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An Estimate of Soybean Production From the 18 Leading Soybean States

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Introduction

This paper builds on Ibendahl's paper from last week of estimating corn yields in the U.S. The USDA collects the crop conditions each week for both corn and soybeans and both sets of estimates are published for the major crop producing states on Monday afternoons. The soybean crop is rated as either: very poor, poor, fair, good, or excellent and is reported as the percentage of state crop acres in each category.

Procedure

The same model used to estimate corn production is used in this soybean model. First a CCIndex is constructed where:

CCIndex = (% acreage Excellent) * 1 +

(% acreage Good) * 0.75 +

(% acreage Fair) * 0.50 +

(% acreage Poor) * 0.25 +

(% acreage Very poor) * 0

This CCIndex for each state is used in a regression analysis of the last 30 years to estimate the deviation from trend line soybean yields for each state. The regression analysis is specific to a given week each year. In this paper, data for week #30 is used for the regression analysis from each state. Because the regression analysis is unique for each week, the model here will be different than a model in future or previous weeks. Ibendahl's corn estimation paper used week #29 as the basis.

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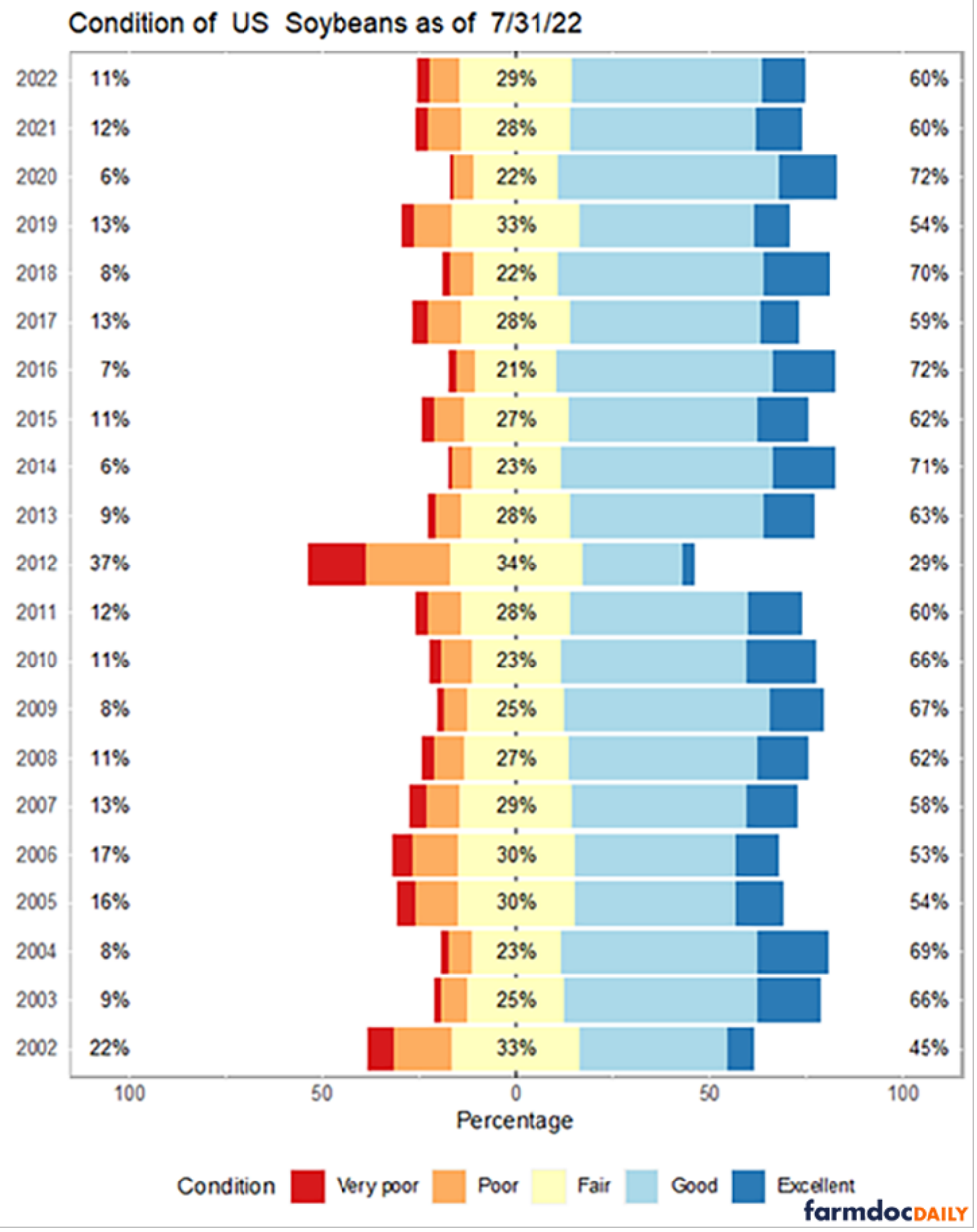
This soybean estimation paper is also different as the June soybean estimation of the USDA was used for the acres in each state. The corn model used a separate procedure to estimate harvest acres but that procedure provided little value to the model, so it was simplified to just the June USDA number.

Results

Figure 1 is a Likert graph of the soybean crop conditions for the last 20 years in the U.S. for the last 20 years. This national number is provided by the USDA in addition to the individual state numbers. The Likert graph has the percent of crop acres in the very poor and poor categories listed on the left-hand-side while the number of acres in the good and excellent categories is listed on the right-hand-side. The Likert graph is centered on the fair category which has the percentage listed in the center of the column.

