

Soil Health: Alderney Room
Interpreting Your Soil

Signals from the Soil: Sensory Guide to Soil Health

Av Singh

Executive Summary

This presentation is accompanied by a slideshow of helpful visual aids which are especially prudent since the content is about our sensory experience as farmers of the soil. By starting at the beginning, this presentation is intended for anyone who works with soil. These notes focus mostly on the review of decoding a soil test which Av Singh handed out during the presentation. It would be helpful to have one on hand to follow along with while reading these notes. Av Singh demonstrates an extraordinary depth of knowledge in his holistic view of the interrelationship between people, plants, and soil.

Detailed Notes

- Get comfortable with your local soil test and its format.
- Composition of soil:
 - 25% Air! 25% Water! This is very important.
 - Microorganisms hold the soil together by excreting a sort of “glue”, along with charged particles. There is a food web in the soil.
 - Soil is also home to macro organisms.
 - Soil can have “advanced” structure when developed.
 - Includes fungi, attracted to plant material
 - Includes rhizosphere, several micrometers around the roots. Bacteria concentrate here. Root cells flake off and break down, releasing nitrogen.
 - Includes mycorrhizae.
- Only inorganic forms of nitrogen are available to plants.
- The natural cycles of the soil go on, yet can be stimulated gently. Drastic change receives a poor response.
- Recommendation: Japanese film “Life in the Soil”.

- Soil Assessment:
 - Past view was chemistry for health of soil
 - Current view is of holistic soil biology, including microorganisms, soil physics (movement), and is more intuitive.
- Don't be intimidated by a soil test. It is simply a snapshot.
 - Results are time sensitive.
 - Research in the Department of Agriculture for your province's test.
 - Your samples are site specific so either take separate samples or test the same soil consistently.
 - Specify crops to be grown for your soil test.

Soil Test:

- Tests only measure available nutrients (inorganic). Through the course of the season nutrients may become more available.
- Nitrogen is a good amendment for the spring to kick-start growing. However, don't over-fertilize, but maintain support for the soil.
- pH: optimum for availability of nutrients is 6.2-6.5
- A healthy proportion of organic matter is 4-6%.
 - More isn't necessarily better. Even if it is higher, you still don't know the availability of nutrients.
 - With a living soil, (i.e. active soil organisms) there is a bigger pH buffer. For example, sandy soil has less organic matter and is thus more pH sensitive.
- Phosphorus recommendations depend on the crop to be grown.
- Potassium influences root development, disease resistance and plant immune systems.
- Calcium is a great transporter, but needs mycorrhizae for nutrient uptake. Calcium also buffers pH, and maintains fungi. The ratio of Calcium to Magnesium is important to balance at about 8:1 or 10:1.
- Magnesium is important for photosynthesis and leaf health.
- Sodium affects conductivity, that is, transportation and proportion of salts.

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- Sulphur didn't used to be a deficiency problem because of acid rain but in recent years it shouldn't be ruled out and is a possibility. Amendments include gypsum and SulPhoMag.
- Iron may be toxic in quantity, but so long as pH is above 5.5 there is no risk of toxicity based on possible uptake.
- Other deficiencies are possible and are important, such as Selenium, and Boron. Note that nutrients work together and affect each other, thus it is very important to achieve the right *balance*. For example, Boron and Calcium can be added together to remedy a deficiency.
- An example of an amendment for nutrients is powdered rock or granite which has effective trace elements. It may be added as a form of compost tea.
- Cations are positively charged particles. Anions are negatively charged particles. For example, soil and organic matter are anions. So how well do cations stick to anions? With less organic matter, more cations are available for exchange. Clay particles can be coaxed to exchange cations to improve percentage of available nutrients.
- Base Saturation: How well are bases held? Anions? That would be an indicator of the percentage of a nutrient such as K, Ca, or Mg. Nutrients can be toed up and require stimulus to become available.
- Required nutrients on a soil test would be a place where a lime or nutrient recommendation would be made. This would be useful for writing a nutrient management plan.
- Once your soil chemistry is well in hand, then approach your soil biology.

Soil – Plant – Human Interface

- Approach physics and biology using all of the senses. You can also sense through your feet.
- Always take a shovel with your and dig.
- Break apart your soil (see how easily it crumbles, an indicator) and smell it. It is a good sign if it smells good, like actinomycetes, or the forest floor.

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- Soil is an aggregate held together by chemistry of mobile particles and organisms.
- Compaction of soil is a problem. Soil can become anaerobic and can breed bad bacteria, detectable by their offensive smell. You can test for it using a penetrometer.
- Soil that sinks too easily is a sign of being overworked.
- The top inch or two of soil should have a texture like granola with big and small crumbs. Below that the crumbs should be a bit larger. Deeper still you should find clumps that will easily break apart. Many hard clods on the top layer are a bad sign.
- When diagnosing a problem in a plant, dig up the *root* to find the cause of problem/disease/deficiency. Roots should be whitish.
- Colour of soil can be an indicator of nutrient presence, and of organic matter which is darker.
- Dig a soil pit. See what layers are revealed to discover what has probably happened in the past, or ask a soil scientist to help you observe. See what happens. Watch how quickly or slowly water drains or fills.
- Crop residues break down over time, but not quickly. Nutrients may leach from the soil if break down is too quickly. If break down is too slow there may be low levels of microbial activity.
- Watch out for surface water. It can cause many issues and may require remediation of the soil.
- As the farmer, you are the closest person to the soil, so give yourself the credit to make observations yourself, over time. Building a relationship with the soil can also encourage intuition and have a positive effect on soil health.