

August 15, 2006**FEFO 06-14****Corn and Soybean Prices for More Corn in 2007**

Recent and planned construction of ethanol plants suggests the need for substantially more corn to meet the needs of ethanol plants, livestock producers, other manufactures, and foreign buyers. For corn production to increase, farmers must plant more corn acres at the expense of other crops. In much of the Midwest, the tradeoff will come down to a choice between corn and soybeans. Hence, the profitability of corn must exceed that of soybean to entice farmers to plant more corn. This enticement generally comes in the form of higher corn prices relative to soybean prices.

Corn prices that make corn production more profitable than soybean production are calculated in this paper. Given a \$6.00 per bu. soybean price, breakeven corn prices range from slightly above \$3.00 down to \$2.50 for a range of yields typical of most Midwest farms. Given current 2007 price forecasts, many farmers may find planting more corn to be more profitable than planting soybeans.

Calculating Breakeven Corn Price

Many Midwest farmers traditionally plant a 50-50 corn-soybean rotation in which corn is planted one year and soybeans the following year. For these farmers, planting more corn requires planting additional corn acres on farmland that was planted in corn the previous year. Hence, the additional corn decision often comes down to a comparison of corn-after-corn returns to soybean returns.

Corn-after-corn returns relative to soybean returns can be evaluated by constructing budgets for corn-after-corn and soybeans. While a large number of factors impact the relative profits of the two crops, the key factors can be summarized in five key variables:

1. Per acres cost difference between corn and soybeans, hereafter referred to as cost difference. This cost difference equals per acre corn production costs minus per acre soybean production costs. As the cost difference becomes larger, corn production becomes more costly than soybean production.
2. Corn yield.
3. Soybean yield.
4. Corn price.
5. Soybean price.

Using these variables, a mathematical relationship that gives a breakeven corn price as a function of the other four variables is:

$$\text{breakeven corn price} = (\text{cost difference} + \text{soybean price} \times \text{soybean yield}) / \text{corn yield}$$

Higher corn prices than the breakeven corn price make corn more profitable than soybeans. Conversely lower corn prices make soybean production more profitable. As can be seen by the formula, higher cost

differences, soybean prices, and soybean yields increase the breakeven price. Conversely, higher corn yields lower the breakeven price.

Factors Impacting Breakeven Corn Prices

Cost differences between corn and soybeans have been increasing since 2002 (see Table 1). In northern Illinois, for example, the average cost difference for grain farms enrolled in Illinois Farm Business Farm Management (FBFM) is \$77 per acre in 2002, \$83 in 2003, \$95 in 2004, and \$103 in 2005. Forecasted cost differences are \$107 per acre in 2006 and \$108 per acre in 2007. Increasing cost differences are caused primarily by higher nitrogen prices, leading to higher corn fertilization costs.

Table 1. Corn Costs Minus Soybean Costs by Region of Illinois, 2001 - 2007F.

Region	Year ³						
	2001	2002	2003	2004	2005	2006F	2007F
	\$ per acre						
North	81	77	83	95	103	107	108
Central -- High ¹	78	76	78	90	100	106	107
Central -- Low ²	83	79	84	89	104	108	108
South	77	74	71	81	100	100	100

¹ Central Illinois with high productivity farmland (avg corn yield last five-years = 171 bu.)

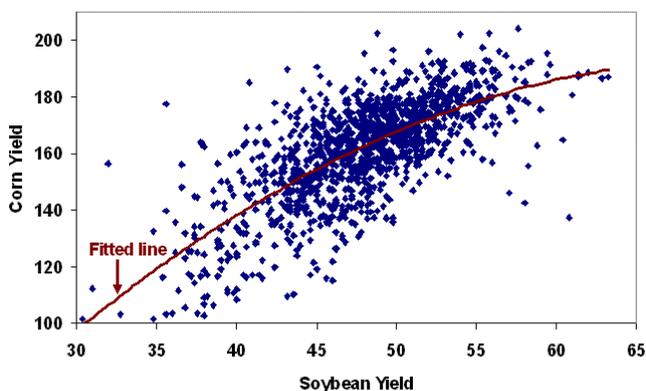
² Central Illinois with high productivity farmland (avg corn yield last five-years = 161 bu.)

