



National Association of
Conservation Districts

Soil Health and Weather Extremes

NACD Soil Health Champions from across the nation discuss how soil health practices have impacted their operations in the face of extreme weather patterns.

INTRODUCTION

The National Association of Conservation Districts (NACD) conducted two focus groups in February 2019 to gain insights from agricultural producers who use soil health practices on the topic: “Exploring whether soil health practices mitigate extreme and variable weather events.”

A total of 22 producers from NACD’s Soil Health Champion Network participated. They represented six of NACD’s seven regions as follows: North Central, 7; Northeast, 2; Northern Plains, 2; South Central, 4; Southeast, 4; Southwest, 3. Fifteen states were represented.

Producers reported a range of farming operations, including: 11 reported row cropping with a diversity of crops including corn, cotton, dry peas, flax, forage, milo, peanuts, rye, sunflower, wheat. Cover crops and no-till were incorporated into their operations. Eight producers grazed cattle, four said they had incorporated cattle grazing into row-crop systems. Two operated dairy farms, one of them an organic, grass-based system. One producer who grazed cattle did so as part of a prairie/longleaf pine system in Louisiana. Cover crops across the spectrum included a wide range of varieties dominated by rye. One producer intentionally planted pollinator crops and native species. No-till adoption among crop farmers ranged from a few years to several decades.

Producers were asked a range of questions relating to soil health practices and climate. A list of questions is available at the end of this report. The questions led to wide-ranging discussions about extreme weather events and how they and their neighbors are responding. The discussion also focused on social resistance to adopting soil health practices and the lack of support in conversion to soil health practices from land-grant universities, and in some cases agronomists and conservation delivery system staff. Producer responses are collected below, following an Executive Summary highlighting key points that emerged from the focus group discussions.

Executive Summary

Producers in the two focus groups strongly agreed they have witnessed more extreme weather events, regardless of their region. While soil health practices increase their operations' resilience, they said yields and profits are impacted by the most extreme weather events, such as 100- or 500-year storms. Even then, they said their lower input costs compared to conventional systems make their operations more resilient. While they believe their systems are more resilient, they said peer pressure still prevents other producers from converting to soil health systems even when evidence shows its benefits.

When asked, "Have you or others in your community noticed any indications of new or changing weather trends in the last decade?" producers from all regions were nearly unanimous in responding affirmatively. As noted in the responses below, virtually every producer who spoke cited numerous site-specific examples of extreme and variable weather events that impacted operations. Prolonged drought, more intense winds, extreme heat and heavy rains at inopportune times were among examples cited. A New Hampshire farmer noted the lack of consistent snow cover leading to undesirable frost-thaw cycles. A Minnesota farmer said weather extremes are not new but building resilience with soil health practices should take place in any case. A Wisconsin producer noted, "In the last 10 years, we have had four 100-year storms." During a 13-inch rainfall in August 2018, several PL 566 flood control dams in the Coon Creek Watershed were breached, the Wisconsin producer said.

Several producers said in addition to extreme weather events, they had witnessed dramatic swings in weather conditions. A Minnesota producer summed it up this way: "We are going to get both wetter and drier." A Florida producer said, "We can't depend on weather patterns anymore." A Louisiana producer said, "We've had 10 years of swings that I haven't seen previously." Similarly, a Mississippi producer said, "I've been farming for 46 years, and we have more wide ranges and temperature swings now." A Minnesota producer said: "We get more extremes. We can have highs in the 90s, but now it's for longer times. We had a week of 40 below, then it went to 38 above zero, so we are having huge swings." Producers used terms like "erratic," "unpredictable,"

“inconsistent” and “unusual” to describe the weather extremes and weather swings they have witnessed.

Follow-up questions dealt with whether producers had made changes to their operations as a result of weather extremes, whether soil health practices increase resilience to weather extremes, if extreme weather events had inhibited successful implementation of soil health practices and whether yields/profits had been impacted by extreme weather events.

Producers from Louisiana and North Dakota said they have actually witnessed other producers in their area increasing tillage in response to weather extremes. The Louisiana producer said some are digging deeper ditches, although he has also seen some movement toward soil health systems. The North Dakota producer said windbreaks are being removed to increase tillage. Producers from several states said large farming operations are not willing to invest in soil health practices like cover crops, regardless of weather extremes. Several other producers said changes in practices are related more to economic decisions than weather extremes. An Indiana producer said he is seeing producers convert but would like to see the change come faster. A Mississippi producer said he had switched to wider cotton rows, which respond better to both dry and wet conditions. His cover crops help mitigate the impact of wind, but he primarily plants them for water retention. A New Hampshire producer said increasing diversity in cover crop mixtures and growing shorter season varieties for silage corn are among his adaptations. Several producers in both focus groups said regardless of weather extremes, peer pressure remains an obstacle to adopting soil health practices. Producers also cited examples where rented land was more difficult to convert to soil health systems because of landlord resistance.

