

health. Scientists love those numbers, but it's not clear they serve much of a purpose on the field level. And it's not just farmers who need practical indicators of whether their techniques are taking soil health in the right direction. Food companies like General Mills have shown interest in paying premiums for products raised in a soil-friendly way. Consumer surveys show food produced using soil smart methods is a selling point. But how do we create indicators that are universally recognized and meaningful, and yet useful to individual farmers?

"At this point we are just so far from connecting functions like nutrient release or crop yield to any of the indicators we're using," says Cates.

As a result, MOSH is collecting soil health indicator data from farms across Minnesota. The office and its partners hope to eventually have a database of regional soil health measurements, a suite of case studies highlighting farmers who have adopted soil health practices, and a detailed economic analysis of soil health management systems.

Cates says one key way MOSH is making practical use of this research is to conduct trainings with people who work directly with farmers on soil health techniques: staffers with Soil and Water Conservation Districts and the USDA's Natural Resources Conservation Service, for example. Other "audiences" MOSH would like to build relationships with are input suppliers and crop consultants, two groups that are also extremely influential in farm country. In Indiana, similar outreach to these latter groups has fueled successful efforts to expand cover cropping there.

The 250-Bushel Bugaboo

Cates and Lewandowski say an Upper Midwestern state like Minnesota faces its own particular challenges when it comes to adoption of soil health practices. Besides cold, wet soils and a short growing season that can disrupt efforts to grow cover crops and utilize no-till, there is the issue of, ironically, good soil fertility. In a sense, Minnesota's position represents a Venn diagram encompassing the highly productive Corn Belt to the south, and the climatic limitations of the High Plains and Canada.

"And where those two intersect, you have the pressures of the cold climate growing season on top of the pressures of you could be growing 250-bushel corn on this land," says Cates. "And anything else looks like a waste of time."

Indeed, Minnesota lags behind Iowa, Illinois, Indiana, Wisconsin, and Michigan in the number of cover cropped acres, and is dead last in the country when it comes to how much land is managed under no-till.

But extreme weather conditions brought on by climate change are making it a little less of a sure bet to raise 250-bushel corn consistently in places like southern Minnesota. In a sense, all those non-gamblers are having risk visited upon them in the form of a changing climate. This may make efforts that build soil resiliency more appealing, no matter what the land's corn suitability rating.

And getting more late adopters on board with building soil health has taken on a sense of urgency when it comes to the state of the larger landscape. Namely, it's become evident that many water quality problems can be traced to how the soil is treated on farmland. Healthier soil sheds fewer contaminants, including chemicals and sediment. It also manages water better,

an increasingly important service as climate change spawns intense storm events. Lewandowski says that's why an interdisciplinary approach to building soil health is key. Not just soil scientists need to be involved, but people who know about hydraulics, economics, cropping systems, plant pathology, and engineering. Even specialists who can speak to how policy impacts farming methods or what the food industry is looking for are needed. A place like the U of M is where all those areas of expertise are represented.

"This isn't just dealing with nitrogen or just dealing with a particular pest or something," says Lewandowski. "This is a systems approach."

But she and Cates make it clear that no matter how much scientific clout MOSH can bring to the table, in the end what matters is making sure the true leaders in this movement, farmers, are listened to. After all, they are the ones that have to implement these practices on a daily basis. That means providing them hard evidence to back up what they are seeing take place in their own fields as they take those first steps beyond non-adopters to early adopters. In a sense, the U of M is arriving on the soil health scene at about the same time that an increasing number of conventional farmers are as well.

"The University isn't the fastest moving organization on the block, but we're getting there," says Cates while sitting in her cramped basement office on the U's St. Paul campus. "Now I think we need to get to those people who wouldn't enjoy that role of being an early adopter, but are excited about changing some things." □

For more on the Minnesota Office for Soil Health, see www.wrc.umn.edu/mosh or contact Anna Cates at 612-625-3135.

Soil Health Stats: Good News & Bad News

Since 2012, the USDA's Sustainable Agriculture Research and Education program and the Conservation Technology Information Center have been working together to survey farmers across the country about cover cropping practices. The surveys have unearthed some promising trends in the soil health movement.

For example, the 2019-2020 survey found that around a quarter of the 1,172 respondents had more than 10 years of experience with cover cropping. These are the early adopters and they have become committed to not only building soil health, but adding new twists in the future such as interseeding and planting row crops into living covers. But just as exciting is that just under 12% of the survey respondents had

started planting cover crops sometime between 2015 and 2019, which represents a significant number of later adopters.

They represent a promising future, but that future needs to come a little sooner. Minnesota is a poster child for the potential, as well as the reality, in terms of soil building practices.

The good news is that between 2012 and 2017, cover cropped acreage in Minnesota increased almost 42% to 579,147 acres, according to the U.S. Census of Agriculture. However, that only represents 3% of cropland in the state. Perhaps even more troubling, only 5.8% of Minnesota's crop acres are managed under no-till, which, percentage-wise, puts the state dead last in the U.S., according to the Soil Health Institute.

Nationally, a similar dynamic is at play:

trends are encouraging, but we've got a long ways to go. U.S. cropland planted to cover crops increased 50% between 2012 and 2017, a jump from roughly 10 million acres on 133,500 farms to more than 15 million acres on 153,400 farms. But overall, less than 6% of U.S. cropland is cover cropped.

The good news is that there's little doubt that farmer-to-farmer networks can produce results when it comes to adoption of soil health practices. For example, the Land Stewardship Project has been working in southeastern Minnesota the past few years to bring early adopters and late adopters together through the Soil Builders' Network. According to a Minnesota Department of Agriculture report released in July, all the counties in that region — with the exception of Houston County — are showing cover crop adoption on over 10% of the farms.