

**July 24, 2002****FEFO 02-14****CORN AND BEAN ACREAGES IN ILLINOIS UNDER THE 2002 FARM BILL**

The 2002 Farm Bill alters loan rates such that corn production may become more profitable relative to soybean production. As a result, some Illinois farmers may increase corn acres while they decrease soybean acres. This newsletter analyzes the economics of such a switch by 1) describing features of the 2002 Farm Bill that increase the attractiveness of corn versus soybean production, 2) analyzing costs and returns for growing corn and soybeans under different rotations, and 3) analyzing how corn yields relative to soybean yields affect the decision to switch from soybean acres to corn acres.

In general, most farmers will not find it advantageous to switch to more corn. However, this situation will vary across the state. Farmers in south-central and extreme southern Illinois have higher corn yields relative to soybean yields than in other areas of the state. These farmers may find it advantageous to grow more corn. Scenarios where prices are above loan rates may also favor growing more corn.

**2002 Farm Bill**

The 2002 Farm Bill includes three kinds of payments for program crops: direct payments, counter-cyclical payments, and loan deficiency/marketing loan payments. Payments for the direct and counter-cyclical programs will not depend on plantings during the 2002 through 2007 crop years. Hence, these programs will not influence planting decisions during 2002 and 2007.

The Marketing Loan and Loan Deficiency Payment (LDP) programs may impact planting decisions. Like the 1996 Farm Bill, the 2002 Farm Bill includes these programs which pay LDPs or Market Loan gains when market prices are below loan rates. Market prices plus LDPs and Market Loan gains provides farmers with “effective” prices near loan rates.

Loan rates between the 1996 and 2002 Farm Bills differ. The national loan rate for corn under the 1996 Farm Bill equals \$1.89 per bu. The 2002 Farm Bill increases the national corn loan rate to \$1.98 for the 2002 and 2003 crop years (\$1.95 for the 2004 through 2007 crop years). The national soybean loan rate decreases from \$5.26 per bu. under the 1996 Farm Bill to \$5.00 under the 2002 Farm Bill. The increase in corn loan rate and decrease in the soybean loan rate favors corn production relative to soybean production.

In and of itself, these changes in loan rates will not cause acres to switch from soybeans to corn. Market prices may be above loan rates such that loan rates do not influence planting decisions. Moreover, corn and soybean costs may indicate that soybean production still is profitable than corn production. The next section details corn and soybean production costs to examine whether additional corn production is warranted.



## Costs of Corn and Soybean Production

Table 1 shows budgets for corn and soybeans grown in central Illinois on high productivity farmland. (Appendix Table 1 shows the same budgets for northern, central Illinois (low productivity farmland), and southern Illinois.) These budgets only include revenue, variable costs, and machinery costs. These items will vary whether corn or soybeans are produced. Not included are fixed costs, such as land costs, that will not vary with production.

**Table 1. Revenue Less Variable Costs for Different Crop Rotations, Central Illinois, High Productivity Farmland, 2002.**

	Com Following Soybeans	Com Following Com	Soybeans Following Corn	Soybeans Following Soybeans
Average yield (bu. per acre) <sup>1</sup>	161	153	50	48
Effective price (per bu.)	<u>2.05</u>	<u>2.05</u>	<u>5.15</u>	<u>5.15</u>
Revenue per acre	\$330	\$314	\$258	\$247
Fertilizer and lime <sup>2</sup>	50	55	20	20
Pesticides <sup>2</sup>	32	35	33	33
Seed <sup>2</sup>	35	35	20	20
Drying and storage <sup>2</sup>	16	15	5	4
Machinery costs <sup>3</sup>	<u>63</u>	<u>63</u>	<u>51</u>	<u>51</u>
Variable and machinery costs	\$196	\$203	\$129	\$128
Net Margin	\$134	\$111	\$129	\$119

<sup>1</sup> Average yields for "corn following soybeans" and "soybeans following corn" are average 5-year yield from farmers enrolled in Illinois FBFM. Yield for "corn following corn" is 5 percent less than "corn following soybeans". Yield for soybeans following soybeans is 5 percent less than "soybeans following corn".

<sup>2</sup> Costs for "corn following soybeans" and "soybeans following corn" are from Illinois FBFM records. "Corn following corn" and "soybeans following soybeans" are adjusted to reflect additional costs associated with continuous rotations.

