



## Comparing Revenue and Price Declines during Recent Multiple Year Declines

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### Introduction

Since 1973, crop commodity programs in the farm bill have largely been transformed to policies that make payments to farmers from policies that support and increase market price. Payment was usually triggered by low price, with the goal of helping farm income during multiple years of low or depressed prices. The last two farm bills have included a policy option that makes payment triggered by low revenue using a combination of price and yield declines. By taking into account yield as well as price, revenue arguably is a more inclusive payment policy. We explore this matter further by comparing changes in price, yield per planted acre, and revenue per planted acre in the current low price environment and one from the late 1990s.

### Data and Procedures

Because multiple year price declines (and increases) extend across crops, the index of prices received for all crops is used to identify periods of multiple year declines. No comparable index exists for revenue. Two multiple year decline periods have occurred since the use of price support policies was minimized by the 1985 and 1991 farm bills: 1997-2001 and 2013 through at least September 2016. Although the all crop price index bottomed in calendar year 2000, the 2001 crop year was used as the last year because the price of rice, soybeans, and upland cotton bottomed in that crop year. Note that 1997-2001 contains 5 crop years while 2013-2016 contains 4 crop years. Percent change in revenue, price and yield is calculated relative to the average revenue, price, and yield for the 3 crop years that end in the peak year of 1996 and 2012. A 3 year average provides a more accurate measure of the underlying strength of the revenue and price increase that preceded the multiple year declines. A composite average percent change is calculated for barley, corn, oats, rice, sorghum, soybeans, upland cotton, and wheat. Corn, soybeans, and wheat are also examined individually. The data used in this analysis are from the US Department of Agriculture's [QuickStats](#) data base and the [September 2016 World Agricultural Supply and](#)

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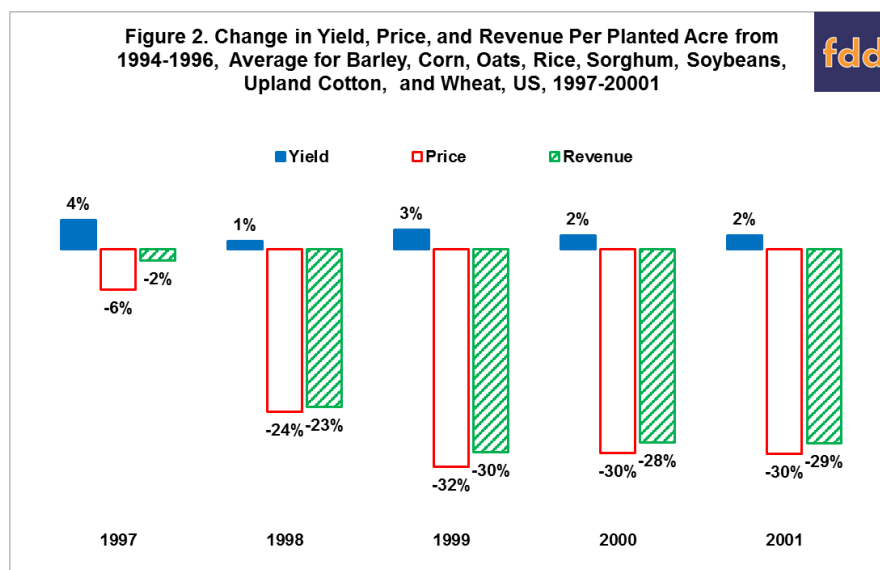
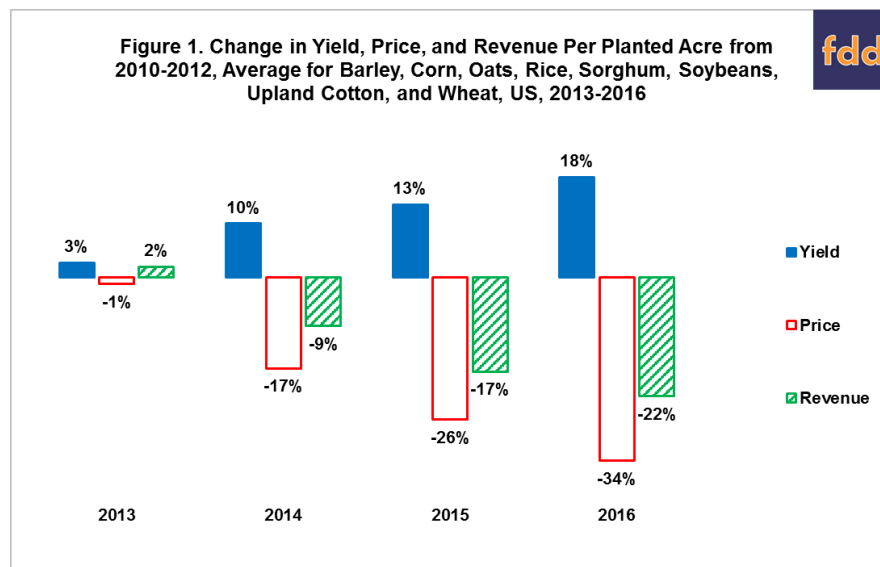
*Demand Estimates.* See data note 1 for a discussion of the calculation of yield per planted acre. See data note 2 for a discussion of the decline that occurred during the early to mid-1980s and why it was not included in the analysis.