Figure 1. Historical Soybean Crop Conditions for the U.S. – 7/31/22 (Week 30)



As Figure 1 illustrates, 2022 appears to be close to a typical year. In fact, 2022 is almost identical to 2021 at the end of July. However, as will be shown below, the expected national yield is lower than last year

because the biggest soybean states are expected to have yields lower than last year. This pushes the national soybean yield per acre down even though the national crop conditions look the same.

Table 1 shows the estimated yield per harvested acre prediction along with the confidence intervals for each state as of 7/31/22 (week 30.). This estimation is based on 30 years of observations from week #30. The R-square values will improve as the season progresses, but the estimates are still not nearly as good as the corn estimates. Soybeans, along with wheat, are more difficult crops to estimate for yields and much can happen before harvest.

Table 1. Estimated Yield per Harvested Acre for 18 States as of 7/31/22

Soybean Yields per Acre by State - 7/31/22

Bushels per harvested acre

		2022 prediction			
State	Last year	Lower CI	Predicted	Upper CI	R squared
Arkansas	51.0	51.7	52.8	54.0	0.38
Illinois	64.0	58.7	60.2	61.7	0.23
Indiana	59.5	53.2	54.3	55.5	0.56
Iowa	62.0	56.4	58.0	59.6	0.21
Kansas	39.5	35.1	37.3	39.6	0.38
Kentucky	56.0	43.6	47.3	50.9	0.22
Louisiana	52.0	53.7	55.2	56.7	0.29
Michigan	51.0	46.7	48.1	49.6	0.12
Minnesota	47.0	48.0	49.6	51.1	0.20
Mississippi	54.0	52.2	53.7	55.2	0.33
Missouri	49.0	45.1	46.3	47.4	0.57
Nebraska	63.0	58.3	59.5	60.6	0.56
North_Carolina	40.0	35.5	36.8	38.1	0.27
North_Dakota	25.5	33.2	35.0	36.7	0.08
Ohio	56.5	53.3	54.4	55.6	0.36
South_Dakota	40.0	43.8	45.3	46.7	0.19
Tennessee	50.0	33.1	37.9	42.7	0.40
Wisconsin	55.0	47.3	49.7	52.1	0.08

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Table 2 shows the harvest acres from last year, the planted soybean acres this year, and the USDA June soybean estimate of acres. As discussed above, trying to estimate harvested acres from the June estimate didn't provide anything that would improve just using the June estimate. Both the USDA national soybean acres and the 18 major soybean states scaled to a national level are expected to increase by 1.4% from last year.

Table 2. Estimated Harvested Acres for 18 States as of 7/31/22

Soybean Harvested Acres by State - 7/31/22

1,000 acres

	State	Last year	Planted acres	June acres
	Arkansas	3,010	3,200	3,170
	Illinois	10,510	11,200	11,100
	Indiana	5,640	5,850	5,830
	Iowa	10,030	10,300	10,220
	Kansas	4,800	5,000	4,950
	Kentucky	1,840	2,050	2,040
	Louisiana	1,060	1,150	1,130
	Michigan	2,140	2,250	2,230
	Minnesota	7,580	7,500	7,430
	Mississippi	2,180	2,300	2,270
	Missouri	5,650	5,900	5,850
	Nebraska	5,570	5,600	5,550
	North_Carolina	1,640	1,800	1,790
	North_Dakota	7,120	5,900	5,850
	Ohio	4,880	4,950	4,930
	South_Dakota	5,390	5,500	5,450
	Tennessee	1,520	1,800	1,770
	Wisconsin	2,070	2,250	2,220
Total	—	82,630	84,500	83,780

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Table 3 shows the estimated soybean production by state and is the result of multiplying the June acre estimate by the expected yields. Because yields in some of the major soybean growing areas are estimated to be lower, total production is expected to be 0.49% lower even though acres are expected to be higher. Total production when scaled to a national level is expected to be 4.413 billion bushels with a range from 4.272 billion bushels to 4.553 billion bushels. This range is from 3.65% lower than last year to 2.67% higher than last year.

Table 3. Estimated Soybean Production for 18 States as of 7/31/22

Total Soybean Production by State - 7/31/22

1,000,000 bushels

	State	Last year	2022 prediction		
			Lower CI	Predicted	Upper CI
	Arkansas	154	164	167	171
	Illinois	673	652	668	685
	Indiana	336	310	317	324
	Iowa	622	576	593	609
	Kansas	190	174	185	196
	Kentucky	103	89	96	104
	Louisiana	55	61	62	64
	Michigan	109	104	107	111
	Minnesota	356	357	368	379
	Mississippi	118	118	122	125
	Missouri	277	264	271	277
	Nebraska	351	324	330	336
	North_Carolina	66	64	66	68
	North_Dakota	182	194	204	214
	Ohio	276	263	268	274
	South_Dakota	216	239	247	255
	Tennessee	76	59	67	76
	Wisconsin	114	105	110	116
Total	—	4,271	4,115	4,250	4,385

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Table 4 lists these estimated national numbers. Table 4 also shows the calculated yield per acre. Last year, the national yield per acre was 51.4 bushels per acre. This year, the national yield per acre is expected to be a full bushel lower at 50.4 bushels per acre with a range from 48.8 to 52.0 bushels per acre. A follow-up article will be written sometime in August to update these estimates

Table 4. National Projections for Soybean Acres, Yields, and Total Production

		June Acres
Acres (1,000 ac)	Expected	87,511
Yield/ac	Low	48.8
	Expected	50.4
	High	52.0
Production (1,000,000 bu)	Low	4,272
	Expected	4,413
	High	4,553

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References

Ibendahl, G. "An Estimate of Corn Production From the 18 Leading Corn States." *farmdoc daily* (12):111, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, July 27, 2022.