ISSUE BRIEF

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

Nebraska

Half of total corn/soybean acres planted with cover crops

MORE THAN **2.5 MILLION METRIC TONS** OF GHGs CAPTURED ANNUALLY

145 BILLION GALLONS OF WATER STORED

Known as the Cornhusker State, Nebraska relies heavily on agriculture to support its economy. In fact, one in four jobs in the state is related to agriculture.[1] Nebraska's strong agricultural tradition is a source of pride for the state; however, when extreme weather hits, stress in the agricultural sector resonates throughout the economy, making the state particularly vulnerable to climate change. Yet, farmers can become more resilient to extreme weather and climate risks by using soil stewardship practices to build soil health.

IMPORTANCE OF THE AGRICULTURAL SECTOR

Table 1. Nebraska's Top 5 Crop Commodities by Value in 2014[2]

Commodity	Value
Corn	$6.0 billion
Soybeans	$2.8 billion
Hay	$570 million
Wheat	$412 million
Beans	$120 million

As might be expected given its nickname, Nebraska's landscape is indeed heavily influenced by corn. In 2014 Nebraska farmers planted 9.3 million acres of corn, more than any other crop.[3] Soybeans are another important crop for Nebraska, with 5.4 million acres planted in 2014.[4] Other crops include hay, wheat, dry edible beans, potatoes, sorghum, sunflowers, millet, oats, and sugar beets.[5] In total, Nebraska's nearly 50,000 farms and ranches produced over $23 billion worth of agricultural products in 2012 (approximately $10 billion of which came from crops).[6] In 2014 Nebraska's total agricultural sector production value exceeded $26 billion, the fourth-highest state total in the United States.[7] While the agriculture sector officially contributes approximately 10 percent to the state's GDP, the combined direct and indirect effects of agricultural production are even more substantial.[8] In 2010, agricultural production accounted for more than 40 percent (almost $69 billion) of the state's total output.[9] Further, agriculture is a critical component of regional economies throughout the state. In five of the state's nine economic regions, agriculture provides more than 60 percent of all economic output.[10] Across the state, nearly one out of every four Nebraskans is employed in some aspect of agricultural production.[11]

EXTREME WEATHER AND CLIMATE CHANGE IMPACTS ON AGRICULTURE

Agriculture in Nebraska is highly vulnerable to extreme weather and climate risks. From 2012 to 2014, the state had 463 USDA county disaster declarations due to drought, excessive heat, and flooding.[12] From 2010 to 2014, insured crop losses due to these causes, along with hot wind and extreme precipitation, were nearly $2 billion.[13]

Scientists predict that climate change will only increase the state's extreme weather risks. By mid-century, typical summer temperatures are expected to be equivalent to the extreme heat that Nebraskans experienced during the infamous 2012 drought, when the state's farmers lost more than $1.5 billion in crops due to drought, heat, and hot wind.[14,15] Precipitation patterns also are expected to change, with most rain falling in intense, flood-causing events separated by longer dry periods.[16] In fact, states in

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the region have already seen an increase in the amount of precipitation falling during the heaviest events.[17] Most notably, in May and June 2011, a series of storms with record-breaking rainfall converged on the headwaters of the Missouri River, causing widespread flooding downstream. Across the region, the flooding caused more than $2 billion in damage; in Nebraska, more than 230,000 acres were flooded, resulting in output losses of $188 million.[18,19] While flooding risks are expected to increase, warmer temperatures in conjunction with precipitation changes will likely lead to a reduction in soil moisture of 5 to 10 percent by the end of the century.[20]

The increase in extreme weather will directly affect farmers. Heavier springtime rain events can impact farmers' ability to plant their crops in ideal conditions and could cause plants to emerge later than normal, leaving them vulnerable to summer heat as well as erosion and disease from summer rain.[21] Hotter temperatures will lead to lower soil moisture during the growing season, further stressing crop growth.[22] And although many farms in Nebraska are irrigated, irrigation alone will not be sufficient to help farmers get through future droughts as extreme as the one seen in 2012. That year, farmers' reliance on continuous irrigation for nearly two months revealed the limits of Nebraska's irrigation and power infrastructure. Increased power demands to operate irrigation pumps caused rolling blackouts, and almost 200 communities experienced water shortages as aquifer levels declined.[23] Overall, Nebraska farmers could be facing yields up to 23 percent lower than today's yields by mid-century.[24]

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

To manage the increased challenges associated with climate change, Nebraska 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.[25] Using cover crops (and other soil stewardship practices, like no-till farming and compost application) to increase soil organic matter on just half of Nebraska's corn and soybean acres would help store an additional 145 billion gallons of water—enough to provide more than 4.5 million people with water for one year.[26]

Cover crops can also help farmers cope with the increased weed pressures associated with the shifting growing season, as well-managed cover crops can be used to suppress unwanted weeds.[27] Further, cover crops have been shown to increase yields: during the 2012 drought, cover crops demonstrated their ability to build agricultural resiliency by providing the most yield benefit in areas that were hardest hit by extremely dry weather.[28,29]

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 more greenhouse gas emissions.[30,31] Growing cover crops on half of Nebraska's corn and soybean acres could reduce greenhouse gas emissions by more than 2.5 million metric tons each year—the equivalent of taking nearly 540,000 cars off the road.[32]

Despite the benefits of cover crops, their adoption in Nebraska remains extremely low. In 2012, only 357,000 acres were planted with cover crops in the Cornhusker State—less than 2 percent of its total cropland.[33] If Nebraska wants to remain an agricultural powerhouse throughout the century, its farmers would be wise to increase their use of cover crops and other soil stewardship practices.

NEBRASKA FAMILY SOWS SEEDS OF COVER CROP REVOLUTION[34]

Keith and Brian Berns of Bladen, Nebraska, have been farming their family's land for most of their lives. About a decade ago, they became interested in the concept of cover cropping but found it difficult to locate cover crop seed suppliers. They knew from their own research that cover crop mixes, in particular, could provide significant soil health benefits while using limited soil moisture. At the same time, some of their family members desired to return to the farm, and to support additional members of the business, their operation needed to expand.

So in 2009, the Bernses set up shop to sell approximately 2,000 acres' worth of cover crop seed, hoping they could grow their business to support the family. Six years later, their company, Green Cover Seed, expects to sell annually more than half a million acres' worth of cover crops, and has done business in all 50 states. Green Cover Seed now supports 14 full time employees, about half of whom are members of the Berns family.

Keith Berns attributes their success to the changes his customers notice from the use of cover crops, including an immediate reduction in erosion, increased biological life in the soil, weed suppression, and grazing forage for cattle. He notes, however, that in order to be successful, cover crops need to be part of a bigger system designed to improve soil health. "Our goal is to make soils healthier," he says. "To build them up, not erode them away."

ENDNOTES

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