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Estimates of Corn Production and Yields Based on 6/30/2024 Crop Conditions

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This article estimates corn yields for the 18 leading corn states and then calculates total corn production and average national corn yield using the recently released NASS crop acre estimates. Based on the 6/30/24 crop condition report (week 26), total corn production is estimated to be 15.0 billion bushels with a range from 14.6 billion to 15.4 billion bushels. The national corn yield is estimated to be 179.7 bu/ac with a range from 174.8 to 184.6 bu/ac.

Introduction

Starting in June, the USDA collects weekly crop conditions from all the leading corn states. Some states have earlier estimates though. These estimates continue until harvest. The crop is rated as either: very poor, poor, fair, good, or excellent. These estimates are reported on Monday afternoons based on reports collected from the prior weekend. With only a few days between reporting and publication, this is some of the most current data available from the USDA. There are crop condition reports going back to 1986.

These weekly crop reports have been used with varying degrees of success to predict both state crop yields and harvested acres. Ibendahl (2022 and 2023) has used the data to predict state and national wheat, corn, and soybean yields, acres, and total grain production. As might be expected, the accuracy of the predictions increases as the growing season progresses. The first few weeks of crop reports have very low predictive power, and this report is no different. Irwin and Good (2017), using a different model of crop conditions, reported similar predictive accuracy early in the growing season.

Even though the predictive power of the crop report model is low at this point, especially for the northern states, it is improving. This article demonstrates how the model works and provides an estimate of corn yields, harvested acres, and total production from the 18 leading corn states. This model is based on the NASS estimate of harvested acres from June 28th USDA-NASS Acreage Report. Corn yields are estimated from the June 30th USDA-NASS Crop Condition Report following the procedure described below. The results include the expected corn production from each state as well as the confidence interval for that estimate. To produce an estimate of corn production, the estimated yield for each state is multiplied by the NASS estimate of state harvested acres. The model presented here is unique as a

national corn estimate is based on predicting each state's corn yield per acre from a 30-year timeline of data from a specific week during the year. The individual state estimates are then combined into a national estimate.

Procedure

As described earlier in Ibendahl (2022 and 2023), the Bain and Fortenbery model uses all five of the crop condition values in the construction of an index (CCIndex).

CCIndex = (% acreage Excellent) * 1 +

(% acreage Good) * 0.75 +

(% acreage Fair) * 0.50 +

(% acreage Poor) * 0.25 +

(% acreage Very poor) * 0

Because the crop conditions are mutually exclusive, the sum of the percent of acres across the five categories must total to 100 percent. Thus, possible index values range from 100 (if all the crop acres are excellent) down to 0 (if all the crop acres are very poor). A value of 50 would indicate the average crop condition for the state is in fair condition. The USDA provides data at the state level but not at the crop reporting district level nor at the county level.

In this analysis, the crop condition report for a specific week is used to construct a CCI index for the last 30 years (the same week from each of the 30 years). The crop conditions from the week of June 30th are used in the model reported here (week 26). These CCIndexes are then used in a regression analysis to estimate the deviation from trend line corn yield in each state. Each state is estimated individually and the yield per acre confidence interval for each state is also calculated. Because the yield estimate is based on a specific week, the model must be rerun for each week of the growing season. That is, an analysis of the crop growing conditions next week will produce a different set of parameters than the current week as the CCIndex changes from week to week for both the current and historical years.

Results

Figure 1 is a Likert graph of the corn crop conditions for the last 20 years in the U.S. The Likert graph is centered on the fair category to make comparisons among years easier. The number along the left-hand-side of the figure is the total of the very poor and poor categories while the number along the right-hand-side is the total of the good and excellent categories. The Likert graph shown in Figure 1 indicates that corn over the last 20 years looks remarkably similar the last week of June. Corn so far in 2024 looks a little better than last year and almost identical to 2022.

Figures 2, 3, and 4 show the estimated yield per harvested acre, the estimated harvested acres, and the total production for each of the 18 leading corn states. As mentioned above, the fit of the model in most states is still improving at this point. The model is basically giving a trend line estimate for yield with wide confidence intervals. The harvested acre estimate comes directly from the USDA-NASS estimate from the June 28, 2024 *Acreage* report.