³ F stands for forecast.

Source: Illinois Farm Business Farm Management as reported in "Per Acre Revenue and Costs for Illinois Crops" in management section of *farmdoc* (www.farmdoc.uiuc.edu).

All regions have cost differences projected at over \$100 per acre for 2007: \$108 for northern Illinois, \$107 per acre for central Illinois with high quality farmland, \$108 for central Illinois with low quality farmland, and \$100 for southern Illinois (see Table 1). These cost differences represent averages blended over corn-after-soybean and corn-after-corn production. Cost differences will be higher for corn-after-corn production. Corn-after-corn production requires additional nitrogen fertilizer than does corn-after-soybean production. Additional nitrogen needs add about \$7 per acre to the cost difference.

Figure 1. Five-Year Average Corn and Soybean Yields on Illinois Farms, 2001 - 2005.



Corn and soybean yields also impact breakeven corn prices. These yields will vary across farms as illustrated in Figure 1. Figure 1 shows five-year average yields for 2001 through 2005 for FBFM farms. Each dot represents a farm's yields, with the soybean yield indicated on the horizontal axis and the corn yield represented on the vertical axis. As can be seen, yields vary across farms.

The solid "fitted line" gives a projected corn yield for every soybean yield. For example the projected corn yield is 168 bu. per acre given a soybean yield of 50 bu. per acre. Projected corn yield increases as the soybean yield increases.

A farm's actual corn yield can vary from the projected corn yield. This variability is illustrated in Table 2, which shows a low, projected, and a high corn yield for a given soybean yield. Take for example, a 50 bu. soybean yield. The low corn yield is 135 bu, the projected is 150 bu. and the high is 165 bu. The low and high give the range in which 80% of the yields fall. At a 50 bu. corn yield, 80% of the five-year average corn yields are between 135 bu and 165 bu.

Breakeven corn yields are calculated at the soybean and corn yields shown in Table 1. This gives a range of breakeven corn prices for a range of yield situations covering most Midwest farms. The cost difference is set at \$115 per acre.

Breakeven Corn Prices

The body of Table 3 shows breakeven corn prices for different soybean prices, given the variety of yields shown in Table 2. Current price forecasts suggest that soybean prices will be near \$6.00 per bu. for the 2007 crop year. Hence, the column giving breakeven corn prices for the \$6.00 soybean price likely is the most relevant. The other columns are shown in case expected soybean prices change.

At a \$6.00 soybean price and a 50 bu. yield, breakeven prices range from \$3.07 for a corn yield of 135 bu. down to \$2.52 for a 165 bu. yield. About half the farms can reasonably expect to have corn yields above 150, given a 50 bu. soybean yield. These farms will have breakeven corn prices below \$2.77. Current corn price projections are in the \$2.70 to \$2.80 range for the 2007 crop. Hence, about half the farms with 50 bu. expected soybean yield can expect corn to be more profitable than soybeans.

As shown in Table 3, similar results exist for all soybean yields above 45 bu.: 1) the range in breakeven corn prices are from slightly above \$3.00 down to \$2.50 for the \$6.00 soybean price and 2) about half the farms can expect corn production to be more profitable than soybeans given the current 2007 price forecast. These expected yields cover much of the production in the Midwest and are particularly relevant to northern and central Illinois.

Table 3 also shows break-even prices for expected yields of 40 bu. per acre. Breakeven prices range from \$3.38 for a 105 bu. expected corn yield down to \$2.63. Generally, breakeven corn prices are higher for the 40 bu. soybean yield than for higher expected soybean yields.

Caveats

Breakeven corn prices also will vary as the cost changes. Each \$5 increase in the cost difference causes the breakeven prices in Table 3 to increase by \$.02 to \$.03 per bu.

Breakeven corn prices in Table 3 are based on an expected corn yield that should – in most cases – reflect corn-after-corn production. Agronomic research indicates that corn-after-corn yields are 10% below that of corn-after-soybean production. Many farmers do not believe that corn-after-corn has a yield drag. Consideration should be given to yields used in calculating breakeven corn prices. Lower expected corn yields will increase breakeven corn prices.