## Background Discussion

Consecutive years of low yields can occur but are uncommon in the US even for an individual crop. Thus, multiple-year decline periods are largely driven by low prices. However, increases in yield can moderate low prices, causing revenue/acre to decline less than price. Hence, a policy that pays on low prices may overcompensate farmers for their economic stress. Similarly, a policy that pays on low prices may undercompensate farmers for their economic stress if yield and price both decline. Divergence happens because revenue is more than price.

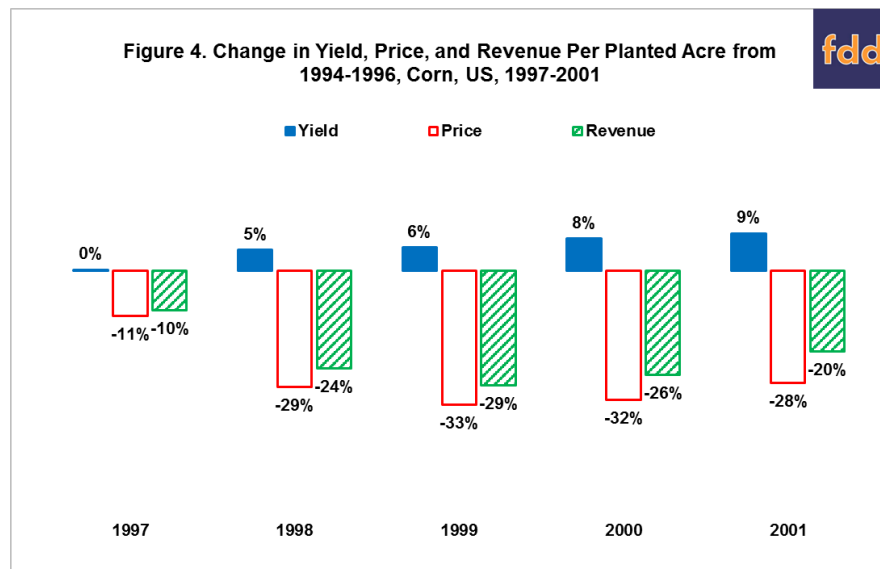
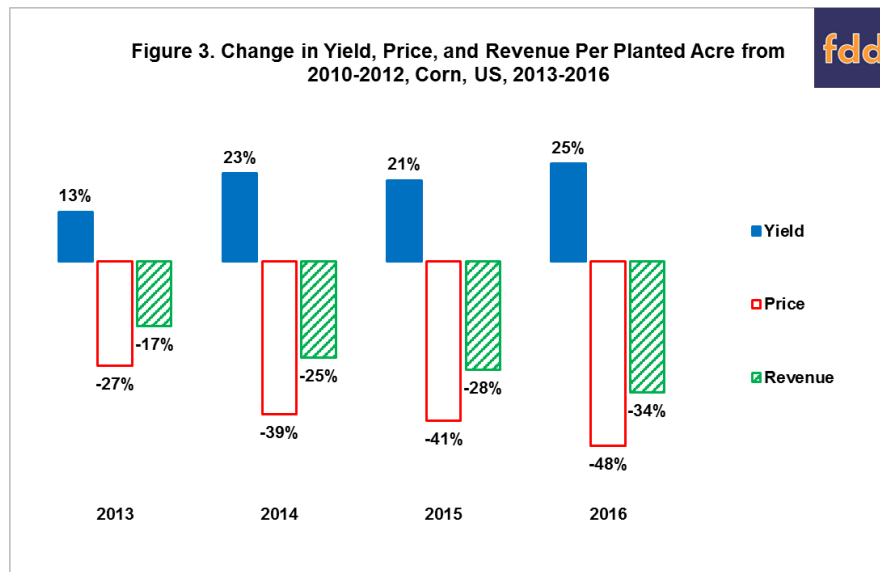
## Crop Composite

Yield has increased strongly during the current period of revenue and price decline (see Figure 1). As a result, decline in revenue/acre is notably smaller than decline in price. For example, the currently expected yield and price for the 2016 crop year results in a composite revenue decline of 22% compared with a composite price decline of 34%. In contrast, composite yield increased only 2% to 3% during 1997-2001, resulting in little difference between the declines in composite revenue and price (see Figure 2). Overcompensation is thus a bigger potential policy issue during the current decline period than during the 1997-2001 decline period.



