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South Dakota
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Cropping Systems in South Dakota

A 2013 Inventory and Review

In 2013, the U. S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and partners in South Dakota conducted a county-level inventory of the types of cropland management systems being used by agricultural producers across the state.

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 various cropping systems relate to soil health, productivity and sustainability.

Information was collected for the cropping management systems used. It was completed in June, 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 it.

The field observations by trained technical personnel show that South Dakota farmers have continued to be leaders in the use of conservation technology and advanced cropping systems. The new 2013 data shows a 29 percent expansion in acres farmed under a no-till system since 2004 (*the last time this type of data was collected*), however, the location of those acres has shifted.

The 2013 Cropping Systems Inventory will be used to:

1. provide information that can be used by individual conservation districts and others in establishing priorities for educational or other programs,
2. evaluate progress achieved in reaching county or statewide goals, and
3. provide data on the adoption of conservation cropping systems across the state of South Dakota by crop.

Results of the South Dakota Cropping Systems 2013 Inventory

The inventory recorded a statistical "snapshot" of the types of cropping systems being used on cropland in each county. Use of a no-till cropping system was found to be the predominant cropping system with 45 percent of South Dakota cropland (6.2 million acres). A cropping system that leaves more than 30 percent residue cover on the soil surface after planting (including no-till) was used on more than 60 percent of the state's cropland. The percentage of acres under a conventional tillage system was unchanged, however, the location of the acres shifted.

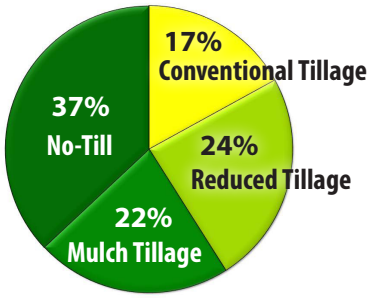
No Tillage (no-till): the soil is left undisturbed from harvest to planting with greater than 30 percent residue remaining after planting.

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.

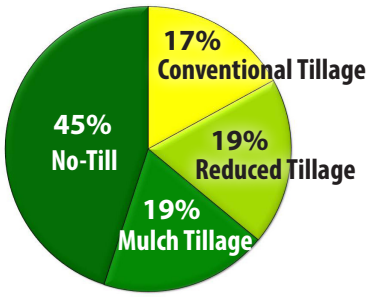
Reduced Tillage: disturbs the entire soil surface and is performed prior to and/or during planting with 15-30 percent residue cover remains planting.

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

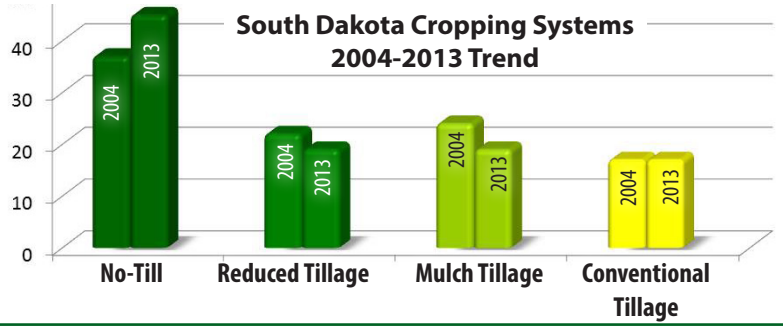
South Dakota Planted Cropland 2004 (13,068,600 Acres)



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



		2004	2013
	No-Till	4,873,352 acres (37%)	6,229,856 acres (45%)
	Mulch Tillage	2,851,399 acres (22%)	2,603,467 acres (19%)
	Reduced Tillage	3,165,728 acres (24%)	2,665,327 acres (19%)
	Conventional Tillage	2,178,121 acres (17%)	2,357,387 acres (17%)



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 $4/gallon would come to a $10,000 annual savings on the average 1,200-acre farm.

Advanced soil health management systems include conservation practices such as no-till, diversified cropping rotations and cover crops.

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 it 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 organic matter and the soil's ability to infiltrate and retain precipitation.

