



United States Department of Agriculture

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South Dakota
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Cropping Systems in South Dakota

A 2015 Inventory and Review



Al Miron, Crooks, SD, is a 25-year no-till farmer operating 1,400 acres in Minnehaha County, SD. Pictured is a cropland field under his management on which he implemented a no-till cropping system eight years ago. Soil tests have shown the soil organic matter in his fields has risen from 2.4% in 1994 to 4.7 % in 2014. Al has also been conducting infiltration tests and tracking rates.

In 2015, the U. S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and partners in South Dakota (SD) again conducted a county-level inventory of the types of cropland management systems being used by agricultural producers. The 2015 Cropping Systems Inventory 1) provides information that can be used by individual conservation districts and others in establishing priorities for educational or other programs, 2) evaluates progress achieved in reaching county or statewide goals, and 3) provides data on the adoption of conservation cropping systems across South Dakota.

The purpose was to capture a "snapshot in time" of the types of cropping systems being used across South Dakota and to be able to apply current knowledge of how cropping systems relate to soil health, productivity, and sustainability. Conducting this inventory on a biennial basis allows for the identification of short-term fluctuations, in addition to long-term trends.

Information was collected for the crop management systems used. Selected counties with large acreages of winter wheat completed the survey for fall seeded crops prior to December 1, 2014. Fall-gathered data was combined with the data collected in the spring of 2015. It was done after crop emergence but before the crop canopies closed, and while it was still evident what type of cropping system had been employed to plant the crop.

The field observations since the 2013 data was collected indicate that No-till Cropping Systems are still the most predominant cropping system utilized in South Dakota.

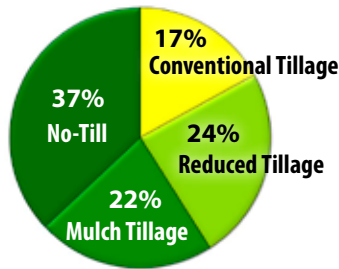
In 2015, one percent more cropland acres were added to South Dakota annual cropland production compared to 2013. The 2015 data (6,475,903 acres) shows about a 4 percent expansion in total acres farmed under a no-till system since 2013 (6,229,856 acres) and a 36 percent expansion since 2004 (4,873,352 acres).

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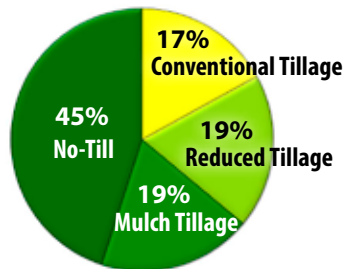
Results of the 2015 South Dakota Cropping Systems Inventory

The inventory recorded a county-level statistical “snapshot” of the types of cropping systems. Use of a no-till cropping system was found to be the predominant cropping system with 46 percent of South Dakota cropland (6.4 million acres). A cropping system that leaves more than 30 percent residue cover on the soil surface after planting (including no-till and mulch-till) was used on more than 68 percent of the state’s cropland. The percentage of acres under conventional tillage systems decreased from 2013 to 2015. Use of conventional tillage is seen most often in eastern South Dakota counties.

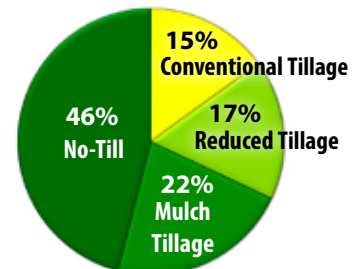
2004 South Dakota Planted Cropland
(13,068,600 Acres)



