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Reduce Fertilizer Cost with Soil Profile Testing

If there is one silver lining to a year of less than average corn yields, it often means that there will be more nitrogen left in the soil for the wheat. How much nitrogen can really only be determined with a soil profile test and this deeper soil test will also determine amounts of chloride and sulfur in the profile as well. A profile test can directly save on nitrogen applications and determine if extra sulfur or chloride is needed. With the expense of nitrogen and often unknown status of sulfur and chloride, taking a few profile soil samples before planting wheat can make good financial sense.

How to Profile Test

A profile test is taken slightly different than a normal soil test for pH, phosphorus, and potassium. A profile test should be taken with an 18-to-24-inch soil core, rather than a 6 inch core. If there isn't 24 inches of soil to take, then however deep the probe can go. However, it is still important to take at least **10 cores per soil sample**. It is also important to have around the **same depth for each core**. Because soil can be pretty hard and dry in the summer after corn, sometimes it requires a different type of probe. Instead of a smooth tube needed for surface samples, profile samples can be taken with a drill-bit type probe. While it takes longer to take a deeper soil sample, profiles samples can represent a larger area. One per 40 to 80 acres is fine. Profile samples are really to get a general idea of what the soil still has left in it. While the number of cores and depth are still important for profile samples, the results and recommendations don't need to be as exacting as surface samples. This is because mobile nutrients and immobile nutrients have completely different aspects of testing within the soil.

Mobile vs Immobile

Nitrogen, chloride, and sulfur are very different from the commonly tested phosphorus, potassium, and zinc. It is more than just the mobile nutrients, being anions, move easily through the soil while the cationic immobile nutrients don't. They actually exist differently in the soil. When we test for immobile nutrients, we are only getting an index of total nutrients, merely a fraction of the total pool that we expect the plants can adsorb. When we test for mobile nutrients, we are getting the full mass quantity amount (except for that contained in organic matter which is also important to test for application recommendations). Nitrogen, chloride, and sulfur all have gaseous forms as well and can be lost to or gained from the atmosphere.

One thing for the sake of curiosity though is to add pH on to your profile sample. While knowing the pH of the subsoil won't alter any recommendations, we don't really know much about the

sub-soil in our fields. I'd be interested in seeing those pH results and if our lime recommendations are really matching up with our subsoil pH expectations.

Six Isn't Good Enough

In truth, profile testing for the mobile nutrients is rare and I've seen very few come into the extension offices over the years. Largely, I assume, because profile soil test are a 'snap-shot' of what is in the soil at the time of the test. Therefore, the results can only be used one time and for one fertilizer application. I have seen plenty of 6" surface samples tested for nitrates and sulfur because it was added on to a surface sample. However, after an entire season of mobile nutrients moving down with the few rains we've gotten, moving up during periods of evaporation, and being pulled into plant roots, it is impossible to tell where they are at this point. They could be concentrated in the top 6 inches...but probably not. The only thing for it is to test the entire profile and get the total amount. Like mentioned before, mobile nutrients are determined in a total concentration, not an indexed plant-available approximation.

Profile Test Saves Costs

K-State nitrogen recommendations without a profile N test will assume a flat residual N amount of 30 lbs per acre. This can easily be an underestimate during drought years like this one. 80 bu corn yield will remove only 60 lbs N per acre and 7 tons silage will remove about 55 lbs N. If 160 lbs N was applied and 40 more from O.M. breakdown, even with a denitrification, runoff, and other losses of 35%, that leaves 70 lbs N left after 80-bu corn. If a profile test finds 60 lbs N per acre instead of the assumed 30 lbs N, and with the current price of 52 cents per unit of N, then that is \$15 per acre. For a 60 acre sample, that's \$900 saved for a \$15 profile test.

Past research has shown that residual N left in the profile after a drought year in corn can be up to 100 lbs N per acre. However, before drastically cutting pre-plant fertilizer before the wheat, proof is needed for how much N is still there. The logic is simple. Poor yield due to drought leaves more nutrients in the soil, and fertilizer is expensive. Therefore, profile samples and surface samples are needed to find what nutrients are left. If you have any questions about soil sampling, please give me a call at 620-724-8233.

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