



IOWA STATE UNIVERSITY
College of Agriculture and Life Sciences

Agriculture in a Changing Climate: What the Future Holds for Iowa

Summary of November 25, 2019 ([VIDEO](#))

On November 26th, 2019 an unprecedented gathering of Iowa agriculture, business, academic, government and conservation leaders met at the Savery Hotel in Des Moines to discuss the future of Iowa's agriculture. The group sought to bring a truly multi-stakeholder view to the extreme weather events Iowa farms, ranches and woodlands are experiencing, using this perspective to both understand the problems and highlight solutions that well-managed landscapes can deliver in support of global climate and other Sustainable Development Goals (SDGs).

Their conclusion: Iowa's farmers will need science and policy working side-by-side to adapt to climate challenges and take their rightful spot at the forefront of reaching desired food system, energy, environmental and climate outcomes.

The forum was co-sponsored by [Solutions from the Land](#) (SfL) and [Iowa State University's College of Agriculture and Life Sciences](#) (ISU/CALS). It was hosted by the [Iowa Smart Agriculture Work Group](#), a group of Iowa agricultural thought leaders and value chain partners leading an Iowa Smart Agriculture Initiative that is building a 2050 vision for Iowa's food system. The Work Group's Co-Chairs, SfL board member Ray Gaesser and Dean Daniel Robison of ISU/CALS, opened the forum. "What we do in agriculture how we treat our landscapes has everything to do with what the future holds for us, our children and well beyond that," said Robison.

The Co-Chairs' introduction was followed by comments demonstrating the commitment of Iowa's elected officials, given by Paul Trombino, Chief Operating Officer for Governor Kim Reynolds, Governor; Carol Olson, State Director for U.S. Senator Chuck Grassley; Dustin VandeHoef, Special Assistant in Agriculture for U.S. Senator Joni Ernst; and Kaity Patchett, District Director for U.S. Representative Cindy Axne. The legislative representatives read letters and spoke to the audience to pass on messages of support for Iowa's agricultural producers as trusted stewards of the land, with huge potential to advance both conservation and innovation into the 21st century. "Agriculture is the lifeblood of Iowa," reaffirmed Paul Trombino.

"What are agriculture and climate science telling us?" is a question everyone whose life touches Iowa's number one industry must answer. It was addressed at the Forum by a group of scientists representing government, Iowa State University and interested NGOs. The overall message: regardless of cause, climate is changing, and farmers and scientists must work together to ensure sustainability of individual farms and broader agricultural landscapes under the "new normal." Some solutions are farm-by-farm, taking advantage of each property's unique conditions and management – others may involve shifts as widespread and far-reaching as changes to federal

policy. A “new economy” in which soil carbon levels are valuable for both production and climate has emerged.

Climate variability is a serious threat and a global issue. Scientists say it is no longer a future issue but a present threat. Dr. Cynthia Rosenzweig, Senior Research Scientist for the NASA Goddard Institute for Space Studies at Columbia University, [explained](#) that changes in the climate are a contributing factor to impacts on the food supply across the world. These are already being felt in the food systems of the United States, southern Europe, Japan and Pakistan, among others, as documented in the [IPCC Special Report on Climate Change and Land](#).

One of the report’s core themes is that while climate change is a threat multiplier that will likely result in food system instability, many opportunities for adaptation and mitigation exist through the supply chain, including carbon capture – which draws carbon down out of the air and helps slow or reverse climate change – and reclaiming the 25-30% of food that is currently lost as waste between farm and fork. Agricultural production must also be made more resilient to extreme weather to maintain food availability, price, quality and stability.

Dr. Rosenzweig emphasizes that the report does not dictate how “everybody, everywhere” should adapt, as farm systems are unique to their individual geography and conditions. She also lifts up another low-carbon climate solution pathway in the report, “something that's being very much tested and explored here in Iowa: that bioenergy can be done sustainably. We have to work hard to make it happen.”

Dr. Dennis Todey, director of the USDA Midwest Regional Climate Hub, [agrees](#) that climate change is here now, and that even the present growing seasons already indicate climate variability has arrived in Iowa. Based on data from the National Climate Assessment, Todey says the main issue in the upper Great Plains and Iowa is too much water at the wrong time. Average statewide precipitation since 1895 shows that rain is falling with higher volumes and less predictability in the spring and fall, “flashier” precipitation.

According to Todey, Iowa is also warmer over the winter, adding nine or more frost-free days to the growing season; but these cannot be relied upon and are highly variable given other factors. In the summer, Todey says the warming is showing itself at night. Average overnight temperatures are increasing, which may strain livestock. Further issues include insects and weeds who thrive in warmer temperatures or wetter soils.

“We are likely to get wetter in the winter and spring and drier in the summer, exactly what we don’t want in the way of our typical production here,” said Todey. “We are bound to get warmer. Exactly how warm is based on a number of different issues.”

