

## Midwest Laboratories Soil Health Assessment

**The soil health assessment is done on a 0-6 inch sample.**

The soil health assessment is comprised of three components. The first piece of the soil health assessment is an in-depth soil analysis that will address the chemical aspects of the soil. This test package will include available phosphorus, exchangeable potassium, magnesium, calcium, and hydrogen, soil pH, cation exchange capacity, percent base saturation, organic matter, soluble salts, nitrate, and micronutrients. This part of the report will also include recommendations for application rates based on the chemical analysis of the soil, intended crop to be grown, and the target yield.

The second component of the soil health assessment is the Solvita 1-day CO<sub>2</sub>C test. The Solvita soil respiration test measures the carbon dioxide being released by the soil microbes over a 24 hr period. This test is one of the most important numbers in the soil health assessment and is a measure of the microbial activity in the soil and is highly related to the fertility of your soil. In most cases, the higher the number, the more fertile the soil. Microbes exist in soil in great abundance. They are highly adaptable to their environment. Their composition, adaptability, and structure are a result of the environment they inhabit. They have adapted to the temperature, moisture levels, soil structure, crop and management inputs, as well as soil nutrient content in which they find themselves. In short, they are a product of their environment. They are highly adaptive and a dependable indicator of soil health. Since they are motivated by their need to reproduce and are driven by this need for acquiring carbon, nitrogen and phosphate in a ratio of 100:10:1 (C: N: P), it is clear that carbon is the driver of the soil nutrient-microbial recycling system. This consistent need sets the stage for a standardized measurement of their activity which is practically universal. Since soil microbes take in oxygen and release CO<sub>2</sub>, we can couple this mechanism to their activity. It follows that soil microbial activity is a response to the level of soil quality/fertility they find themselves in.

The third component of the soil health assessment is commonly called the Haney test. This set of tests were developed by Rick Haney. The testing methods use green chemistry, in that water is used as a natural extractant. A H3A extract was developed by Haney that mimics organic acids produced by living plant roots. From this data a soil health calculation is generated. This number is calculated as 1-day CO<sub>2</sub>C divided by the organic C:N ratio plus water extractable organic carbon/100 + water extractable organic nitrogen/10 to include a weighted contribution of water extractable organic carbon and organic nitrogen. It represents the overall health of your soil system. It combines 5 independent measurements of your soil's biological properties. The calculation looks at the balance of soil carbon and nitrogen and their relationship to microbial activity. A soil health calculation number can vary from 0 to over 50. We like to see this number increase over time. This number is about where your soil is now and what it needs to reach its highest sustainable state. Keeping track of this number will allow you to gauge the effects of your management practices over the years.

Based on these three components we are able to determine additional nitrogen that is available in your soil that may be credited towards your fertility program.



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**14-351-0438**  
ACCOUNT  
2159

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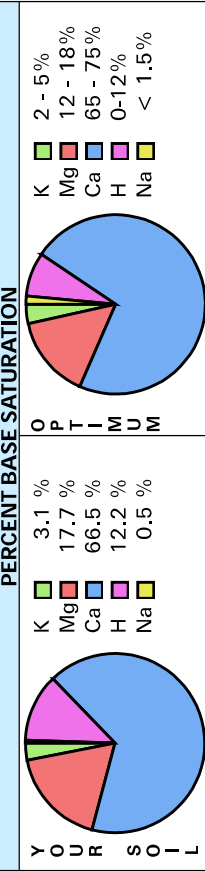
**13500 MASTER IN-HOUSE ACCOUNT**

IDENTIFICATION  
**STUKENHOLTZ**

**MIDWEST LABS**  
13611 B St  
NE

**FIRST FORM**

ANALYTICAL LABORATORY FINDINGS		APPLICATION GUIDELINES				
SAMPLE IDENTIFICATION	GUILLIAT 1	INTENDED CROP	CORN - bu	SOYBEANS - bu	SOYBEANS - bu	SOYBEANS - bu
LABORATORY NUMBER	27690744	YIELD GOAL	175.0	175.0	50.0	50.0
ANALYTE	UNITS	PREVIOUS CROP	SOYBEANS - bu	CORN - bu	CORN - bu	CORN - bu
		FERTILITY ELEMENT	CROP REMOVAL	CROP REMOVAL	CROP REMOVAL	CROP REMOVAL
	RESULTS		MIDWEST SUGGESTS	MIDWEST SUGGESTS	MIDWEST SUGGESTS	MIDWEST SUGGESTS
ORGANIC MATTER	%	NITROGEN (N)	175	145	206	--
EST N RELEASE	lbs/A	CARRYOVER N		(25) lbs		(25) lbs
NITRATE-N	ppm	PHOSPHATE (P <sub>2</sub> O <sub>5</sub> )	61	70	45	50
SUB-SOIL NO <sub>3</sub> -N 1	ppm	POTASH (K <sub>2</sub> O)	43	--	70	--
SUB-SOIL NO <sub>3</sub> -N 2	ppm	MAGNESIUM (Mg)	17.5	--	11.2	--
P <sub>1</sub> PHOSPHORUS	ppm	SULFUR (S)	12.3	9	9.0	8
P <sub>2</sub> PHOSPHORUS	ppm	ZINC (Zn)	0.5	3.7	0.2	2.7
BICARB-P	ppm	MANGANESE (Mn)		2.1		1.8
POTASSIUM	ppm	IRON (Fe)		--		--
MAGNESIUM	ppm	COPPER (Cu)		--		--
SULFUR	ppm	BORON (B)		1.2		0.7
ZINC	ppm					
MANGANESE	ppm					
IRON	ppm					
COPPER	ppm					
BORON	ppm					
CALCIUM	ppm					
SODIUM	ppm					
SOLUBLE SALTS	mmhos/cm					
EXCESS LIME RATE	cm					
pH						
BUFFER INDEX						
C.E.C.	meq/100g					