Regarding their operations’ resilience, most farmers cited examples of where their soil health practices have helped. No-till helps “armor” the soil against weather extremes, said an Oklahoma producer. A North Dakota producer agreed, saying, “My soil is anchored.” A Maryland producer said that his continuous no-till since 1990 allows him to “get on the ground sooner,” even if it is moist. A New Mexico producer cited better infiltration and increases in well levels due to soil health practices. Producers said they believe soil health practices make their operations more resilient in several ways, although there’s little that can be done to mitigate weather extremes like 100- and 500-year

storms. As a Maryland producer said, “We traditionally designed ag practices on 10-year storms. Now we’re getting 50- to 100-year storms regularly.

Several producers said their operations are more resilient because they have used fewer inputs. Even if crop yields decline due to weather extremes, their net input costs are lower, so they can better withstand the extremes.

In response to a question about whether extreme weather conditions had affected yields/profits, the producers again noted they gain from fewer inputs. It’s important, said a Mississippi producer, to stress profitability rather than yield. “What does it cost to get that yield?” he said. A New Hampshire producer said that while saturated soils in autumn prevent some fall harvests, crop diversity can help mitigate the impact. A Louisiana producer said soil health practices have reduced the impact on profit because “I have much less invested.” Indiana and Oklahoma producers said they both saved several thousand dollars annually by going to no-till. A North Dakota producer cited major cost savings through reduced fuel use.

See responses that follow for more detail.

Focus Group Responses: Group 1

Producers who commented included:

IA (Iowa, north central part of state, corn and soybeans)

LA (Louisiana, Longleaf timber and prairie with cattle used to bio-mimic)

MD (Maryland, corn, soybeans, wheat, horse pasture)

MO (Missouri, corn, beans, wheat, pasture cow-calf, no-till since 1986)

MS (Mississippi Delta, retired and rents farm to two friends, 11,000 acres of cotton, corn and soybeans, irrigated)

NH (New Hampshire Sea Coast, direct market organic diversified, grass-based dairy)

FL (Florida, cotton, peanuts, produce, corn for wildlife in northwest part of the state)

MN1 (Minnesota, cattle, cover crops, forage crops, cash corn and soybeans)

MN2 (Minnesota, cow-calf, 80 miles north of Twin Cities)

NM (New Mexico, pollinator plants and native species)

OK (Oklahoma, cattle, wheat, rye, beans)

SC (South Carolina small grass-fed beef operation, rolling hills, Piedmont region)

Have you or others in your community noticed any indications of new or changing weather trends in the last decade?

MD: Noticed rainfall intensity is phenomenal. Traditionally designed ag practices were for 10-year storms, now getting 50- to 100-year storms regularly.

We had 70 inches of rain this year (at beginning of September, more since).

We have had major floods because of intensity of rainfalls. Snowfall totals have declined.

NH: We are seeing fluctuation as well in freeze-thaw. There is no consistent snow cover. The data backs snow cover fluctuation. Normally there is a consistent deep freeze over winter. There are a lot of stress and challenges on shoulders of seasons. Foresters are also challenged by the lack of frozen ground. There are many more days of saturated mud.

LA: We've had 10 years of swings that I haven't seen previously. It is very inconsistent. We had issues previously, but not this many. In 2011-12, we had extensive rangeland drought. We never saw that before. Had to supply water to cattle. In 2017, we had 17-degree weather with snow. We hadn't seen that kind of weather for that long, a week. 2018 was the wettest year we ever had.

Typically, fall is dry, but this year it was wet and soybean neighbors couldn't get in fields because so wet. Couldn't maintain fire lanes.

MN1: We've noticed you need to be ready for anything. There was a stretch in 1996 that it was colder and longer than the current polar vortex, and these have a tendency to happen. We are still doing all the things one should do to mitigate severe events, but I don't necessarily believe that severe events are occurring more frequently. But building resiliency in the system should occur. We had a lot of corn harvested in December this year because we were waiting for the ground to freeze.