<sup>3</sup> Based on costs contained in *Illinois Machinery Cost Estimates* (FBM 0201). For corn, costs are included for chisel plow, fertilizer application, anhydrous nitrogen application, field cultivate, plant, spray and combine operations. For soybeans, costs are included for chisel plow, fertilizer application, field cultivate, plant, spray, and combine operations.

The "corn following soybeans" and "soybeans following corn" budgets are based on summaries from farmers enrolled in Illinois Farm Business Farm Management (FBFM). The 161 bu. corn yield and 50 bu. soybean yields are averages of yields from 1997 through 2001. Variable costs reflect 2001 costs updated for 2002 conditions. These two columns reflect the predominant, average corn and soybean returns in central Illinois since a 50-50 corn-soybean rotation is common in this region. The net margin for "corn following soybeans" is \$134 per acre and the net margin for "soybeans following corn" of \$129 per acre. Hence, these budgets indicate that corn production is more profitable than soybean production.

Switching to more corn acres will require corn to be grown on farmland that had corn as a preceding crop. To account for this fact, Table 1 includes a budget for corn following corn. The "corn following corn" budget adjusts the "corn following soybeans" budget by 1) reducing the corn yield by 5 percent from 161 bu. for corn following soybeans to 145 bu. for corn following corn, 2) increasing fertilizer and lime costs

by \$5 per acre to reflect additional nitrogen needed when corn follows corn, and 3) increasing pesticides by \$3 acre to reflect increased use of pesticides in continuous corn.

Given these adjustments, net margin for “corn following corn” is \$111 per acre (see Table 1). The net margin for “soybeans following corn” is \$129 per acre, \$18 higher than the net margin for “corn following corn”. Therefore, these budgets do not indicate that switching to more corn is advisable.

### **Price Impacts on Net Margins**

The \$18 difference in the “corn following corn” and “soybeans following corn” budgets are calculated using a \$2.05 per bu. corn price and \$5.15 per bu. soybean price. These prices equal the average of the 2002 loan rates for each county in Illinois. These county loan rates are based on national loan rates. Hence, these prices represent loan rates under the 2002 Farm Bill.

Averaging the county loan rates under the 1996 Farm Bill gives prices of \$2.00 for corn and \$5.40 for soybeans. At these prices, the net margin for “corn following corn” production is \$103 and the “soybean following corn” production is \$141. These prices result in a difference in net margins between the “corn following corn” and “soybean following corn” budgets of \$38. This difference is greater than the \$18 net margin difference using 2002 Farm Bill loan rates. Hence, the 2002 Farm Bill causes the difference in profits to narrow between corn production and soybean production

Market prices may be above loan rates. In these cases, relative prices may change and favor corn production. For example, 2002 new crop cash bids in late July were \$2.40 for corn and \$5.40 for soybeans. At these prices, the net margin for “corn following corn” and “soybeans following corn” respectively are \$164 and \$141. Under these prices, “corn following corn” is more profitable than “soybeans following corn”.

### **Yield Impacts on Net Margins**

At some point, increasing corn yields or decreasing soybean yields will cause the relative profitability of corn and soybeans to switch. For the budgets in Table 1, net margins for “corn following corn” and “soybeans following corn” equal when corn yields 162 bu. A corn yield higher than 162 bu. causes “corn following corn” to be more profitable than “soybeans following corn”. Yields lower than 162 bu. cause “soybean following corn” to be more profitable. In this case, the break-even corn-to-soybean yield ratio is 3.24 (162 bu. corn yield / 50 bu. soybean yield).

These break-even ratios will vary with costs. Table 2 illustrates this by showing break-even ratios for different regions of the state. At 2002 loan rate prices (\$2.05 for corn and \$5.15 for soybeans), break-even ratios range from a low of 3.22 in northern Illinois to a high of 3.43 in southern Illinois.

**Table 2. Corn-to-Soybean Ratios to Break-Even Between "Corn Following Corn" and "Soybeans Following Corn".<sup>1</sup>**

	Corn Price	\$2.05	\$2.40
	Soybean Price	\$5.15	\$5.40
Northern Illinois		3.22	2.85
Central Illinois (High productivity lan)		3.24	2.87
Central Illinois (Low Productivity Land)		3.31	2.93
Southern Illinois		3.43	3.03

<sup>1</sup> Costs used in these calculations taken from Table 1 and Appendix Table 1.

