

Haney Report Definitions

1:1 Soil pH: The pH of the soil using a 1:1 ratio of soil and water. We may have to add lime to adjust pH if the value is below 5.5 for most crops.

1:1 Soluble Salts: A measure of the electrical conductivity (EC) of the soil based on the amount of soluble salts at a 1:1 ratio of soil and water expressed as mmho/cm. High levels of soluble salts can be detrimental to plant root growth and microbial function.

Excess Lime Rating: The excess lime rating will either be presented as None, Low or High. Excess Lime in the soil helps buffer against pH changes due to fertilizer additions and biological activity.

Organic Matter: This is the total soil organic matter (SOM) expressed as percent loss on ignition (%LOI). SOM is made up mostly of organic carbon, but it also contains all other essential plant nutrients. We think of SOM as the house the microbes live in.

Soil Respiration: This number is ppm CO₂-C released in 24 hours by soil microbes after a soil sample has been dried and rewetted. This is a measure of microbial biomass and is related to a soil's potential microbial activity during ideal conditions. Furthermore, it is influenced by SOM, aggregation, texture and overall fertility of the soil. In general the higher the number the better. This value can range anywhere from about 0 to nearly 1000, but we typically don't see values higher than 400 for most soils and management scenarios. The rankings would be as follows:

0-10 Very Low

11-20 Low

21-30 Below average

31-50 Slightly below average

51-70 Slightly above average

71-100 Above Average

101-200 High

201+ Very High

Notice that we do not list a true average because these rankings are on a sliding scale, which is dependent on soil types and climate. Sandier soils or dryer climates tend to score poorer. Therefore, we need to focus on the relative differences between samples and track change in time as a response to management rather than be entirely focused on an actual number.

Total Nitrogen: The total *water extractable* N (WEN) from your soil expressed in ppm.

Organic Nitrogen: Organic N is the total water extractable N (WEN) minus inorganic N (NO₃ and NH₄) in ppm. The organic N pool is replenished by fresh plant residues, manure, composts, and dying soil microbes.

Total Organic Carbon: The total *water extractable* organic C (WEOC) from your soil expressed in ppm. This pool of carbon is roughly 80 times smaller than total soil organic C pool (% organic matter) and reflects the energy/food source that is driving your soil microbes.

Nitrate-N: The amount of NO₃-N extracted from your soil using H3A extractant expressed in ppm N.

Ammonium-N: The amount of NH₄-N extracted from your soil using H3A extractant expressed in ppm N.

Inorganic Nitrogen: This is a sum of the NO₃-N and NH₄-N expressed in ppm N. The desired soil test level will depend on the time of year, the crop you are growing and the desired/expected yield goal. We typically do not want to see large amounts of inorganic N present in your soil.

Total Phosphorus: Total P is the amount of elemental P in your soil extracted with H3A and analyzed on ICAP in ppm P.

Inorganic Phosphorus: The amount of P in your soil extracted with H3A and measured as orthophosphate (PO₄-P) expressed in ppm P. The desired soil test level will depend on the crop you are growing and the desired/expected yield goal.

Organic Phosphorus: Organic P is the total P minus inorganic P expressed in ppm P. This represents P that is not currently plant available but may become available through microbial activity.

ICAP Potassium (K): Is the total elemental K extracted with H3A from your soil expressed as ppm K. The desired soil test level will depend on the crop you are growing and the desired/expected yield goal.

ICAP Zinc (Zn): Is the total elemental Zn extracted with H3A from your soil expressed as ppm Zn. The desired soil test level will depend on the crop you are growing and the desired/expected yield goal.

ICAP Iron (Fe): Is the total elemental Fe extracted with H3A from your soil expressed as ppm Fe. The desired soil test level will depend on the crop you are growing and the desired/expected yield goal.

ICAP Manganese (Mn): Is the total elemental Mn extracted with H3A from your soil expressed as ppm Mn. The desired soil test level will depend on the crop you are growing and the desired/expected yield goal.

ICAP Copper (Cu): Is the total elemental Cu extracted with H3A from your soil expressed as ppm Cu. The desired soil test level will depend on the crop you are growing and the desired/expected yield goal.

ICAP Sulfur (S): Is the total elemental S extracted with H3A from your soil expressed as ppm S. The desired soil test level will depend on the crop you are growing and the desired/expected yield goal.

ICAP Calcium (Ca): Is the total elemental Ca extracted with H3A from your soil expressed as ppm Ca. The desired soil test level will depend on the crop you are growing and the desired/expected yield goal.

ICAP Magnesium (Mg): Is the total elemental Mg extracted with H3A from your soil expressed as ppm Mg. The desired soil test level will depend on the crop you are growing and the desired/expected yield goal.

