheat acres.

Figure 1 also shows that the state wheat yield has a large amount of variability. Yields two years ago approached 60 bushels per acre

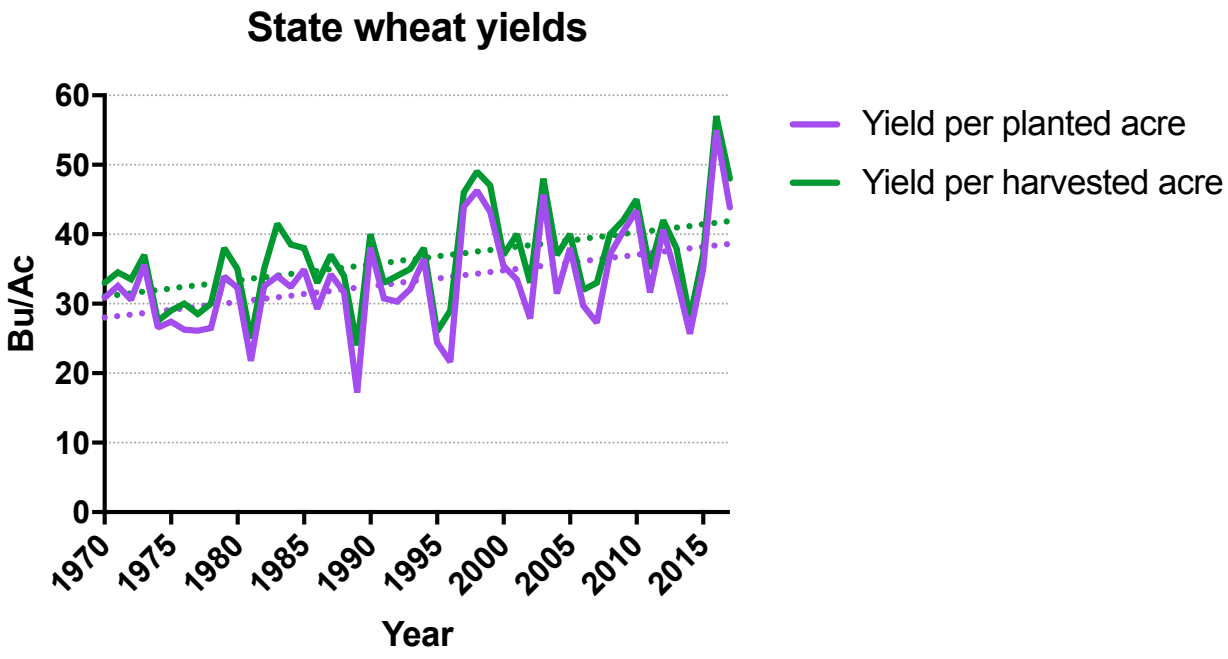

Figure 1. State wheat yields - by planted and harvested acre

while there have been years the average yield was closer to 20 bushels per acre.

Estimate of Crop Condition

The weekly Crop Progress and Condition Report issued by the USDA National Agricultural Statistics Service, includes temperature, precipitation, progress of crop planting, development and harvesting. This report is issued weekly, except during winter months when it is entered monthly. While this report gives the current crop condition, it doesn't make any projections about wheat yields.

There has been some research that has attempted to match the crop condition report back to yields. Bain and Fortenbery (Bain, R. and T. R. Fortenbery. 2013. "Impacts of Crop Conditions Reports on National and Local Wheat Markets." Proceedings of the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management. St. Louis, MO. [http://www.farmdoc.illinois.edu/nccc134]) presented a paper that used an index of the crop condition report to estimate crop yields. Their procedure, described below, is used in this paper to show the relationship between crop conditions and wheat yields.

Procedure

Bain and Fortenbery construct an index of weekly crop conditions:

$$\begin{aligned} CCIndex = {} & (\%\ acreage\ Excellent) * 1 + \\ & (\%\ acreage\ Good) * 0.75 + \\ & (\%\ acreage\ Fair) * 0.50 + \\ & (\%\ acreage\ Poor) * 0.25 + \\ & (\%\ acreage\ Very\ poor) * 0 \end{aligned}$$

The index ranges from [0, 100]. An index value of 100 corresponds to 100 percent of the surveyed crop being reported in excellent condition, and a value of 0 indicates 100 percent of the crop is in very poor condition. A value of 50 indicates the average crop condition for the state is in fair condition.

