



ISSUE BRIEF

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

North Carolina

Agriculture is an important contributor to the North Carolina economy. The state’s top crop commodities—tobacco, soybeans, and corn—generate billions of dollars in income, and the value of the state’s agricultural sector ranks ninth in the nation. North Carolina farms have suffered losses from droughts and floods in recent years and are highly vulnerable to extreme weather and climate risks. Hotter temperatures and changing precipitation patterns driven by climate change will only exacerbate risks for farmers. Yet, greater use of soil stewardship practices like cover cropping can dramatically improve soil health and help farmers become better prepared for future droughts and floods.

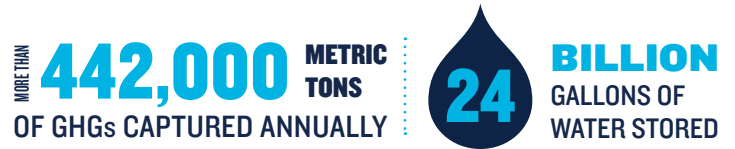
IMPORTANCE OF THE AGRICULTURAL SECTOR

The 50,000-plus farms and ranches in North Carolina produced more than \$14 billion of agricultural products in 2013.¹ The state is the leading producer of tobacco and sweet potatoes and is among the top three states in production of poultry, hogs, turkeys, Christmas trees, and cucumbers.² Approximately 63 percent of the state’s total farm income comes from livestock, dairy, and poultry, and the remaining income comes from crops.³

Table 1. North Carolina’s Top 5 Crop Commodities by Value in 2014⁴

Commodity	Value
Tobacco	\$911 million
Soybeans	\$713 million
Corn	\$417 million
Sweet Potatoes	\$355 million
Cotton	\$307 million

Half of total corn/soybean acres planted with cover crops



North Carolina’s agriculture and agribusiness sector—including the food, fiber, and forestry industries—generated nearly \$76 billion in 2013, more than 16 percent of the state’s total income.⁵ Additionally, more than 660,000 people—17 percent of the state’s workforce—are employed in the agriculture sector.⁶

EXTREME WEATHER AND CLIMATE CHANGE IMPACTS ON AGRICULTURE

North Carolina’s agriculture sector is vulnerable to drought and flooding. From 2012 to 2014, the state had 155 USDA county disaster declarations for flooding, drought, or excessive heat.⁷ From 2010 to 2014, insured crop losses due to drought, heat, hot wind, extreme precipitation, and flooding events came to more than \$778 million.⁸

The state has been affected by both drought and flooding events in recent years. As of mid-August 2015, 31 of the state’s 100 counties were experiencing moderate to severe drought, and an additional 36 counties were classified as “abnormally dry.”⁹ These drought conditions have begun to impact the quality of corn, 27 percent of which was growing in poor or very poor conditions in August 2015.¹⁰ In the past several years, extreme heat and dry conditions have led to reduced crop yields, and flooding events have not only damaged corn, soybean, and wheat crops but delayed crop plantings.¹¹ The 2002 drought caused losses of \$398 million in the agricultural sector and an additional \$233 million in direct and indirect economic losses.¹² Additionally, between 1996 and 2006, tropical storms and hurricanes caused agricultural damages of \$2.4 billion in North Carolina.¹³

Climate and extreme weather risks for North Carolina’s agricultural areas are expected to grow in the future.

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

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Across the southeastern United States, average annual temperatures are projected to increase by 4°F to 8°F by the end of the century, and the number of days exceeding 95°F is expected to more than double in many parts of North Carolina by mid-century.¹⁴ Average annual precipitation is expected to increase up to 6 percent by mid-century, and the number of days with extreme precipitation is also projected to increase, by up to 25 percent, during this same period.¹⁵ Hotter temperatures and changes in precipitation will likely have detrimental impacts on corn and soybean yields. Corn yields could decline by as much as 21 percent in the coming decades and 39 percent by mid-century.¹⁶ Similarly, soybean yields likely will decline by up to 10 percent in the next few decades and 19 percent by mid-century.¹⁷ The productivity of workers who labor outdoors, such as those in agriculture, is also expected to decline due to more extreme-heat days.¹⁸

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

North Carolina's farmers can build resilience to these growing climate risks by improving soil health through practices 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.¹⁹ 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 North Carolina's corn and soybean acres could help store nearly an additional 24 billion gallons of water—enough to fill the needs of almost 750,000 people for a year.²⁰

Cover crops can also help farmers cope with the increased weed pressures associated with the shifting growing season.²¹ Further, cover crops have been shown to 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.^{22,23}

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.^{24,25} Growing cover crops on half of North Carolina's corn and soybean acres could capture more than 442,000 metric tons of greenhouse gases each year—the equivalent of taking more than 93,000 cars off the road.²⁶

Despite the many benefits of cover crops, only approximately 8 percent of cropland in North Carolina is planted with cover crops.²⁷ There remains a significant opportunity to use cover crops and other soil stewardship practices to improve the health of soils in the state, which will help to combat climate change and enable farms to better weather future floods and droughts.

IMPROVING SOIL HEALTH WITH COVER CROPS PAYS OFF BIG²⁸

Leon Moses, superintendent of the nearly 500-acre farm at North Carolina A&T State University, accidentally discovered the benefits of cover crops during a hay shortage in 2006, when he planted them for the farm's livestock. He quickly learned that cover crops can improve soil health and now plants rye, clover, and vetch on 100 percent of the farm. Together with no-till farming, which has been used for more than a decade, cover crops have dramatically increased the farm's soybean and corn yields. Since adding cover crops, yields of soybeans have increased from 25 bushels to more than 65 bushels per acre, and yields of corn for silage have grown from 10 tons to 22 tons per acre. In total, Moses claims that cover crops and no-till have demonstrated a 35 to 45 percent return on investment and have increased production by 300 to 400 percent. Moses has also seen cover crops' benefits in building soil structure, reducing soil erosion, suppressing pests and weeds, and increasing available nitrogen. However, the most surprising benefit has been the ability of the soil to hold moisture during drought conditions. He says that keeping the soil covered year-round and treating it as a living thing instead of just a medium for growing crops has completely revolutionized the farm and made it more profitable than ever.

ENDNOTES

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