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Competitiveness of U.S. Wheat: the Role of Productivity

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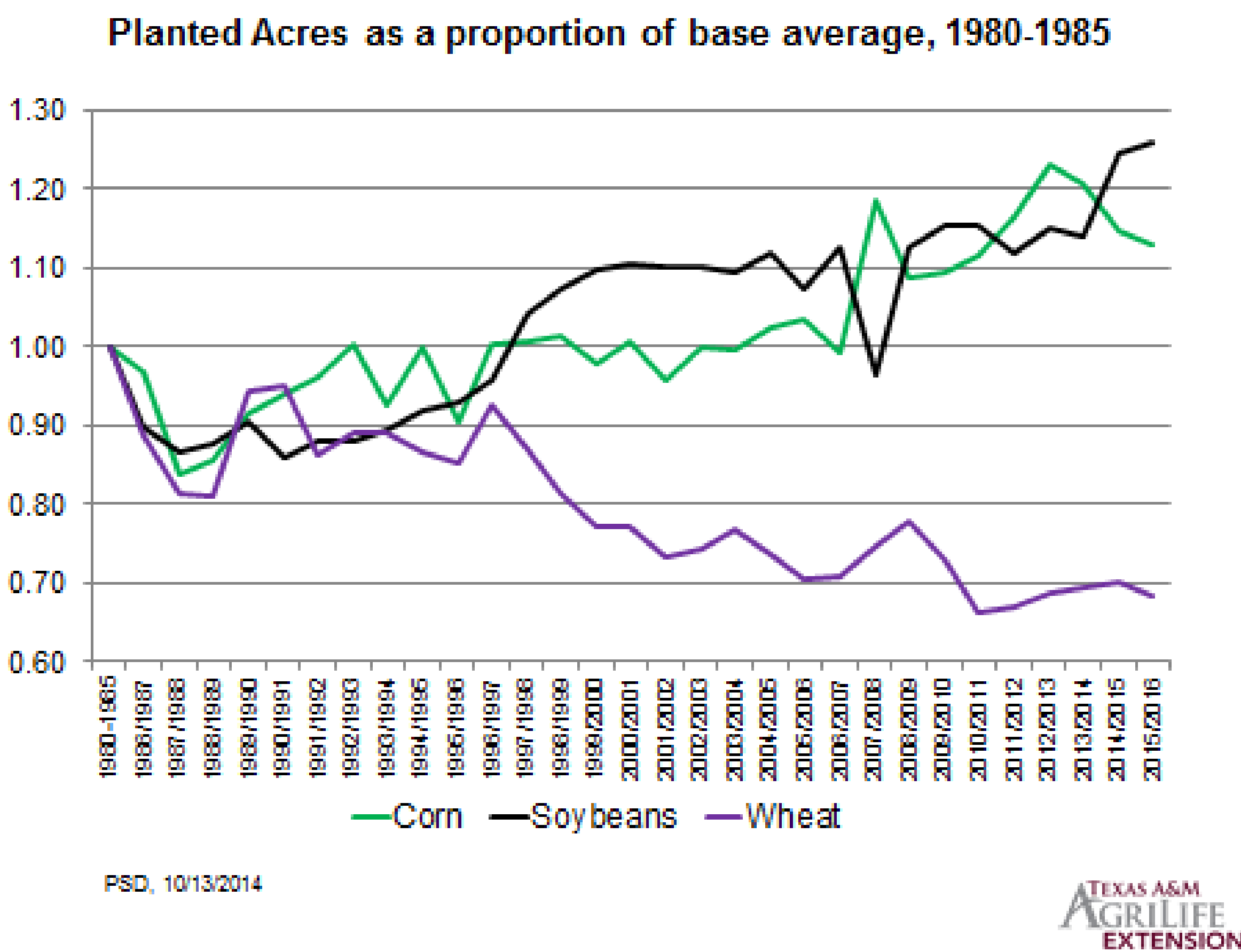
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Background Situation

Crop acreage trends in the United States show increasing acres of corn and soybeans and a decline in wheat. Specifically, wheat is losing acres in the Central Plains states, areas long considered much better suited for wheat production rather than corn or soybeans. This study examines the net returns of wheat versus corn and wheat versus soybeans in sample areas of Kansas, Nebraska, North Dakota, and South Dakota where the acreage shift away from wheat to corn and soybeans has occurred.



Approach

This study compares the net returns from corn, soybeans, and wheat production in areas of North Dakota, South Dakota, Nebraska, and Kansas where the acreage shift away from wheat has occurred in order to determine how much of an increase in wheat yields would be required for wheat to be competitive with soybeans and corn in these areas. The crop production districts identified for analysis are hard red winter wheat in South Central Kansas, hard red winter wheat in Southeast Nebraska, spring wheat in Southeast North Dakota, and spring wheat in North Central South Dakota.