Figure 1. Likert Graph of Corn Crop Condition

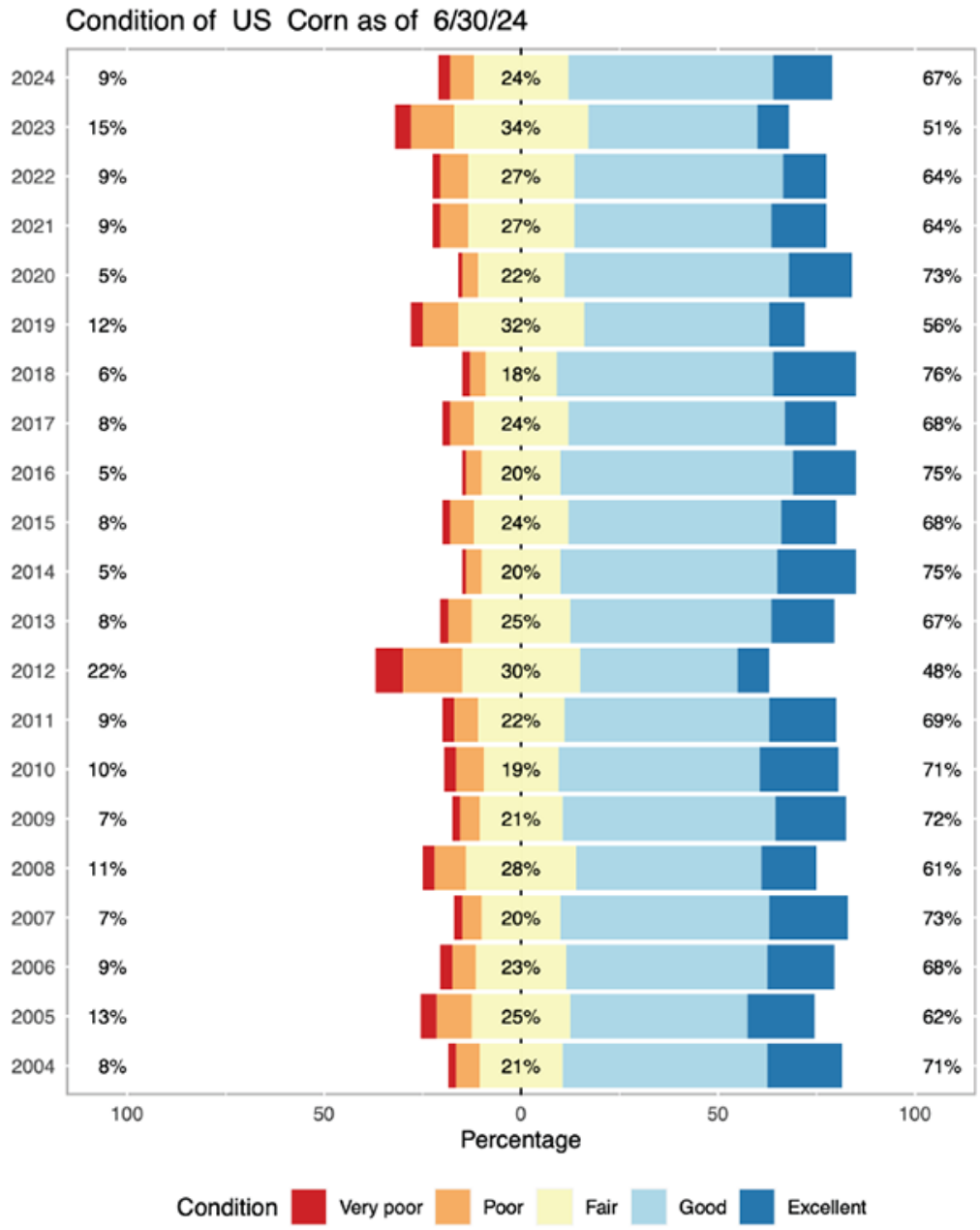

Figure 2. Estimated Yields per Acre for 18 Leading Corn States

Corn Yields per Acre by State - 6/30/24

Bushels per harvested acre

State	Last year	2024 prediction			
		Lower CI	Predicted	Upper CI	R squared
Colorado	122.0	122.2	127.9	133.5	−0.01
Illinois	206.0	199.6	204.9	210.1	0.42
Indiana	203.0	189.8	194.7	199.7	0.42
Iowa	201.0	199.1	203.6	208.0	0.08
Kansas	119.0	120.8	125.3	129.9	0.26
Kentucky	187.0	164.6	170.9	177.2	0.52
Michigan	168.0	170.8	175.0	179.2	0.14
Minnesota	185.0	185.1	189.4	193.7	0.31
Missouri	153.0	166.3	174.6	182.8	0.40
Nebraska	182.0	194.6	198.7	202.8	0.47
North_Carolina	147.0	78.1	92.1	106.2	0.58
North_Dakota	143.0	134.8	140.1	145.4	0.11
Ohio	198.0	184.6	189.7	194.9	0.33
Pennsylvania	157.0	155.1	162.4	169.6	0.06
South_Dakota	152.0	153.8	158.9	163.9	0.10
Tennessee	173.0	160.4	166.3	172.1	0.50
Texas	122.0	123.6	127.4	131.2	0.50
Wisconsin	176.0	169.4	172.9	176.5	0.51

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Figure 3. Estimated NASS Harvested Acres for 18 Leading Corn States

