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The Impact of Weather Extremes on Agricultural Production Methods: Do Extreme Weather Events Increase Adoption of Conservation Tillage Practices?

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Market Report	Yr Ago	4 Wks Ago	8/24/07
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight.	$81.66	$90.26	$92.40
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.	135.35	127.70	135.69
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	121.09	117.15	120.72
Choice Boxed Beef, 600-750 lb. Carcass.	147.32	140.79	145.35
Western Corn Belt Base Hog Price Carcass, Negotiated.	73.15	70.15	64.06
Feeder Pigs, National Direct 50 lbs, FOB.	50.10	54.87	58.00
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean.	76.74	74.01	72.26
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct.	91.25	102.50	102.50
National Carcass Lamb Cutout, FOB.	222.81	254.52	255.49
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	4.14	5.59	6.04
Corn, No. 2, Yellow Omaha, bu.	2.01	3.12	3.24
Soybeans, No. 1, Yellow Omaha, bu.	4.99	7.45	7.91
Grain Sorghum, No. 2, Yellow Columbus, cwt.	2.95	5.11	5.29
Oats, No. 2, Heavy Minneapolis, MN , bu.	2.03	2.70	2.51
Hay			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.	135.00	135.00	135.00
Alfalfa, Large Rounds, Good Platte Valley, ton.	87.50	85.00	85.00
Grass Hay, Large Rounds, Good Northeast Nebraska, ton.	82.50	*	*

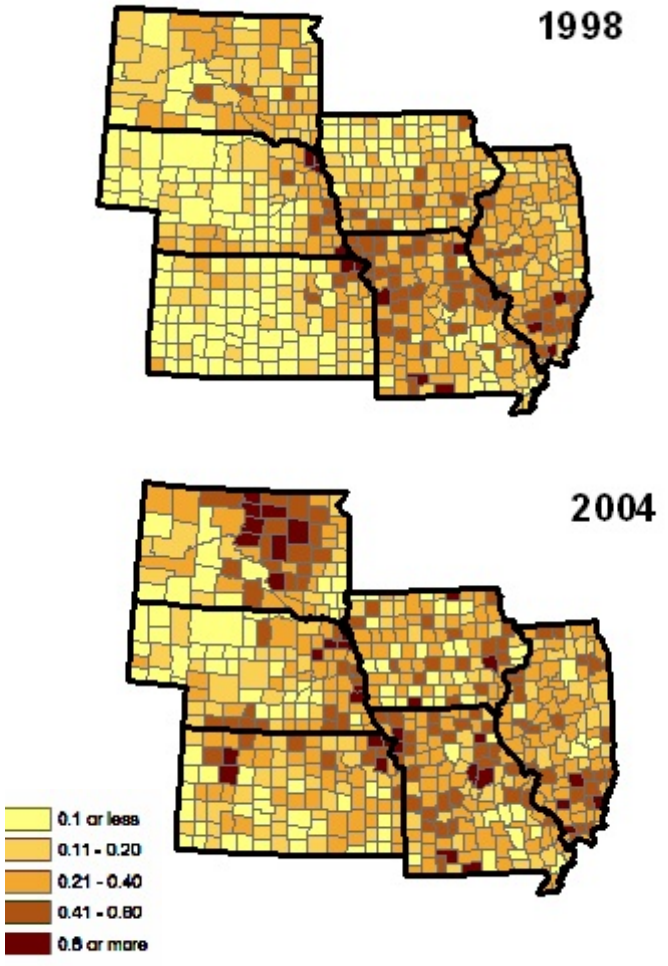
* No market.

A better understanding of how farmers adjust their production practices to cope with extremely wet or dry conditions is essential for developing effective drought mitigation policies and reducing the impact of other natural disasters. Reducing the risk associated with drought and flood in the long-run may be more cost effective than smoothing short-term income losses through disaster relief money. Most existing assistance programs focus on diversifying and stabilizing income risks through crop insurance and direct payments, however there are fewer efforts designed to reduce the long-term agricultural risk. Climate change makes this particularly important, as expected impacts include more droughts and climate variability in the future.

A large amount of government spending in the United States is devoted to programs that help farmers manage risk. Programs such as Federal Crop Insurance subsidize farmers' premiums for risk-reducing insurance policies, with the subsidy varying by type of policy and level of coverage. In addition to crop insurance programs, ad-hoc disaster payments are frequently used to reimburse farmers after natural disasters occur. Drought is the most cited reason for ad-hoc disaster payments, although floods are also a common cause (Garrett, et al. 2004). For example, federal legislative bill PL108-7 of 2003 provided $3.1 billion to crop and livestock producers in counties affected by drought during the 2001 and 2002 seasons, while PL 103-75 of 1993 provided $2.5 billion to Midwest producers impacted by flood (Chite, 2006). However, the adoption of risk-reducing agricultural practices is one method that farmers can use to protect themselves against such events.

The impact of recent drought and flood events on the adoption of risk-reducing production methods was estimated in a current research project. Previous studies found that drought significantly increases the adoption of

water-conserving irrigation systems; however the impact of such extreme weather events on tillage practices has not been studied. No-till agriculture (i.e., zero tillage) is a way of growing crops from year to year without plowing the soil, a practice that results in increased levels of crop residues in the field. Due to the fact that no-till conserves soil moisture, its adoption is one method that agricultural producers can use to reduce their risk associated with drought (Alberts, 2007). According to the Conservation Tillage Information Center, the national percentage of no-till farmland increased 38 percent from 1998 to 2006, while the drought-impacted states of Nebraska, South Dakota and Kansas saw an increase of 67 percent. The following maps illustrate the adoption of no-till agriculture in the Great Plains as well as the adjacent states. High rates of adoption are observed throughout North Dakota, Eastern and Southern Nebraska and Northern Kansas.



The adoption of three categories of tillage systems relative to conventional tillage: no-till, other conservation tillage and reduced till was estimated. One of the benefits of the study is that we use data on the same counties over time, instead of using data from a single year. This means that we are able to observe the trend in the amount of land under conservation tillage over time, instead of just looking at a snapshot in history. Although previous studies of adoption include long-term average climate information as explanatory variables, they have failed to identify the impact short-term climate events. We expect that farmers are more sensitive to recent weather extremes than to long-term climate trends.

Our study uses data from Kansas, Nebraska and South Dakota. The method used compares the adoption rates of conservation tillage in two counties to the relative level of drought or flood in the same two counties. So, if two counties are similar, but one has drought conditions and the other has normal conditions, we attribute differences in conservation tillage to the drought conditions. Our results show that farmers increase their adoption of no-till and other conservation tillage practices in both abnormally dry (i.e., drought) and abnormally wet (i.e., flood) conditions, and that abnormally wet conditions increase the adoption of no-till systems.

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