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'Park the Chisel' First step toward soil health can be simple

By Stan Wise

The benefits of improved soil health for agricultural producers and gardeners are numerous and valuable – reduced input costs, improved profitability, drought and flood resilience, reduced erosion, improved water quality, increased wildlife habitat, and more.

Just as there are many benefits to healthy soil, there are many ways to start adopting soil health practices. The first steps can vary with each individual operation, and sometimes, they can be relatively simple.

"Step one was, for us, it was actually to park the chisel in the fall," said Salem, South Dakota, producer Adam Eichacker.

He said that fall in 2020 was followed by a dry spring, which allowed him to avoid a spring tillage pass, as well. "It just really opened up our window for what we can do in the spring," Eichacker said. "What we found kind of worked kind of nice was actually just no-till, and we were able to get right into some moisture."

This was an eye-opener for Eichacker who raises corn, soybeans, and alfalfa and manages pasture rangelands for a registered seed stock Simmental herd alongside his father, Steve; his mother, Cathy, and his uncle, Greg.



After the Eichacker Family parked their chisel in the fall of 2020, they discovered that no-till practices worked well for them. Courtesy photo.

"We weren't disturbing. We weren't burning fuel. Labor is always a hard thing to come by, and it was one less guy we needed around spring that year, and that just kind of worked. And so, we kind of went back to the drawing board a little bit," Eichacker said.

The decision to make a change happened after Eichacker decided to attend the Soil Health School, held

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Reap the Benefits of Diverse Rotations! See Page 4 to learn about decades-long research that shows diverse crop rotations offer benefits like risk reduction, improved soil health, and more!

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by the South Dakota Soil Health Coalition and its partners. He said seeing the wind and rainfall simulators and participating in the other activities during the school was "was kind of a light bulb moment on how soil actually works."

That light bulb moment and his success with no-till led to trials of 60-inch corn interseeded with cover crops and planting a rye cover crop after chopping silage in the fall.

"We actually did graze it a little bit in the fall there, and the best part was we kicked some cow-calf pairs out on that rye ground in the spring. That's the first thing to green up, just like your yard," Eichacker said. "And for us, having a place to just open up the gate and let these cows out of a lot with these calf pairs outside, kick them out there – and boy, that was just the healthiest group of calves we had coming off of that rye ground. And the cows, they sure loved it, and it was easy on our guy doing chores."

There are five principles of soil health:

- 1. Keep the soil covered with plant residues.
- 2. Minimize physical, chemical, and biological disturbance as much as possible.
- 3. Keep plants growing throughout the year to feed the soil.
- 4. Try to mimic nature with diverse plants.
- Integrate livestock through cover crop and crop residue grazing.

How producers, landowners, or gardeners implement these principles will vary based on the needs of their operations.

"There is no 'one size fits all' with transitioning to soil health. There's a lot of different factors that play in and what happens is once you have them all in place, they work well together," South Dakota State University Extension Forage Field Specialist Sara Bauder said. However, she said that there can be a learning curve when adopting soil health practices.

"You know, for us, transitioning to a lot of this no-till, one of the mistakes was, 'Well, this is what we've always done. It'll work with this program.' You know, get those words out of your head because it's different," Eichacker said. He said early no-till learning experiences taught him the importance having a planter properly equipped and adjusted for no-till field conditions and the necessity for correct timing when terminating a cover crop.

Ask for help

Producers and landowners new to soil health practices can reach out to more experienced producers and professionals for help in understanding this different system and advice on how to avoid mistakes.

"I think if you try to dive in and do everything at once, it can be really overwhelming and difficult. So, it's important to take things one step at a time and try not to do it on your own," Bauder said. "You definitely want to have a mentor or a friend or someone at a local NRCS office, Extension office, or the Soil Health Coalition help you along the way."

