Getting to Know Your Soil

Need a simple way to test your soil quality? Just dig a hole!

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At a recent scientific meeting on soil quality, the question was asked, "If a person was to make one assessment to determine soil quality, what would it be?"

As expected, this question created a lively debate among the meeting's participants. Soil organic matter, salinity, aggregate stability, infiltration rate, soil respiration, as well as other soil tests were all offered as being the assessment needed to determine soil quality. Unfortunately, but not unexpectedly, the discussion turned into a bickering session, with each group defending their assessment as superior to others.

After some time had passed, a well-respected soil microbiologist, obviously fed-up with the scientific infighting, stood up and said, "Just dig a hole." A silence fell over the room. It was as if a new paradigm in soil testing was introduced. Somehow 'digging a hole' seemed to make perfect sense.

Digging a hole has many advantages over traditional soil quality assessments. In a nutshell, it's a quick, easy, no-cost test that does not require specialized equipment. It's a test that relies on our common sense(s) for evaluation (i.e., senses of touch, sight, smell, and taste). Digging a hole is a subjective activity; the conclusion one person has about a particular soil property may differ from that of another person. Nevertheless, it is probably the most practical test for a quick assessment of soil condition. Furthermore, because the person conducting the test is in direct physical contact with the soil, it is the best way to 'get to know' the soil.

The first step in digging a hole is to choose a good shovel. A sharpshooter spade will work nicely, but any shovel with a sturdy handle will do.

The next step is to choose an area to evaluate. 'Problem' areas are often good places to check. If you're not sure where you want to dig, let vegetation be your guide. What exists below ground will affect what grows above ground. Therefore, inspecting vegetation is a useful 'first step' in determining soil condition. Noticing variation in crop color, height, and percent stand can give clues as to what may be occurring in the soil, whether it be a nutrient or aeration problem or some other limitation to crop growth.

Furthermore, weeds, when in clearly defined areas, are excellent indicators of soil condition. Calcareous, saline, compacted, poorly-drained, and nutrient-rich soils are each characterized by the growth of certain types of weeds. For instance, bindweed often indicates the presence of a hardpan, docks usually indicate a poorly-drained soil, and pigweed typically indicates high soil fertility.

Once you've chosen an area to evaluate, start digging. Dig a hole at least four to six inches past the lowest depth of disturbance by tillage implements. While you're digging, be sensitive to how much effort you're putting forth to get the hole dug. If excavation requires a significant amount of energy (like standing on the shovel to get it to go in) you probably have a compaction problem.

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Make sure the hole is dug wide enough so that you can inspect plant roots. Observe their condition. Are they well branched with lots of fine root hairs, or are they balled up and growing sideways at certain depths? A lack of fine root hairs indicates oxygen deprivation in the root zone, and sideways root growth is a sure bet that there is a hardpan.

Having a feel for the amount of earthworm activity can give you a good idea of the overall biological health of your soil. Searching for earthworms can be done as you're removing soil from the hole. Count the worms as you see them. If you find ten earthworms in a hole a foot-square and foot deep, you've got a healthy soil. If you didn't notice any earthworms while digging, inspect the wall of the hole for earthworm burrows.

Once your done looking for earthworms, cut out a slice of soil from the wall of the hole and lay it out on the ground. Here's where the fun really begins! First, look for color changes from the soil surface downward. If you have a tape measure with you, measure the topsoil depth. Soil that is dark brown, very dark gray, or black qualifies as topsoil in Nebraska. If you happened to leave your tape measure back in the shop, but know the distance between the tip of your thumb and pinky with your hand fully extended, you can estimate topsoil depth from that.

Next, break off a chunk of soil about the size of your fist from the top six inches of the hole. Gently break it apart with your fingers and then hold it up to your nose. What do you smell? The smell of soil can range from a strong putrid, sour, chemical smell, to a strong earthy, sweet, fresh smell, to no odor at all. It's the earthy, sweet, fresh smell that we typically associate with healthy soil.

While you have the soil in your hands, notice the size and shape of the soil aggregates. Are the aggregates blocky, granular, or powdery? Having a range of different types of aggregates is best, with the majority having a granular shape and a size of about 1/16th to 1/8th inch in diameter.

The next step is to check soil texture. Take what soil is in your hand and squeeze it. If the soil does not stay in a ball after squeezing, then it's sand. If it stays in a ball, try to make a ribbon with the soil by squeezing it between you forefinger and thumb. Make as long a ribbon as you can, and then estimate its length.

If the ribbon is shorter than one inch, it's probably a silt loam or sandy loam. A silt loam will feel smooth, while a sandy loam will feel gritty. If the ribbon is between one and two inches in length, it's probably a silty clay loam. If the ribbon is longer than two inches in length, it's probably a silty clay or clay.

It is important to recognize that digging a hole is not intended to replace analytical soil tests; there is no substitute for charting trends in soil condition in a quantitative manner. What digging a hole does that analytical soil tests do not do is that it gives you a quick, down to earth idea of what the soil condition is like, without the use of specialized equipment.

Furthermore, you can develop a special relationship with your soil by digging a hole. Checking for compaction, observing soil structure, and looking for earthworms are all activities that will bring you closer to the source of much of our food and fiber. By getting to know your soil in this way, you will almost certainly increase your respect for it as a living, dynamic system that is sensitive to different forms of agricultural management.

For additional information on descriptive assessments of soil quality, consult The Soul of Soil: a guide to ecological soil management (3rd ed.), Grace Gershuny and Joseph Smille, 1995, agAccess, Davis, CA (Address - agAccess, P.O. Box 2008, Davis, CA 95616; Phone - (916) 756-7177).