Corn Harvested Acres by State - 6/23/24

1,000 acres

	State	Last year	Planted acres	2024 harvest estimate NASS est
	Colorado	1,015	1,370	1,100
	Illinois	11,050	10,900	10,750
	Indiana	5,310	5,100	4,960
	Iowa	12,550	13,100	12,550
	Kansas	5,150	6,300	5,800
	Kentucky	1,500	1,550	1,450
	Michigan	2,060	2,150	1,810
	Minnesota	8,180	8,100	7,550
	Missouri	3,670	3,500	3,310
	Nebraska	9,500	10,100	9,700
	North_Carolina	900	910	860
	North_Dakota	3,800	3,800	3,500
	Ohio	3,400	3,400	3,170
	Pennsylvania	680	1,100	750
	South_Dakota	5,620	6,100	5,440
	Tennessee	890	850	800
	Texas	2,100	2,100	1,700
	Wisconsin	3,140	3,700	2,900
sum	—	80,515	84,130	78,100

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Figure 4. Estimated Corn Production for 18 Leading Corn States

Total Corn Production by State - 6/30/24

1,000,000 bushels

	State	Last year	2024 prediction Lower CI	Predicted	Upper CI
	Colorado	124	134	141	147
	Illinois	2,276	2,146	2,202	2,259
	Indiana	1,078	941	966	990
	Iowa	2,523	2,499	2,555	2,611
	Kansas	613	701	727	753
	Kentucky	280	239	248	257
	Michigan	346	309	317	324
	Minnesota	1,513	1,397	1,430	1,463
	Missouri	562	551	578	605
	Nebraska	1,729	1,888	1,927	1,967
	North_Carolina	132	67	79	91
	North_Dakota	543	472	490	509
	Ohio	673	585	601	618
	Pennsylvania	107	116	122	127
	South_Dakota	854	837	864	891
	Tennessee	154	128	133	138
	Texas	256	210	217	223
	Wisconsin	553	491	502	512
sum	—	14,317	13,711	14,098	14,485

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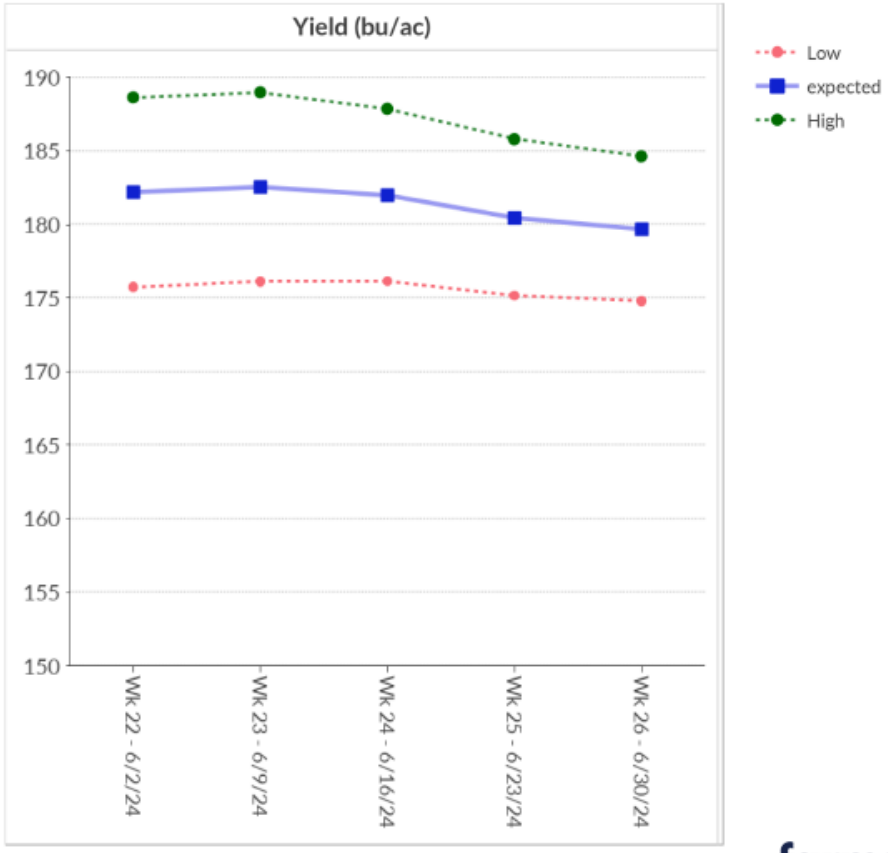
Figure 5 projects a national yield per acre for each week with a crop condition report. Because the yield per acre from the individual states can't be summed together, the shown yield per acre is calculated from the total production divided by the total harvested acres. Total U.S. corn production is calculated by adjusting the production from the 18 leading corn states upward based on the historic relationship between U.S. production and the production from the 18 leading corn states. As calculated, total U.S. corn production is estimated to be 14.99 billion bushels with a range from 14.58 billion to 15.40 billion bushels. The national corn yield is estimated to be 179.7 bu/ac with a range from 174.8 to 184.6 bu/ac.

Figure 5. Estimated National Corn Yield per Acre



Concluding Thoughts

It is still early in the growing season. Readers should expect changes to the estimates as the season progresses and perhaps even significant changes depending on the amount of rain received over the growing season. Also, as noted by Irwin and Good, the earliest estimates probably tend to overestimate yields. Readers should interpret these results as production that could occur during a normal growing season.

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