Research Methods

“Following Staggenborg, Dhuyvetter and Gordon*, this study regressed the net returns of corn over wheat against corn yields and the net returns of soybeans over wheat against soybean yields. This analysis was applied to the crop districts identified above to determine the breakeven yield of corn and soybeans for each district. The analysis was re-run using a wheat yield increase of 20% each year to see the impact increased wheat yields would have on the relative break even corn and soybean yields in these areas.

Data. Net crop revenue was collected for South Central Kansas, Southeast Nebraska, Southeast North Dakota, and North Central South Dakota. Grain yield information for all districts from 1995 to 2014 is from USDA, NASS.

The table below presents the results for South Central Kansas, yields, prices, costs, and revenue.

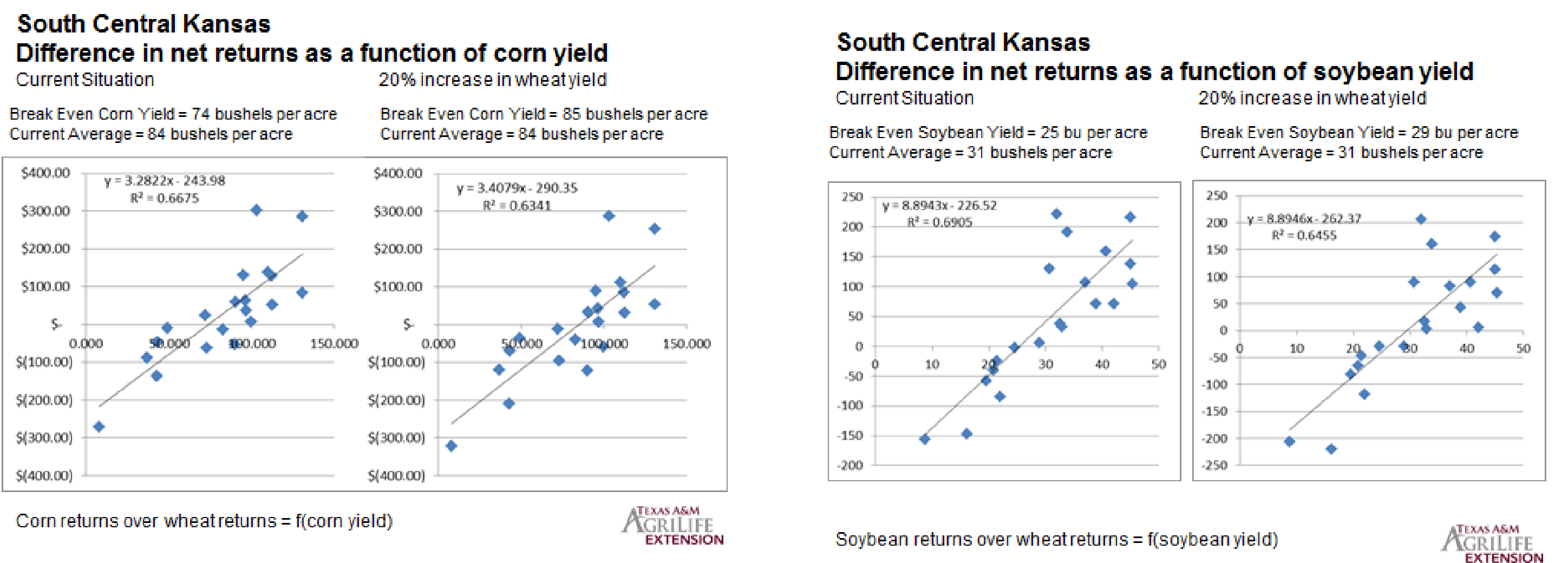
	Hard Red Winter Wheat				Corn				Soybeans			
	Yield	Price	Var. Cost	Net Rev.	Yield	Price	Var. Cost	Net Rev.	yield	price	Var. Cost	Net Rev.
1995	28.2	\$ 4.44	\$ 75.02	\$ 49.97	110.1	\$ 3.22	\$ 167.22	\$ 187.30	37.0	\$ 6.58	\$ 86.75	\$ 156.84
1996	26.0	\$ 4.77	\$ 68.23	\$ 55.55	90.6	\$ 2.58	\$ 119.57	\$ 114.10	45.0	\$ 6.65	\$ 105.73	\$ 193.79
1997	53.4	\$ 3.27	\$ 77.58	\$ 96.97	72.8	\$ 2.63	\$ 155.96	\$ 35.58	45.5	\$ 6.33	\$ 85.77	\$ 201.93
1998	47.0	\$ 2.68	\$ 76.31	\$ 47.76	82.9	\$ 2.13	\$ 143.12	\$ 33.46	20.9	\$ 5.29	\$ 102.47	\$ 7.99
1999	46.7	\$ 2.32	\$ 79.82	\$ 28.43	112.6	\$ 1.66	\$ 106.20	\$ 80.63	32.6	\$ 4.61	\$ 83.94	\$ 66.53
2000	41.6	\$ 2.66	\$ 79.28	\$ 31.27	96.2	\$ 2.03	\$ 100.34	\$ 94.97	21.4	\$ 4.86	\$ 97.23	\$ 6.97
2001	42.7	\$ 2.67	\$ 81.07	\$ 32.94	43.3	\$ 2.07	\$ 104.38	\$ (14.75)	19.6	\$ 4.33	\$ 109.97	\$ (25.10)
2002	36.9	\$ 3.55	\$ 77.74	\$ 53.26	49.1	\$ 2.46	\$ 77.72	\$ 43.07	24.6	\$ 5.42	\$ 82.47	\$ 50.86
2003	50.0	\$ 3.32	\$ 82.71	\$ 83.29	37.0	\$ 2.34	\$ 91.13	\$ (4.55)	22.0	\$ 6.54	\$ 145.39	\$ (1.51)
2004	44.0	\$ 3.32	\$ 89.68	\$ 56.40	131.0	\$ 1.97	\$ 118.98	\$ 139.09	39.0	\$ 6.24	\$ 115.35	\$ 128.01
2005	43.0	\$ 3.35	\$ 100.89	\$ 43.16	97.0	\$ 2.01	\$ 115.79	\$ 79.18	33.0	\$ 5.51	\$ 106.69	\$ 75.14
2006	40.0	\$ 4.38	\$ 104.03	\$ 71.17	72.0	\$ 3.22	\$ 137.52	\$ 94.32	29.0	\$ 6.24	\$ 103.89	\$ 77.07
2007	13.0	\$ 5.88	\$ 119.64	\$ (43.20)	103.0	\$ 4.19	\$ 172.37	\$ 259.20	32.0	\$ 9.48	\$ 125.23	\$ 178.13
2008	47.0	\$ 6.93	\$ 170.05	\$ 155.66	100.0	\$ 3.78	\$ 215.14	\$ 162.86	42.1	\$ 8.83	\$ 144.80	\$ 226.94
2009	41.0	\$ 5.13	\$ 157.99	\$ 52.34	112.0	\$ 3.44	\$ 205.52	\$ 179.76	45.1	\$ 9.48	\$ 158.62	\$ 268.93
2010	40.0	\$ 5.12	\$ 143.86	\$ 60.94	95.0	\$ 4.44	\$ 231.18	\$ 190.62	30.7	\$ 10.79	\$ 139.54	\$ 191.71
2011	36.0	\$ 6.88	\$ 142.93	\$ 104.75	8.0	\$ 5.66	\$ 212.84	\$ (167.56)	8.8	\$ 10.95	\$ 147.93	\$ (51.57)
2012	48.9	\$ 7.50	\$ 164.97	\$ 201.93	42.6	\$ 6.98	\$ 232.75	\$ 64.74	16.2	\$ 13.97	\$ 171.27	\$ 55.04
2013	50.9	\$ 6.88	\$ 153.21	\$ 197.12	89.9	\$ 4.14	\$ 227.42	\$ 144.85	40.7	\$ 12.64	\$ 157.56	\$ 356.51
2014	24.7	\$ 6.37	\$ 163.20	\$ (6.12)	131.1	\$ 3.71	\$ 207.72	\$ 278.51	33.9	\$ 9.79	\$ 146.18	\$ 185.60
Average	40.0	\$ 4.57	\$ 110.51	\$ 68.68	83.8	\$ 3.23	\$ 157.14	\$ 99.77	31.0	\$ 7.73	\$ 120.84	\$ 117.49

