Kansas Wheat Yield Outlook for 2022 - Week #47

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Introduction

The USDA collects weekly crop conditions throughout the growing season. The crop is rated as either: very poor, poor, fair, good, or excellent. For wheat, these estimates are reported for a few weeks in late fall and then the estimates start again in the spring. The fall/winter estimates are not reported consistently for all the weeks but there is a continuous set of observations for week #47 (except for 2014), typically the last week of November.

As of week 47 in Kansas, for the winter wheat crop, 3% was rated very poor, 7% was poor, 28% was fair, 52% was good, and 10% was excellent. Can this information be used as a predictor of yields? Predicting yields for wheat can be difficult as the crop often does better than it looks in the field and can quickly improve with timely rains. In addition, a fall estimate is really more of an indication of how good of a stand of wheat was achieved. There has been work looking at predicting yields based on these crop conditions. A previous AgManager.info article from 2018 did as well. This article examines the relationship between crop conditions and final yield in an effort to provide some guidance about what final yields producers might realistically expect.

Background

The USDA has historical state wheat yields going back to 1866. Figure 1 plots these as a line graph. What is interesting about this graph is that wheat yields were flat until 1950. Since then, yields have been steadily increasing. As shown in Figure 1, a regression of the last 30 years (the blue line) shows a 0.36 bushel increase in yield each year. The lowest yield in any year since 1970 has been 25% higher than the highest year before 1950.

Figure 1 also shows the state average wheat yield has a large amount of variability. Yields were only 28 bushels per acre in 2014 while in 2016, yields were 57 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, and progress of crop planting, development and harvesting. This report is issued weekly, except during

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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:

CCIndex = (% acreage Excellent) * 1 +
(% acreage Good) * 0.75 +
(% acreage Fair) * 0.50 +
(% acreage Poor) * 0.25 +
(% acreage Very poor) * 0

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 crop report available by either the last week of March or the first week in April. There is also a series of crop reports in the fall before a break occurs. The last 20 years (minus 2014) of the wheat crop condition for late fall in Kansas is shown in Figure 2. Like the spring crop condition reports, the exact week a report is conducted varies. However, there is a crop condition report for week #47 in every year (last week of November and missing 2014).

In this analysis, the late fall/early winter crop condition reports (week #47) are used to construct a CCI index for the last 30 years. These CCI indexes are then used in a regression analysis to estimate the wheat yield per 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 3 plots the deviation from the state average wheat yield tend line on the left axis and the CCI index on the bottom axis. The dark gray band represents the standard error. The standard

error of the regression is the average distance that the observed values fall from the regression line.

Results

As might be expected for a wheat crop condition report at the end of November, the model doesn't predict very well. Based on week #47 scores, the model predicts wheat yields with an R-squared of 0.04. The estimated yield equation is

*Yield = 0.187 * CCI_score - 11.18*

That is, an improvement of 1% in the CCI score can increase the average state yield by just under 0.2 bushels per acres. However, 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, especially with the winter report on crop conditions. The large variability can easily be seen in Figure 3.

The 2022 wheat crop, as of week #47 last fall, had a CCI score of 65. The model for this week indicates a CCI score of 60 is average so a score of 65 would be better than average resulting in a wheat yield about a bushel per acre better than average. However, the low R-squared value for the model means much could change before harvest.

Implications

Producers should look at these results as only a guide. Once the spring crop condition reports become available, this model will be update and the reliability will improve as harvest gets closer.