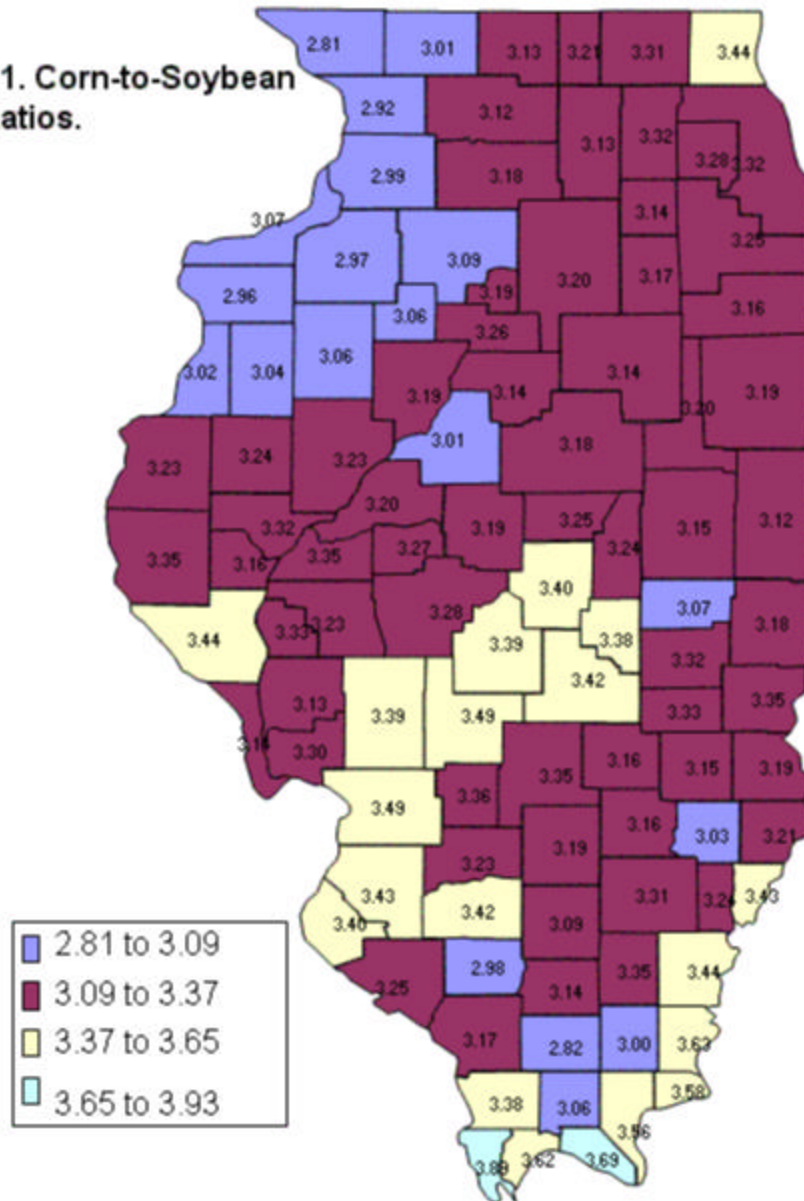
### Corn-to-Soybean Yield Ratios across Illinois

Ratios of actual corn yields to soybean yields vary from farm to farm with location in the state impacting likely corn-to-soybean yield ratios. Figure 1 shows the ratio of average county corn yields to average county soybean yields. In constructing these ratios, county yields obtained through the National Agricultural Statistics Service were averaged from 1997 through 2001. Corn yields were then divided by soybean yields to arrive at the ratios shown in Figure 1. Average yields, ratios, and ranks also are given in Appendix Table 2. There is considerable range in county corn-to-soybean ratios. Alexander county has the highest ratio of 3.89. Jo Daviess county has the lowest ratio of 2.81.

Dispersion of high and low county corn-to-soybean ratios is geographically related (see Figure 1). An area in south-central Illinois has high corn-to-soybean ratios (Madison, Macoupin, Montgomery, Christian, Macon, Shelby, and Moultrie counties). Also an area in southern Illinois near the Mississippi, Ohio, and Wabash rivers has high ratios. Difference in net margins using county yields were calculated for these counties (i.e., difference = "corn following corn" net margin – "soybean following corn" net margin using costs in Table 1). The net difference for Alexander county is \$6 per acre at loan rate prices. This is the only county where "corn following corn" is more profitable than soybean following corn at loan rate prices. All other counties have negative differences at loan rate prices. In rank order, Macon county has a -\$4 per acre difference, Gallatin county a -\$5, Christian county a -\$6, Montgomery county a -\$7, and Pike county a -\$8. At 2002 bid prices (\$2.40 for corn and \$5.40 for soybeans), these counties all have positive net differences.

