

Myth Buster Box

An Ongoing Series on Ag Myths & Ways of Deflating Them

→ Myth: Deep Soils Are Always Healthy Soils

→ Fact:

The depth of soil in the American Corn Belt is legendary.

One popular saying is that some Midwestern soil is deep enough to bury a pickup truck in — vertically. In many cases, such images are not that far from reality. But there is a danger of equating soil depth with soil health or soil productivity.

It turns out a relatively small portion of the soil profile is where most of the biological magic takes place in terms of productivity. It's called the "A horizon" — the darker part of the profile we know as "topsoil," and it's full of the living microorganisms and decaying plant roots that create organic carbon. Sitting on top of the topsoil is the "O horizon," which is made up of dead plants and other organic material in various stages of decomposition. Beneath the A horizon is the subsoil, which normally has less organic matter than the A horizon, so it is generally a paler color. Below that is the "substratum" — a layer of rock and mineral parent material that has not been exposed to much weathering, so is pretty much intact. Finally, in the deepest recesses of the land's basement is bedrock, or the "R horizon." All those horizons play a role in making this resource so useful for doing everything from producing food to managing water and storing carbon. But topsoil, despite the fact that it can occupy a relatively narrow space compared to the other horizons, punches above its weight in terms of biological activity. If soil was a car, topsoil would be the gas tank, and without it, that car doesn't go very far.

That's why a recent study showing that a third of the farmland in the Corn Belt — that's some 100 million acres — has lost its carbon-rich topsoil to erosion since we started plowing it is so troubling. The study, published in the journal *Proceedings of the National Academy of Sciences*, was based on an examination of corn and soybean fields in Indiana, Illinois, Minnesota, and Iowa.

Because the A horizon is darker, scientists were able to use satellites to compare the color of soil with the USDA's direct measurements of soil quality. In many cases, the lighter colored soil they documented contained so little organic carbon that it wasn't

even considered A horizon soil anymore, even though it was sitting where topsoil was supposed to be. In effect, erosion was so bad the subsoil had become the topsoil. The bottom line: the removal of all that rich topsoil has released nearly 1,500,000,000 metric tons of carbon and reduced corn and soybean yields by 6%. This is costing farmers some \$3 billion annually, estimate the researchers.

The study found that the greatest loss of carbon-rich topsoil was on hilltops and ridgelines, a sign that repeated tillage is taking its toll. You don't need satellite imagery to witness some of this firsthand — when you drive by a field that has lighter, tannish colored soil at the top of a ridge, that means the A horizon has been seriously compromised.

This study indicates that we have lost much more fertile topsoil than the USDA has been estimating. Some soil experts have questioned the *Proceedings* study's methodology, but acknowledge that even if it is exaggerating the loss, we are still losing that A horizon at a troubling rate. And that causes numerous problems on and off the farm. For one thing, if a field is to remain productive, the fertility benefits provided by a biologically-active A horizon need to be replaced somehow. In most cases, that means adding more petroleum-based fertilizer, which is already a major water quality problem when it escapes agricultural acres. And loss of carbon-rich soil means more greenhouse gas emissions.

It doesn't have to be this way. Farmers throughout Minnesota and the rest of the Midwest are utilizing regenerative practices like no-till, cover cropping, managed rotational grazing, and diverse rotations to build back soil health and sequester carbon. In fact, recent scientific breakthroughs show that farmers have a much greater ability to send soil health trends in a positive direction than once thought. LSP's Soil Builders' Network initiative (page 27) is working with hundreds of farmers who are proving soil healthy practices can be practical and profitable.

But regenerative practices won't become

enough of a norm to have widespread landscape impacts without public support. For decades, government subsidies and tax-funded land grant research, along with market signals, have made raising corn and soybeans in an intensive, soil-damaging manner just about the only game in town. Stepping out of a monocultural, input-intensive system can be accompanied by significant financial risk. Converting to no-till and managing cover crops costs time and money. No wonder less than 15% of farmland in the upper Mississippi River watershed is managed using no-till methods, and under 3% of Minnesota crop ground is cover cropped any given year, according to estimates.

That's why the provisions of the "100% Soil-Healthy Farming Bill," which LSP introduced in the Minnesota Legislature this year, are so critical. Studies and surveys show that once farmers have transitioned into a practice like cover cropping or no-till, they see higher yields, more profit, and resilient soils. But it takes a couple of years to go from good idea to practical, everyday field method. Bridging the gap to ensure that regenerative methods are profitable in the near term removes financial barriers that often limit farmers' ability to put in place long-term investments on the land.

States like Indiana, Illinois, and Iowa have shown that public cost-share and grant programs can play a significant role in increasing the number of "soil smart" acres. They've committed to helping farmers bridge the innovation gap. It's time we did the same in other states, before the other two-thirds of the all-important A horizon ends up over the hill.

More Information

- To read the *Proceedings of the National Academy of Sciences* study called "The extent of soil loss across the US Corn Belt," see www.pnas.org.

- For more on the "100% Soil Healthy Farming" legislative provisions, see page 8.