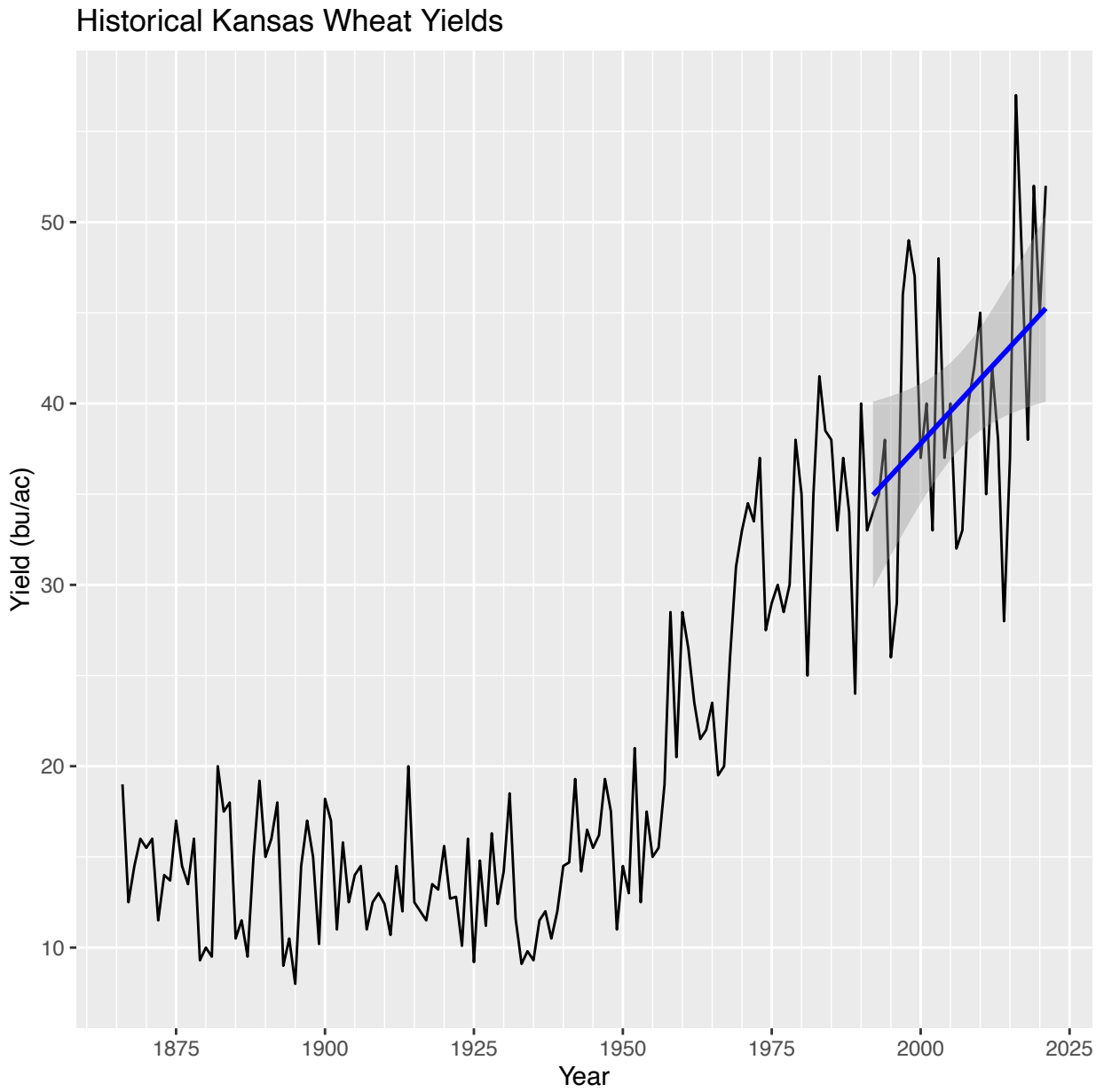

Figure 1. Historical State Wheat Yields from Kansas

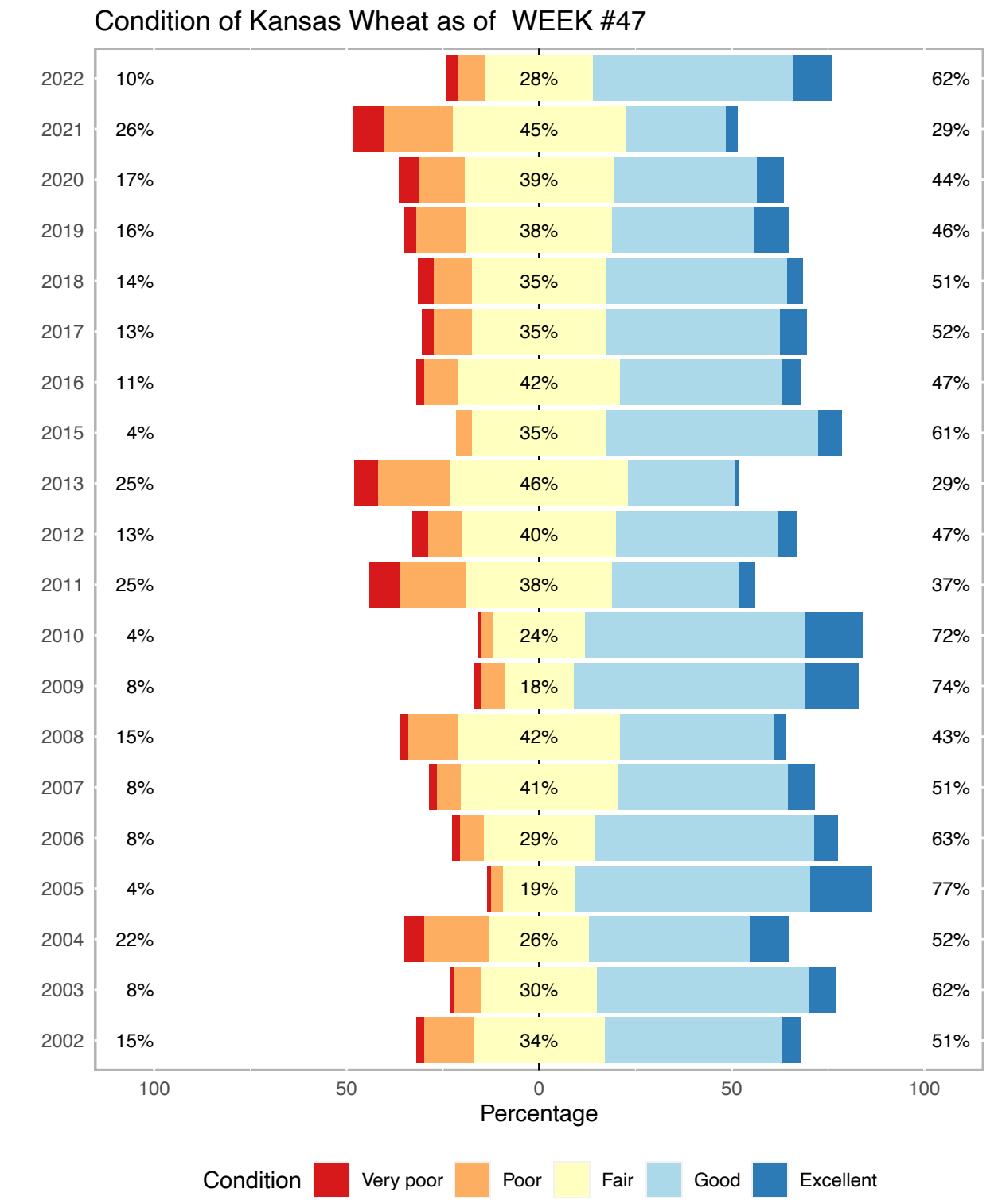

Figure 2. Historical Crop