Table 2. Ranges of Five-Year Corn Yields Given a Five-Year Average Soybean Yield.

Soybean Yield	Corn Yield ¹		
	Low ²	Projected ³	High ⁴
	bu. per acre		
40	105	120	135
45	125	140	155
50	135	150	165
55	145	160	175
60	155	170	185

¹ All yields are rounded to nearest 5 bu. increment.

² 10% of 5-year average yields are below the "low".

³ Gives the average corn yield for the given soybean yield.

⁴ 10% of 5-year average yields are above the "high".

Table 3. Breakeven Corn Prices to Plant Corn Rather than Soybeans Given Different Yields and Soybean Prices.

Expected Corn-After-Corn Yield	Expected Soybean Yield	Soybean Price				
		\$5.50	\$5.75	\$6.00	\$6.25	\$6.50
bu.	bu.	Breakeven Corn Price				
105	40	\$3.19	\$3.29	\$3.38	\$3.48	\$3.57
120	40	\$2.79	\$2.88	\$2.96	\$3.04	\$3.13
135	40	\$2.48	\$2.56	\$2.63	\$2.70	\$2.78
125	45	\$2.90	\$2.99	\$3.08	\$3.17	\$3.26
140	45	\$2.59	\$2.67	\$2.75	\$2.83	\$2.91
155	45	\$2.34	\$2.41	\$2.48	\$2.56	\$2.63
135	50	\$2.89	\$2.98	\$3.07	\$3.17	\$3.26
150	50	\$2.60	\$2.68	\$2.77	\$2.85	\$2.93
165	50	\$2.36	\$2.44	\$2.52	\$2.59	\$2.67
145	55	\$2.88	\$2.97	\$3.07	\$3.16	\$3.26
160	55	\$2.61	\$2.70	\$2.78	\$2.87	\$2.95
175	55	\$2.39	\$2.46	\$2.54	\$2.62	\$2.70
155	60	\$2.87	\$2.97	\$3.06	\$3.16	\$3.26
170	60	\$2.62	\$2.71	\$2.79	\$2.88	\$2.97
185	60	\$2.41	\$2.49	\$2.57	\$2.65	\$2.73

¹ Based on a per-acre corn-soybean costs difference of \$115.

The breakeven corn prices shown in Table 3 do not consider long-run changes in crop rotations. Planting more corn in 2007 will result in lower amounts of corn-after-soybean production in 2008 and beyond. Corn-after-soybeans generally has higher profits than corn-after-corn production. Hence, shift in 2007 production could lower 2008 returns. More on this issue is provided in an *Illinois Farm Economics: Facts and Opinions* titled “The Economics of Adding More Corn to Corn-Soybeans Rotations (Nov. 30, 2004 at http://www.farmdoc.uiuc.edu/manage/newsletters/fefo04_20/fefo04_20.html).

Corn production traditionally has been more risky than soybeans. Furthermore, yields from corn-after-corn production are more variable than yields from corn-after-soybean production. Hence, switching to more corn increases revenue risks. Calculation of breakeven prices do not consider risks.

Summary

Given a \$6.00 soybean price and soybean yields above 45 bu. per acre, breakeven corn prices range from slightly above \$3.00 for relatively low corn yields down to about \$2.50 for relatively high corn yields. Current 2007 price projections are in the \$2.70 to \$2.80 per bu. range. Hence, some farmers may find switching to more corn profitable for the 2007 production year.

Acknowledgements

Data used in this study comes from the local Farm Business Farm Management (FBFM) Associations across the State of Illinois. Without their cooperation, information as comprehensive and accurate as this would not be available for educational purposes. FBFM, which consists of 6,000 plus farmers and 60

professional field staff, is a not-for-profit organization available to all farm operators in Illinois. FBFM field staff provides on-farm counsel with computerized recordkeeping, farm financial management, business entity planning and income tax management. For more information, please contact the State FBFM Office located at the University of Illinois Department of Agricultural and Consumer Economics at 217-333-5511 or visit the FBFM website at www.fbfm.org.

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