Spring Issue 2020

SOUTH DAKOTA SOYBEAN LEADER

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Planting with 2020 Vision

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- Repairing field ruts left after a wet year
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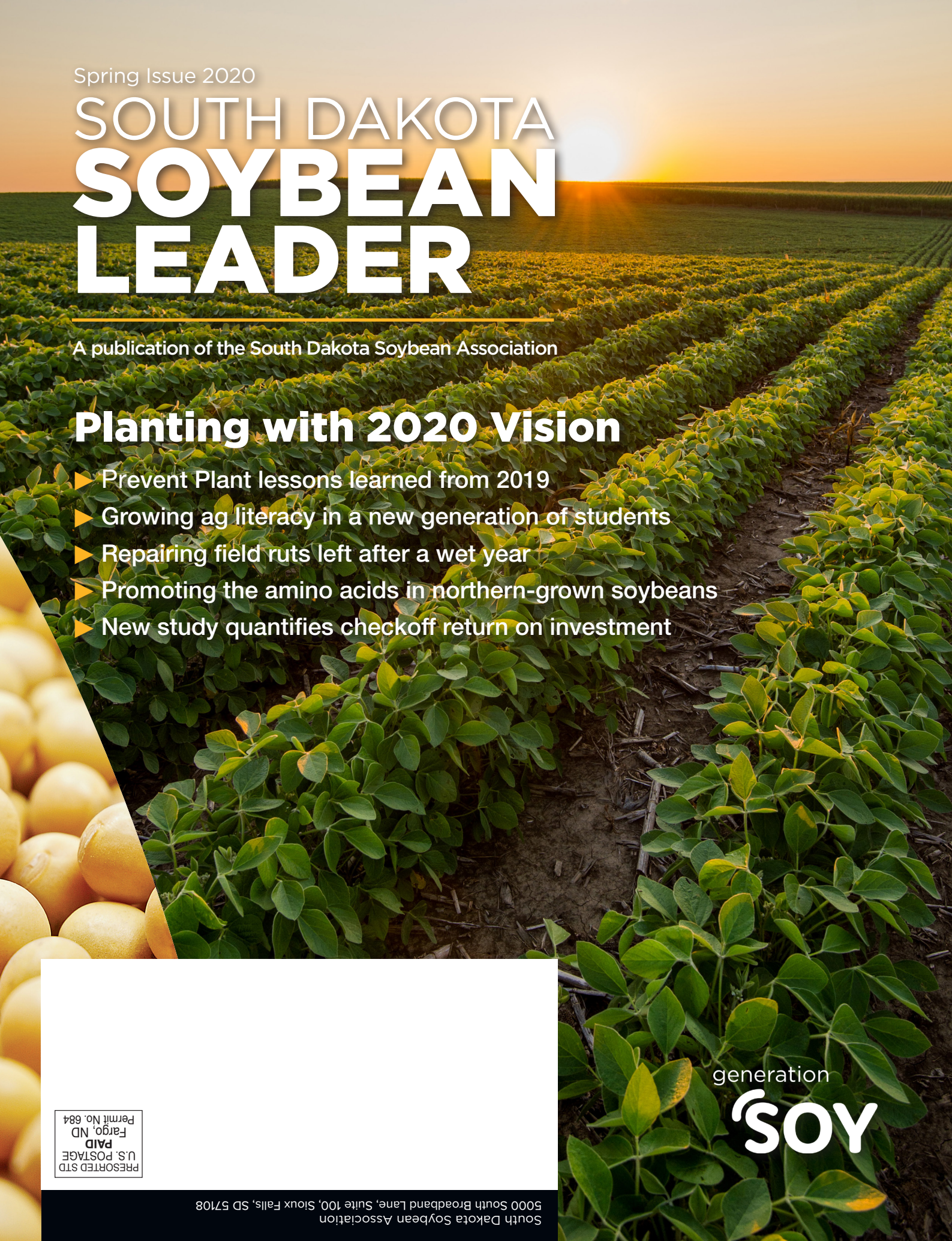

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Lessons Learned From Prevent Plant 2019

By Kurt Lawton, Ag Writer, NRCS / Photos Courtesy of NRCS-SD

The wet weather cycle and saturated soils have some farmers and ranchers seeking solutions to make their soils, and their farms, more resilient against frequent rain events.