Conditions for Wheat in Kansas (Week #47)

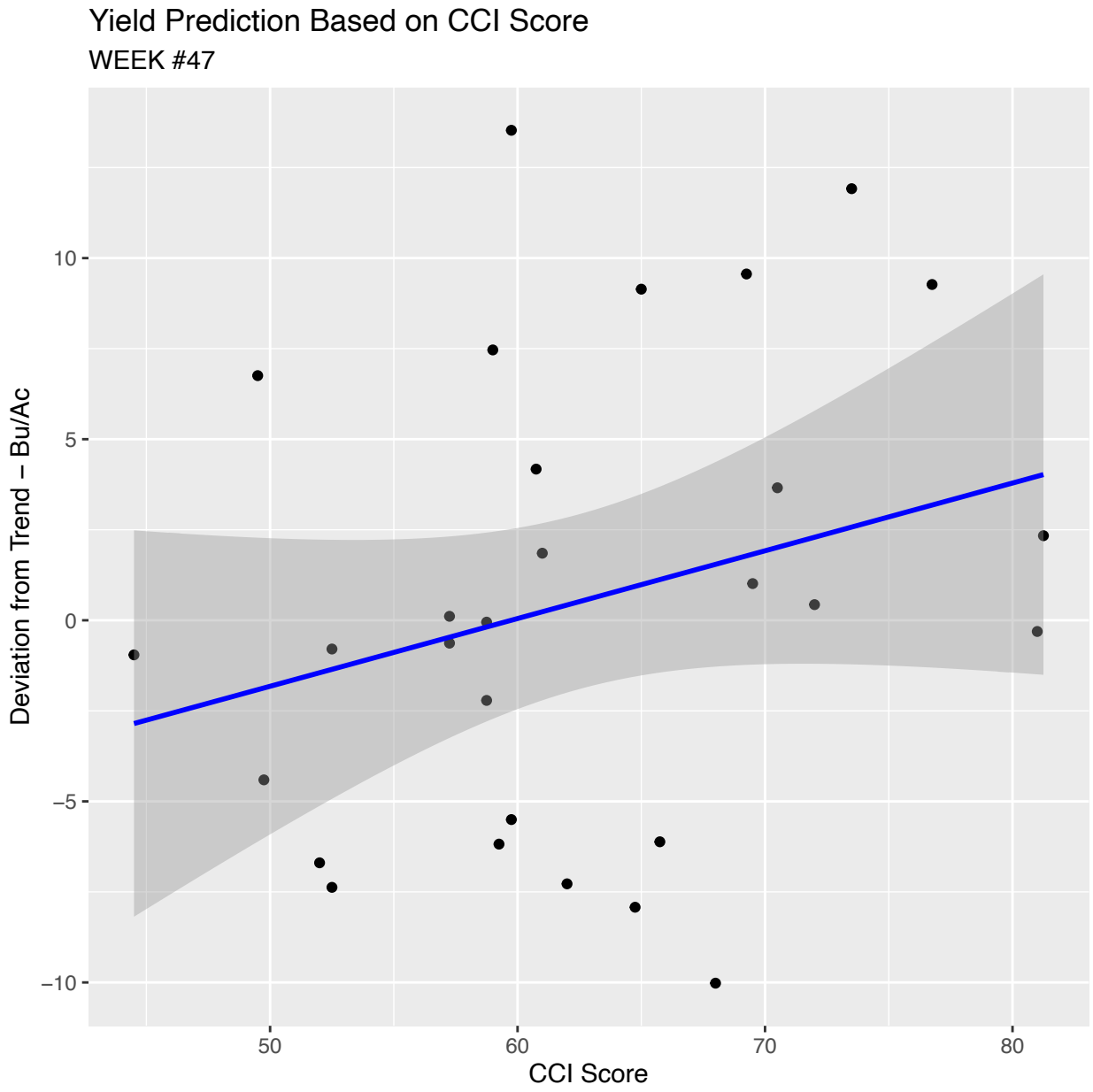

Figure 3. Expected Yield (Deviation from Trend) for Various CCI Index Values