This is important; for example in South Dakota's Lower James River watershed about 52 percent of the land is cultivated cropland with about 30 percent under a no-till cropping system. If no-till was applied to one fourth of the acres currently not in a no-till system, infiltration of an additional two-tenths of an inch of rainfall could occur over those acres from just one 2.5-inch rainfall.

That small increase in infiltration is nearly 1.1 billion gallons! That amount of water would potentially flood over 3,300 acres downstream (one foot deep) if it ran off instead of infiltrating.

Most farmers can increase their soil's organic matter and infiltration by keeping the soil covered as much as possible, minimizing soil disturbance, and using diverse crop rotations and cover crops to maximize the time growing plants can feed the soil.

Cropping Systems: Use of No-Till is on the Rise, but Acres Have Shifted

Since 2004, large areas of South Dakota 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 planted cropland in 2013 increased by 857,437 acres since 2004 to 13,926,037. The inventory showed the acres of cropland under a no-till system increased since 2004 by 29 percent, or an increase of 1,426,504 acres.

The number of counties with less than 25 percent of their cropland acres under no-till systems decreased from 32 counties in 2004 to 22 counties in 2013.

The number of counties with more than 75 percent of the acres under a no-till system increased from 4 counties in 2004 to 14 counties in 2013.

While the overall number of counties with acres under no-till systems increased between 2004 and 2013, in eastern South Dakota 16 counties decreased their acres of cropland under a no-till system. The counties listed below moved cropland acres out of a no-till farming system:

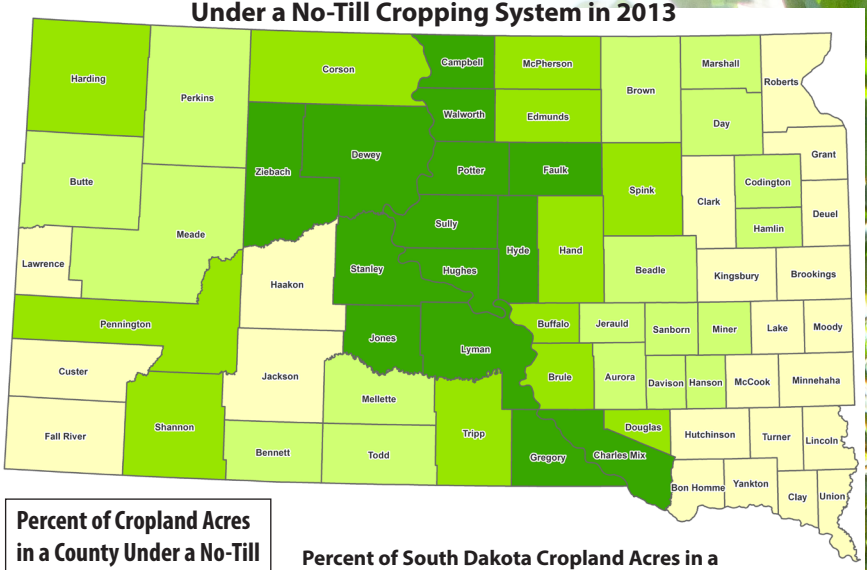
County and Percent Decrease in Acres under No-till

Kingsbury (64.9)	Lake (61.6)
Grant (60.4)	Clark (56.6)
Moody (44.3)	Day County (44)
Brookings 42.8)	Codington (33.9)
Yankton (32.2)	Beadle (29.4)
Marshall (25.4)	Sanborn (23.7)
Aurora (18.9)	Union (15.5)
Spink (13.1)	Brown (2.2)

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. It may be notable that most of the counties that reduced acres of no-till systems also greatly reduced small grain production. Row crop production (corn, soybeans) saw a corresponding increase in the same counties.

The greatest density in increased use of no-till systems occurred 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.