Seeking solutions, South Dakota USDA Natural Resources Conservation Service (NRCS) and SDSU agronomists shared Prevented Plant field management results from 2019. They compared five different field scenarios, with and without cover crops, to compile lessons learned from this challenging year.

To expand on the topic, NRCS State Soil Health Specialist Kent Vlieger led two roundtable discussions with agronomists and local farmers near Crooks and Mitchell. The overriding theme of the lessons learned from Prevented Plant 2019 was that no-till soils saw the highest planting success, and cover crops provided numerous benefits like erosion control and water infiltration on PP fields.

Farmer Roundtable Lessons

Craig Stehly, who farms near Mitchell, says 2019 was the most stressful year since he began farming in 1984. "Fortunately, we were able to seed a lot of cereal rye cover crops and winter wheat in September, so we'll have spring growth to use up the excess moisture."

"What I've found with long-term no-till is we don't have ruts across a whole field, and the driest soils we had were on wheat stubble, or where I put a cover crop," he said. "The cover made the trafficability much better, proving we do learn things in this wet environment."

Anthony Bly, SDSU Extension soils field specialist agronomist, talked to a lot of farmers during the season and, while no-till farmers also struggled, those building soil health saw the best results. "I think they won the battle, and I believe others are going to pay attention to that, and adoption is going to increase further," Bly said.

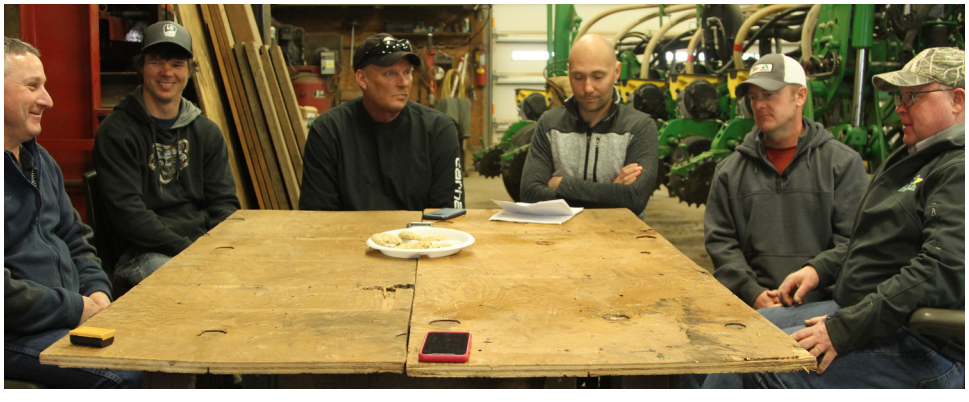
When you see black snow, and ditches, culverts, and roads impacted by silt from fields, you really see the value of no-till and cover crops, according to Nate Stroschein, who farms near Crooks. "After heavy rains, you can really tell that water infiltration is a big deal on our no-till fields, thanks to better soil biology, compared to conventional tillage," Stroschein commented.

Cover Crop Plans

Farming west of Mitchell, Charlie Edinger said knowing what you want to accomplish with cover crops helps select the best species. "We like a wide variety of smaller-seeded species because they're less expensive," Edinger said. "But if you want to reduce compaction or add nitrogen, there's a whole range of specific cover crop traits to meet your needs."

The multiple-species cover crop mixes offered by seed retailers in 2019 were designed to deliver optimum plant biomass and root diversity. The mixes were created to increase biomass accumulation and soil organism diversity. For example, NRCS worked with some seed companies to formulate multiple species cover crop blends for Prevented Plant acres containing a legume, brassicas, and cool and warm season broadleaves and grasses: e.g., oats, barley, sudangrass, rapeseed, radishes, turnips, flax, buckwheat, and common vetch.