MS: I've been farming for 46 years, and there are more wide ranges and temperature swings. It's not unusual to have 102-103, but with 96 percent humidity? Last year was wettest year we've had in a long time, but all the rain came during harvest. We had timely spring rains previously, but they don't seem

to be occurring anymore. But we also have more flooding than previously. We are seeing climate change from upstream. Wind is a major issue. Sand blasts the cotton, so farmers may have to replant. But you are losing a lot with double-planting, double-passes of tractor, etc.

FL: We've had 30 inches of rain since Thanksgiving. Some people haven't harvested yet. We used to, after dog days, get cotton and peanuts out. The last 10 years, can't depend on weather patterns anymore. Then there are the tropical storms or hurricanes.

MO: I believe in global warming, but sometimes it is blamed for natural cycles. We had a 500-year flood in 1993 and 2011. (The later one "was caused by Army Corps of Engineers" when levee was breached because of Mississippi River flooding.)

OK: We had 30.5 inches of rain this year, 10 inches above average. We also now have longer periods of drought. There are periods of extreme weather – snow, rain, hail and storms are worse. We've moved 100th meridian east 100 miles. The desert is moving east. I firmly believe we are causing all that. We went a long time with no rain at my farm (130 days) with rye behind beans in fall, it never germinated. Then we got a few inches of rain, and the rye germinated. Then wildfires came, and the germinated rye helped save our cattle because we could move them into the green.

NM: We had three big floods in the last year with economic impacts, one that shut down Interstate 25. There was a \$1.2 million loss on just one orchard. We get 7.5 inches of rain in a regular year. We had flooding events last year of five inches per hour, eight inches per hour and nine inches per hour. Locals talk about more fall rain, monsoons shifting more to fall and away from August to September-October. There are lower temperatures in late winter and then rising in early spring. Seems like the highs are staying the same, but the lows are getting lower.

MN2: In January, we've gotten rain in the last few years, and normally those would be snows. We traditionally get highs in 90s in the summer, but now for longer times. We just had a week-long of 40 below, then 38 above 0, so there are huge swings. In summer you have to be ready to go. If there's hay to be put up, you got to go.

SC: We've had extreme rains, but also drought. We had a pond from many years ago, but we went through some droughts and it didn't recover.

Are farmers in your area making changes to their operations in order to adapt to weather extremes?

MS: We've made cultural changes. We've gone to skip row cotton, 30-inch rows. In dry extremes, it uses water better. We're not the pioneers, many people are doing it. We're taking the whole farm to 30-inch rows. In soybeans, the canopy closes quicker. Cover crops help with wind, but I am into them for the moisture. With our cereal rye, we kill it 10 days to two weeks before planting. If we have a dry situation, it then acts as a cover and acts to help preserve moisture. I am disappointed in the land-grant universities for not going after cover crop research.

MO: A lot of neighbors going for no-till because of money (not climate). It saves a ton of money.

NM: There is potential for people to start adopting "socially risky" practices by having conversations. We have the technology, it's a matter of promotion and adoption.

NH: With extremes in season shoulders, the diversity in the operation is important. We are seeing more adaptation in the area with ZRX rollers for crimping in field, cover crop cocktail mixtures and shorter season varieties for silage corn. There are more conversations throughout the region, and willingness to adopt soil health practices. It has only started to change in the last two years. The conservation district has equipment available, but you also need a leader in the community who can be a showcase.

OK: Peer pressure is a problem. A neighbor was doing great, but had a hiccup with weather, and he was worried about what people would think about how his system looks. I guided him through the failures and reminded him that everyone experiences failures.

A story about peer pressure: I was growing cowpeas as cover crop seed. I had harvested my soybeans (I was told you can't raise them). I went to the coffee

spot and was questioned on my operation. My response was, "There's a market and a window." Another producer questioned me, so I asked, "How many times have you plowed ground?" The guy said it was his fifth time. I said, "All you've done is spend money, and you're planting wheat. I generated revenue." I don't like doing that, but there's so much peer pressure, and I want to challenge that.

MN1: We need to quietly go about helping people through peer pressure.

MO: There's this big mentality in the room with farm, the chemical pressure to start clean, stay clean. Farmers are creatures of habit.

FL: When we started strip tilling peanuts, a neighbor suggested I couldn't make 5,000 (pounds per acre) peanuts. I said I don't have to, because I make two trips across field to his seven or eight.

SC: People are changing, but it's for the money. People are adapting money from conservation practices for their own needs, not necessarily for conservation. It would be more effective if the producers are ranked by the rest of their operation in order to get funding. I suggest a point system.

