TABLE 1. SOIL HEALTH PROTOCOL COMPARISION

Category	Performance Area	Test	CASH Lab Test ($160/test)	NOFA Field+Lab Test ($175/test)	Test Descriptions
PHYSICAL	Baseline	Baseline Test	Yes	Yes	One test for each performance area
	Water Infiltration	Available Water Capacity	Yes		Reflects the quantity of water that a disturbed sample of soil can store for plant use. It is the difference between water stored at field capacity and at the wilting point, and is measured using pressure chambers.
		Water Infiltration		Yes	To measure the capacity of soil to absorb water without puddling or running off causing erosion. Better infiltration indicates more pores and aggregates, which means greater carbon, soil health, and water holding capacity.
	Physical Structure	Aggregate Stability	Yes	Yes	Is a measure of how well soil aggregates resist disintegration when hit by rain drops. It is measured using a standardized simulated rainfall event on a sieve containing soil aggregates between 0.25 and 2.0 mm. The fraction of soil that remains on the sieve determines the percent aggregate stability.
		Bulk Density		Yes	
		Soil Hardness		Yes	
		Soil Texture and Aggregation		Yes	To make note of sub-surface observations in a single spot of land to track changes over time in topsoil depth, root depth, resistance, structure, aggregation, and texture. More aggregation and less compaction are signs of increasing carbon and health.
		Subsurface Hardness	Yes		Is a measure of the maximum resistance (psi) encountered in the soil between 6 to 18 inch depths using a field penetrometer.
		Surface Hardness	Yes		Is a measure of the maximum soil surface (0 to 6 inch depth) penetration resistance (psi), or compaction, determined using a field penetrometer.
BIOLOGICAL	Soil Organic Carbon	Active Carbon	Yes	Yes	Is a measure of the small portion of the organic matter that can serve as an easily available food source for soil microbes, thus helping fuel and maintain a healthy soil food web. It is measured by quantifying potassium permanganate oxidation with a spectrophotometer.
		Organic Matter	Yes		Is a measure of all carbonaceous material that is derived from living organisms. The percent OM is determined by the mass of oven dried soil lost on combustion in a 500°C furnace.
		Soil Protein	Yes		Is a measure of the fraction of the soil organic matter which contains much of the organically bound N. Microbial activity can mineralize this N and make it available for plant uptake. This is measured by extraction with a citrate buffer under high temperature and pressure.
	Microbial Biomass	Earthworm Count		Yes	Earthworm burrows improve infiltration and their castings improve aggregation, nutrient availability to plants, cation exchange capacity, and soil organic matter. Because they eat microbes in the soil (primarily bacteria, also fungi, nematodes and protozoa) their population is a visible indicator of the invisible life present in the soil—the more food is present, the higher the worm population supported. An increase in the number of worms in the soil is a strong indicator of improving soil health.
		Soil Respiration	Yes	Yes	Is a measure of the metabolic activity of the soil microbial community. It is measured by re-wetting air dried soil, and capturing and quantifying carbon dioxide (CO_2) produced
		Soil Surface Biology		Yes	To make note of surface observations in a single spot of land to track changes over time in biological diversity of plant and animal activity, and percentage of bare ground. More diversity and less bare ground are correlated with increasing soil health. Frequency: At least annually at same time of year
		*Potentially Mineralizable Nitrogen	Yes		Is a combined measure of soil biological activity and substrate available to mineralize nitrogen to make it available to the plant. It is measured as the change in mineralized plant-available nitrogen present after a seven day anaerobic incubation.
		*Root Pathogen Pressure Rating	Yes		Is a measure of the degree to which sensitive test-plant roots show symptoms of disease when grown in standardized conditions in assayed soil. Assessed by rating washed roots through visual inspection for disease symptoms.
CHEMICAL	Soil Chemical Composition (Fertility)	Soil Chemical Composition	Yes		A standard soil test analysis package measures levels of pH and plant nutrients. Measured levels are interpreted in this assessment's framework of sufficiency and excess but no crop specific recommendations are provided.
		*Heavy Metals	Yes		Is a measure of levels of metals of possible concern to human or plant health. They are measured by digesting the soil with concentrated acid at high temperature
		*Salinity and Sodicity	Yes		Salinity is a measure of the soluble salt concentration in soil, and is measured via electrical conductivity. Sodicity is a calculation of the sodium absorption ratio (SAR) and is measured using ICP spectrometry to determine Na+, Ca2+, Mg2+ concentrations and using an equation to calculate the absorption ratio.

*Add-on Indicator

CASH Tests and descriptors from the Comprehensive Assessment of Soil Health, The Cornell Framework, Table 2.02: Indicators of the Comprehensive Assessment of Soil Health and what they mean. Version 3.2