

Principles for Healthy Soil

Ian Cunningham, Pipestone County, Minn.

Cunningham Farms, a southwest Minnesota operation totaling 800 acres, began with Ian Cunningham's great-grandparents in 1885. As the fourth generation of conservation-minded farmers, Ian has continued the family's evolving set of soil and water conservation practices.

Ian follows five principles for building healthy soil: (1) Disturb the soil as little as possible; (2) Keep the ground covered as much as possible; (3) Have diversity in rotation; (4) Have a living root in the soil as much as possible; and (5) Integrate livestock.

Cunningham Farms is an integrated livestock and crop operation with a focus on soil health. Their beef cow herd is part of a managed system that includes cover crops, rotational grazing, crop residue and harvested feed. Calves not retained for breeding are fed out. No-till is used, except for corn, which is strip-tilled.

Since 1998, Ian has been an elected member of the board of supervisors for the Pipestone Soil and Water Conservation District. In 2014, he was elected president of the nonprofit Minnesota Association of Soil and Water Conservation Districts. Ian now works with his son, Richard; his wife, Cindy, helps as needed when not working at the local hospital.

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Farmer to Farmer Success Stories are a series of interviews of farmers sharing how they have found success in incorporating conservation into their operation. To follow this series, visit www.HarvestingThePotential.org.

Q: What do you have against disturbing the soil or keeping it uncovered?

A: Any time you disturb the soil structure by running steel through it, you lose carbon dioxide and organic matter, hurting the soil's ability to allow water to infiltrate and provide moisture for the crop.

While other growers are planting in a dust cloud in spring, my soil is covered with an armor of crop residue and living plants. The moisture used by the cover crops is insignificant compared to the moisture that the soil will retain.

It all starts with having a good home or habitat for microorganisms. Tillage destroys those pathways.

In the last six years I have realized that bare soil is never a good thing. Bare-naked soil releases carbon dioxide that could be feeding the plant. Even in undisturbed cornstalk residue, it's nice to have more plants growing in the fall and spring.

Bare soil is also vulnerable to raindrops. When you have residue or cover crops, raindrops are not going to splash; they are going to soak in.

In Minnesota, we have this odd belief that in order to warm the soil and get the crop to germinate, soil needs to be tilled until it is black. However, I rely on soil structure and soil biology to move water down into the root zone and warm the soil, and my corn is coming up at the same time as my conventional neighbor's.

Q: How do you use diverse rotations to keep living roots in the soil as long as possible?

A: Soil organisms appreciate diversity; they don't get much excitement from a corn-soy rotation. There's an exchange of nutrients between microorganisms and the fine roots on crop plants, and soil organisms release nutrients as a plant-available source. In a monoculture, microorganisms have a symbiotic relationship with plant roots for only a short time. In bare, hot soil without a living root, microorganisms are going to decline. But if you can add diversity, then over time the microorganisms increase.

For example, we seeded a seven-way cover crop last fall, terminated the rye portion of it with herbicide this spring and then planted corn into it. We had six weeks of living roots in the soil before we planted.

Q: What are the benefits of your livestock rotation?

A: Manure provides food for soil microbes that you can't get from purchased fertilizer. Our costs are much lower when the animals harvest their own feed and spread their own manure. That's all money in the bank.

There is a night-and-day health difference between a feedlot and grazing. In late spring, our cow-calf pairs were grazing on two 80-acre fields of cereal rye cover crop, where they could spread out. We supplement when needed with an energy source. We only use the feedlot when the situation is best for them, such as calving time or finishing on corn.

Some cattle are sold directly to consumers, but we are still making money on the rest that are commodity marketed.

Q: You're very involved with water conservation. How does this all tie in?

A: The reason we do all of this is because we can sequester carbon – organic matter – in the soil. The biggest benefits have been water infiltration, water-holding capacity and nutrient cycling.

For every 1% of organic matter you increase, you have 1 inch of rainwater that is not lost to runoff. So for each square mile of land, you would have roughly 100 acre-feet of water retained in the soil. In a 600-acre field, that equals a 10-acre pond, 10 feet deep.

Conventional tillage doesn't hold the water in a beneficial way; there are no pore spaces. You can commence field operations more quickly in healthy soil, too.

In the flooding last spring, I estimated our land was able to hold 200 more acre-feet of water with our conservation structures and soil health program. The runoff water I collected from a tile outlet by my sediment-control basin was clear, while on neighboring farms, the creeks were muddy. You could tell which farms prioritized soil conservation.

Q: Conservation farming didn't work well for me. Why should I bother trying again?

A: One of the big dangers of changing practices is making them on too large of a scale initially. When you first no-till a field that has been tilled for 100 years, that soil does not have the resilience it needs; it's sick. That is why people say, "I tried it and it didn't work." What they're actually experiencing is the background damage from years past; it takes a while to rehabilitate the soil.



The soil on Cunningham Farms, which is nurtured by cover crops, rotation and livestock grazing, "has the consistency of cottage cheese," Ian Cunningham says.

Q: I can't afford to add practices that don't give me a return. What about my bottom line?

A: Our yields are as good as any, but our input and machinery costs are considerably lower. Most of our fuel is used to run the combine and haul grain. And we're having fun! We're more than busy; we're profitably employed.

We're also weatherproofing our operation. Even in the 2012 drought, our first field yielded 180 bushels an acre and got better after that. The results were due to how our soils let moisture infiltrate. In a sprint, conventional practices might appear to be winning. But in the long run, this approach protects you from low yields and low prices.

Q: What is your vision for your operation's future?

A: I would hope that our land is being cared for as a precious living thing, not as a possession to be exploited for short-term gain. The care of the soil is a long-term, precious thing that will last longer than an individual human life.