Weekly crop condition reports are available from NASS and go back to 1988. The start of the weakly wheat report in Kansas varies but for all the years since 1988, there is a weekly

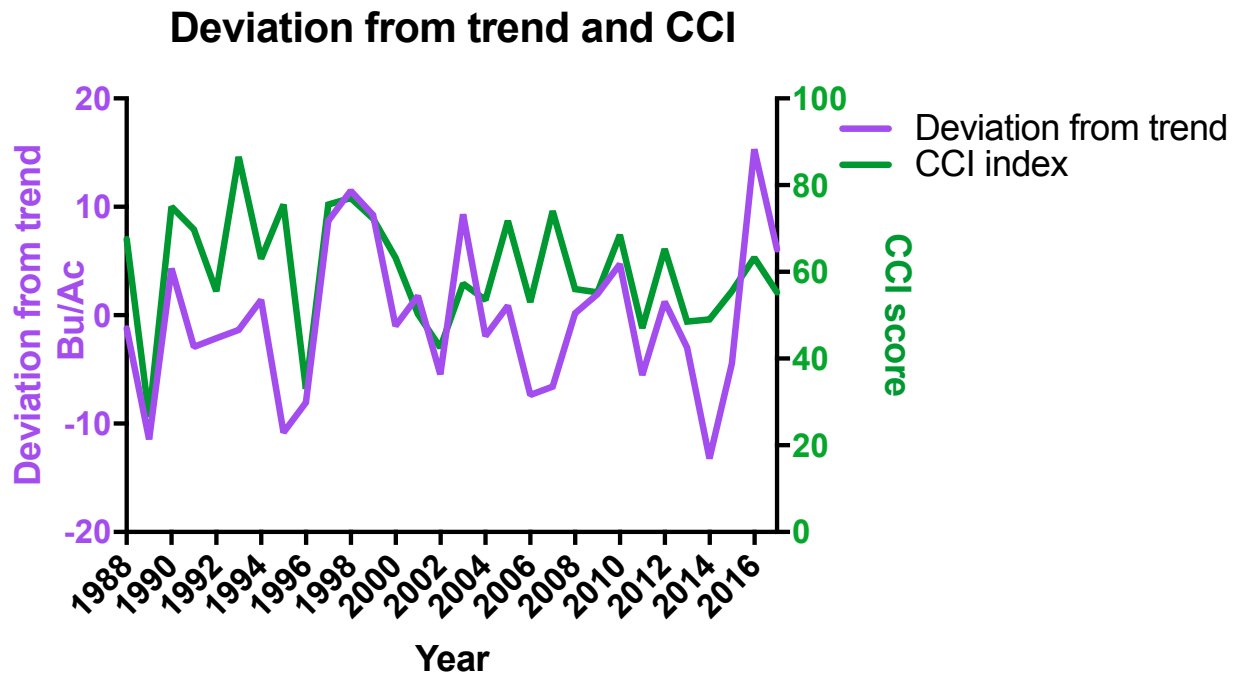

Figure 2. Comparison of wheat yield variations and CCI index scores across time

crop report available by either the last week of March or the first week in April. In this analysis, these late March/early April crop condition reports are used to construct a CCI index for all the years from 1988 through 2017. These CCI indexes are then used in a regression analysis to estimate the wheat yield per planted acre where the yield is a function of the CCI index. To account for the yield trend, the actual model is an estimation of the deviation from the yield trend as a function of the CCI index. Figure 2 plots the deviation from the state average wheat yield tend line on the left axis and the CCI index on the right axis.

Results

Regression results show that the CCI index can predict the wheat yield with an R-squared value of 0.21. The estimated yield equation is:

*Yield = 0.233 * CCI_score - 14.35*

That is, an improvement of 1% in the CCI score can increase the average state yield by a quarter bushel.

Figure 3 plots the wheat yield against the CCI index. As can be seen in the figure, the low R-squared value is the result of large variations in the final wheat yield for a given CCI score. In other words, the CCI index is far from a perfect indicator of final wheat yields in the state.

