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Weekly Farm Economics: Low Crop Revenue Most Likely Due to Lower Prices

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Much of the Great Plains and western corn-belt still is in drought, leading to concerns about a drought in 2013. While a drought in 2013 is a possibility, a more likely scenario resulting in low crop revenue is declining prices combined with near normal yields. Herein, historical yield and price changes are used to illustrate potential revenue scenarios under drought yields, near normal yields, and above average yields. Then, situations in which low revenues occur from historical yield and price changes are identified.

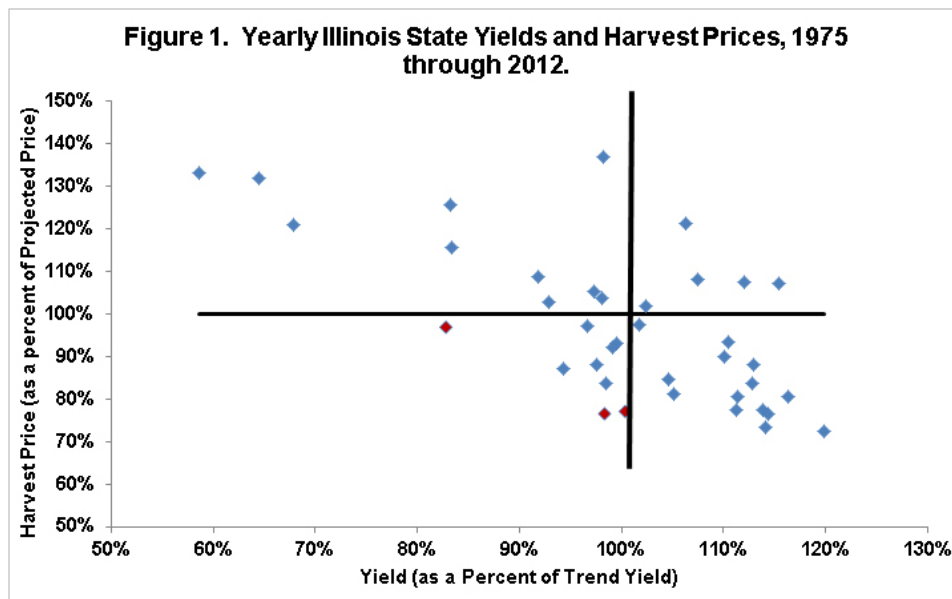
Yield and Price Correlation

This analysis is conducted using Illinois state yields. For each year between 1975 through 2012, the Illinois state yield is stated as a percent of trend yield. Trend yield represents the expected yield in each year given "normal" weather conditions. Trend yields are found by statistically fitting historical data with a straight line from 1975 through 2012. In 2012, the trend yield for Illinois is 163 bushels. Actual 2012 yield is 105 bushels. The yield stated as a percent of trend is 64% ($.64 = 105 \text{ bushel actual yield} / 165 \text{ bushel trend yield}$).

Also calculated each year is the percent change between projected and harvest prices. The projected price is used to set crop insurance guarantees each year and equals the average of settlement prices of the December Chicago Mercantile Exchange (CME) contract during the month of February. The harvest price is used to calculate crop revenue for crop insurance purposes and equals the average of the settlement prices of the December CME contract during the month of October. The change in the projected and harvest prices provide an indication of how markets reacted to weather and other market changes during the growing season. In 2012, the projected price is \$5.68 and the harvest price is \$7.50, yielding harvest price as a percent of projected price of 132% ($1.32 = \$7.50 \text{ harvest price} / \$5.68 \text{ projected price}$).

These yield-price change pairs are shown in Figure 1. As yield increases relative to trend yield, note that price change declines. There is a negative correlation between yields and price changes of $-.54$. Because Illinois is a large producer of corn and Illinois production is correlated with other large producing states, high yields in Illinois generally mean higher total supplies of corn, leading to lower prices for corn.

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Illinois yields have been extremely low relative to trend in three years. Actual yield is 59% of trend yield in 1988, 64% of trend yield in 2012, and 68% of trend yield in 1983. As can be seen in Figure 1, where these three years are labeled, harvest price in each of these three years is higher than the projected price. During these three years, the harvest price averages 129% of the projected price, meaning that the harvest price is 29% higher than the projected price.

Average years are represented by arraying yields from lowest to highest and selecting the ten years in the middle of the range. The average yield in these ten “median” years is 101% of trend yield. These median years correspond to the pairs close to the vertical line in Figure 1. During these ten years, harvest price is 92% of projected price, indicating that historically average yields in Illinois are associated with slight declines in harvest prices.

