Making Sense of Soil Health Reports for No-Till

Vinayak Shedekar

1/11/2023

Grand Ballroom A/B (4th Floor)

You Will Learn: how key soil health and agronomic factors impact yields and water quality, and how to interpret soil health testing to implement actions.

Making Sense of Soil Health Reports for No-Till

SARE PROJECTS

LNC20-439 ("Soil health and water quality nexus in sustainable agroecosystems"**)**

ONC18-047 ("Making sense of Soil Health Reports – A partnership to develop recommendations for soil health testing, interpretation"**)**

You Will Learn: how key soil health and agronomic factors impact yields and water quality, and how to interpret soil health testing to implement actions.

Why Test Soil Health?

What's wrong with the traditional soil fertility test?

So, would a soil health test help?

What test is the best?

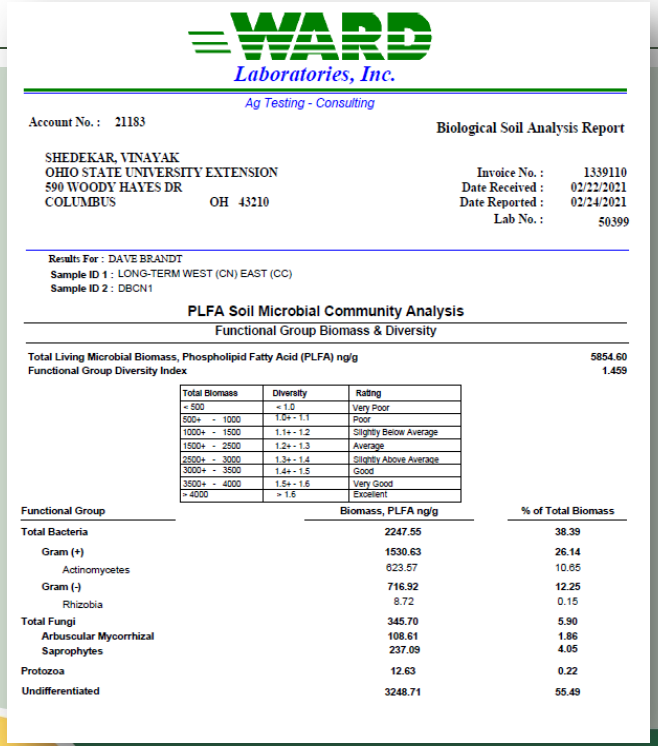
How do I interpret a soil health test? And can it help adjust/change my management?

Soil health & human health

Human health	Soil Health
Body mass index (height, weight)	Physical properties
Lipid profile (cholesterol)	Chemical properties
Nutrition/digestive health	Biological properties
Bones & muscles	Structure, compaction, erosivity

Just like us, soil needs daily calory/vitamin intake, annual check ups, and long-term health monitoring!

Soil health reports can soon look just like human health reports!



WARD Laboratories, Inc.

Ag Testing - Consulting

Account No. : 21183

Biological Soil Analysis Report

SHEDEKAR, VINAYAK
OHIO STATE UNIVERSITY EXTENSION
590 WOODY HAYES DR
COLUMBUS OH 43210

Invoice No. : 1339110
Date Received : 02/22/2021
Date Reported : 02/24/2021
Lab No. : 50399

Results For : DAVE BRANDT
Sample ID 1 : LONG-TERM WEST (CN) EAST (CC)
Sample ID 2 : DBCN1

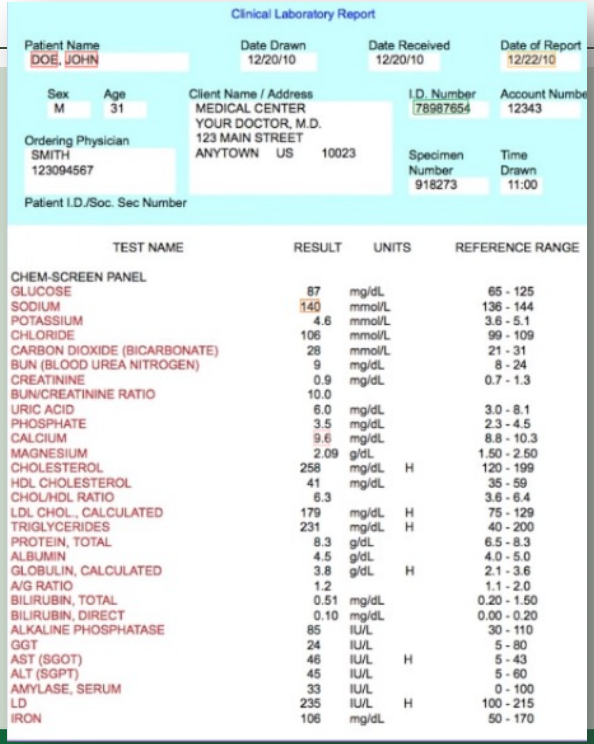
PLFA Soil Microbial Community Analysis

Functional Group Biomass & Diversity

Total Living Microbial Biomass, Phospholipid Fatty Acid (PLFA) ng/g 5854.60
Functional Group Diversity Index 1.459

Total Biomass	Diversity	Rating
< 500	< 1.0	Very Poor
500+ - 1000	1.0+ - 1.1	Poor
1000+ - 1500	1.1+ - 1.2	Slightly Below Average
1500+ - 2500	1.2+ - 1.3	Average
2500+ - 3000	1.3+ - 1.4	Slightly Above Average
3000+ - 3500	1.4+ - 1.5	Good
3500+ - 4000	1.5+ - 1.6	Very Good
> 4000	> 1.6	Excellent

