Performance and Adoptability

Biodegradable Mulch

biodegradablemulch.org

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Summary

Soil quality is a measure of how well a soil provides nutrients and water for plants and other organisms, cleans and filters water, and recycles essential plant nutrients.

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USDA United States Department of Agriculture National Institute of Food and Agriculture

What Is Soil Quality and How Is It Measured?

Soil quality is a measure of the capacity of a soil to perform necessary functions. Soil functions include providing nutrients and water to plants, filtering and cleaning water, regulating temperatures, recycling and storing nutrients, and providing habitats for organisms. Given these various functions, there is no single measurement for soil quality. Instead a series of physical, chemical and biological properties are measured in combination.

The United States Department of Agriculture (USDA) has developed a Soil Quality Test Kit that can be used to assess soil quality in the field. The test is designed specifically so that different soils or different experimental treatments can be compared. The test includes the following measurements:

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- **Soil respiration:** Measures the amount of CO2 released from the soil (Figures 1-3). Respiration is an indicator of biological activity.

- **Infiltration:** Measures how fast water can infiltrate into the soil (Figure 4). Infiltration is an indicator how easily water will infiltrate, pond, or runoff during rainfall or irrigation.

- **Bulk density:** Measures the weight of the soil per volume of soil. Bulk density is an indicator how well plant seedlings can emerge and how well air can circulate through the soil.

- **Electrical conductivity:** Measures how well an electrical current travels through the soil water (Figure 5). Electrical conductivity is an indicator of how much salt is present in the soil.

- **pH:** Measures the activity of hydrogen ions in soil water (Figure 5). pH is an indicator of whether the soil is acidic, neutral, or basic.

- **Nitrate:** Measures the amount of nitrate in the soil (Figure 5). The amount of nitrate is an indicator of the availability of the important plant nutrient- nitrogen.

- **Aggregate stability:** Measures the ability of soil aggregates to resist disintegration when immersed and shaken continuously in water. Aggregate stability is is an indicator of how well water can infiltrate into the soil during rainfall or irrigation and how easily soil is washed off or blown away.

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Figure 1: Soil respiration measurements with a closed chamber inserted into the soil.

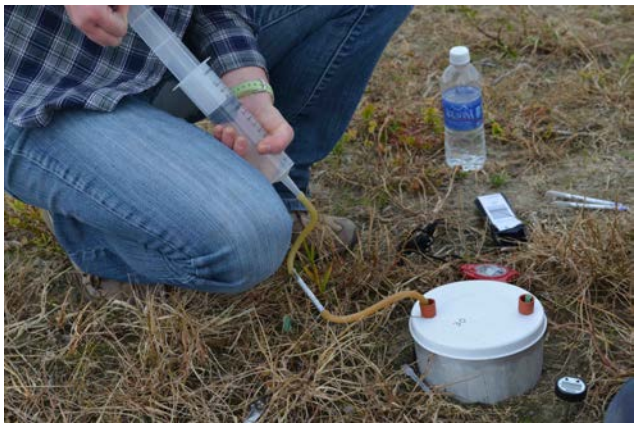

Figure 2: CO_2 is pulled through a measurement tube with a syringe.

Figure 3: Coloration indicates the CO_2 concentration in the soil air.

- **Slaking:** Measures how fast soil particles disperse in water. Slaking is an indicator of whether and how fast soil will form a slurry during rainfall or irrigation.

- **Earthworm counts:** Measures the number of earthworms in soil. Earthworms generally enhance microbial activity, soil fertility and physical properties.

- **Penetration resistance:** Measures the force required to insert a metal rod into the soil. Resistance is an indicator of how easily roots can grow in the soil.

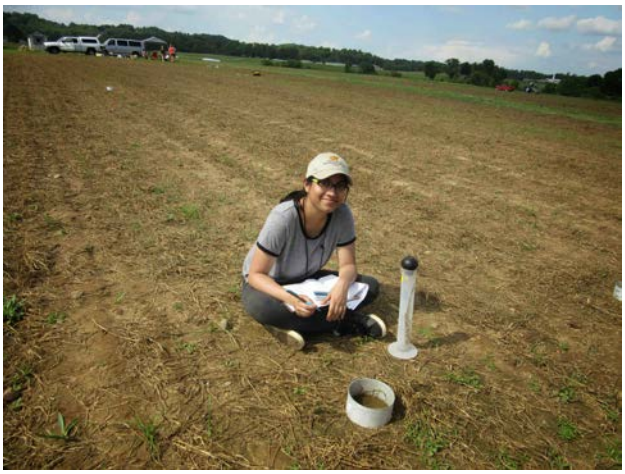

Figure 4: Infiltration rate measurement in the field.

Other soil tests can be performed to fit specific needs. In our SCRI project, *Performance and Adoptability of BiodegradablePlastic Mulch for Sustainable Specialty Crop Production*, we opted for the USDA Soil Quality Assessment Kit because it allows us to assess the effects of different mulch treatments on soil quality, and allows us to quantify soil quality changes over time.

Figure 5: Soil pH, electrical conductivity, and nitrate measurements in the field.

For further information

USDA Soil Quality Test Kit: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/health/assessment/?cid=nrcs142p2_053873

USDA-NRCS: Soil Quality for Environmental Health http://soilquality.org/

USDA-NRCS: Soil Health http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

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