## Corn

Like the crop composite, a strong increase in corn yield is a feature of the current decline period (see Figure 3). As a result, a notable gap exists between the decline in revenue/acre and decline in price. During 1997-2001, increases in corn yield were smaller but still large enough to create a smaller decline in revenue than price (see Figure 4).



## Soybeans

Like corn and the crop composite, soybean yields have increased strongly during the current decline period (see Figure 5). As with the crop composite, yield changes during 1997-2001 were minimal, resulting in similar declines in soybean revenue/acre and price (see Figure 6). In fact, yield of the 1999 and 2000 soybean crops was slightly lower than in its baseline period. As a result, the decline in revenue was slightly larger than the decline in price for these crop years.

## Wheat

Yield declines have been a feature of US wheat during the current decline period (see Figure 7). Relative to the 2010-2012 baseline, average US yield was lower in 2013, 2014, and 2015. As a result, revenue declines exceeded price declines, especially in 2013. For all but 2001 during the 1997-2001 decline period, substantial yield increases resulted in revenue/acre declines that were smaller than the declines in price (see Figure 8).

Figure 5. Change in Yield, Price, and Revenue Per Planted Acre from 2010-2012, Soybeans, US, 2013-2016

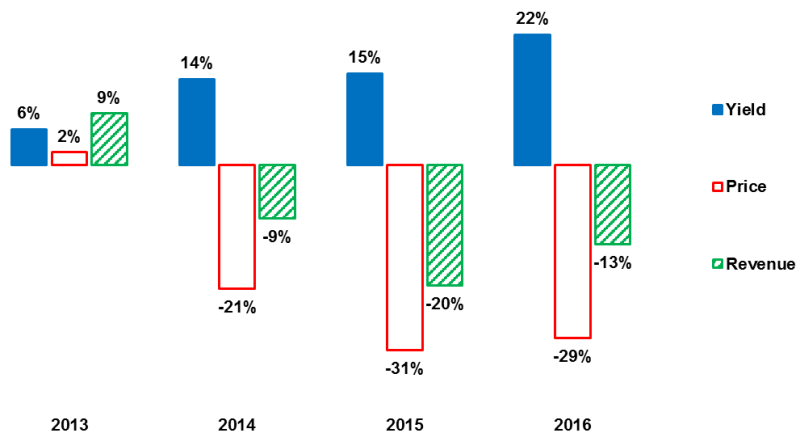


Figure 6. Change in Yield, Price, and Revenue Per Planted Acre from 1994-1996, Soybeans, US, 1997-2001