A new free mobile app called Growing Connections can help producers find experienced mentors near them who are willing to offer advice and answer questions. The app is available for download in the Apple App Store and the Google Play Store. More information about the app is available at

www.sdsoilhealthcoalition.org/growing-connections-app/.



The Eichacker Family let some cow-calf pairs graze their rye cover crop. Adam Eichacker said the calves that grazed the rye were their healthiest group of calves that year. Courtesy photo.

"Finding someone that's done the things you've done – maybe they're in your area or have soil similar to you in another area – can really help guide you," Bauder said. "Sometimes hearing about someone else's mistakes and successes can help provide reassurance and direction."

She said there are other resources available to help producers implement new soil health practices like the South Dakota Soil Health Coalition website (<u>www.sdsoilhealthcoalition.org</u>), the Natural Resources Conservation Service website

(www.nrcs.usda.gov), and the SDSU Extension publication "Transitioning to Soil Health Systems in Eastern South Dakota" (bit.ly/3mYRciz).

Registration for the 2023 Soil Health School, Aug. 28-30 near Garretson, South Dakota, is open to anyone who would like to learn more about adopting sustainable land management practices. More information about the school is available at

www.sdsoilhealthcoalition.org/event-calendar/soil-health-school/.

Taking the first steps toward improved soil health may seem daunting, but with the help of mentors, several different agencies and organizations, and cost-share programs, producers and landowners can help their land stay resilient and productive for generations to come.

"Things that I never really thought changed, all of a sudden, these things change when you look at the whole agronomic perspective a little bit differently – when you start to realize how good nature can actually be if you just work with her," Eichacker said.

Membership Minute: Benson Kleinschmidt

B enson Kleinschmidt and his wife, Madison, operate Kleinschmidt Farm and Ranch 30 miles east of Pierre, SD, with Benson's father, Lee, and mother, Dawn. They have a cow-calf operation raising Lim-Flex cattle, and they have a diverse set of crop rotations that include spring wheat, winter wheat, peas, sunflower, soybeans, corn, milo, and many different species of cover crops. Benson said that he manages the crop side of the 4th-generation operation while his father manages the cattle side, and they both help each other during busy times. The land was purchased by Benson's great-grandfather. "My wife, Madison, and I are fortunate to live in the same farmyard with my parents and grandparents," he said.

Benson's soil health journey began when he started college in 2012. "Some of the faculty at the college I attended instilled in us that 'it's not dirt, its soil," Benson said. After college, Benson worked as an agronomist and began renting some of his first farmland. As an agronomist, he was able to learn from other agronomists, as well as farmers and ranchers. When returned to the family farm full time, he started learning more about soil health. "Since then, our farm has gone from a two-crop rotation, wheat-corn, to the 10 -year modified rotation we currently use," he said.

"Rotating in cover crops has also had a huge benefit for the soil, and we are able to offset costs with our cattle," Benson said. "The cattle really have helped jumpstart soil health where we have been able to access fields."

Benson modifies his rotation based on the needs of the soil and the challenges posed by Mother Nature. "For example, if you have three years of drought, and you are struggling to keep residue on the soil, you probably will skip soybeans even if it is time for them in your rotation," he said. "Weeds can also be a reason to modify the rotation. I try to rotate crops that will give me a good and affordable chance to control broadleaves and grasses, even though it may not be both at the same time."

Benson said his experiences as a hunter and fisherman have instilled in him a desire to be a good land steward. "I grew up hunting and fishing and learning that it's not just a pasture or a field, it's an ecosystem, and if you take care of the ground the ground will take care of you," he said. "Once I came back to the farm, I wanted to take that mentality and implement it on the crop side of the business. I want to create an ecosystem that promotes the health of everything involved."

Benson's best day on the farm happened early in his farming career. "I had planted peas for the first time ever that year, which was intimidating. I harvested a good crop of peas and that fall, I planted it back to winter wheat," he said. "The next spring after scouting the field, I decided that herbicide or fungicide wasn't needed as the wheat had shaded everything out and was healthy. The best day on the farm was that fall when I harvested the field – not a weed in site and an amazing yield, especially considering that it had no herbicide, fungicide, insecticide, and only a moderate amount of fertilizer."

