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## Residue Helps Farmers Save on Water, Fertilizer Costs

By Janelle Atyeo

What's left behind after a cash crop can be pretty valuable if it remains in the field.

South Dakota farmers see a range of benefits from crop residue – corn stalks, soybean stems and wheat straw left after harvest – especially in a dry season.

It can be tempting to cut corn for silage or bale oat straw to feed to cattle when yields and feed supplies come up short. But there are major costs to removing residue.

In northeastern South Dakota near Twin Brooks, farmer Dave Kruger planted his soybeans on light, sandy ground and watched them burn up in last summer's heat. Across the road, soybeans planted in the same sandy soils held on.

The difference was that the second field of beans grew through a thick mat of rye straw. It took another two to three weeks to see signs of heat stress, Kruger said.

Residue's role in moisture retention is two-fold. It acts like a lid, keeping soil covered and moisture from escaping. It also helps build organic matter and carbon, which in turn increases the soil's capacity for holding water.

Kruger is short on moisture again this year. Most of his farm has seen 10-11 inches of rain or snow since January – about 3-4 inches below normal.

But Kruger's crops continue to pull through.

"It definitely has helped it hold on and survive through drier spells," Kruger said.

### Removing residue removes nutrients

It wasn't a great year for small grains in central South Dakota. Marvin Schumacher, who farms north of Pierre, had to abandon one of his oat fields because the grain just didn't fill in the hot, dry summer.

"It's been a tough year," said Schumacher.

Even so, he left the failed oats instead of putting them up for hay.

"I hate to remove residue anytime if I can help it. What you lose for residue doesn't pencil out," he said.



Grazing is a great way to use residue as forage and build soil health at the same time. USDA-NRCS SD photo.

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## See photos from the 2021 Soil Health School

The 2021 Soil Health School was held Aug. 25-27 in Mitchell, SD, and was hosted by the Stehly Farm. The two-and-a-half day school was packed with excellent soil health instruction and discussion!

See Page 4 to learn more.



**These soybeans near Frankfort, SD, were planted into heavy corn residue.** SD Soil Health Coalition photo.

Some of the most concrete costs of removing residue come from the nutrients that must be replaced when straw and stalks are baled up and hauled away.

A ton of dry harvested corn residue contains 17 pounds of nitrogen, 4 pounds of phosphorus, 34 pounds of potash and 3 pounds of sulfur, according to research from the University of Nebraska-Lincoln. At today's fertilizer prices, each round bale of corn stalks would add up to \$32.61 worth of fertilizer.

The nutrient values of wheat straw and soybean residue are a little less, with 1 ton of wheat or bean stubble at around \$20 worth of fertilizer.

Those numbers align with what Kruger has experienced on his farm. He has four quarters of ground that have been managed with continuous light tillage. While most of his ground has been no-till since 1993, those acres serve as a good side-by-side comparison. When it comes to fertilizer, his no-till land saves him \$20-30 per acre per year.

"I think that's the result of building that organic matter," he said. "When you take any of the straw or the residue, you're just carrying more fertilizer off the fields."

Producers should consider the long-term impact of removing residue, said Dwayne Beck, a soil health expert who manages the Dakota Lakes Research Farm near Pierre.

"When you take off residue and you don't replace it, that's a permanent thing. It takes a long time to recover from that," he said.

### **Cover crops, diverse rotation can help**

A lot of less-than-stellar corn crops are being cut for silage this year. That takes a lot of potential residue out of the mix.

A high-residue cover crop planted behind the silage cutters can stem those losses, Beck said. Cereal rye, triticale or winter wheat are good options.

He also urges producers who cut silage to consider changing their rotation if they were going to plant soybeans next year. Growing a high-residue crop would be more appropriate. Producers will have to factor in the nutrients they'll miss out on and maybe apply some manure to bring some of that fertility back.

"You've turned a high-residue crop, corn, into a low-residue crop. With two low-residue crops in a row, it could cause some real is-

ues," Beck said. "The worst thing you can do to a piece of ground is to take the forage off year after year."