Crooks area farmers met with NRCS and SDSU soil specialists in February to discuss 2019 challenges and possible solutions for 2020. (L to R) Kurt Stiefvater (farmer, Salem); Ryan Larson (farmer, Garretson); Nate Stroschein (farmer, Crooks); Kent Vlieger (NRCS soil health specialist); Ross Hanson (farmer, Garretson); Anthony Bly (SDSU soils field specialist).



Five Field Scenarios

Here are five Prevented Plant (PP) field scenarios along with lessons learned from each, compiled by agronomists and soil scientists from USDA Natural Resources Conservation Service (NRCS) and SDSU Extension, with involvement from South Dakota's Conservation Districts, South Dakota Soil Health Coalition, South Dakota Grassland Coalition, and South Dakota Corn.

PP FIELD SCENARIO 1

Seeded to cover crops; left standing through winter.

▶ The best scenario to optimize soil structure and health. Great seeding environment for no-till cropping.

▶ Avoid tillage this spring on the cover crop as that leads to platy soil structure, reduced water infiltration, and nutrient uptake. Be patient and reap Mother Nature's benefits of healthier soil with more stable aggregate and structure formation.

▶ Provides soil armor, erosion control, soil structure and organic matter improvement, plant and root diversity, improved water infiltration, nutrient cycling, and soil carbon capture from increased photosynthesis—all work together for higher soil health benefits.

▶ Provides optimal seeding conditions for spring cash crops after control of any surviving cover crop species.

PP FIELD SCENARIO 2

Seeded to cover crops; grazed, baled or chopped for feed.

▶ A good scenario for soil microbial and livestock feeding. (Grazing preferred over forage removal)

▶ Grazing provides excellent results with initiation after 6-8-inches of cover crop growth. Overgrazing causes exposed soil due to a lack of regrowth. Grazing can provide savings toward hay/forage feeding and harvest costs. Avoid grazing excessively wet soils. When soils begin to thaw, do not graze until soil frost dissipates and soil moisture lowers.

▶ Soil health is greatly improved compared to bare soil with weeds, but not as great as non-grazed, living cover crops. Grazing should increase nutrient cycling of plant nutrients back to the soil from manure; check with a soil test before the following year's crop.

▶ Baled cover crops were not successful because species in cover crop mixes remained too wet to bale.

PP FIELD SCENARIO 3

Seeded to cover crops; killed with herbicide or tillage in fall.

▶ Considered an "okay" scenario, as it provides more soil armor than bare soil or weeds. However, it reduces an opportunity to improve soil aggregation, structure, organic carbon, microbial activity, and improved water infiltration that is achieved by allowing cover crop development over a full season of growth.

PP FIELD SCENARIO 4

No cover crops seeded; weeds grew unchecked.

▶ Very few soil health benefits, potentially significant soil erosion and losses, and potential for increased weed pressure if weeds produced seed. This scenario could lead to Fallow Syndrome in a 2020 cash crop.

▶ Weeds are not cover crops. Prolific weeds such as marestail, waterhemp, and other amaranth species lack the positive soil structure benefits of cover crops. The harmful competition from weeds on crops and increases of weed seed banks (especially herbicide-resistant weed seeds) greatly outweighs the small potential soil carbon capture or slight erosion benefits.

PP FIELD SCENARIO 5

No cover crops seeded; used tillage or herbicides to control weeds.

▶ Absolutely no soil health benefits. Potential for significant erosion and soil loss is very high. This scenario supports the most significant probability of Fallow Syndrome for 2020 cash crops.

▶ Multiple tillage passes did not control all weeds and caused more significant soil erosion and degraded soil structure. Tillage and herbicide effectiveness were reduced because weeds were often too large for full control.