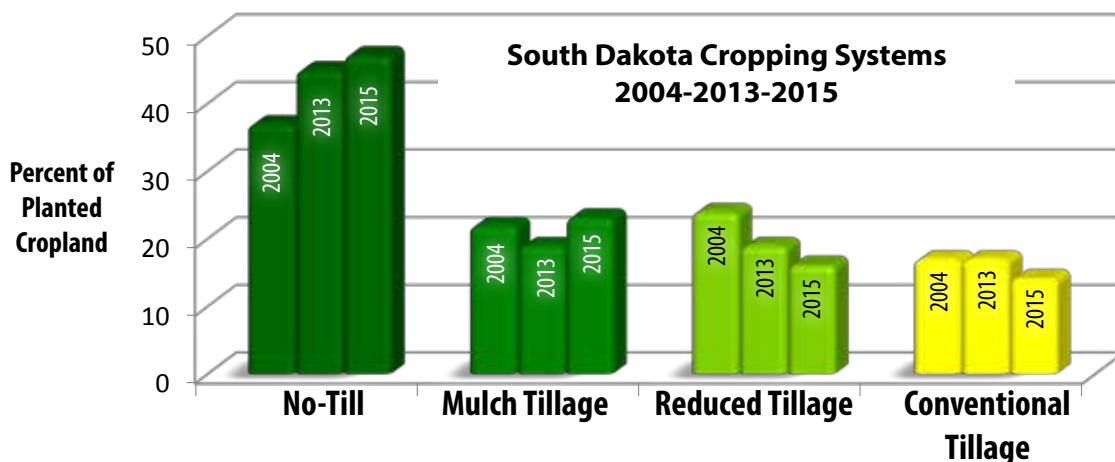
2013 South Dakota Planted Cropland
(13,926,037 Acres)



2015 South Dakota Planted Cropland
(14,078,051 Acres)



		2004	2013	2015
	No-Till	4,873,352 acres (37%)	6,229,856 acres (45%)	6,475,903 acres (46%)
	Mulch Tillage	2,851,399 acres (22%)	2,603,467 acres (19%)	3,097,171 acres (22%)
	Reduced Tillage	3,165,728 acres (24%)	2,665,327 acres (19%)	2,393,269 acres (17%)
	Conventional Tillage	2,178,121 acres (17%)	2,357,387 acres (17%)	2,111,708 acres (15%)



No Tillage (no-till): the soil is left undisturbed from harvest to planting with greater than 30 percent residue remaining after planting.

Mulch Till: disturbs the entire soil surface and is done prior to and/or during planting with greater than 30 percent residue left after planting. Usually, 1 to 3 tillage trips. Chisel plow, disk, field cultivator, and combination tools are used. This includes vertical tillage tools such as salford, turbo-till, and supercoultter.

Reduced Tillage: disturbs the entire soil surface and is performed prior to and/or during planting with 15-30 percent residue cover remains planting.

Conventional Tillage: soil in the entire field is tilled with one or more tillage trips that disturb the entire soil surface and is performed prior to and/or during planting with less than 15 percent residue cover remaining after planting. This system generally involves plowing or intensive (numerous) tillage trips.

Use of Conventional Tillage Drops in 20 Counties

Although use of conventional tillage systems continues, in the last decade a significant drop (*greater than 10 percent of the county acres*) has been seen across South Dakota counties.

Since 2004, producers in 20 counties have significantly decreased their use of conventional tillage systems.

This conversion from tillage to a higher residue management system was observed in counties statewide.

Soils with improved soil structure can better carry farm equipment (traffability) in changing weather conditions.

Counties with Greater than 10 Percent Drop in use of tillage:

Bennett, Brookings, Butte, Corson, Dewey, Gregory, Haakon, Hand, Harding, Hughes, Hyde, Jones, Lyman, Meade, Miner, Pennington, Shannon, Stanley, Todd, and Ziebach.