According to Beck, the best rotations are made up of 80% high-residue crops such as corn, wheat and other cereal grains.

### **Saving water**

Combining his oats in south central South Dakota this summer, Clint Vanneman could look down the row and see residue from the previous milo and wheat crops. Those layers of cover helped to hold moisture and insulate the ground.

"The ability to save some of it for a dry day is big," said Vanneman, who farms near Ideal with his son Justin.

No-till management, residue, cover crops and a diverse crop rotation work together on the Vanneman farm to build soil health.

They've been able to reduce applied nitrogen as their organic matter has climbed.

Carbon feeds a thriving community of micronutrients below ground, and that contributes to a healthy soil structure with stable pores that can move water through the soil profile.

"That's where you get your water infiltration and your root development," Schumacher said.

Reducing runoff helps keep nutrients in place. A residue cover also saves valuable topsoil from wind erosion.

Schumacher pays close attention to soil cover in his rotation. He plants two years of corn to build residue and rotates to soybeans, wheat, then a cover crop before going back to corn.

Planting through heavy residue can be a problem, which is why his planter is equipped with a trash manager that moves the residue to the side as he makes his furrow. The cover also cools his soil in spring, so his crops start slower.

"They will look a little worse at the beginning, but this time of year, it really starts to shine now," he said.

Schumacher sees the benefits of a residue cover in his irrigated fields, saving him 4-6 inches of water a year.

"It's cut our water use by a third with no-till management and residue cover," he said.

The Vannemans work to make sure the residue is evenly distributed after harvest. Most of the time, the combine does a pretty good job of spreading it out, Justin Vanneman said, but sometimes in wheat or oats he'll run over it with a harrow to spread the straw.

The Vannemans' cattle benefit from the residue, as well, grazing the wheat stubble and the cover crops planted into it after harvest.

"In the fall and winter time, that's where you'll find our cows," Justin said, adding that they manage their grazing to be sure the cattle don't remove too much.

"If grazed appropriately, very little nutrient goes away," Beck added, "You keep a lot of the armor there, you just change its form a bit."

When it comes to cover crops and residue, bigger is better. Over the winter months, soil cover catches snow and holds moisture.

The Vanneman farm didn't get much snow last winter, but milo stalks caught what fell, and the oats planted into those stalks in early spring reaped the benefits.

Some harvest small grains with a stripper head so the straw is left standing in the fields.

"There's a lot of value in leaving it on the ground," Vanneman said.

## Membership Minute: Matt and Max Leischner

**M**att Leischner and his brother Max operate South Branch Farms, a grain operation southwest of Parkston, SD. They took over the farm from their father and have grown it since.

The brothers are longtime no-tillers, and some of their fields have been no-tilled for 25 years. In the late 1990s and early 2000s, the operation grew cover crops after winter wheat with success. However, when wheat became less profitable, it left their rotation, and the cover crops left with it because the brothers did not think they had enough time to get them established after corn or soybeans.

In recent years, the Leischners have realized that no-till practices alone are not enough. “We need to increase the life in our soil and get the nutrient cycle producing the nutrients that the plants need,” Matt said. The brothers have begun to include different cereal crops in their rotation. They have grown rye and oats and harvested them for grain to be used on their farm as cover crops. “This has been a successful venture, and the oats and/or rye provide a good base to many cover crop cocktails,” Matt said. The practice saves on shipping costs for the bulky rye and oats. “Smaller seeded crops such as radish or hairy vetch can be easily purchased and blended in with the rye and oats on the farm. Two gravity wagons and a conveyor can be used to blend mixtures of cover crops together with very good results.”

Matt and Max are working hard to reduce their input costs and increase water infiltration. “Water matters. Too much or not enough, almost every year. The answer is infiltration. Get the water in the ground where it belongs, not running over the top,” Matt said.