There are twelve years in which actual yields are more than 10% higher than trend yields. During these twelve years, yield average 13% higher than trend yields. Prices declined in most of these years, although there are some years in which harvest price is above projected price (see Table 1). On average, the harvest price is 85% of the projected price during these high yielding years.

Revenue under Three Yield Scenarios

Based on the descriptions provided above, three scenarios are defined under which projected revenue for 2013 is calculated:

1. Drought year in which yield is 64% of trend and harvest price is 129% of projected price.
2. Median yield year in which yield is 101% of trend yield and harvest price is 92% of projected price.
3. High yield year in which yield is 113% of trend yield and harvest price is 85% of projected price.

The trend yield used in calculations is the 2013 Illinois trend yield of 165 bushels per acre. This gives a drought year yield of 104 bushels per acre ($165 \times .63$), a median year yield of 166 bushels (165×1.01) and a high year yield of 187 bushel per acre (165×1.13).

The projected price used in calculations is \$5.90, close to the price of the December 2013 CME futures contract in the beginning of February 2013. This gives a drought year harvest price of \$7.61 ($\5.90×1.29), a median year price of \$5.46 ($\$5.90 \times .92$), and a higher yield year price of \$5.03 ($\$5.90 \times .85$)

Crop revenue equals yield time the harvest price minus a \$.30 basis. This gives crop revenue of \$760 in the drought year, \$857 in the median yield year, and \$885 in the high yield year (see Table 1). The lowest crop revenue is associated with the drought year. However, there would likely be a crop insurance payment associated with a drought year. Revenue from an 80% Revenue Protection (RP) policy is

estimated for each scenario. Under the drought year scenario, there would be a \$183 per acre RP payment, giving crop revenue plus the RP payment of \$943 per acre.

Table 1. 2013 Revenue Scenarios Given Historical Yield and Price Changes

Historic yield scenario	Yield as a % of Trend ⁴	Harvest Price as a % of Projected Price ⁵	2013 Projection for Historic Scenario				
			Yield ⁶	Harvest Price ⁷	Crop Revenue ⁸	RP Payment ⁹	Crop Revenue Plus RP
			bu/acre	\$/bu	\$/acre	\$/acre	\$/acre
Three drought years ¹	63%	129%	104	7.61	760	183	943
Median yield years ²	101%	92%	166	5.46	857	0	857
High yield years ³	113%	85%	187	5.03	885	0	885

¹ Yields and price changes based on three drought years (1983, 1988, and 2012).

² Yield and price changes given the ten years closest to the mid range of yield changes (1976, 1977, 1978, 1990, 1996, 1998, 1999, 2000, 2001, 2010).

³ Years in which actual yield exceeded trend yield by 10% or more (1975, 1979, 1981, 1982, 1985, 1986, 1992, 1994, 2003, 2004, 2007, 2008).

⁴ Average of actual yield as a percent of trend yield in each scenario.

⁵ Average of harvest price as a percent of projected price during each scenario

⁶ The 2013 trend yield (165 bushel) times average yield as a percent of trend.

⁷ The projected harvest price of \$5.90 times harvest price as a % of projected price.

⁸ Equals yield times (harvest price minus \$.30 basis).

⁹ Estimated Revenue Projection (RP) insurance payment using state yields, a 165 TA-APH yield, an 80% coverage level, and a \$5.90 projected price.

Drought years will not necessarily result in the lowest revenues. This occurs if suitable crop insurance is available for purchase. Also, the median and high yield years do not necessarily result in low revenue. However, there have been some years that do result in low revenue, as illustrated in the following section.

Low Revenue Years

Using procedures detailed above, revenue for each year from 1975 through 2012 have been calculated. Lowest revenue occurs in:

1. 1991 when actual yield is 100% of trend yield and harvest price is 77% of projected price. Revenue equals \$729 per acre (includes a \$25 RP payment).
2. 1977 when actual yield is 98% of trend yield and harvest prices is 76% of projected price. Revenue equals \$730 per acre (includes a \$45 RP payment).

Note that 1991 and 1977 have near normal yields, but large price declines.

Summary

Using history as a guide, low revenue will likely be caused by a large price declines. This year, large projected plantings of corn are projected. Large planting combined with normal or higher yields could result in large supplies of corn, resulting in large price declines.