Still, it's important to keep everything in perspective, Benson said. "Do not focus too hard on your success and don't be afraid to make mistakes," he said. "You will learn more from your failures than you will from your successes."

With a strong spirit of stewardship, Benson has his eye on the future of his family's farm. "Some of my long-term goals are to eliminate or reduce pesticides greatly, increase soil biology and soil organic matter, and reduce inputs while maintaining or improving yield and the quality of the land," he said.



The Kleinschmidt family receives a 2022 Soil Conservation Farm/ Ranch Award. From left, Benson, Madison, Betty, Roland, Dawn, Lee, and Terry Ness, far right, presenting the award. Courtesy photo.

Upcoming Soil Health Events

May 11 SDSHC Board Meeting Online

May 16-17

Landowner Prescribed Fire Classes and Training Astoria, SD

June 2-3 Bird Watching Tour Brandon, SD

June 8 SDSHC Board Meeting Online

June 8-9

Women on the Range: Nicole Masters Sturgis, SD

<u>June 14-15</u>

Rangeland and Soils Days Watertown, SD

<u>June 16</u>

Soil Health and Sustainability Landowner Meeting Rapid City, SD

June 20-22 SD Grazing School Wall, SD

<u>June 28</u>

Grazing Management Bus Tour Murdo, SD

July 10-13

Young Adult Rancher Management Workshop Belle Fourche, SD

July 25-27 SD Grazing School Summit, SD

Aug. 28-30

South Dakota Soil Health School Garretson, SD

Access Our Events Calendar <u>HERE</u>.

Long-term Research Reveals Advantages of Diverse Crop Rotations

By Stan Wise

t can take time for scientists to build new knowledge of biological processes, especially when those processes play out over the course of years.

Researchers with the U.S. Department of Agriculture-Agricultural Research Service North Central Agricultural Research Laboratory near Brookings, South Dakota, have put in that time – decades, in fact. Thanks to their work, farmers now have more reliable information to use when designing their crop rotations.

The ongoing Alternative Rotation Experiment has been running at the Eastern South Dakota Soil and Water Research Farm since 2000.

"We are evaluating multiple four-year crop rotations and comparing them to a two-year corn-soybean rotation," USDA-ARS Research Agronomist Shannon Osborne said. She said that the fouryear rotations include combinations of corn, soybeans, spring wheat, winter wheat, oats, field peas, and sunflowers. All the plots are managed with no-till practices.

This experiment has produced some eye-opening data indicating that diverse crop rotations have several advantages over a common two-year corn and soybean rotation.

Increased corn and soybean yields

"As we've gone through, we initially started seeing improvements in soybean yields," Osborne said. "So, we saw those probably after about five or six years where we would have improved soybean yields up to about 25% when soybeans are grown in a rotation following a small grain crop compared to following corn."

Over time, researchers also began to see increased corn yields when it is grown in rotations with other crops. "After we've been in that rotation for at least 12 years to 16 years, we're seeing improved corn yields when corn is grown in a rotation with winter wheat and peas, especially when corn is going in right after that pea crop," Osborne said.

Decreased risk

Having more than 20 years of data allows researchers to draw



USDA-ARS researchers found that corn plants grown in a fouryear rotation following field peas have an increased plant height of 78 inches (200 cm) at 105 days after planting compared to 59 inches (150 cm) for corn grown in a two-year rotation following soybeans, leading to increased yields in the corn-soybeansspring wheat-peas rotation. USDA-ARS photo.



