News Column
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SOIL ORGANIC MATTER

I admit to being a skeptic. If you tell me an amazing story, even if you are the most convincing person in the world and you truly believe what you are telling me, I'm going to want proof. I don't do it on purpose, but I'll probably have my arms crossed, my head cocked to one side, and a distinct look of disbelief in my eyes.

I imagine that's how I looked a few years ago when one of the panel members at the soil health workshop I was attending told of his dramatic increase in soil organic matter after just 3 or 4 years of no-till production. The numbers cited were something like an increase in soil organic matter from 2.5% to 4.5% in three years.

I don't doubt that he had the numbers – I'm sure he had soil test results to back up his claim – but I doubt that the numbers were accurate. There had to be a sampling error.

I didn't jump out of my seat to point out how implausible those numbers sounded, but I'm sure my arms were crossed and that look of disbelief was present in my eyes.

Don't get me wrong, I believe trying to increase soil organic matter is a good thing. Higher organic matter is an indication or higher soil productivity. Therefore, increasing organic matter is something we want to do. I just don't believe it can be done that quickly.

To be clear, increasing organic matter 1 percent, or even ½ percent, in just one year isn't possible. It can't be done!

I like math, but some of you won't want to wade through the calculations that I'm going

to cite. If you're one of those folks, just skip to the bottom line. The bottom line is that, at best, you might be able to increase organic matter by 0.1 percent in a year. One percent in a year isn't going to happen.

A soil scientist at Pennsylvania State University, Sjoerd Willem Duiker, did the calculations and I'm stealing his numbers rather than starting from scratch.

For his best case scenario he assumes a highly productive soil that will produce a 200 bushel per acre corn crop. Corn produces about the same weight of stover as it does grain so, we figure there is 9,464 pounds of residue if we adjust to correct for moisture. The math is 200 bushels x 56 pounds/bushel x .845 (to correct for 15.5% moisture) = 9,464 pounds.

In his calculations, Duiker assumed the below ground root mass would equal 20% of the above ground residue, so his total residue produced by a 200 bushel corn crop was 11,357 pounds.

Now, to give the farmer a better chance of improving soil organic matter, he also assumed a rye cover crop was grown, producing 6,000 pounds of dry matter (5,000 pounds above ground and 1,000 of roots). The total dry matter for the two crops now totals 17, 357 pounds.

From here the math gets even more complicated, making me wish I hadn't even started down this road, but let's charge on anyway.

The next step is to multiply 17,357 pounds by .40 because stover is about 40% carbon. Now we are down to 6, 943 pounds of carbon to add to the soil.

An important part of the calculation is knowing that a one acre slice of soil to a depth of 6.7 inches weighs 2,000,000 pounds. One percent of 2,000,000 is 20,000 pounds. Multiply by .58 (58% carbon in soil) and we find that 1 percent organic matter in an acre slice of soil will contain about 11,600 pounds of carbon.

Now, it is already clear that we can't increase organic matter by 1 percent per year, if you look at the 6,943 pounds or carbon produced and compare to the 11,600 pounds needed. But, there is one more step.

The conversion factor for plant residue to organic matter is only 10-20 percent. Therefore, in this example we only have 1,389 pounds of carbon added to the soil. That's closer to 0.1%.

The bottom line is that, at best, we might be able to increase soil organic matter by 0.1% per year. That doesn't mean it isn't worth trying. It just means it will take time to really make a difference.

If you have questions, you can reach me at the Riley County Extension Office at 785/537-6350. Or, you can send e-mail to gmcclure@ksu.edu.

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