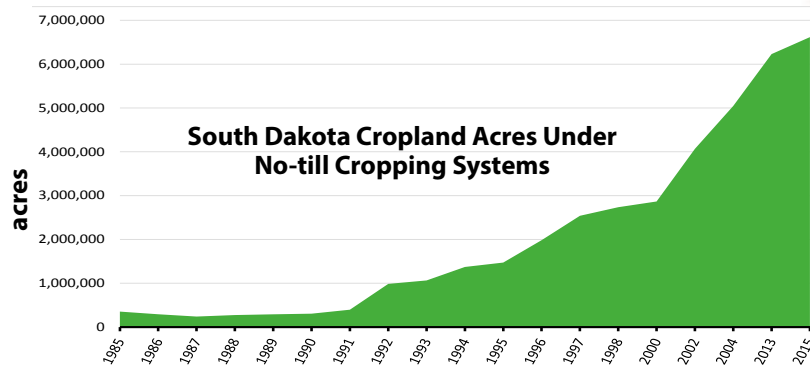
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In 2013, nearly 100 years after his great-grandfather first put a plow to the ground, Corson County farmer Robert Nehl decided it was time for a big change. With help from NRCS, Robert planned and implemented a new no-till cropping system that integrated cover crops for grazing with his crop rotation. "The wheat in 2014 was the best I ever had where there had been cover crops," says Nehl. His cattle grazed 3 1/2 weeks before until bad weather set in. Spring soil tests showed available nitrogen was tripled where the cattle grazed. The cover crop mixture was turnips, radishes, lentils, winter peas, sweetclover, oil sunflowers, sorghum, sudangrass, and forage oats. Nehl's records showed up to a 57% increase in gross return in one year.

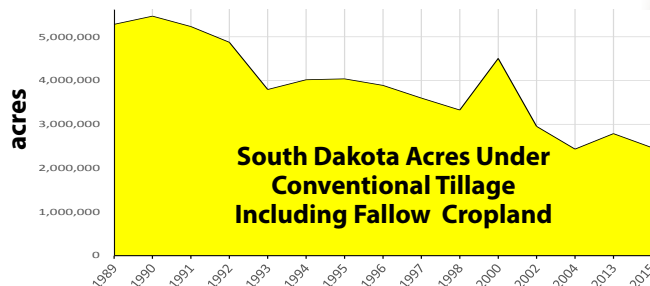
30-Year Trend Shows Increase in No-Till Systems

Over the last the 30 years, use of a no-till cropping system on South Dakota planted cropland acres is at an all-time high (46 percent of all acres planted).



Use of Conventional Tillage Down Over 30 Years

Over the last the 30 years, use of conventional tillage on South Dakota planted cropland acres has decreased dramatically since 1989.* Summer fallow acres are included in this trend chart.



*Source: Conservation Technology Information Center (CTIC), Lafayette, Indiana, and the USDA Natural Resources Conservation Service.

Review of Cropping Systems Inventory County-Level Data:

Use of No-Till in Some Counties is on the Rise, but Other Counties Lost Acres

A significant number of South Dakota annually planted cropland acres have been, and are being, managed with a minimum level of soil disturbance, primarily the no-till cropping system.

In South Dakota, the overall acres of annually planted cropland in 2015 exceeded 14 million acres.

The inventory showed the acres of cropland under a no-till system increased since 2013 by 4 percent, or an increase to 246,047 acres. Since 2004, no-till acres have increased 33 percent or 1,602,551 acres.

The number of counties with less than 25 percent of their cropland acres under no-till systems remained fairly constant at 21 counties, down 1 county from 2013.

The number of counties with more than 75 percent of the acres under a no-till system continued to increase from 4 counties in 2004, 14 in 2013, and to 17 counties in 2015.

While the overall number of counties with acres under no-till systems increased between 2013 and 2015, two counties, Charles Mix, and McPherson, dropped two classes with a dramatic decline in acres of cropland under a no-till system.

The counties listed below represent locations where the cropland acres with no-till systems shifted from the no-till category to another category.

Counties that had a Significant Loss in No-till Systems Acres since 2013:

Bennett
Charles Mix
Hand
Hanson
McPherson
Oglala Lakota (formerly Shannon)
Spink
Ziebach

Counties that had a Significant Gain in No-till Systems Acres Since 2013:

Bon Homme
Brown
Buffalo
Butte
Clark
Corson
Codington
Grant
Haakon
Hamlin
Jerauld
Marshall
Meade
Moody

Day and Spink Counties had a decline in no-till acres from 2004 to 2013 and continued to decline acres in 2015.