“Our goal is to be able to reduce our inputs as much as possible and let the soil supply itself with what it needs. We understand this is a long-term goal, but one day we would like to use no input other than the seeds,” Matt said. “God willing, my best day on the farm is yet to come—a day when any of our children who choose to come back to the farm can, a day when we no longer need any governmental subsidies and can use minimal inputs to produce high quality food.”



**Matt and Max Leischner now use a roller-crimper to terminate cover crops which already have a cash crop growing in them.** Photo courtesy of Matt Leischner.

## Discovery Center to Premiere New Soil Health Exhibit

**T**he South Dakota Discovery Center will open a new exhibit on Sept. 24 titled “Soil Is Life,” which showcases soil health and organisms that live in the soil.

Special Projects Director Anne Lewis said that the new exhibit fits within the Discovery Center’s environmental education goals. “We realized there really wasn’t much out there for younger kids, hands on, interactive, that specifically talked about healthy soil and soil is life,” she said. “We settled on focusing on the soil biota, specifically for kids, because that’s really the most compelling and relevant component to the five soil health principles.”

The exhibit, which targets kids ages 4-11, will feature four kiosks, each one highlighting a different organism: fungi, rotifers, tardigrades, and earthworms. There will also be a mural highlighting soil health management information for older audiences, and a soil tunnel that children can crawl through. The exhibit is made possible through a grant from the U.S. Department of Agriculture Natural Resources Conservation Service with matching funds from the Pierre-Fort Pierre Rotary Club.

The Discovery Center has also developed a K-5 soil health education curriculum and is working with the South Dakota Soil Health Coalition and other partners to provide resources for science teachers. Lewis said that there is currently a sea change in how science is taught in schools. “We want to make sure soil is included in that and help get the teachers a resource and equip them with what they need to be able to teach soil in this new and compelling, hands-on way,” she said.

Parents with children who would enjoy learning more about the soil can also visit [www.sdsoilhealthcoalition.org/youth-resources/](http://www.sdsoilhealthcoalition.org/youth-resources/) where they can find a link to order “The Soil Quilt” children’s book and links to other soil health education resources.



SD Discovery Center photo

### Upcoming Soil Health Events

#### Sept. 24

SD Discovery Center  
Soil Exhibit Opening  
Pierre, SD

#### Sept. 24-25

Master Gardener Update  
Conference  
Huron, SD

#### Sept. 24-25

SD Sheep Growers Assn.  
Annual Convention  
Pierre, SD

#### Oct. 5-7

Finding the Right Balance  
Holistic Management  
Event  
White River, SD

#### Oct. 6

Blioux River Ranch Tour  
Castlewood, SD

#### Oct. 9

Goat Targeted Grazing  
To Control Eastern Red  
Cedars Field Day  
Pickstown, SD

#### Oct. 14

SDSHC Board Meeting

#### Nov. 4-6

South Dakota Local  
Foods Conference  
Online

#### Nov. 11

SDSHC Board Meeting

#### Nov. 16-17

Range Cow Beef  
Symposium  
Rapid City, SD

#### Nov. 30-Dec. 1

Ag Horizons Conference  
Pierre, SD

#### Nov. 30-Dec. 1

SD Cattlemen’s Assn.  
Annual Convention  
Rapid City, SD

#### Dec. 8

Livestock Environmental  
Training for CAFOs  
Workshop  
Huron, SD

#### Jan. 18-19

Soil Health Conference  
Aberdeen, SD

#### Jan. 27-29

Northern Plains Food &  
Farming Conference  
 Fargo, ND

**Access Our Events  
Calendar [HERE](#).**

# 2021 Soil Health School: Learning New Tricks



A class of 30 participants gathered Aug. 25-27 in Mitchell, SD, for the 2021 Soil Health School. They learned about soil structure and soil health management practices from an array of soil experts and producers.