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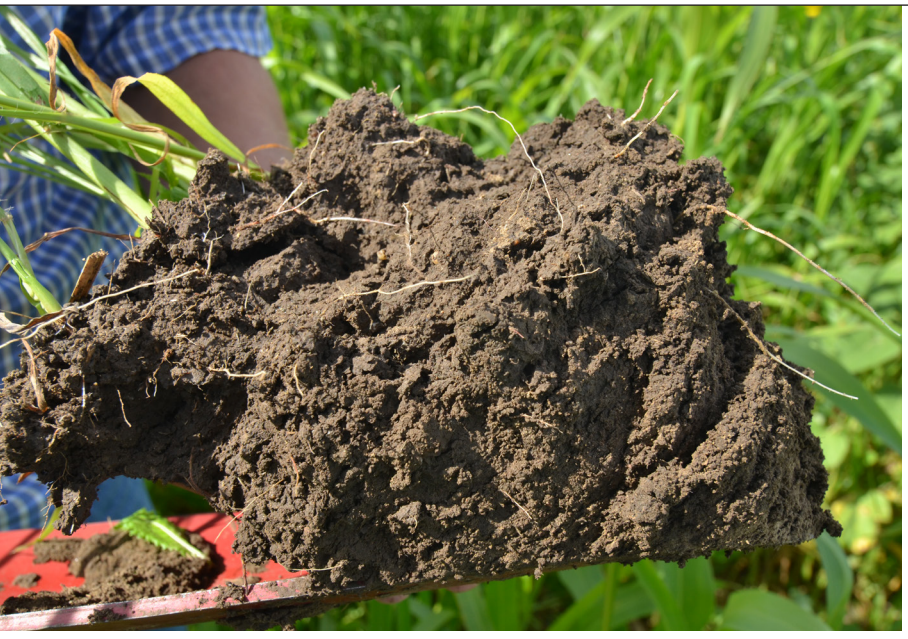

Good soil structure is shown on Brent Wood's farm near Parkston, a PP field that was seeded to a seven-way cover crop mix last summer.

The seed blends that resulted in tall and heavy biomass concerned new cover crop growers about potential difficulty planting 2020 cash crops. Some producers chose to use tillage or herbicides to reduce the biomass, rather than wait for natural winter decomposition. The tillage of cover crops negatively impacted the soil structure forming benefits of living roots, and significantly reduced the cover crop biomass that used photosynthesis to fix atmospheric carbon into the soil reserves.

Grazing cattle on cover crops is one of the goals of Daniel Harnish, who farms near Clayton. "We like to put in oats, radish and field pea mix, trying to keep our costs under $20 per acre. To get additional growth to graze, we haul manure over the live crop when it's 4-5 inches tall." Harnish continued, "In spring, the canopy of brassicas and oats has broken down the manure, making it easy to plant into while continuing to build soil organic matter and improve water infiltration."

Fallow Syndrome and Fertility

If no cover crops were seeded on your conventional-tilled or minimum-till PP field (or only brassica cover crops like radish, turnip, mustard or rapeseed), the soil might lack key beneficial organisms, e.g., mycorrhizal fungi, that support early corn growth. For more details, visit extension.sdstate.edu and search "Fallow Syndrome."

To overcome this potential soil biology challenge, some agronomists recommend the addition of phosphorus (P) and chelated zinc in-furrow as a pop-up starter or a banded application to minimize early-season growth challenges and potential yield loss from Fallow Syndrome. If that's not an option, broadcast application rates that include an additional 15-20 lbs. P/acre will also help, according to Antonio Mallarino, Iowa State University Extension.

Some agronomists and long-term no-till farmers believe that no-till fields are probably less susceptible to fallow syndrome due to better soil health. "We know that mycorrhizal fungi are greatly reduced in tilled systems, and I think our soil health systems [no-till, strip-till] are going to show more resilience," Bly says.

Stehly said it's hard to predict fallow syndrome. "If you've got a cover crop on, it probably won't happen, but the pop-up does so much good anyway on corn and small grain, then I split the N with stabilizer to manage volatilization."

"We also use a pop-up in-furrow for the P issue," Harnish said. "I think that could be critical this spring to prevent fallow syndrome, especially on fields that didn't get cover crops or were saturated for long periods, as that can decrease microbial populations, too."

Regarding weeds, most farmers had issues with timely spraying if they could spray at all due to the continued rains. Those farmers who achieved good cover crop stands kept weed populations down. Stroschein said he had a field with marestail problems, but his cover crops that produced heavy biomass provided pretty decent control. Other farmers mentioned they shift to small grains and cover crops in the rotation to eliminate marestail.