All those observed changes have a direct impact on the soil. Dr. Michael Castellano, professor at Iowa State University Department of Agronomy, [has felt](#) the same challenges as the farmers he serves as he struggles to manage his research plots in the spring and fall. His research indicates that as fields change, some parts will need to be abandoned, while others may become more productive. The influx of water to the system is a special challenge. Dr. Castellano asserts:

“This increase in precipitation not only make challenges for crop production more complex, but it also challenges many of the practices that we describe as solutions to climate change. Things

like cover crops, precision nitrogen management, no till... These become tougher and tougher as we see this increasing precipitation.”

Castellano said the nitrogen plants need first and foremost comes from organic matter. The highest levels of organic matter in a field are typically found in the low-lying areas prone to flooding. Water prevents soil microbes from transitioning that organic matter to available nitrogen for the plants. What should be the highest yielding areas of a field based on organic matter are some of the lowest yielding areas because of excess water.

To make sure that increased soil organic matter – which also captures soil organic carbon – will lead to plants being able to access the necessary nitrogen, Castellano called for high nutrient *cycling*, not high nutrient *stocks*. To keep soil microbes doing their job, farmers should pursue improved drainage infrastructure which is compatible with water quality. Combined with conservation practices like buffer strips and wetlands – and with the policy backing and resources for the required structural overall – diverse landscapes and modernized infrastructure may together offer potential irrigation solutions during the summer months with less rainfall.

Those conservation practices may help address another major result of the increased precipitation. Falling water is powerful and when 40 inches of rain on 100 acres exerts a force equivalent of 4.7 tons of TNT, soil often goes along for the ride. Erosion is a major concern, [according to](#) Dr. Richard Cruse, professor at Iowa State University Department of Agronomy and director of the Iowa Water Center.

The ability to sequester carbon and nutrients in the soil hinges on keeping the soil where it is, which requires early planning: the ground must be covered by a plant canopy or residues at the right times, in the right places, with the right coverage. These “where,” “when,” and “how much” questions need to be asked in advance to determine the fingerprint of erosion.

The [Daily Erosion Project](#) collects this information using remote sensing over 200,000 field slopes in Iowa. According to Cruse, two different computer programs have used the data to estimate an average loss of about five tons of soil loss per acre per year in Iowa. Concentrations of soil loss occur in areas with more hill slope; areas like the Loess Hills of southwestern Iowa and east central Iowa, where the Des Moines lobe of the glacier didn’t grind the ground flat.

What kinds of ground cover will best slow down the water? Using his computer modeling, Cruse estimated the impact of planting switchgrass on hill slopes. The greatest impact can be made with hill slopes over 10 percent. In southwestern Iowa alone, perennial planting on those hill slopes reduced soil erosion rates from 13 tons per acre per year to three tons.

Cruse points out the spring rains we’re seeing may have an even bigger impact on erosion. Soil is most vulnerable after tillage and before the crop canopy is established. “We’re moving the vulnerable time for the soil into the period where precipitation can cause more problems.” Cruse’s suggestion is a systems-based approach, that includes things like no-till and perennials. Farmers who have implemented those practices are seeing it.

“Perennials are essentially to agriculture what exercise is to human beings,” [said](#) Dr. Emily Heaton, associate professor at the Iowa State University Department of Agronomy. “It’s free,

you know how to do it, you know you should do it, and you know it will solve almost every problem you have.”

Integrated prairie strips are a tool being used across the Midwest and is now included in the USDA-NRCS Conservation Reserve Program under the 2018 Farm Bill. Heaton asserts prairie strips are cheaper than installing terraces that are no longer effective at higher levels of rainfall. Even 10 percent coverage of perennials added to no-till corn-soy field can lead to a 95% reduction in sediment loss.

Strips may not be suitable for every field, but there are a wide variety of perennial grasses available in the tool box. The roots are deeper and serve as rebar improving the strength of our soil. Perennial grasses can be used for renewable energy, livestock feed, bedding and disposable products. “What’s the biggest egg producing state in the country,” said Heaton. “Wouldn’t it be cool if we grew the egg cartons here too?”

Heaton also looked at areas that might be best served in perennials to help profitability. With minimal input cost after installation, thoughtfully applied perennial grasses may make a farmer more money than corn and soybeans. Though there’s no current market for perennials, farmers can identify individual locations in the field that are not productive and where perennials like switchgrass and native tall grasses are well suited. Retiring these unproductive locations within fields to perennials will do no economic harm: less than five percent of Iowa farmland loses money every year.

At the farmer panel, Bryan Sievers of Sievers Family Farms (selling custom-fed cattle), Bill Couser of the Couser Cattle Company (cattle and grain) and Dave Walton at Walton Farms (which raises corn, soybeans, hay, cattle, sheep) mused on what they had heard and on the challenges that have faced their own operations – the boots-on-the-ground obstacles to profit per acre that farmers must diversify their systems to overcome and survive.

“Before you’d get a shower an inch of rain a week. It’d soak in and you’d get back to work in a day or two,” said Dave Walton of the “flashy” precipitation that’s plagued his Cedar County operation. “Now we’re seeing those 3- and 4- and 6-inch rains that are really hammering us that are coming more often. And then it stops all together.”