OK: I met with the state conservationist recently and suggested an incentive to pay producers for cover crops, maybe a five-year plan with cover crops for at least three years. The goal would be to get incentives out there, but efficiently.

Have extreme weather events presented obstacles to successful implementation of good soil health practices?

OK: We never had soil blow again after started cover cropping. We can't rely on the old norm, so we're trying to grow something that will fit the window of the weather.

NM: Does the modern earth have the capacity to deal with storm events? I have a concern that earth does not have the capacity.

MD: We are looking to change designs for conservation structures.

Have extreme weather events affected your yields?

MN2: It has affected my neighbor's yields.

NH: When you have saturated soils in the fall: that's it. You can't get fall cuttings. Everything grows great, but then you are getting zero yield. But with diversity, it's not all zero, and good practices across the board help mitigate the issue.

OK: You're going to have zero years.

MS: Or affect profitability? What does it cost to get that yield?

Do soil health practices such as no-till and cover crops reduce soil loss in your operations during periods of heavy rainfalls? How? Do soil health practices increase your operation's resilience to drought?

MO: No-till and cover crops help soften against changes. It might keep the soil wetter longer, but it helps develop soil structure to reduce damage. I think no-till will work anywhere.

IA: We have been no-till since 1983. We added cover crops five to six years ago. The change in soils occurred after cover crops. We finally got our neighbors to a field day. We walked out in the field, and there was no mud on their shoes. That's what convinced them. I used to kill worms and other soil life, but now I'm seeing a lot more soil ecology.

MD: We have been continuous no-till since 1990. We can get on the ground sooner if it is wet. Benefits: on the ground sooner if its wet. During rain events, residue moved, but the soil did not. As a soil conservation district employee, I have seen transition to no-till and cover crops be very successful. We used to push filter strips, but now no-till farms take care of that.

SC: With no-till, the rain is going into the soil. Some of my neighbors have fields that are muddy messes. And when you do soil health practices, you're building soil root structure. I can go two months before I'm feeding hay, unlike most others. My soils have more resiliency and help me survive a drought, provided the root structure is built up.

FL: Fifteen, 16 years ago, I rented a 350-acre piece of land on a creek with terraces from a coffee shop farmer, it was about to wash away. I started no-

tilling, moved into strip tilling. We've never stuck a harvest machine after getting it built back.

LA: Using cattle for biomimicry in a prairie regime is positively influencing soil health. Brush species are down, and carbon is stored. My forestry buddies are not impressed, and my cow buddies are not impressed. My systems are making money, but it's a different model. The key is to talk. We need to sit down and explore different ideas.

NH: We need to bring in real data to conversation. The science can help provide the markets and incentives.

Focus Group Responses: Group 2

Producers who commented included:

IN (Indiana corn, soybeans, wheat, cover crops)

LA (Louisiana corn, soybeans on a cotton/rice farm, a few cows with rotational grazing)

WI (Wisconsin dairy in Driftless Region)

MN (Minnesota corn, soybeans, 100 percent cover crops)

ND (North Dakota, near Canadian border, oats, barley, canola, dry peas, soybeans, sunflowers, corn, rye, full-season cover crops, flax)

OK (Oklahoma corn, soybeans, wheat, milo, dry land)

WV (West Virginia pasture)

Have you or others in your community notices any indications of new or changing weather trends in the last decade?

WV: This was our wettest year on record. Our driest month is historically October. Now it's the wettest. Not sure the implications for the district. Most are cattle farmers. I'm sure the wettest month is going to have an impact.

MN: We have lots of extremes. Extreme cold, windstorms, extreme rain and too much of it. We are going to get both wetter and dryer.

WI: We're experiencing extremes. In the last 10 years, we've had four 100-year storms. We are averaging 28-29 inches of snow and 50-some-inches of rain. Last year, planting didn't start until the 18th of May. That's the latest I've ever started.

OK: I've been farming for 50 years. We get 40-inches per year of rain. But in the last 10-15 years it's been erratic. In 2007, we had a 500-year flood. That's when I went to no-till.

IN: In 2017, we had a six-inch rain event in July. If you're losing 10 percent of your crop (to rain), it's not sustainable.

LA: Infiltration rates play a key role. My review is that we are seeing more consolidated rain events. That leads to more irrigation for those in tillage. Those in full tillage are suffering the worst during these events.

WI: In the Coon Creek Watershed, the PL-566 structures failed during the rain event in August 2018. Actually, it was the land the structures were built on (berm) that failed, not the structure, themselves.

