Relevance to farmers of Soil Quality Indicators

(Content adapted, compiled, and categorized by Jennifer Hashley from various sources including university extension websites and NRCS / USDA documents using the descriptors of soil quality analysis tests from the USDA Soil Quality Test sampled in a field lab.)

Soil quality is defined as "the capacity of a specific kind of soil to function." Soil quality is evaluated to assess the extent of soil degradation and maintain or improve the condition of a soil. In agriculture, soil-quality assessment is only meaningful when the results are used to maintain and improve soil quality.

Physical Quality Indicators

Field or site characterization – soil properties vary across a field and even within the same soil type; farmers must consider general field characteristics for each field or management unit in order to set appropriate soil quality goals and to monitor their management decisions over time

Infiltration – affects rates at which you can safely apply water to the field for irrigation; applying water faster than it can infiltrate can cause pooling or ponding which may lead to increased possibility of diseases and increase runoff, which causes erosion and possible fertilizer loss

Bulk density – serves as an indicator of compaction and relative restrictions to root growth; compacted soil layers have high bulk densities and inhibit the movement of air and water throughout the soil

Aggregate stability – the greater percentage of stable aggregates, the less erodible a soil will be; aggregates improve a soil by protecting SOM from decomposition; they improve water and air movement by increasing pore space; and they improve soil organism habitat

Soil Slaking – a soil's ability to resist loss of its structure and is affected by water content, rate of wetting, texture, clay mineralogy, and organic matter content.

Soil physical observations – topsoil depth, root growth, penetration resistance, and structural characteristics of the soil indicate capacity for good plant growth

Chemical Quality Indicators

Electrical conductivity (EC) – indicates the amount of salts present in the soil; excess salts will hinder plant growth by affecting the soil-water balance. Crops have varying degrees of salt tolerance and excess salts can affect plant growth by interfering with nutrient uptake and reducing water availability to plants. Excess salt can also deteriorate soil structure

pH – measures acidity or alkalinity of a soil which affects the availability of plant nutrients, activity of microorganisms and solubility of soil minerals. pH values between 6 and 7.5 are optimum for general crop growth

Soil nitrate test – although it is difficult to determine how much and when N will be available to meet crop needs (soil nitrogen is constantly cycling), if conducted in spring, the soil nitrate test tells farmers whether their soil and cropping management practices were effective in providing sufficient N for optimal crop yields

Water quality tests – can indicate salinity levels in water important for livestock considerations or potential corrosion damage to irrigation systems

Biological Quality Indicators

Soil respiration – indicates biological activity in the soil by microorganisms, live roots, and macroorganisms (earthworms, nematodes, insects)

Earthworms – contribute to improved permeability and infiltration in the soil; they create additional pore space in soil that fosters good root development; earthworms also encourage the formation of soil aggregates and help to accelerate decomposition of organic matter by incorporating litter into the soil