ICAP Sodium (Na): Is the total elemental Na extracted with H3A from your soil expressed as ppm Na. The desired soil test level will depend on the crop you are growing and the sensitivity to excess levels of Na.

ICAP Aluminum (Al): Is the total elemental Al extracted with H3A from your soil expressed as ppm Al. The desired soil test level will depend on the crop you are growing and the sensitivity to excess levels of Al.

Microbially Active C: Microbially Active Carbon or %MAC is how much of the water extractable organic C was acted upon by the microbes. It is calculated as soil respiration divided by water extractable organic C expressed as a percentage.

Organic C:Organic N: This is the ratio of organic C to organic N in your soil based on the water extraction. This number is a very sensitive indicator of the health of your soil and has a significant impact on the activity of soil microbes. We like to see number **below 20**. When the value is above 20, we will suggest a higher percentage of legumes in the system to help build organic N and lower the ratio over time. We want to see this value between 8 and 15 and we consider it to be ideal when it falls between 10 and 12.

Organic N:Inorganic N: This is the ratio of organic N to inorganic N in your soil. Soils that are reliant on fertilizer inputs typically have a lower amount of organic N and a higher amount of residual inorganic N. Therefore, the ratio is very low (<2). We want to see this ratio get to a value above 5 and the higher it is the better.

Organic N Release: The total amount of nitrogen being released through microbial activity from the organic N pool expressed as ppm N. The N released here is counted as a credit to the next crop and is subtracted from recommendations made on the Haney Test. The amount of N being released is dependent on how much water extractable organic N we can measure, how high the soil respiration or microbial biomass value is and how balanced the organic C:organic N ratio is. Overall, the organic N release value typically increases as the soil system gets healthier.

Organic N Reserve: The amount of nitrogen left in the organic N pool in ppm N following the release by microbes. The organic N reserve or organic N pool is replenished by fresh plant residues, manure, composts, and dying soil microbes.

Organic P Release: The amount of phosphorus that will be released through mineralization of organic P by soil microbes depending on their abundance and the organic C:organic N ratio expressed in ppm P.

Organic P Reserve: Organic P reserve is the amount of P that remains in the organic P pool following the release by microbes expressed in ppm P.

Soil Health Calculation: This number is calculated as soil respiration divided by 10 plus a weighted organic carbon and organic N addition. It summarizes the overall health of your system based on the indicators measured in the test. The score typically ranges anywhere from about 0-50 with a higher number being better. We like to see this number above 7 as a starting point, but a score above 10 is typically good for most soils. Not all soils, however, have the same potential when it comes to the soil health score. The best way to get started is to establish a baseline of where your farm is right now. Then find one or two soils in the area (neighbor or down the road) that you think are in poor soil health based on your own observations or definitions. Then find a soil that you define as being in the best health. Try to look beyond yield when defining soil health, so this might be a fencerow or a tree line or a well-managed perennial

pasture. The goal is to establish your own range based on your area's general climate and soil types. This will also tell you where you have progressed from if you have been trying different tactics aimed at improving soil health, but it will also allow you to set some goals and realistic expectations. Again, not every soil has the same potential. Keeping track of this number will allow you to gauge the effects of your management practices over the years.

Cover Crop Mix: This is a suggested cover crop planting mix recommendation based on your soil test data, the soil health score, and the organic C:N ratio. It is designed to provide your soil with a mixed species cover crop to help you balance the C:N ratio and feed the soil microbes to improve your soil health.

Nitrogen, lbs N/acre: Pounds of plant available N per acre in soil. This value includes the inorganic N measured as nitrate and ammonium and the amount of N expected to be released from the organic N pool by biological processes.

Phos, lbs P2O5/A: Pounds of plant available P2O5 per acre. This value includes the inorganic P measured as orthophosphate and the amount of P expected to be released from the organic P pool by biological processes.

Potassium, lbs K2O/A: Pounds of plant available K2O per acre.

Nutrient Value, \$/A: Is the estimated value of the plant available NPK in your soil based on common fertilizer prices.

Traditional N Eval: This number reflects the amount of N in lbs per acre that would have been measured using a more traditional soil test where NO₃-N was the only test used for N evaluation.

Haney Test N Eval: This number is the same as plant available N in lbs per acre and represents the amount of N measured with the Haney Test methods. It includes NO₃-N, NH₄-N, and the organic N release.

Lbs N difference: Is the difference in the amount of N in lbs per acre between the Haney Test and a traditional soil test using NO₃-N. This value typically increases with positive gains in soil health.

N Savings: Is the amount of money saved on N application per acre based on the difference of N measured using the Haney Test and current N prices.