



Do Warm Winters Tell Us Anything about Summer Temperatures and Corn Yields?

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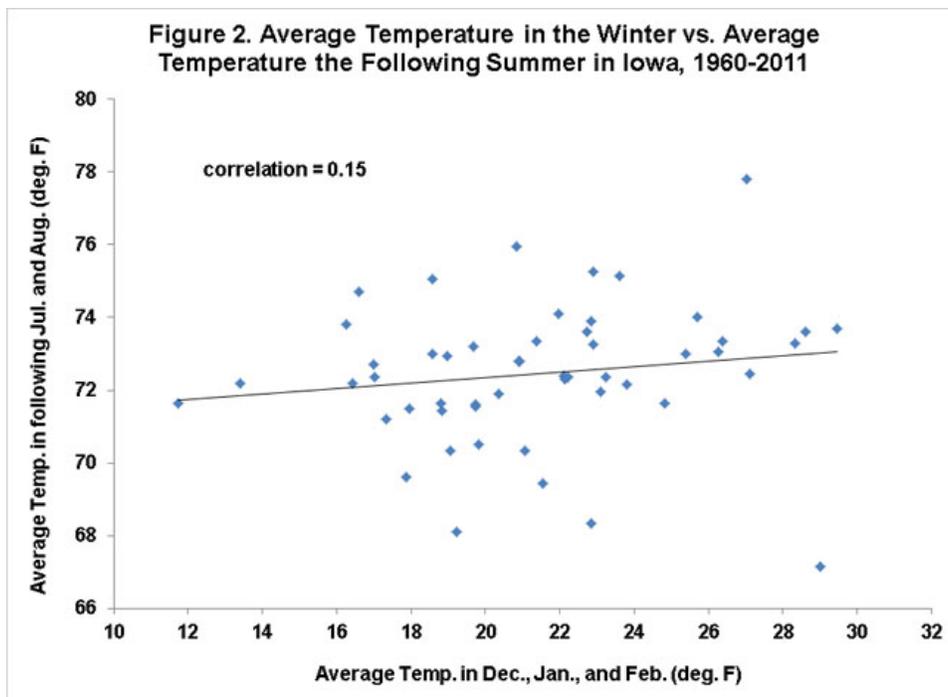
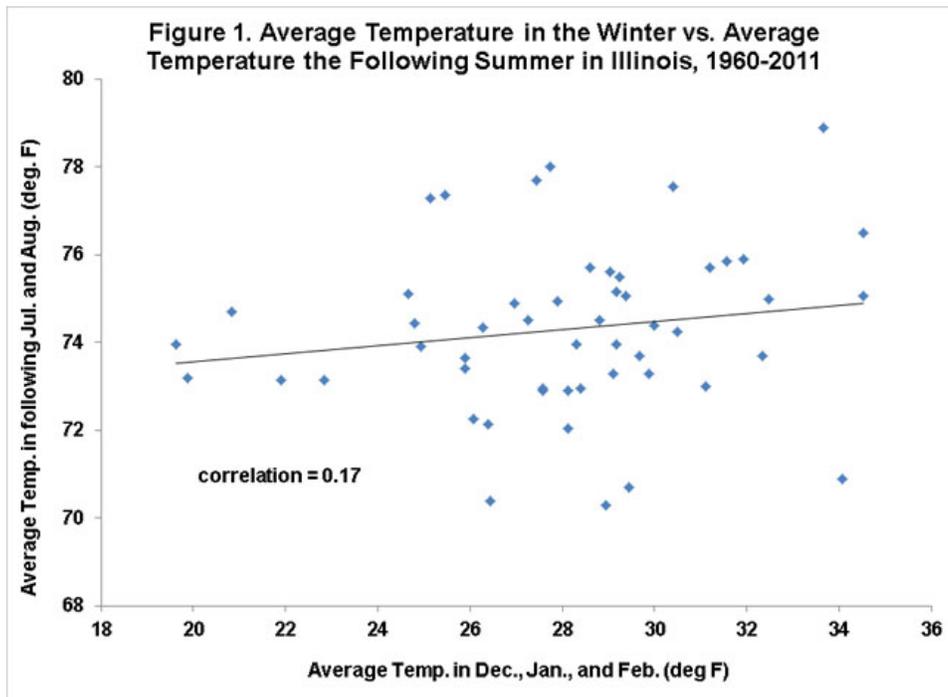
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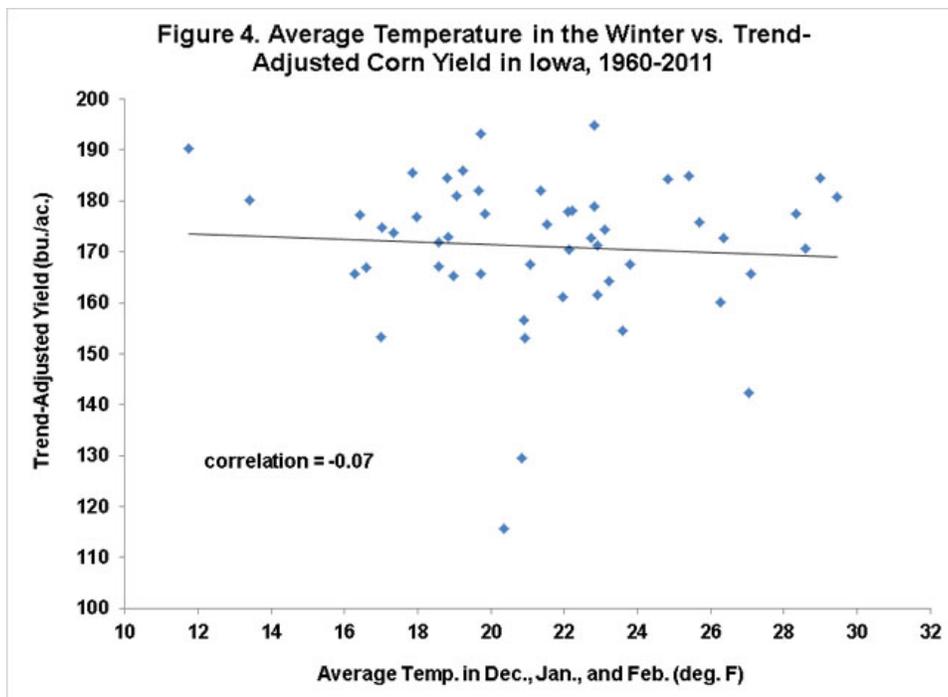
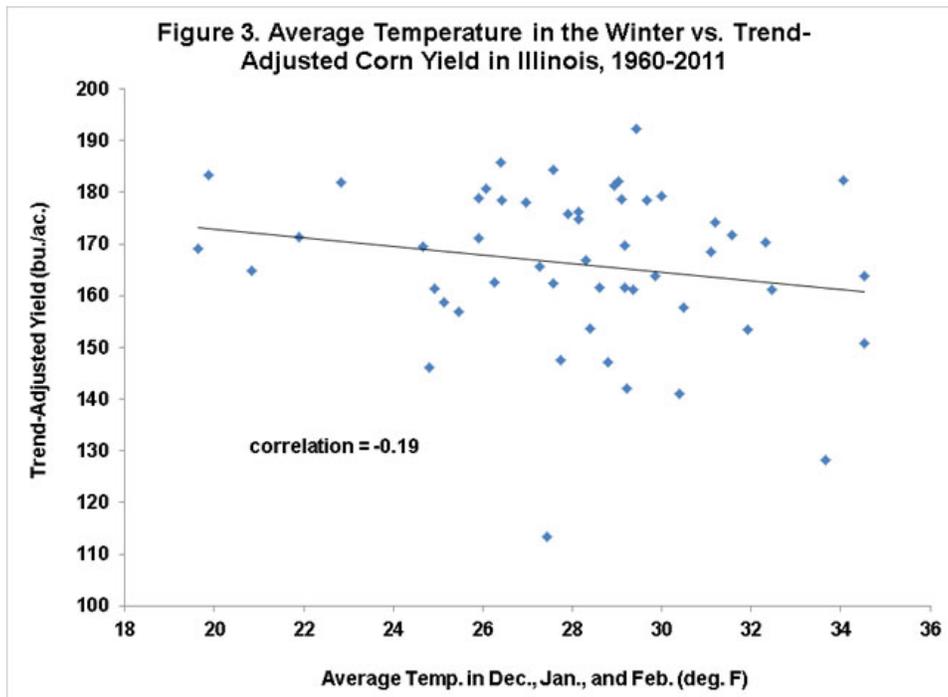
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The mild temperatures experienced in the winter of 2011-12 have some wondering if there is any relationship between average winter temperatures and average temperatures the following summer. Implicit in that question is whether there are any implications for crop yields following a mild winter. Here we examine the relationship between state average temperature during December, January, and February and the average temperature in the following July and August. In addition, we examine the relationship between the average winter temperature and the trend-adjusted corn yield the following year. The analysis is conducted for Illinois and Iowa (the two largest corn producing states) over the period 1960 through 2011.