More typical counties fluctuate within a category having gains and losses in no-till acres. It appears a number of farmers, although utilizing no-till cropping practices, have not fully committed to a no-till system. When faced with challenging situations, such as unusual weather patterns, large storm events, and weed pressures, some farmers revert back to tillage for a solution. As conditions change, a shift back to a no-till system occurs.

The distribution of cropping systems across South Dakota, in part, reflects the variation in soils and climate and the crops that are well-adapted to those conditions.

The greatest density of no-till systems continues to occur in central South Dakota's transition zone between the drier western and the more moist eastern areas. This area's cropping systems are built around a diverse crop rotation of row crops and small grains. Those counties that consistently have a high number of no-till systems are utilizing that no-till system regardless of the crop type planted.

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Steve Reimer, Chamberlain, SD

Diversified operation with livestock, a no-till cropping system with a crop rotation of corn, soybeans, wheat, and forage oats with a cover crop mix including turnips, radishes, and lentils.



"However large or small they might be, validating improvements is important."

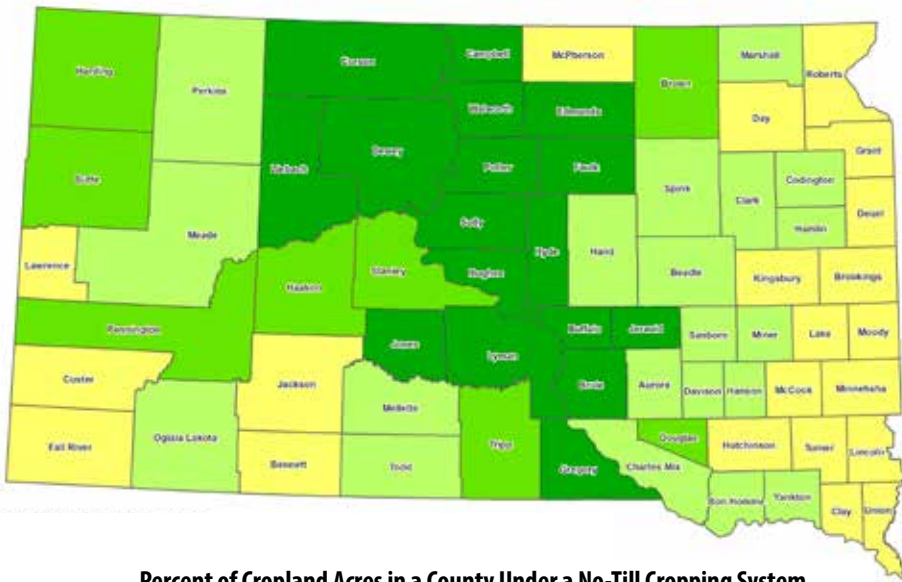
-Steve Reimer

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Joel Erickson, Langford, SD



Percent of South Dakota Cropland Acres in a County Under a No-Till Cropping System in 2015



Marshall County, SD, farmers Joel and Karen Erickson use a no-till cropping system with diversified crop rotation. Crops include corn, soybeans, wheat, and alfalfa, and the use of cover crops.

Joel says that no-tilling saves time, money, fuel, and machinery wear and tear. “All of these financial benefits make a huge difference when the bottom line on crops prices is much lower now. We watched our costs when corn was \$7, but you sure need to be even more diligent watching your costs now.”

Percent of Cropland Acres in a County Under a No-Till Cropping System

0-25 percent 26-50 percent 51-75 percent > 76 percent

2004

2013

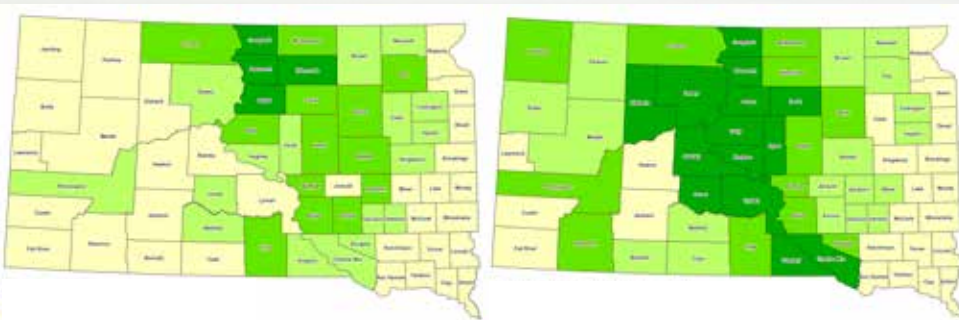


Photo shows corn planted into small grain residue in Hamlin County, SD.