Mornings were devoted to presentations at the Ramada by Wyndham Hotel and Conference Center. There were detailed sessions on goal setting, soil basics, soil health concepts, agronomics, salinity, crop diversity, beneficial insects, cover crops, soil microbiology, temporary fencing, carbon management, poly cropping, planting and harvesting equipment, and the economics of soil health.

Afternoon sessions were conducted in the field at nearby Stehly Farm. These sessions covered cover crop mixes, livestock integration, cover crop grazing, manure management, water infiltration and slump tests, biomass sampling, Solvita tests, slake test, soil pit examinations, sheep grazing, bulk density explanation, and a rainfall simulator.

Presenters included Soil Health Coalition Board members and staff, SDSU Extension specialists, NRCS soil scientists and specialists, crop consultants, independent and university researchers, and producers.

Participants returned to the hotel in the evenings for more classroom sessions, dinner, and discussion. The insightful discussions allowed participants to pose questions to the experts and discuss their interests with each other.

One of the key takeaways from the school was that for many producers soil health practices are new trick, and it will take time and practice to master the details of the new tricks those producers want to implement on their operations.

This year's Soil Health School was the culmination of the work and cooperation the Stehly farming family who hosted the school, SD Soil Health Coalition board members and staff, Natural Resources Conservation Service, SDSU Extension, the SD Grassland Coalition, and many speakers and volunteers. A huge thank you goes out to everyone who supported the school!



## Expanding Mesonet Weather Network to Focus on Soil Moisture

By Stan Wise

What's better than real-time weather data? More real-time weather data, of course.

The South Dakota Mesonet currently has 32 weather stations in the state, according to Mesonet Director Nathan Edwards, and it's about to get a lot more. That's good news for agricultural producers who make use of the network.

"The Mesonet is the state's network of weather stations. Mesonet is short for Mesoscale Network. Mesoscale weather is weather that happens on shorter time scales and shorter scales of distance than what typical weather stations look at," Edwards said. "So, our stations are closer together, and they measure every five minutes to capture those smaller, more dynamic events of weather."

Thanks to the efforts of South Dakota's congressional delegation, the Mesonet will be able to take advantage of a U.S. Army Corps of Engineers program to drastically increase its number of stations over the next several years.

The Corps of Engineers is responsible for managing the runoff in the Upper Missouri River Basin, which includes nearly all of South Dakota, and the Mesonet is being beefed up to increase the state's ability to monitor for flood and drought, Edwards said.

"We're looking at something like 150 stations total in South Dakota – one every 500 square miles – so there'll be hardly a South Dakotan who's not within 20 miles of a station. It's a game changer," he said.

The network, run by South Dakota State University, offers more than a typical forecast.

"So your typical weather station, we do wind and temperature and humidity and rainfall and that kind of thing, but we have a special focus in agriculture. Actually, we have just as many measurements below ground as we do above ground," Edwards said. "We do soil temperature and soil moisture at five different depths going down to 40 inches. That's under grass, and then under bare soil we have a 4-inch temperature sensor. Out of those, we can get what the soil moisture profile looks like."

In addition to current conditions and local forecasts, the data generated by Mesonet is channeled into various tools that can be of use to producers who are making management decisions. These include ag weather, degree days, livestock stress, small grains disease, and spray tools. Producers can see soil temperatures at different depths or see if there's an inversion when they're timing their chemical applications.

Chet Edinger operates Edinger Brothers Partnership with his brother, Charlie, near Mitchell, SD, and they grow corn, wheat, soybeans, sunflowers and cover crops.

"The nice part about Mesonet is it's ground-truthed. So, a storm comes through, and it updates every 5 minutes to the internet," Edinger said. "So, you can pull it up on your phone and know within 5 minutes after the rain stops the total rainfall, or as it's accumulating, you can check it as often as you like. It's also great for checking windspeeds for spraying."

Edwards explained that Mesonet's ag weather tool can show the exact point when the water demands of a crop begin to outstrip the precipitation that was supplied. This tipping point has long been used by irrigators in their decision-making but can also be used by dryland farmers to gain insight into water balance.



