



ISSUE BRIEF

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

## Illinois

Farms in Illinois are an important contributor to the state’s overall economy. The state’s top crop commodities, corn and soybeans, generate billions of dollars in income and help to support communities throughout Illinois. Recent droughts and floods, which have caused billions of dollars in losses, have made it clear that farms in Illinois are highly vulnerable to extreme weather and climate risks. Hotter temperatures and greater rainfall extremes from climate change will only exacerbate risks for farmers. However, greater use of soil stewardship practices like cover crops can dramatically improve soil health, help combat climate change, and make Illinois farmers more resilient to extreme weather risks.

### IMPORTANCE OF THE AGRICULTURAL SECTOR

Illinois’s agricultural sector produced more than \$21 billion in 2014, ranking sixth-highest among all U.S. states.<sup>1</sup> The state also ranks third nationally in agricultural commodity exports, with approximately \$8.2 billion worth of goods, mainly soybeans and feed grains, exported annually.<sup>2</sup>

Commodity	Value
Corn	\$8.6 billion
Soybeans	\$5.6 billion
Hay	\$268 million
Wheat	\$220 million
Pumpkins	\$47 million

Half of total corn/soybean acres planted with cover crops



Total production agriculture and agriculture-related industries, such as food processing and farm machinery manufacturing, accounted for \$120.9 billion— nearly 10 percent—of Illinois’s total economic output in 2012.<sup>4</sup> Nearly half of this economic output was from crop industries. Additionally, more than 430,000 jobs (about one in every 17) were in the agriculture industry.<sup>5</sup> Not only is agriculture a major economic sector at the state level, but it also is a cornerstone of many local economies. Nearly one out of every four counties in Illinois obtains at least one-third of its total economic output from agriculture and related industries.<sup>6</sup>

### EXTREME WEATHER AND CLIMATE CHANGE IMPACTS ON AGRICULTURE

As is true in many states, Illinois agriculture is vulnerable to drought and flooding. From 2012 to 2014, the state had 214 USDA county disaster declarations for drought or excessive heat.<sup>7</sup> From 2010 to 2014, insured crop losses due to drought, heat, hot wind, extreme precipitation, and flooding events totaled more than \$4 billion.<sup>8</sup>

Illinois has been heavily impacted by both droughts and floods in recent years. The 2012 drought, which affected a wide swath of the central United States, had severe impacts on Illinois agriculture. Yields for the state’s most valuable crop commodities (corn, soybeans, and hay) were significantly reduced, and extremely low water levels on the Mississippi River prevented shipments of crops to overseas markets.<sup>9,10</sup> Together, these conditions led to a 30 percent decrease in corn shipments and a 16 percent decrease in shipments of soybeans from Illinois in 2012.<sup>11</sup> In sharp contrast, heavy rains in 2011 caused historic flooding along

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the Ohio and Mississippi Rivers, forcing the U.S. Army Corps of Engineers to intentionally breach a levee and flood agricultural lands in Missouri in order to protect upstream communities in Illinois and other states from floodwaters.<sup>12</sup> Across the Midwest, more than 1.2 million acres of farmland were impacted by the flood, which caused estimated agricultural damages of almost \$700 million.<sup>13</sup>

Over the past 50 years, flooding has become more frequent in the central United States, including Illinois.<sup>14</sup> Flooding risks in the region are projected to grow in the future due to climate change. Spring precipitation is expected to increase by as much as 20 percent in northern Illinois and up to 10 percent in central Illinois by the end of the century, likely disrupting the planting of seeds.<sup>15</sup> At the same time, rainfall during the summer likely will decrease by up to 20 percent. In addition to these changes in seasonal precipitation, the magnitude and duration of extreme precipitation events are expected to change. The amount of precipitation falling during the wettest events is likely to increase, while the length of dry periods also is expected to grow, suggesting more intense floods punctuated by longer dry spells.<sup>16</sup>

Warmer temperatures also will have negative impacts for farmers. In the coming decades, some counties in Illinois could see decreases of up to 20 percent in corn yields and nearly 10 percent in soybean yields, due to extreme heat alone.<sup>17</sup> These climate-related yield reductions likely will cost the state \$1.1 billion to \$2.6 billion annually in crop losses in the coming decades and from \$1.5 billion to \$13 billion annually by the end of the century.<sup>18</sup> Extreme heat will also reduce labor productivity in “high risk” sectors like agriculture, where workers spend significant time outdoors.<sup>19</sup> In the Chicago area, the average number of days over 95°F will likely double to quadruple in coming decades.<sup>20</sup>

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

Farmers in Illinois can become more resilient to these growing climate risks by turning to practices that build soil health, like cover cropping. Cover crops increase the water-holding capacity of soil, allowing farmers to capture more water from heavy rainfall events and to store water for increasingly hot and dry summers.<sup>21</sup> In fact, using cover crops (and other soil stewardship practices, like no-till farming and compost application) to increase soil organic matter on just half of Illinois’s corn and soybean acres could help store nearly an additional 214 billion gallons of water—enough to fill the needs of nearly 6.7 million people for a year.<sup>22</sup>

Cover crops can also help farmers cope with the increased weed pressures associated with the shifting growing season.<sup>23</sup> 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 greatest yield benefit in areas that were hardest hit by extremely dry weather.<sup>24,25</sup>

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.<sup>26,27</sup> Growing cover crops on half of Illinois’s corn and soybean acres could reduce greenhouse gas emissions by nearly 4 million metric tons each year—the equivalent of taking more than 832,000 cars off the road.<sup>28</sup>

Despite the multiple benefits of cover crops, just 1 percent of cropland in Illinois is planted with cover crops.<sup>29</sup> There remains a significant opportunity to use cover crops and other soil stewardship practices to improve the health of soils in the state, thereby combating climate change and making farms more resilient to future droughts and floods.

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### DAHMER FARMS USES COVER CROPS TO RETURN TO ITS ROOTS<sup>30</sup>

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Adam and John Dahmer, and their father, Terry, are continuing the family business, Dahmer Farms, which has been operating in Williamson County, Illinois, for more than 130 years. The Dahmers have been using no-till farming on their 1,300-acre spread of corn and beans since 1983, and they have been experimenting with cover crops like cereal rye since the late 1990s. Their main goal for planting cover crops is to increase organic matter in the soil, and in fact this effort has paid off dramatically by increasing soil organic matter content from 1.5 percent up to 3.5 percent and still climbing. The Dahmers have seen many other benefits from using cover crops and no-till practices, such as greater nitrogen retention, suppression of weeds and diseases, reduced erosion and runoff, and improved water retention and infiltration—all of which helped their crops to survive the record-breaking drought of 2012. The Dahmers work regularly with district conservationists from the USDA’s Natural Resources Conservation Service (NRCS), who provide them with technical and financial assistance. Their success has convinced the Dahmers to plant cover crops on 100 percent of their fields, returning the farm to an earlier era when Adam and John’s grandfather and great-grandfather took care of the soil by planting wheat and clover before planting corn.

## ENDNOTES

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