Cropping Systems in South Dakota - A 2015 Inventory and Review

Cropping Systems Matter...

Cropping systems impact the health and productivity of soil. Reducing or eliminating tillage not only improves soil health, but can increase fertility, lower long-term fertilizer inputs, and save fuel costs. A 50-percent reduction in fuel costs at \$2.50/gallon would come to a \$8,000 annual savings on the average 1,200-acre farm. Farmers are encouraged to estimate their own fuel savings by using the Energy Tools located at <http://energytools.sc.egov.usda.gov>.

No-till cropping systems can be part of an advanced Soil Health Management System that includes conservation practices such as residue management (no-till), diverse cropping rotations, and

cover crops. These practices result in higher levels of soil organic matter and improved microbial activity.

Healthy soils are high-performing, productive soils with increased levels of organic matter. Research shows that organic matter builds when tillage declines and plants and residues cover the soil.

Organic matter plays a big role in soil/water interaction. One percent of organic matter in the top six inches of soil holds approximately 16,500 gallons of water per acre. The rate water infiltrates a soil and the amount of water that a soil can hold is higher with increased organic matter. Higher organic matter

means less run-off and erosion. It means more plant available water held in the root-zone, and that means more of the crop inputs (fertilizer, etc.) remain with the soil and plants.

The adoption of increased residue management practices or no-till systems on additional acres could make a substantial increase in crop resilience due to large swings in seasonal precipitation.

Most farmers can improve soil health indicators by keeping the soil covered as much as possible, minimizing soil disturbance, using diverse crop rotations, and cover crops to maximize the time living roots can feed the soil.



Unedited photos from adjacent cropland fields in eastern Brookings County, SD, taken June 19, 2014, after several heavy rain events. Hours before the photos, a thunderstorm left .80 rain on the no-till system (left) and the conventional tillage system (right). The protected field had good soil structure which allowed infiltration while the macropores in the tilled field were destroyed through tillage leading to major runoff and erosion.

Diversified Crop Rotations and Cropping Systems



No-till cropping systems go hand-in-hand with diverse crop rotations. The 2015 Inventory again showed cropping systems with the lowest soil disturbance typically had the greatest diversity in crop rotations and the greatest diversity in crops grown.

There are a few exceptions in western South Dakota where counties with low numbers of cropland acres have good crop diversity present, but less than 25 percent of the cropland acres were in a no-till cropping system. This may be attributed to the economics of making the equipment conversion on fewer farmed acres or the fact that perennial crops often follow a short annual cropping rotation.

However, western South Dakota has made great strides in converting to higher quality no-till systems in the last decade.

Areas with less diversity in their crop rotation were also the areas with the greatest soil disturbance, i.e., conventional tillage, relying heavily on tillage for seedbed preparation. Typically, less than 20 percent of the cropland acres planted are planted to crops other

than corn and soybeans. In fact, 80 percent of the counties on the eastern side of the state had fewer than 5 percent of their planted acres in something other than corn and soybeans.

With the wetter growing conditions, eastern South Dakota has the opportunity to utilize cover crops in standing row crops in a way that may not be feasible for drier parts of the state thereby increasing plant diversity without sacrificing profits.

Research shows that soil managed with the highest diversity of crops in the rotation is also healthier soil.

Prior to advancements in conservation farming technology, many producers had used tillage to prepare seed beds and for weed control. In wetter areas, tillage caused soil compaction. Now, no-till systems that use diverse crop rotations have become critical for drier areas of South Dakota because of the moisture savings that allows introduction of alternative crop types in the rotation.