Surface Nitrate Depth: 0-6  
The above analytical results apply only to the sample(s) submitted.  
Samples are retained a maximum of 30 days.

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MASTER IN-HOUSE ACCOUNT

SOIL HEALTH ASSESSMENT

ANALYTICAL LABORATORY FINDINGS					
SAMPLE IDENTIFICATION LABORATORY NUMBER	UNITS	RESULTS	LOW	MEDIUM	VERY HIGH
GULLIAT 1 27690744					
<b>H3A EXTRACTION</b>					
NITRATE-N	ppm	8.0			
AMMONIACAL-N	ppm	2.3			
ORTHOPHOSPHATE-P	ppm	9.4			
PHOSPHORUS	ppm	14			
POTASSIUM	ppm	47			
MAGNESIUM	ppm	63			
CALCIUM	ppm	174			
SODIUM	ppm	14			
IRON	ppm	59			
ALUMINUM	ppm	114			
<b>WATER SOLUBLE</b>					
NITRATE-N	ppm	13			
AMMONIACAL-N	ppm	3.2			
ORTHOPHOSPHATE-P	ppm	1.6			
CARBON	ppm	195.0			
TKN	ppm	14.0			
<b>1 DAY CO<sub>2</sub> BURST</b>		94.13			
ORGANIC CARBON	ppm	195.0			
ORGANIC NITROGEN	ppm	10.8			
ORGANIC C/N RATIO		18.1			

ADDITIONAL NITROGEN CREDIT IDENTIFIED VIA HANEY TEST: 19 lbs/A

NITROGEN RECOMMENDATIONS MAY INCLUDE ADDITIONAL NITROGEN CREDITS BASED ON PREVIOUS CROPS AND NITROGEN MINERALIZATION RATES.

The above analytical results apply only to the sample(s) submitted. Samples are retained a maximum of 30 days.

### SOIL HEALTH CALCULATION

8.2

The **H3A Soil Extractant** was developed by Haney\*. This extract is designed to mimic organic acids produced by living plant root systems. These organic acids increase nutrient availability in the root zone.

The **Water Soluble Extract** provides a snapshot of nutrients that are immediately available to the plants.

The **CO<sub>2</sub> Burst** test is very good indicator of soil health. This test measures the amount of CO<sub>2</sub> naturally released from the soil due to the activity of the soil microbes through microbial respiration. This test is very dependant on the amount of carbon that is available to the soil microbes and the form that the carbon is in. As the available carbon increases in your soil the Microbial respiration will increase.

**Organic Carbon** is the available total water extractable organic carbon from your soil. This pool of carbon is roughly 80 times smaller than the Soil Organic Matter. The organic carbon pool reflects the energy/food source that is driving the soil microbes.

The **Organic Nitrogen** pool is replenished by fresh plant residues, manure, composts, and dying soil microbes.

The **Organic C/N ratio** is a critical component of the nutrient cycle. A soil C/N ratio above 20 generally indicates that Nitrogen will be tied up and not available to plants. The ideal range for the Organic C/N ratio will be from 8:1 to 15:1.

The **Soil Health Calculation** uses the CO<sub>2</sub> Burst, Organic Carbon, Organic Nitrogen, and the C/N ratio to generate the soil health number. This calculation looks at the balance of soil carbon and nitrogen and their relationship to microbial activity. This number represents the overall health of your system. Soil values will range from 0 to 50. A soil with a value below 7 would be considered low. You want to see this number increase as you make changes and adjustments. Keeping track of this number will allow you to gauge the effects of your management practices over time.

\*Modifications to the New Soil Extractant H3A-1: A Multinutrient Extractant  
R.L. Haney (a); E.B. Haney (b); L.R. Hossner (c); J.G. Arnold (a)