This is a field view of the USDA-ARS, North Central Research Laboratory, Brookings, SD, long-term Alternative Rotation Experiment established in the fall of 2000 to evaluate the impact of diversified crop rotations on improving crop yield, quality, and soil health. USDA-ARS photo.

conclusions that would be unfeasible in shorter term experiments. One of those conclusions, Osborne said, is that four-year rotations can be as productive — in terms of total yield for all crops within the rotation — as a corn-soybean rotation while being less susceptible to weather extremes.

"That four-year rotation is less environmentally risky," Osborne said. "It's just as productive, but it's a lot more stable to changes in environmental conditions, which is kind of what we're seeing the last few years. We have these ups and downs in weather and temperature and rainfall."

USDA-ARS researchers also worked with economists at South Dakota State University to evaluate the economics of the different rotations, including crop prices and production costs. They determined that some four-year rotations have a higher benefit-cost ratio. Osborne said this occurred due to lowered input costs for rotations that include two legumes, which add nitrogen to the soil.

Improved soil biological activity and reduced erosion

"We're seeing when we have a diversified rotation versus a twoyear rotation, we have an increase in short term carbon mineralization," Osborne said. "So that's indicative of more microbial activity, more things happening in that soil being more active in that fouryear rotation compared to the two-year corn-soybean rotation." The increased biological activity leads to healthier, more stable soil that offers more efficient nutrient cycling and reduced erosion. Osborne said that in the four-year rotations, "you get more soils that are in larger aggregates, or more stable aggregates that are less susceptible to wind erosion." In the two-year corn and soybean rotations, she said "those aggregates are less stable, and they are more highly erodible, leading to them being more susceptible to wind and water erosion."

Other benefits

Osborne said that diverse rotations have shown other benefits. "We have found in these diverse rotations, we have more carbon build up, more soil organic matter being built up," she said. Increased soil organic matter is associated with increased water infil-

tration and storage capacity, which helps crops be more resilient during droughts.

Osborne said the soils in the diverse rotations are also showing

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decreased greenhouse gas emissions, increased mycorrhizal fungi, and improved plant disease resistance.

Putting it in practice

Marvin Schumacher, who farms about 15 miles north of Pierre, knows the benefits of diverse rotations. His operation has used notill practices since the mid-1990s, and he grows oats, spring wheat, winter wheat, corn, milo, sunflowers, peas, millet, and cover crops.

"We've got different rotations based on what we're doing. The dryland, we will run oats, followed by winter wheat, and then we do corn, and on some of it we'll follow up with a milo. And then we'll do a broadleaf, either a sunflower or a pea or soybean," Schumacher said. "On the irrigated, we've kind of been changing things around a little bit, but right now we run two corns, and then we'll follow it with a soybean, and then we'll follow it with a spring wheat. And after the spring wheat, a lot of times we'll put in a cover crop."

Schumacher uses diverse rotations for several reasons, one of which is the reduced need for chemical inputs. He thinks a lack of diversity in crop rotations is responsible for herbicide resistance in weeds and pesticide resistance in insect pests. He credits his diverse rotations for increased weed control due to crop residue and fewer insect problems. "We hardly ever use an insecticide," he said.

Schumacher also notes that he has seen improved disease resistance. He said that while he uses fungicides on wheat, "we don't do anything on corn or soybeans or anything like that because we really haven't seen any benefit from it."

The diverse range of crops has helped to break up Schumacher's workload. "You can't beat the fact that you've got diverse crops because you can get a lot more done," he said. "You've got different seasons, and different things need done at different seasons."

The main reason Schumacher uses diverse crop rotations is improved soil health. "You're changing up the crop residues, and you're changing up your root systems or putting different root structures down," he said. "It stimulates different microorganisms, so you're getting more of a diverse, healthier structure."

Schumacher said he has noticed an improvement in his soil structure. "We're seeing a lot less soil plating," he said. "You go out there, and you dig up the earth, the earthworms are all over out there. I mean, it's amazing how much activity is going on in the soil because of the rotation."

