



ISSUE BRIEF

CLIMATE-READY SOIL: HOW COVER CROPS CAN MAKE FARMS MORE RESILIENT TO EXTREME WEATHER RISKS

Kansas

Kansas ranks seventh in agricultural production among U.S. states and is the top producer of an iconic crop: wheat. Like its midwestern neighbors, Kansas is also a major producer of corn and soybeans. Because it is such a dry state, farmers rely heavily on groundwater from the Ogallala Aquifer to irrigate their crops.¹ The Ogallala is infamously over-tapped, which has led to declines in groundwater levels of more than 150 feet in some parts of western Kansas.² Climate change is expected to pressure Kansas farmers to withdraw even more water from the Ogallala. Fortunately, they can use soil stewardship practices like cover cropping to build the health of soils on their farms, which will allow them to better withstand future droughts and floods.

IMPORTANCE OF THE AGRICULTURAL SECTOR

Agriculture dominates the Kansas landscape. The state's nearly 62,000 farms and ranches produced more than \$18 billion of products in 2013.³ There are approximately 28.5 million acres of cropland in the state, including 9.6 million acres of wheat and more than 8 million acres of corn and soybeans.⁴ The state is the nation's leading producer of not only wheat but sorghum and is among the top five producers of sunflowers and hay as well as cattle.⁵

Table 1. Kansas's Top 5 Crop Commodities by Value in 2014⁶

Commodity	Value
Corn	\$2.1 billion
Wheat	\$1.5 billion
Soybeans	\$1.4 billion
Sorghum	\$755 million
Hay	\$665 million

Half of total corn/soybean acres planted with cover crops

NEARLY **1.4 MILLION**
METRIC TONS
OF GHGs CAPTURED ANNUALLY



BILLION
GALLONS OF
WATER STORED

Farmland makes up nearly 89 percent of Kansas's total land area, and agriculture is the largest economic driver in the state. It accounts for more than \$53 billion a year (37 percent) of the state's economy and employs nearly 215,000 people.⁷

EXTREME WEATHER AND CLIMATE CHANGE IMPACTS ON AGRICULTURE

Kansas's agriculture sector is highly vulnerable to drought, floods, and other extreme weather risks. From 2012 to 2014, the state had 661 USDA county disaster declarations for drought or flooding.⁸ From 2010 to 2014, insured crop losses due to drought, heat, hot wind, extreme precipitation, and flooding events totaled nearly \$3.6 billion.⁹

In the past decade alone, Kansas has seen major flood events in 2007, 2011, and 2015. Flooding along the Missouri River in 2011 caused damages of more than \$1 billion in Nebraska, Iowa, Missouri, and Kansas, including damage to infrastructure and cropland.¹⁰ In late spring and early summer of 2015, a series of severe thunderstorm systems brought heavy rains and flash flooding to Kansas, especially in the southern and southeastern parts of the state.^{11,12} Fields in these areas were flooded, and hail damaged wheat crops.¹³ Kansas has also seen major droughts. The 2012 drought cost farmers in the state more than \$3 billion in crop losses, and the drought in 2011 caused approximately \$1.8 billion in agricultural losses.¹⁴

Climate change is likely to exacerbate these extreme weather risks. Scientists predict that the number of extremely hot days (above 95°F) in Kansas will double by mid-century and could triple by the end of the century.¹⁵ Areas of Kansas are likely to see longer dry periods but

Additional information on this topic is available for download at www.nrdc.org/water/climate-ready-soil.asp

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may also see increased precipitation in the winter and spring.¹⁶ These combined changes will negatively affect Kansas farmers. Hotter, drier weather will lead to greater evaporative losses from rivers, lakes, and streams and increase pressure to irrigate using groundwater, which will accelerate depletion of the Ogallala Aquifer.¹⁷ Ultimately, groundwater levels could decline so much that wells run dry and groundwater resources are no longer available for irrigation.¹⁸ Increased precipitation in the winter and spring can benefit farmers by increasing soil moisture during the early growing season; however, it also can lead to fields becoming too wet to plant in a timely fashion.¹⁹ Overall, crop yields in Kansas could decline by nearly 24 percent by mid-century and 58 percent by the end of the century.²⁰

COVER CROPS CAN HELP COMBAT THE PRESSURES OF CLIMATE CHANGE ON KANSAS AGRICULTURE

To manage the increased challenges associated with climate change, Kansas farmers can turn to practices that build soil health, like cover cropping. Cover crops have been shown to increase soil's water-holding capacity, allowing farmers to capture more water from heavy rainfall events and store that water for increasingly hot summer days, potentially deferring the need for irrigation and reducing stress on water resources like the Ogallala Aquifer.²¹ Using cover crops (and other soil stewardship practices, like no-till farming and compost application) to increase soil organic matter on just half of Kansas's corn and soybean acres could help store nearly an additional 81 billion gallons of water—enough to meet the needs of more than 2.5 million people for a year.²² Further, cover crops can increase yields: during the 2012 drought that affected much of the central United States, cover crops demonstrated their ability to build agricultural resiliency by providing the greatest yield benefit in areas that were hardest hit by extremely dry weather.^{23,24}

Cover crops can also help to reduce emissions of greenhouse gases that contribute to climate change by sequestering carbon and reducing the need for synthetic fertilizers, whose production and transport result in increased greenhouse gas emissions.^{25,26} Growing cover crops on half of Kansas's corn and soybean acres could capture nearly 1.4 million metric tons of greenhouse gases each year—the equivalent of taking more than 291,000 cars off the road.²⁷

Despite the benefits of cover crops, their adoption in Kansas remains remarkably low. In 2012, roughly 322,000 acres of cover crops were planted in Kansas, which represents just 1.5 percent of total cropland.²⁸ If Kansas farmers want to continue to be the top wheat producers in the country, they should consider expanding adoption of cover crops and other soil stewardship techniques to improve soil health and build resilience to future extreme weather risks.

BUILDING FEDERAL SUPPORT FOR COVER CROPS²⁹

Gail Fuller of Emporia, Kansas, has seen firsthand how cover crops and soil stewardship can improve outcomes on the farm. Since the 1990s, Fuller has used a variety of cover crop mixes to ensure that he's keeping his soil protected on top and living roots are feeding the soil below. As a result, he's seen an improvement in his moisture infiltration, an increase in beneficial insects, and an increase in soil microbial predators that help prevent diseases.

But Fuller's route to becoming a cover crop champion wasn't an easy one. Confusing rules about how cover crops fit into the federal crop insurance program meant that in 2012, during one of the worst droughts in memory for many Kansans, Fuller nearly lost his crop insurance coverage. Fortunately, he was able to not only successfully appeal the negative decision against him, but also work with the USDA's Risk Management Agency (RMA) to reform the crop insurance rules and make them more cover crop-friendly. However, Fuller would like to see even more support of cover crops. "What they've done to the soil-health movement is inexcusable," Fuller tells *No-Till Farmer*. "We've got producers just loving what we're doing here, but they're scared to try cover crops, thanks to the RMA."

ENDNOTES

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