Figure 3 also includes the 90% prediction bands. 90% of the time a producer's yield will fall within the black dashed lines at a given CCI score. Currently (as of 3/4/18), the state wheat crop has a CCI score of 37.25. The model shown here is based on CCI scores at the end of March, so the current CCI score is a bit early but I am assuming the current score will be comparable for discussion purposes.

A CCI score of 37 translates to a yield deviation of 5.7 bushels below the trend line yield of 39 bushels per planted acre. The predicted state

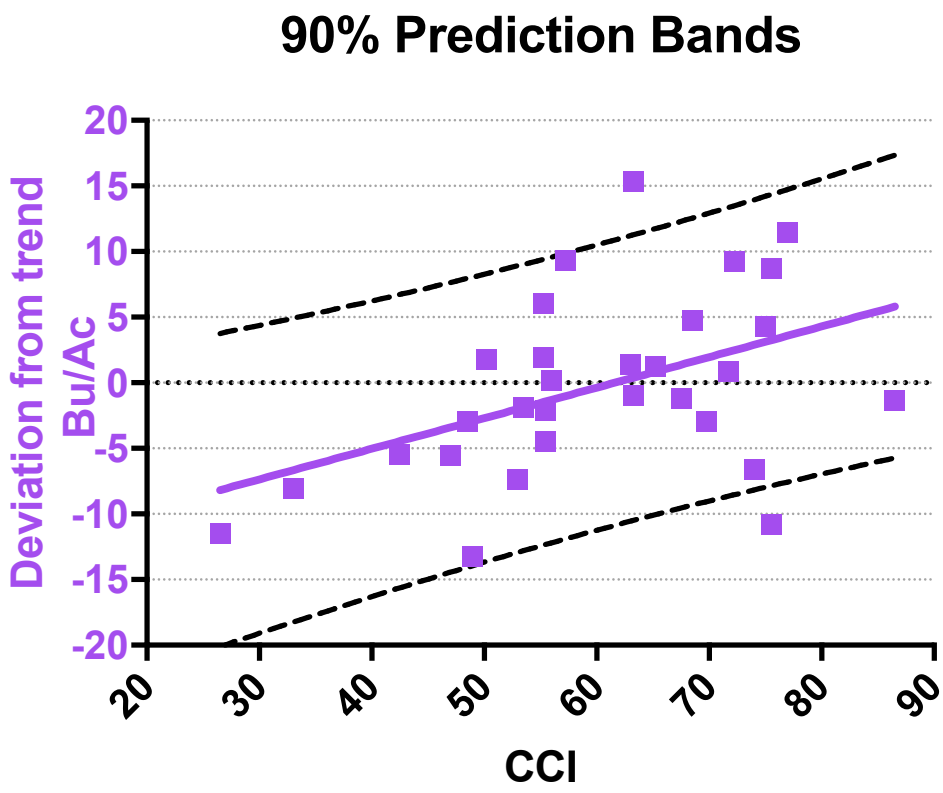

Figure 3. Expected yield and the 90% confidence interval for various CCI index values

average wheat yield is thus 33 bushels per planted acre. This is a yield reduction of about 15%. The 90% prediction bands indicate that with a CCI score of 37, producers would expect a state average wheat yield from 6 bushels above average to 17 bushels below average, 90% of the time.

Implications

There have only been two years since 1988 where the CCI score was below 40 at the end of March. In 1989, the CCI score was 27 and the final wheat yield was 11 bushels below average. In 1996, the CCI score was 33 and the final wheat yield was 8 bushels below average. Thus, there is some indication that the very low CCI score of the current wheat crop indicates the potential for low wheat yields.

Also, all of the above average wheat yields had CCI scores above 50 at the end of March. Having a high CCI score through doesn't guarantee an above average yield as in 2007, the CCI score was 74 but the wheat yield was still 6.5 bushels below average.

Producers should look at the results presented here as only a guide. The amount of variability shows that the CCI score is not perfect. However, the data that we do have currently indicates yields will be below average. I plan to update these projections as the season progresses. Results from the previous study indicate that the accuracy of the model improves the closer harvest becomes.