South Dakota has over 650 types of soils that developed over thousands of years as productive grasslands with minimum soil disturbance and maximum plant diversity.

The cropping systems that mimic natural cycles and lack disturbance (no-till with diverse rotations) are proving to be successful.

In 2015, the Jorgensen Land and Cattle Partnership, Tripp County, SD, installed 20 miles of new fence around their cropland acres so their livestock could be integrated to graze the cover crops in their crop rotation.

With the proper crop diversity and crop intensity over the long-term, producers in both wet and dry areas are seeing improved yields and less weed, disease, and insect problems.

A well-designed no-till cropping system with a diversified crop rotation, including cover crops or perennial crops, will build soil organic matter, use extra water in the soil profitably, reduce compaction, and address any salinity issues.

The bigger benefit is that using a diversified crop rotation with cover crops equates to more diversity below the soil's surface also promoting better soil biological health and productivity.

Contact your local NRCS for help in "Unlocking the Secrets" in your soil or visit the NRCS' National Soil Health Information Center at <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/>.

Managing for Healthier Soil

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Paul Hetland
Davison and Aurora Counties, SD
Crop and livestock operation with a cover crops mixture augmenting a diversified crop rotation



"We started using covers because we felt microbial activity in our soils was dying back in late summer and fall, which had a negative effect on the organic matter," says Paul Hetland. "We also successfully use covers to fix nitrogen. Sometimes our fall covers are not as successful because it is too dry. But overall we believe the long-term benefit is worth the annual investment. We are still on a learning curve with improving our soil, but in using all these different elements, we believe we are on the right track."

PROFILES IN soil health

Little Farm, Castlewood, Hamlin County, SD
Diversified farming and ranching operation with no-till and strip till cropping systems with a rotation of corn, soybeans, hard red spring wheat and cover crops mixtures for grazing



"There's definitely a learning curve when grazing cattle on new species," Barry Little says. "Now the cows recognize the forage." Cover crops do more than provide forage. They also help farmers manage excessive moisture. "We had a lot of rain in 2014 and the fall moisture was really going to be excessive, so we made use of it with cover crops. Instead of the nutrients leaching out of crop ground, the cover crops bring them back up to the surface where they are available for next year's crop."



PROFILES IN soil health

Weerts Family Farms
Diversified farming operation with livestock and a no-till farming system with covercrops
Kingsbury, County, SD



"Since we began leaving crop residue in the field and following our wheat with cover crops, we have seen increased organic matter and improved water infiltration," Steve says. "We're now working on managing excess water in some of our fields and finding ways to reduce compaction without using tillage."



PROFILES IN soil health

Leitheiser Family, Emery, SD
Diverse livestock and farming operation: dairy and beef cattle; crops with a no-till cropping system with nutrient management and a diversified crop rotation including: corn for grain, corn silage, alfalfa, soybeans, winter wheat, oats, and cover crops for grazing.
Soils: Poorly drained clay-silt-loam.



George Leitheiser says he has heard arguments that no-till won't work. He looks at things differently. "Mother Nature does not till and things seem to grow," says George, who chairs the McCook County Conservation District. "We are not doing anything that anybody else can not do," he says. "It doesn't matter how many times you succeed, it is a challenge to repeat it. There will be both dry spells and wet spells." No-tilling helps the Leitheisers deal with wild swings in the weather. "When we dried out in 2012, our no-tilled corn was not as terrible compared to conventionally tilled corn-on-corn in a nearby field. We had an 80-acre field of no-tilled corn that yielded 80 bushel, while a nearby field of corn-on-corn where they had done a lot of tillage, got cut for silage."

Producers interested in a free on-farm consultation for evaluating their soils and suitability for higher level cropping systems should contact the USDA NRCS. Learn more at the South Dakota NRCS Soil Health Web page: <http://www.nrcs.usda.gov/wps/portal/nrcs/main/sd/soils/health/>.

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