This station on the South Dakota State University campus in Brookings, SD, is the first of over 150 South Dakota Mesonet weather stations that will be installed or upgraded over the next several years. South Dakota State University photo.

The new and upgraded weather stations will have a focus on soil moisture.

"Some of the real significant upgrades are keeping track of water year-round, above and below the surface. So, all of these stations will have the full profile of soil moisture sensors and soil temperature sensors," Edwards said. "They'll be able to measure snow depth. They will also be able to measure precipitation all year round. Currently we only do rainfall, and this will give us the capability to measure the liquid equivalent of the snow."

"One of our biggest downfalls in agronomy or just the ag sciences, in general, is we don't have a good understanding of soil moisture storage capacity and where it's at, what the current status is," South Dakota State University Soils Field Specialist Anthony Bly said. "I think if we could get that information in more real time on our own operation, in certain fields we could make better management decisions."

Edwards said that most of the stations that have been installed in the last 10 years were placed in representative soils, and all the new stations will be placed in representative soil types. To further increase the accuracy of the data generated by the network, the Natural Resources Conservation Service has performed a full soil analysis at most current station locations, and all new stations will have their soils analyzed, as well.

The increased accuracy of the network is critical to agricultural producers because it is used to make decisions in government programs that affect them. "One of the primary purposes of this is to improve the accuracy and the timeliness of the Drought Monitor," Edwards said. "The Drought Monitor is kind of decided on a county level. Certainly, the safety net programs that are triggered by it are based on whether or not certain shades of orange and red show up within county lines, and there are many counties that just don't have that data."

"As that network expands, and we get more and more sites with soil moisture probes, that will strengthen that data," Bly said.

Producers who would like a Mesonet station near them can sponsor one.

Producers who wish to sponsor a station should visit Mesonet's website at <https://mesonet.sdstate.edu> and use the "Contact Us" link.



South Dakota

## Soil Health Coalition

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## Farmer Rancher Grant Proposals Due Dec. 2

Do you have a problem you'd like to solve using sustainable agriculture? The North Central Region-Sustainable Agriculture Research and Education Farmer Rancher Grant Program can help. It is designed to provide opportunities for farmers/ranchers to use sustainable agriculture practices to explore solutions to problems on the farm or ranch, and to share their ideas, innovations, and results with others. The program values learning by doing and reporting on what worked, what didn't, and what farmers/ranchers would recommend for others.

You can apply for an individual grant of up to \$15,000 or work together with a team of farmers and ranchers to apply for a grant of up to \$30,000. Grant projects may last up to 23 months. Proposals are due Dec. 2, 2021.

Learn more at <https://northcentral.sare.org/Grants/Apply-for-a-Grant/Farmer-Rancher-Grant/>.



Registration is officially open for the

## 6th Annual Soil Health Conference!

The 2022 Soil Health Conference is just around the corner, so don't wait to sign up to hear our excellent lineup of keynote speakers and participate in exciting breakout sessions! The conference will be held Jan. 18-19, 2022, at the Best Western Ramkota Hotel in Aberdeen, SD. Keynote speakers will include Dr. Kris Nichols, Jay Fuhrer, Anthony Bly, and Steve Kenyon. There will also be contests with prizes for students, award presentations, and the chance to socialize with other producers! Learn more about this excellent event at [www.sdsoilhealthcoalition.org/soil-health-conference/](http://www.sdsoilhealthcoalition.org/soil-health-conference/).

## Know of opportunities for young producers?

The South Dakota Soil Health Coalition would like to create a webpage to list any available opportunities for young people to either work in sustainable agriculture or learn more about sustainable agriculture. These could be internships, jobs, competitions, scholarships, conferences, land available for lease, or even livestock available for custom grazing. If you know of any such opportunities, please contact the SD Soil Health Coalition at 605-280-4190 or [sdsoilhealth@gmail.com](mailto:sdsoilhealth@gmail.com).