Counties with low corn-to-soybean ratios tend to be located in the northwest part of the state (see Figure 1). A stretch of counties from Jo Daviess and Stephenson in the north down to Henderson, Warren, and Knox counties in the south have low corn-to-soybean yield ratios. Williamson, Saline, and Johnson counties in southern Illinois also have low ratios. Differences in net margins are negative at loan rate prices and at 2002 cash bid prices. Switching to more corn in these counties is not likely to be profitable.

**Figure 1. Corn-to-Soybean Yield Ratios.**



**Summary**

Changes in loan rates under the 2002 Farm Bill from those in the 1996 Farm Bill cause the relative profits of corn and soybeans to change. These changes favor corn. Most Illinois farmers, however, will not find it advisable to switch to more corn production. Costs cause “soybeans following corn” to be favored over “corn following corn” in most areas of the state. Farmers in central and extreme southern Illinois have higher corn yields relative to their soybean yields. These farmers will find the decision on whether to grow additional corn more difficult. Farmers will have less difficulty making the decision in northern Illinois where corn yields are lower relative to soybean yields. In this area, the switch does not appear warranted.

For most Illinois farmers, corn prices must be above loan rates to justify growing more corn. More specifically, corn prices must increase relatively more than soybean prices to justify growing “corn following corn”. These situations may occur with some regularity in future years. Current bid prices for 2002 crop would indicate that growing “corn following corn” would be profitable for many farmers.

This analysis is subject to the usual qualifications of these studies. Average costs of production and yields are used to represent the economic situation faced by farmers across Illinois. Costs and yields will vary from farm to farm. Therefore, farmers should use their own costs and yields to reach suitable conclusions for their own farm.

Issued by: Gary Schnitkey and Dale Lattz, Department of Agricultural and Consumer Economics

**Appendix Table 1. Revenue Less Variable Costs for Different Crop Rotations, 2002.\***

	Com Following Soybeans	Corn Following Corn	Soybeans Following Com	Soybeans Following Soybeans
<b>Panel A. Northern Illinois.</b>				
Average yield (bu. per acre) <sup>1</sup>	156	148	50	48
Effective price (per bu.)	2.05	2.05	5.15	5.15
Revenue per acre	\$320	\$303	\$258	\$247
Fertilizer and lime <sup>2</sup>	48	52	19	19
Pesticides <sup>2</sup>	32	35	33	33
Seed <sup>2</sup>	37	35	20	20
Drying and storage <sup>2</sup>	14	15	5	4
Machinery costs <sup>3</sup>	63	63	51	51
Variable and machinery costs	\$194	\$200	\$128	\$127
Net Margin	\$126	\$103	\$130	\$120
<b>Panel B. Central Illinois, Low Productivity Farmland.</b>				
Average yield (bu. per acre) <sup>1</sup>	148	141	47	45
Effective price (per bu.)	2.05	2.05	5.15	5.15
Net Margin	\$303	\$289	\$242	\$232
Fertilizer and lime <sup>2</sup>	50	55	18	18
Pesticides <sup>2</sup>	29	32	30	30
Seed <sup>2</sup>	37	35	19	19
Drying and storage <sup>2</sup>	15	15	5	4
Machinery costs <sup>3</sup>	63	63	51	51
Variable and machinery costs	\$194	\$200	\$123	\$122
Net Margin	\$109	\$89	\$119	\$110
<b>Panel B. Southern Illinois.</b>				
Average yield (bu. per acre) <sup>1</sup>	131	124	42	40
Effective price (per bu.)	2.05	2.05	5.15	5.15
Revenue per acre	\$269	\$254	\$216	\$206
Fertilizer and lime <sup>2</sup>	56	61	22	22
Pesticides <sup>2</sup>	31	34	31	31
Seed <sup>2</sup>	35	35	22	22
Drying and storage <sup>2</sup>	8	15	3	2
Machinery costs <sup>3</sup>	63	63	51	51
Variable and machinery costs	\$193	\$208	\$129	\$128
Net Margin	\$76	\$46	\$87	\$78

\* Footnotes are at the end of Table 1.

