528 Testing Soil Health without Soil Health Tests

#RealisticRegenAg | In the very first season of Plants Dig Soil I talked about soil health tests. Has anything changed since then? In my opinion no, not really. There are tests that are getting closer to wide scale adoption, but I just don't see any of them worthwhile yet. In this episode I'll cover the thinking I had then as to how to approach evaluating them and I'll cover how I assess soil health in my consulting.

Welcome to Plants Dig Soil, a podcast about #RealisticRegenAg. I'm your host, Scott Gillespie, and I'm an agronomist from the western Canadian prairies specializing in climate-smart agriculture. I discuss scientifically proven practices that benefit the planet and, just as importantly, farmers' economic sustainability. Be sure to visit my website, www.plantsdigsoil.com, for resources and information about the services I offer.

Resources mentioned in this podcast:
https://www.plantsdigsoil.com/podcast/005-soil-health-tests-are-they-worth-it
https://www.plantsdigsoil.com/podcast/504-insurance-organic-matter
https://www.realagriculture.com/2023/01/how-to-measure-soil-health/
http://csanr.wsu.edu/whats-the-problem-with-my-soil/

Transcript is available:
https://www.plantsdigsoil.com/podcast/testing-soil-health

My course: Profitable From the Start: Cover Crops for the Prairies:
https://plantsdigsoil.thinkific.com/courses/cover-crops-prairies

My funding service offerings:
https://www.plantsdigsoil.com/pricing/#paperwork
SCAP overview: https://youtu.be/0icitHJR2lk
SCAP program details https://www.alberta.ca/sustainable-cap.aspx

My consulting packages:
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Chemical analysis of soil emerged in the twentieth century to aid farmers in determining the appropriate application of chemical-based fertilizers. I take for granted today that I can have my sample dropped off at the lab and get results back within a week of what is in the soil. Research was done decades ago to calibrate these results to responses in the field. I can use the test numbers and response curves to come up with what I need to add to the soil.

Soil health testing has gained prominence as farmers increasingly focus on practices that correct, maintain, or enhance soil health. The objectives of soil health testing align with those of traditional soil testing programs: finding indicators that accurately represent the soil's condition. An ideal indicator possesses attributes such as ease of measurement, compatibility with other indicators, accessibility, repeatability, cost-effectiveness, and comparability across regions.

Examining the testing process for phosphorus demonstrates these attributes in action:

Measurement: Phosphorus testing requires extractants and procedures that work best on the local soil type. Most areas have developed tests that work for them. Samples can be dropped off or cooled and shipped to a lab for testing.

Compatibility: The same sample used for phosphorus testing can also provide insights into other nutrients. If we needed to take samples multiple times a year to get all the nutrients the costs would increase, and it would be less likely anyone would do it. By being able to take one sample in the fall or spring and getting all the results at once means it is more likely to be done.

Accessibility: Various sampling methods, including truck or ATV-mounted samplers, make sample collection quick and accessible to most individuals. Hand sampling can be time-consuming, but it still means that anyone can do it. If sampling required specialized equipment or procedures, it wouldn’t be done.

Repeatability: Using GPS systems to mark sampling points enables consistent sampling in subsequent years, facilitating reliable comparisons. A couple decades ago this was not possible for most people. Now, with smart phones and scouting apps, it’s easy to mark the points and come back to the same places every year.

Cost-effectiveness: Soil tests typically represent a small percentage (1-2%) of the cost of applied nutrients. The potential savings in input costs or yield gains from proper nutrient application justify the expense.

Comparability: While individual soil test numbers may not be directly comparable across regions, broad-scale comparisons can be made by assessing the percentage of farms with low, mid, and high levels of soil test phosphorus.

In January of this year on this podcast I mentioned how the Soil Health Institute is narrowing down their list of potential soil health indictors. They list similar criteria that I came up with: Low cost, easy to do, scalable, and something most labs will be able to add to their suite of tests.

The three tests they have come up with are organic carbon, carbon mineralization and aggregate stability. The problem with those tests right now is that the numbers are meaningless to me. I could get them done, but I don't know how to interpret them. When the research is done that can give me guidelines for what they mean and how I can advise farmers to change practices I will use them. In the meantime, I'll stick to what I know.

So, what do I do? I use traditional soil tests, farmer knowledge, and my own observations. Soil tests that are chemically based have the advantage of legacy. I can compare results now to tests taken years ago or even decades ago. Sure, they aren't perfect, but they give me something. I can see overall trends of nutrients, organic matter, salts, or pH going up or down.

But soil tests alone don't tell me the whole story. Farmers know the good areas and the poor areas. If they don't know because it's a new field, I can go back to satellite imagery. Even something simple like the free resource Google Earth can tell me a lot. Historical imagery may show old divisions of fields that explain why certain areas are performing better or worse than other areas.

When it comes to in-the-field measurements, I let the soils and plants do the talking. Dr. Andrew McGuire made a flow chart four years ago that has proven to be very valuable to me in formalizing my assessment of a field. I'll link to the blog post with the flow chart in the description.

Here's the six questions you ask yourself. At any point that you answer no, you stop, and address that. Or you may go through it all, but you prioritize the first questions, first, and then move on.

1. Does your soil blow or flow away? This addresses wind or water erosion concerns and is crucial for retaining soil, particularly for crops like potatoes, carrots, and sugar beets. If you're losing soil, it doesn't matter what else you're doing. Fix this first. Period.

2. Does your soil allow water to soak in rapidly? There are numbers you can follow but the important thing is to watch what happens while it's raining, or you are irrigating your field. If it can't take in the water, address this. Crop rotation, cover crops, or changing up your tillage regime are all things to consider. I didn't say no-till. You may need a small amount of tillage to address surface compaction.

3. Does your soil drain well? Once soil erosion and water movement are under control, focus shifts to drainage. If a hard pan exists deeper than the reach of tillage equipment, plants with robust root systems, such as tillage radish, can help break up the hard pan. The decomposition of tillage radish creates channels through the soil, enhancing drainage. If you can make forages economical, try three years of alfalfa. There is just nothing like a perennial.

4. Does your soil crust? Surface crusting can indicate a lack of organic matter, excessive tillage, or insufficient surface cover. Minimizing tillage and increasing organic matter content becomes crucial in these cases. Strategies like compost or manure application, cover cropping throughout the rotation, or dedicating a year to growing a green manure prior to planting can help protect and enhance the soil.

5. Does your crop recover most of the nutrients you apply? This question focuses on nutrient flow. It could refer to synthetic nutrients, composts, manures, or nutrients assimilated or mined by cover crops. A diverse mix of cover crops may prove beneficial in nutrient uptake and release dynamics. For example, cereal rye efficiently takes up leftover nutrients but may not release them quickly enough for the subsequent crop. On the other hand, tillage radish rapidly absorbs nutrients but can leach them away if it dies and decomposes too soon. Mixing these with a legume might work for you. However, you need to be mindful of water usage. You could have all the nutrients you need but a dry soil impedes cash crop growth.

6. Are there areas where plants die or grow poorly? This question relates to disease and insect pests and chemical issues such as salts. A cover crop like mustard, grown before potatoes, can act as a biofumigant, releasing chemicals toxic to disease organisms while benefiting the potato crop in the subsequent year. Deep rooted crops like alfalfa growing near saline areas can help pump water from deep down. This isn't a quick fix, but over the course of 5-10 years it can make a big difference.

So, there you have it. This is how I approach soil health assessment. I'm not saying I will never use the new soil health tests. I'm saying I'm going to use the tried-and-true methods and integrate the new tests as they provide value. Thanks for listening. I'll talk to you next week.