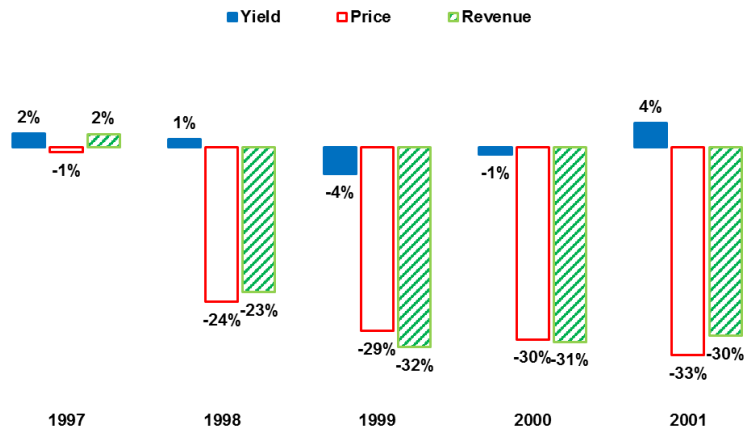
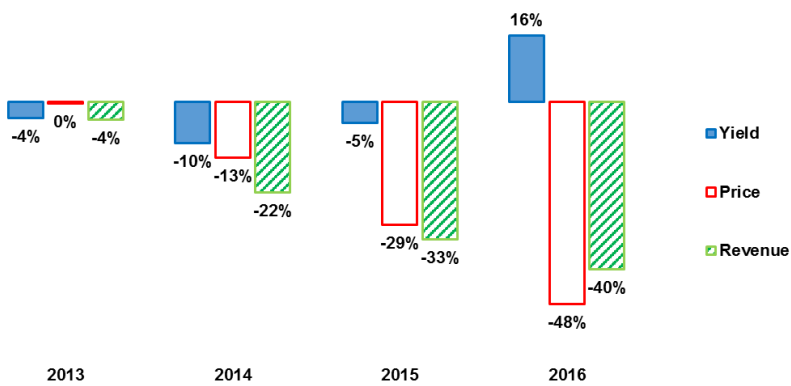
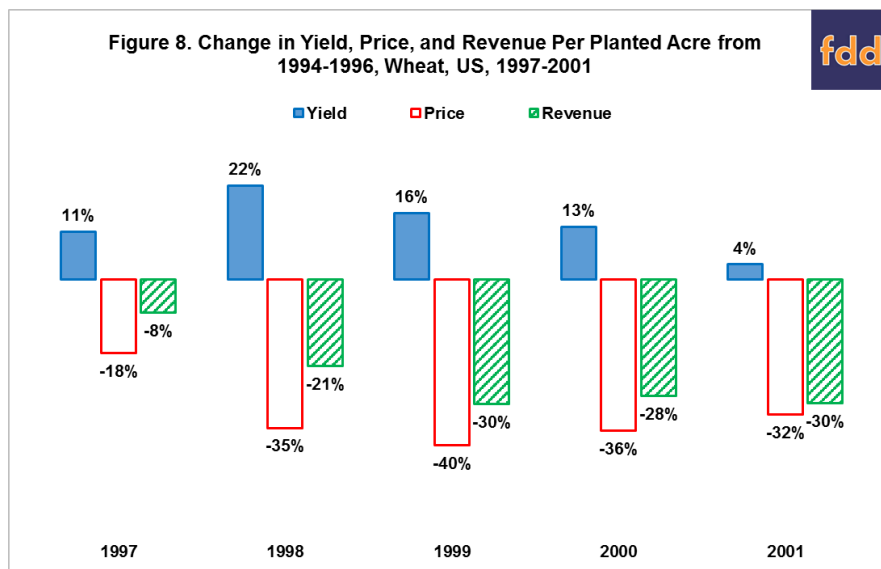


Figure 7. Change in Yield, Price, and Revenue Per Planted Acre from 2010-2012, Wheat, US, 2013-2016





### Summary Observations

- Revenue/acre is a more inclusive measure of financial well-being and stress than is price since revenue/ acre includes yield.
- Consecutive years in which average US yield is substantially below normal can happen but is not common. Thus, multiple year declines in revenue/acre are largely driven by declines in price.
- Revenue/acre and price will decline by the same percent if yield does not change.
- Percent decline in revenue/acre is smaller than percent decline in price if yield is increasing.
- Percent decline in revenue/acre is larger than percent decline in price if yield is decreasing.
- These 3 situations have each occurred in the current and 1997-2001 multiple-year decline periods.
- Programs based on price rather than revenue/acre, everything else the same; will overpay relative to the economic stress that is occurring if yield is increasing while price is declining.
- If yield and price are both declining, programs based on price rather than revenue/acre, everything else the same, will undercompensate relate to the economic stress that is occurring.
- Since 2012, large yield increases have occurred for many US crops, making overcompensation by price programs a potential policy issue.

### References and Data Sources

US Department of Agriculture (USDA), National Agricultural Statistics Service. September 2016. *QuickStats*. <http://quickstats.nass.usda.gov/>

USDA, Office of the Chief Economist. September 12, 2016. *World Agricultural Supply and Demand Estimates*. WASDE-557. <http://www.usda.gov/oce/commodity/wasde/index.htm>.

### Data Notes

1. Yields are calculated per planted acre by dividing production by acres planted for a crop year. For corn and sorghum, acres harvested for silage are subtracted from planted acres. Yield per harvested acre is used for oats since a large share of oats is planted as a cover crop.

2. The 1981 farm bill enacted high non-recourse loan rates, creating a price floor much above market clearing price. Revenue/acre and price were thus relatively stable until Congress reversed this policy in

the 1985 farm bill. Revenue and price declined precipitously after this farm bill was passed in December 1985. Relative to the 1979-1981 crop year average, revenue/acre and price for the 1986 crop declined -32% (-38%) for the 8-crop composite, -35% (-45%) for corn, -20% (-28%) for soybeans, and -39% (-37%) for wheat. These declines are similar to the 1997-2001 and 2013-2016 declines, but the path was very different. Hence this period was not included in this analysis.