Are farmers in your area making changes to their operations in order to adapt to weather extremes?

OK: We had that 500-year flood in 2007, and that's when I went to no-till. It woke me up. Change your ways or close the doors. By changing to no-till, I welcome the weather events, but the weather events are definitely changing things. No-till armored the soil. The rains don't tear things up, and the water infiltrates better.

LA: I'm seeing some of the opposite. I see neighbors digging ditches deeper.

ND: I see the same. There's more tillage being done, windbreaks being pulled out. Seems to be following the money.

LA: Are you saying the poor people are tilling to get more out of the land?

ND: Yes.

LA, OK, MN: The big farms are not wanting to invest in cover crops, etc. They're the ones not wanting to do it.

IN: I encourage neighbors to start small, give it a chance over multiple years. That's how I got started.

OK: I have a problem getting neighbors into cover crops, but they'll get into no-till.

LA: It's changing. Some neighbors are finally seeing the difference and they're on board.

WI: Some of this can be the age of the landowner, the farmer. The peer pressure some folks feel.

LA: I had a landlord say not to do that on his land. But I encouraged him to come to my farm to see it. He was OK with the short covers, but not the tall covers. He is 82 years old. It's a mindset.

ND: I had a similar experience. By the end of the next year, my landlord changed his mind.

OK: Why would a renter put in covers if you're not sure you're leasing next year? You must have a longer investment. The answer to the question is no. Decisions are more tied to economics.

IN: It's more positive in my area, but I want it to move faster.

MN: We formed a cover crop group. It's been great. There are seven like-minded people. It's been huge. We have been meeting for three years. We get together three to four times per year. We do an aerial seeding. We get together about what we want to do on seed mixes. It's really helped get us organized. It's no longer "look at that one guy." The group is pretty honest. They share a lot of information. It's helped.

Have extreme weather events presented obstacles to successful implementation of good soil health practices?

LA: Negative. My soil is holding too much water, and it sits. My planter going over that is not good. Clay soil stops the water from going deeper, so it just sits.

IN: I suggest trying tiling to get rid of the excess moisture. Wherever I have tile installed, yields go up.

OK: We need to be champions of these practices in our area.

ND: My neighbors are following us now, because they see how we've successfully managed.

Have extreme weather events affected your yields/profits?

LA: Much less than before. I have much less invested (in inputs).

IN: It's the seven-inch rains now that affect my yields, but no longer the two- to four-inch rains. The risk is less because of fewer inputs. We can manage the two- to four-inch rainfalls better.

WI: You don't see the impacts of drought as quickly, as the land is holding more of the water.

MN: I quit treating the soybean field. It was a cost-savings, and my yields are better. My neighbor's yields were lower, and it was treated seeds.

LA: Soil temperatures are going to be lower with cover crops.

OK: It's important to get the economics tied to the warm and fuzzy/spiritual side of it. There are so many intangibles.

IN: If I were to do full tillage, I'd have to spend another \$6,000.

ND: I am using so much less fuel than previous generations. Your next best practice is your next best improvement. Some crops really respond to organics. You're going to have healthier soils and plants. I apply 20 percent less fertilizers than my neighbors, and I don't spray for insects anymore. You might just be a few days from the good insects coming along to take out the bad.

Other topics that arose during Focus Group 2 discussions:

LA: We need uniform research with NRCS. The research from land-grant universities is being funded by corporations. Some district conservationists are not wanting to get involved. Agronomists are starting to.

MN: Cooperatives and agronomists are staying out of it.

APPENDIX 1

Following are the questions used to guide focus group discussions, although both groups did not get through all questions:

Have you or others in your community noticed any indications of new or changing weather trends in the last decade? (Such as but not limited to longer/shorter frost-free growing season or more/less annual rainfall.)

Are farmers in your area making changes to their operations in order to adapt to weather extremes?

Have extreme weather events presented obstacles to successful implementation of good soil health practices?

Have extreme weather events affected your yields?

Do soil health practices such as no-till and cover crops reduce soil loss in your operations during periods of heavy rainfalls? How?

Do soil health practices increase your operation's resilience to drought?

Which soil health practices in your operation are most beneficial for building resilience to extreme weather events?

Report submitted by Bill Berry, NACD contractor. Focus group notes taken by Beth Mason and Ariel Rivers of the NACD staff. Thanks to Clay Pope of the USDA Southern Plains Climate Hub for opening remarks at both focus group sessions.