After implementing conservation practices that he once viewed with skepticism, Dave emphasizes that farmers must observe and question everything, as well as reach out for new sources of knowledge – including and especially tough conversations with the next generation of farmers. If new ideas don’t work, the key is to learn from mistakes and embrace failing gracefully.

Bryan Sievers is trying to minimize impacts by closing the energy cycle in his own beef cattle feedlot operation. He’s using anaerobic digester to decompose organic matter in a couple of days rather than the years it takes in the soil.

“It may just be some of the things we’ve stumbled upon with regard to our soils and what we’re seeing from the practices we’re seeing may be providing us an opportunity to weather proof those soils,” said Sievers. He says that cover crops are particularly well suited to helping reintegrate these recycled nutrients.

Bill Couser emphasized that new technologies and science are key to many of these conservation processes. His farm worked with the John Deere Company to find a baler that helps minimize nutrient loss and has enabled them to start developing new products and feeds.

Couser discovered that by taking away residues like corn cobs which are resource-intensive to break down while leaving “what needs to be on there,” then incorporating them into cattle feed instead, he was able to improve profitability per acre while increasing his soil carbon content. However, without the work he’s done directly with Iowa State University, Couser would have no reliable metrics to show how his practices have improved the water and soil.

The lack of reliable metrics is only one obstacle to initiating these land management changes. Many farmers rent land rather than owning it. Experimentation is often punished, not rewarded. Everyone agreed the most opportunity to effect change lies in policy and incentives, including the potential for carbon markets or other compensation for ecosystem services. The Farm Bill included multiple programs that would impact these areas, but many went unfunded.

When the floor was opened to farmers in the audience, Wayne Fredericks, a farmer from Osage, Iowa stood up to contribute: “Farmers aren’t denying that the climate is changing. We’re trying to figure out how to farm as it happens... and profitably.” He also spoke to his own experiences with conservation practices: “We don’t have to measure it, but I can tell you when we moved from a tillage system to no-till we can see it. We don’t have to go into the waterway and put that sediment back on the field.” In the end, farmers have the final perspective on how these practices will affect their local landscapes.

Those in attendance valued the robust and multi-dimensional discussion. “I appreciate that you all are here,” said Iowa Secretary of Agriculture Mike Naig. “The reality of farms across the state is that we need to figure out how to be resilient in the face of changing weather.”

Jerry Hatfield, Director of the USDA National Laboratory for Agriculture and the Environment, reviewed some of the issues that had been presented at the forum: that the future of ag in Iowa will be shaped by keeping water where it needs to be in healthy, quality soil; taking advantage of workable field days in the spring and fall; and improving gas exchange for operations like Bryan Sievers’. Increased yields are not and have never been the true goal: the real goal is efficient production, farm profitability and sustainability. As such, producers may be able to partner with researchers in shifts from small-plot pilots into realistic, landscape scale work.

However, Hatfield was positive about facing the barriers ahead. “We have to enhance our soils. The path will be complex. Will it be economic, regulatory or reward? We know what we need to get done,” he said. While ag may be accused of being doom and gloom, he reiterated that there are opportunities to build a new agricultural system to capture environmental value.

Fred Yoder, Chair of the North America Climate Smart Agriculture Alliance and an SfL Co-Chair, [supported](#) the message that “ag is not broken.” He warned that instead, climate challenge goals cannot be met without embracing technology and innovation.

He cited the three pillars to climate smart agriculture: 1) Adaptation and resiliency, 2) productivity, and 3) greenhouse gas reduction, noting that the first and second pillars lead to the third.

Yoder admitted that agriculture and science may not have all the answers today, "but we have some of the answers...We need tools in the toolbox to build resilience and mitigate climate impacts...We need farmer leaders to integrate all of this into the system."

He added that farmers learn from other farmers, and farmers from Iowa will lead the effort to meet the climate challenge. It is thus critical that agriculture assert its leadership position now, taking an active role in decisions being made at all policy levels, including global, national, state and local. Otherwise, ag risks losing a place at the table to interests that won't necessarily represent the ag sector's positions.

"If agriculture doesn't lead, others will," Yoder said.

Ray Gaesser returned to the stage to thank everyone for their participation in the forum. Reinforcing Yoder's point, he reminded everyone that "this is about mobilizing leaders, solutions from the land and (helping) the next generations in Iowa."

The Iowa Smart Ag Work Group reconvened the day after the forum to discuss their findings and continue the conversation on how to create a path forward. In Iowa and around the world, the dialogue on the solutions that can be provided from the land will continue to become more and more critical in days to come.

FOR MORE INFORMATION: [Dr. Kendall Lamkey](#), professor and chair of the Iowa State University Department of Agronomy or [Ernie Shea](#), Solutions from the Land 410-952-0123.

Solutions from the Land (SfL) is a non-profit entity focused on land-based solutions to global challenges. SfL identifies and facilitates the implementation of integrated policies, practices and projects at a landscape scale that will result in land being sustainably managed to produce food, feed, fiber and energy, while enhancing biodiversity, protecting and improving critical environmental resources and delivering high value solutions to combat climate change. For more on ***Solutions from the Land***, click [HERE](#).