The main benefit of the improved soil health, Schumacher said, is the conservation of moisture. "You're not relying so heavily on that next rainfall," he said. "The soil will keep the moisture longer." He knows it's working because he can see the difference on his irrigated land. "I figure we've cut back our water by 30 percent," he said. "I think it's a win-win really, overall."

Choosing a rotation

Producers thinking about adding diversity to their crop rotations will have to think carefully about the needs of their individual operations and resources available to them.

"You know, a lot of my rotation is focused on soil organic matter," Schumacher said. "So, we're trying to build that organic matter. You do that with the carbon, and so that's why my rotations tend to be leaning pretty heavily towards the corn and the grasses as opposed to the broadleaves." He said that he still uses broadleaf crops, but they appear less often in the rotations.

"The best rotation is kind of dependent upon your production system, what you have going on, what kind of your circumstances are," Osborne said. "If you're a producer who is wanting to look at lower fertilizer costs, those rotations where we have corn, soybeans, a small grain and a pea are very beneficial when you have those two legumes in there because they are providing more nitrogen. If you're just wanting to get more root growth, more roots there all the time, greater soybean yields, the ones with the winter wheat and especially where you have oats in that rotation."

The ability to either market or make use of each crop in the rotation will also affect producers' decisions, Osborne said. She said that a corn, oats, winter wheat, and soybean rotation would be an easy rotation for many producers to adopt at first.

"If it's a producer who has done just traditionally corn-soybeans, I would encourage them to include a small grain to begin with and kind of go from there," Osborne said. "Don't let one year discourage you, and don't put it on the worst land and think that it's going to improve it all of a sudden. You're building the system, and you're trying to get that system to work together. And so, it takes time to do that for the organisms to get those feedback loops and everything to get working together."

For questions about the Alternative Rotation Experiment, contact Osborne at <u>shannon.osborne@usda.gov</u> or 605-693-5234. To learn more about soil health and benefits of biodiversity, visit www.sdsoilhealthcoalition.org.



Marvin Schumacher includes milo as part of his diverse crop rotation which is designed to increase soil organic matter. Increased soil organic matter is associated with higher water infiltration rates and storage capacities. Courtesy photo.



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Growing Connections App Puts Solutions in the Palm of Your Hand!

The new Growing Connections mobile app creates a network of producers, landowners, gardeners, and ag industry professionals designed to help users get answers to their sustainable land management questions and share insights gained from their own experience. Released by the South Dakota Soil Health Coalition with the help of partners, this FREE app makes use of a network of verified and trusted mentors who are experienced in sustainable agriculture. Growing Connections can be downloaded from the **Apple App Store** or the **Google Play Store**, or it can be used in a web browser at <u>www.growingconnectionsapp.com</u>. Learn more about the app and download use instructions at www.sdsoilhealthcoalition.org/growing-connections-app.

List Land and Livestock on the SD Grazing Exchange

The South Dakota Grazing Exchange is a free website designed to livestock owners connect with land owners who have pasture, rangeland, cover crops, or crop residue available for grazing. Improve your soil by forming a private agreement to let a livestock producer graze your land! Find forage for this fall or winter! Learn more at www.sdgrazingexchange.com.

Register for the 2023 Soil Health School!

f you haven't attended one of SDSHC's Soil Health Schools, you're missing out! This outstanding event combines classroom presentations and field exercises with discussion and networking opportunities to benefit every producer, gardener or landowner, regardless of where they are in their soil health journey!

This year's school will be held Aug. 28-30 near Garretson, SD. Industry professionals and experienced producers are working to provide outstanding instruction for this year's school. A valuable part of the experience is the chance to meet and form connections with these instructors and other attendees! Class size is limited, so sign up today! The cost to attend is \$150 and \$75 for each additional person from the same operation. Learn more and register at www.sdsoilhealthcoalition.org/event-calendar/soilhealth-school. For questions contact the SDSHC at 605-280-4190 or sdsoilhealth@gmail.com.