Findings

The regression of corn returns minus wheat returns against corn yield and soybean returns minus wheat returns against soybean yields shows the yield of corn and soybeans at which the returns from these crops is expected to be the same as for wheat.

For South Central Kansas, the breakeven yield for corn is 74 bushels per acre compared to a current average of 84 bushels per acre.

This information supports the shift in acres in this area from wheat to corn. If wheat yields were 20% higher, the breakeven corn yield needed to equal returns from wheat rises to 85 bushels, just above the current average. For soybeans, the yield at which returns from soybeans equal returns from wheat is 25 bushels per acre. This is 6 bushels lower than the current average yield of 31 bushels. With a 20% increase in wheat yields, the breakeven soybean yield becomes 29 bushels per acre, just below the current average.



With a 20% increase in wheat yields:

- the breakeven yields for corn and soybeans in Kansas rise to current averages (corn and soybeans lose their expected net return advantages over wheat);
- results from Nebraska show higher net returns from corn and soybeans as yields increase but the specific calculation of the breakeven yields is not meaningful;
- North Dakota and South Dakota wheat becomes more competitive with corn with a yield increase but the average corn yield is still above breakeven. Soybean returns lose their advantage over wheat with a wheat yield increase.

Not considered as part of this analysis is the agronomic benefit of crop rotation. Revenue calculations in this analysis are for grain only. Not considered are other sources of crop income such as grazing or baling straw.

*Staggenborg, S.A., K.C. Dhuyvetter, and W.B. Gordon. “Grain Sorghum and Corn Comparisons: Yield, Economic, and Environmental Responses”, *Agronomy Journal*, 100, (2008):1600-1604.