The relationship between average winter and summer temperature is presented in Figures 1 and 2. The results show a slight positive relationship between average winter and summer temperature in both states. The correlation is about 0.15 in both states (correlations can vary between -1 and +1, with zero indicating no relationship), so the strength of the relationship is quite small. This is also evident in the wide scatter of data points around each line. In particular, winters with above-average temperatures are associated with a wide range of temperatures the following summer.



Given the low correlation between average winter and summer temperature in Illinois and Iowa, it would be expected that the correlation between average winter temperature and the state average trend-adjusted corn yield the following year would also be small. That expectation is confirmed by Figures 3 and 4, which actually show a small negative relationship between average winter temperature and trend-adjusted average state yield. Once again, above-average winter temperatures are associated with a wide range of trend-adjusted yields.



While the correlation between average winter temperature and both average summer temperature and average state yield is small over the entire period, what about the relationships when attention is restricted to the very warmest winters? Table 1 contains the temperature and yield data for the five warmest winters in Illinois and Iowa from 1960 through 2011. The averages for those five years are calculated along with the averages for the entire period. The average winter temperature for 2012 is also shown (average temperature for February is preliminary). Average winter temperature in those five years was above the average for the entire period by 5.8 degrees in Illinois and by 7.1 degrees in Iowa. Average summer temperature in those five years was above the average for the entire period by one degree in Illinois and below the average by 0.5 degree in Iowa. Warm winters were followed by average summer temperatures that were both well above and well below average. The average trend adjusted

corn yield for the five years was below the average for the entire period by 9 bushels in Illinois and above the average by 5 bushels in Iowa. Average yields in individual years were both well above and below the average for the five-year period, particularly in Illinois. Average yields showed less variation in Iowa, but the range was still considerable.

Table 1. Average Temperature in the Five Warmest Winters vs. Average Temperature the Following Summer and Trend-Adjusted Yield in Illinois and Iowa, 1960-2011

Year	Illinois			Year	Iowa		
	Avg. Temperature Dec.-Feb.	Avg. Temperature Jul.-Aug.	Trend Adjusted Yield		Avg. Temperature Dec.-Feb.	Avg. Temperature Jul.-Aug.	Trend Adjusted Yield
1998	34.5	75.1	164	2002	29.5	73.7	181
2002	34.5	76.5	151	1992	29.0	67.2	185
1992	34.1	70.9	182	1998	28.6	73.6	171
1983	33.7	78.9	128	1987	28.3	73.3	177
1999	32.5	75.0	161	2000	27.1	72.5	166
5 Yr. Avg.	33.9	75.3	157		28.5	72.0	176
1960-2011 Avg.	28.1	74.3	166		21.4	72.5	171
2012	33.9	???	???		27.6	???	???

Conclusion

The average winter temperature in Illinois in 2011-12 was equal to the average temperature of the previous five warmest winters since 1960 and the past winter ranks as the fourth warmest since 1960. For Iowa, the average winter temperature was 0.9 degree cooler than the average of the previous five warmest winters and the past winter ranks as the fifth warmest since 1960. Based on relationships in previous warm winters in these two states, the warm winter of 2011-12 provides little indication of likely average summer temperature or state average corn yields in 2012. The lack of a relationship is consistent with the view that, beyond seasonal tendencies, weather is very difficult to predict over time horizons longer than a few weeks.