Reducing Future Risks

While no one can control precipitation and large rain events, the no-till farmers around the tables all said that their decisions to build soil organic matter levels and soil structure have dramatically improved water infiltration. By investing in cover crops following cash crops, the additional root and plant biomass produced by the cover crops improve the formation of humus that aids soil aggregation.

Reduced input costs, like fertilizer and chemicals, to less equipment needed, less fuel, and less tractor time were benefits listed by farmers who switched to no-till. Ryan Larson, farmer from Garretson, added, "One thing I never realized was that you could trade your high horsepower tractor and all your tillage equipment and buy a no-till set-up and still have money left over. It's been really eye-opening when you examine your break-even prices and compare to other operations."

Such plans help aid future planting under wet conditions, reducing PP acres. It's the best option to minimize water and wind erosion, decrease nitrate runoff and leaching, and reduce weed pressure for increased productivity in subsequent years.

Videos from these roundtable discussions can be viewed at **www.nrcs.usda.gov**. ■

Managing for Better Soil Structure: Repairing Field Ruts

Written by agronomists and soil scientists with USDA-NRCS South Dakota and South Dakota State University Extension, with support from South Dakota's Conservation Districts and South Dakota Soil Health Coalition.

Field ruts from last year's harvest equipment are of concern to many South Dakota producers. The following suggestions are designed to help mitigate field rut issues this spring.

Assess the damage.

How deep are the ruts, and how large is the affected area? All ruts deeper than planting depth should be leveled. Leveling the ruts may be all that is necessary to restore the field to planting condition. In no-till fields, where ruts are often shallow, many growers choose to let nature, not steel, rebuild ruts, i.e.: living roots, improved biological activity, and freeze/thaw/wet/dry cycles.

Wait for drier soil.

The top 2-4 inches of soil need to be dry before mechanical leveling occurs. Grab a handful of soil from the area between ruts and 2 inches above the operating depth of tillage. Form a ball and throw like a baseball; if the ball stays mostly intact when hitting the ground, it's still too wet. After soil has dried adequately, use secondary light tillage (vertical tillage tool, light disk, soil finisher, or harrow) only in the width of the impacted areas, not the entire field.

Avoid deep tillage.

It's a myth that deep tillage is the best fix for ruts because any tillage causes compaction in wet soils. Compaction caused by tillage breaks down soil structure, reduces root growth, slows water infiltration and cuts water availability for growing plants.

Deeper ruts need more time.

For 5-inch or deeper compacted ruts, multiple light tillage passes will be necessary, with a week in-between passes to dry the tilled layer. If needed, a chisel plow set to depth just below the ruts could work, but only till in the rutted area to avoid further compaction.

Preventive Actions: Focus on long-term soil structure.

Growers using no-till, especially with diverse rotations and cover crops, are achieving improved soil biological activity and increasing soil organic matter--leading to fewer ruts, less compaction, quicker access to wet fields, and reduced inputs to produce equal or greater yields as conventional-tilled fields. Seeding cover crops such as cereal rye after harvest, with its fibrous root system, can also help alleviate soil compaction in these rutted areas, and build a healthier soil. Manure and residue cover help build soil structure as well by increasing soil biological activity.

Ruts created during harvest in southeast South Dakota.

PHOTO: SD SOIL HEALTH COALITION AND SD PHEASANTS FOREVER

Although these practices can make fields passible, expect yield losses of 10-25% in rutted areas depending on soil type and compaction severity. Improvement of yield should occur in time (3-5 years). For more details, see "Stuck in a Rut: How to Deal with Field Ruts This Spring" at **extension.sdstate.edu**. ■

South Dakota Soil Health Coalition

ABOUT SDSHC: The South Dakota Soil Health Coalition is a producer led, non-profit, membership organization, governed by a nine-member board of farmers and ranchers from across the state. Promoting improved soil health through innovative projects, education, and outreach, all designed to provide agricultural producers and decision makers with the information they need to increase the stability and profitability of their operations. Visit **www.sdsoilhealthcoalition.org** for more information.