Appendix Table 2. County Yields, Ratios and Ranks for Illinois, 1997 -- 2001.

County	Average Yield			Rank	County	Average Yield			Rank
	Corn	Beans	Ratio <sup>1</sup>			Corn	Beans	Ratio <sup>1</sup>	
Adams	142	42	3.35	25	Lee	151	48	3.18	62
Alexander	128	33	3.89	1	Livingston	136	44	3.14	77
Bond	119	35	3.36	22	Logan	152	48	3.19	56
Boone	146	46	3.21	52	Macon	163	48	3.40	16
Brown	139	44	3.16	68	Macoupin	142	42	3.39	19
Bureau	150	49	3.09	84	Madison	135	39	3.49	8
Calhoun	127	40	3.14	75	Marion	120	38	3.19	58
Carroll	155	53	2.92	100	Marshall	151	46	3.26	40
Cass	149	44	3.35	23	Mason	140	44	3.20	53
Champaign	149	47	3.15	72	Massac	111	30	3.69	2
Christian	157	46	3.39	18	McDonough	155	48	3.24	45
Clark	135	40	3.35	24	McHenry	140	42	3.31	34
Clay	117	37	3.16	67	McLean	153	48	3.18	64
Clinton	121	38	3.23	48	Menard	152	46	3.27	39
Coles	152	46	3.32	32	Mercer	145	49	2.96	99
Cook	122	37	3.32	33	Monroe	127	37	3.40	17
Crawford	123	39	3.19	57	Montgomery	142	41	3.49	7
Cumberland	131	39	3.33	28	Morgan	150	47	3.23	49
De Witt	156	48	3.25	42	Moultrie	156	46	3.38	21
DeKalb	154	49	3.13	80	Ogle	152	49	3.12	81
Douglas	141	46	3.07	85	Peoria	152	48	3.19	60
DuPage	134	41	3.28	37	Perry	95	32	2.98	97
Edgar	143	45	3.18	63	Piatt	159	49	3.24	46
Edwards	121	37	3.24	44	Pike	146	42	3.44	11
Effingham	122	39	3.16	70	Pope	92	26	3.56	6
Fayette	127	38	3.35	27	Pulaski	121	34	3.62	4
Ford	140	44	3.20	55	Putnam	154	48	3.19	59
Franklin	102	33	3.14	74	Randolph	112	35	3.25	41
Fulton	144	45	3.23	50	Richland	112	37	3.03	91
Gallatin	131	36	3.63	3	Rock Island	144	47	3.07	86
Greene	140	45	3.13	78	Saline	108	36	3.00	95
Grundy	141	44	3.17	65	Sanqamon	155	47	3.28	38
Hamilton	117	35	3.35	26	Schuyler	143	43	3.32	30
Hancock	144	45	3.23	47	Scott	141	42	3.33	29
Hardin	112	31	3.58	5	Shelby	140	41	3.42	14
Henderson	148	49	3.02	92	St. Clair	133	39	3.43	12
Henry	145	49	2.97	98	Stark	155	51	3.06	87
Iroquois	147	46	3.19	61	Stephenson	146	49	3.01	93
Jackson	111	35	3.17	66	Tazewell	150	50	3.01	94
Jasper	124	40	3.15	71	Union	118	35	3.38	20
Jefferson	109	35	3.09	83	Vermilion	142	46	3.12	82
Jersey	140	43	3.30	36	Wabash	128	37	3.43	13
Jo Daviess	144	51	2.81	102	Warren	155	51	3.04	90
Johnson	107	35	3.06	88	Washington	120	35	3.42	15
Kane	150	45	3.32	31	Wayne	118	36	3.31	35
Kankakee	137	43	3.16	69	White	124	36	3.44	9
Kendall	138	44	3.14	76	Whiteside	143	48	2.99	96
Knox	154	50	3.06	89	Will	136	42	3.25	43
La Salle	147	46	3.20	54	Williamson	97	35	2.82	101
Lake	113	33	3.44	10	Winnebago	138	44	3.13	79
Lawrence	123	38	3.21	51	Woodford	153	49	3.14	73

<sup>1</sup> Ratio of corn yield to soybean yield.