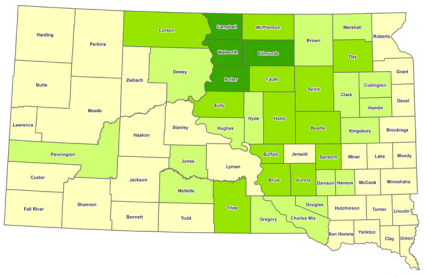
Percent of South Dakota Cropland Acres in a County Under a No-Till Cropping System in 2013



Percent of Cropland Acres in a County Under a No-Till Cropping System in 2013

- 0-25 percent
- 25-50 percent
- 50-75 percent
- > 75 percent

Percent of South Dakota Cropland Acres in a County Under a No-Till Cropping System 2004



Soil samples in Bill Nelson's fields in Lake County, SD, show a rich, dark soil with high organic matter (averaging 5- to 6.1 percent). For more than 30 years, the fields have been under no-till with a diversified crop rotation including corn, soybeans, alfalfa, oats, spring wheat, winter wheat, rye, and cover crops. Nelson adjusts the rotation based on what he feels the soil needs based on visual and soil test results. He believes that the use of a cover crops mixture and small grains has been the key factor why he has fewer weed, disease and insect problems because they build the soil.

For example, 2009-2011 were above average precipitation years in eastern South Dakota. "Like everyone, I was worried about getting in to plant. By waiting, I allowed the soil to function (let the macro pores move the extra precipitation into the soil profile) rather than using tillage to dry the surface. I was surprised when my soil performed well under the planting equipment." Nelson says, "That's a good cropping system!"

"We had that big rain on May 5 and I had no erosion and no run-off. Not one field had a problem because the organic matter and good soil structure put that water into the profile." That sub soil moisture was useful in August.

"The no-till cropping system works and I'm happy with the yield results," he says. "For me, it is my choice and a personal challenge to continue to decrease chemical inputs while getting respectable return. I am seeing better soil structure, better infiltration, an increase in the biological activity in the soil, and more beneficial insects around my fields."

Diversified Crop Rotations and Cropping Systems

No-till cropping systems appear to go hand-in-hand with diverse crop rotations. The 2013 Inventory showed cropping systems with the lowest soil disturbance were also the systems with the greatest diversity in crop rotations.

Areas with less diversity in their crop rotation were also the areas with the greatest soil disturbance, i.e., conventional tillage. Areas with the greatest amount of acres under a no-till cropping system also had the greatest diversity in crops grown.

At the time of this inventory, the 14 counties with greater than 75 percent of their cropland acres under a no-till system typically had a more diversified crop rotation *(a ratio of 1 acre small grain to 2.5 acres row crops)* than the 22 counties with the least amount of acres under no-till systems.

In those 14 counties, small grains were spring or fall planted and also included a sizable acreage of millet seeded during the summer. Row crops used in the rotation included a diverse mix of corn, soybeans, sunflowers, sorghum, sudangrass and field peas.

The 2013 data showed systems in the 22 counties with the least diversity in crop rotations also had the least percentage of no-till acres and were relying heavily on tillage for seedbed preparation.

At the time of the inventory, the 22 counties in eastern South Dakota with less than 25 percent no-till acres averaged a ratio of 1 acre small grain to 28 acres row crop. The row crops were almost exclusively corn and soybeans. The inventoried acres of small grain in this area was negligible.

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 crops types in the 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 to use the extra water in the soil profile, will also reduce compaction and address 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.

Jorgensen Farms *manage 16,500 acres in south central South Dakota near Ideal. Their no-till farming system has a diversified cropping rotation with cover crops and livestock. Their crop rotation includes: corn, cane, milo, oats, soybeans, winter wheat and alfalfa with use of cover crops.*

In the 1990s, Bryan Jorgensen channeled his energy and interest in healthier soil toward a complete overhaul of their operation. "Frankly, our soils are now much more robust and healthy for the direction we've taken. Our fields have about 4 percent organic matter and the microbial growth in the soil has increased significantly over the past three decades."

Jorgensen's nutrient management plan approach has shifted from relying solely on soil test chemical results to now evaluating a combination of soil chemical and biological processes to achieve his yield goals with less inputs. Yield is the proof, but the success of his decisions, he says, lies in the soil.