

# Broadening Horizons

*Pete Fandel, Woodford County, Ill.*

**G**rowing up and working alongside a father who was “conservation minded all his life,” Pete Fandel, Metamora, Ill., couldn’t help but have these attributes rub off on him. Practicing minimum tillage or no-till for over 25 years, Fandel and his dad also carried the trend forward by installing terraces and dry dams to stop erosion; rotating livestock, hay and wheat with cash crops; and restoring an eroded, “train wreck” field to full productivity, among other practices and successes.

From these roots, Fandel’s agricultural career branched out. He earned bachelors’ degrees in agronomy and agribusiness from Illinois State University and a master’s degree in agronomy from the University of Illinois (UI), then spent 18 years as a crops educator with UI. He is now a cover crops specialist with the Illinois Council on Best Management Practices and a researcher and associate professor of agriculture at Illinois Central College, all while walking the talk on his own 500 acres of minimum tillage corn, beans and cover crops.

From these multifaceted vantage points, Fandel is in a unique position to help farmers bridge the gap from theory to practice, thereby broadening their horizons on soil health.

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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](http://www.HarvestingThePotential.org)

**Q:** In a nutshell, how would you explain your approach to soil health?

**A:** Producing high-yielding crops starts with feeding the soil, because that is what feeds your crop. Anything you can do to build up the physical and chemical properties of the soil is going to domino into higher yields.

Soil health as a total package is not always thought about. There are lots of facets besides fertility, including soil structure, microbiology and soil health.

**Q:** What do you aim for in soil structure, and how does that relate to soil health?

**A:** I want to see a granular structure, which is much more resistant to breaking apart than crumb structure. They look identical, but granular soil doesn’t break or crush as easily because of the “glue” that holds the granular structure together. The “glues” from mycorrhizal fungi and other secretions, such as glomalin, and the breakdown of organic matter help the silt, sand and clay particles stick together, forming stable pieces called aggregates or peds. This is the natural process of building soil structure.

I no-till my beans and cover crops and only do a shallow tillage pass ahead of corn, with maybe an inline ripper over compacted parts every four years or so. Tillage is taught as a way to get good, fluffy soil tilth, but it’s a temporary fix. As soon as you get a big rain event, you’re worse off than you were in the first place. Also, beneficial microbes living in the soil are suddenly exposed to wind and air, and many die. It’s like a tornado ripping the roof off of your house.

I’m improving my soil structure, getting it back to where it wants to be naturally. It has good physical properties: lots of pore spaces, and macropods are gearing up and coming back healthy. Cover crops are making root channels in the soil. Rain infiltrates much faster and roots can find their way through the peds. I’m seeing deeper rooting of crops, higher earthworms populations, and more worm castings.

Soil structure is a benefit of organic matter. One big benefit of minimum tillage, no till and cover crops is that you are building soil structure back to how it was under prairie grass conditions. Plant roots from cover crops and biomass from residue help the soil form the basics of soil structure.



Abundant macropods and microorganisms live in the pore spaces in the sandy river-bottom soil in one of Pete Fandel's fields in Metamora, Ill. (left). The soil has a healthy granular structure and good organic matter content. Cereal rye and rapeseed, aerially seeded on Sept. 16 after corn, display aggressive growth by Oct. 10 (right). Fandel says research trials and his own experience prove that cereal rye will suppress resistant weed species such as marestalk.

**Q:** What exactly are you feeding in the soil, and what are you getting back?

**A:** The microbial population breaks down residue. After corn harvest, I'll have 7 to 8 tons of biomass per acre. The soil microbes turn it into humus. Then the soil organisms will release the nitrogen later in the year.

Some soil microbes use nitrogen as a food source to break down this carbon, making nitrogen temporarily unavailable to the plant. This is why we need to put more nitrogen on corn-on-corn – it's for feeding microbes. We were led to believe that soybeans, as a legume, put nitrogen back into soil for the following corn crop. That is true, but I think the story is reversed. It's really the microbes tying up nitrogen while breaking down all the residue from the previous corn crop, and that nitrogen is not available to the plants while the microbes are using it.

For cover crop biomass, the species and when it is killed determines how quickly it will release to plant-available nitrogen. The earlier you kill the cover crop, the earlier nitrogen will be released. The nitrogen not used by the previous crop will be sequestered by the cover crop and released the following year.

This more of an art than a science. A good local agronomist who has a good knowledge of those cycles will be helpful with applying this on your individual farm.

**Q:** What are the benefits and challenges that you've seen with cover crops?

**A:** Depending on the cover crops species, there are many advantages: nitrogen sequestration, more organic matter for the soil, living plant roots for hosting microbial populations, compaction breakup, weed suppression, allelopathic effects against SDS and SCN, and management of soil moisture, among other things.

When deciding on cover crops, first determine which issues you are having in your field, then find the cover crop that will address them. For example, in a corn-soy rotation with a compaction issue, annual rye would be good ahead of the corn crop. For a "generic" cover crop in a corn-soy rotation, the most immediate success would be cereal rye, after corn going into soy. It's the easiest to get established, the most winter hardy and the most flexible to plant in the fall.

There are three major reasons for lack of cover crop germination: lack of light on seed, the wrong moisture levels, and the herbicide used that spring and summer. If it's the herbicide, you might not realize the problem. In my side-by-side research trials, I can see the difference in growth. Until more research is done and chemistry labels are more specific, farmers will need to keep investigating. This factsheet might help: [http://www.mccc.msu.edu/states/Wisconsin/2014\\_Factsheet\\_HerbicideRotationRestrictions.pdf](http://www.mccc.msu.edu/states/Wisconsin/2014_Factsheet_HerbicideRotationRestrictions.pdf)