Functional Group	Biomass, PLFA ng/g	% of Total Biomass
Total Bacteria	**2247.55**	**38.39**
Gram (+)	**1530.63**	**26.14**
Actinomyoetes	623.57	10.65
Gram (-)	**716.92**	**12.25**
Rhizobia	8.72	0.15
Total Fungi	**345.70**	**5.90**
Arbuscular Mycorrhizal	**108.61**	**1.86**
Saprophytes	**237.09**	**4.05**
Protozoa	**12.63**	**0.22**
Undifferentiated	**3248.71**	**55.49**



Clinical Laboratory Report

Patient Name: DOE, JOHN
Date Drawn: 12/20/10
Date Received: 12/20/10
Date of Report: 12/22/10
Sex: M
Age: 31
Client Name / Address: MEDICAL CENTER, YOUR DOCTOR, M.D., 123 MAIN STREET, ANYTOWN US 10023
I.D. Number: 78987654
Account Number: 12343
Ordering Physician: SMITH 123094567
Specimen Number: 918273
Time Drawn: 11:00
Patient I.D./Soc. Sec Number

TEST NAME	RESULT	UNITS		REFERENCE RANGE
CHEM-SCREEN PANEL				
GLUCOSE	87	mg/dL		65 - 125
SODIUM	140	mmol/L		136 - 144
POTASSIUM	4.6	mmol/L		3.6 - 5.1
CHLORIDE	106	mmol/L		99 - 109
CARBON DIOXIDE (BICARBONATE)	28	mmol/L		21 - 31
BUN (BLOOD UREA NITROGEN)	9	mg/dL		8 - 24
CREATININE	0.9	mg/dL		0.7 - 1.3
BUN/CREATININE RATIO	10.0			
URIC ACID	6.0	mg/dL		3.0 - 8.1
PHOSPHATE	3.5	mg/dL		2.3 - 4.5
CALCIUM	9.6	mg/dL		8.8 - 10.3
MAGNESIUM	2.09	g/dL		1.50 - 2.50
CHOLESTEROL	258	mg/dL	H	120 - 199
HDL CHOLESTEROL	41	mg/dL		35 - 59
CHOL/HDL RATIO	6.3			3.6 - 6.4
LDL CHOL., CALCULATED	179	mg/dL	H	75 - 129
TRIGLYCERIDES	231	mg/dL	H	40 - 200
PROTEIN, TOTAL	8.3	g/dL		6.5 - 8.3
ALBUMIN	4.5	g/dL		4.0 - 5.0
GLOBULIN, CALCULATED	3.8	g/dL	H	2.1 - 3.6
A/G RATIO	1.2			1.1 - 2.0
BILIRUBIN, TOTAL	0.51	mg/dL		0.20 - 1.50
BILIRUBIN, DIRECT	0.10	mg/dL		0.00 - 0.20
ALKALINE PHOSPHATASE	85	IU/L		30 - 110
GGT	24	IU/L		5 - 80
AST (SGOT)	46	IU/L	H	5 - 43
ALT (SGPT)	45	IU/L		5 - 60
AMYLASE, SERUM	33	IU/L		0 - 100
LD	235	IU/L	H	100 - 215
IRON	106	mg/dL		50 - 170

Challenges with soil health testing

There is no universally accepted / agreed upon test

Soil type, region, climate affect interpretation

Sampling plays a role in the outcome

Difficult to come up with prescriptive interpretation

Then why do it?

Skeptics – may help you cross the hump

Beginners – track your progress, correct mistakes, accelerate transition

Transitional systems – accelerate transition

More mature systems – save costs, maximize benefits!

6. Reflect, Learn, Share!

Why do a soil health test? What to expect?

Ideally, we would have a few simple measurements that indicate a field's current level of soil health. And **these measurements would help us identify management practices** to increase the soil health.

A soil health test should be **much like a "wellness exam" for human health** that **finds areas that need some attention** and provide us with an overall "health rating."

PURDUE EXTENSION

AY-366-W

Indiana Soil and Water

Authors
Stacy Zuber and
Eileen Kladivko

How to Understand and Interpret Soil Health Tests

Soil health has received increased attention during the past few years — and for good reason. The USDA-Natural Resources Conservation Service (NRCS) defines soil health as the "capacity of the soil to function as a vital, living ecosystem that sustains plants, animals, and humans."

It is important for us to protect and improve the soil health on our agricultural lands for both short- and long-term productivity. Soil health matters to farmers, consumers, and society as a whole. So clearly, finding ways to improve soil health on our nation's croplands should be a high priority.

But the question of how to adequately measure soil health arises. Soil health intertwines many aspects that function together as a system: soil biology, fertility/chemistry, and physical properties. Ideally, we would have a few simple measurements that indicate a field's current level of soil health. And these measurements would help us identify management practices to increase the soil health.

A soil health test should be much like a "wellness exam" for human health that finds areas that need some attention and provide us with an overall "health rating." In the same way, a soil health test should identify areas

Purdue Agronomy
ag.purdue.edu/AGRY

North American Project to Evaluate Soil Health Measurements

Soil Health Institute led a 3-year, $6.5-million project partnered with over 100 scientists at **124 long-term agricultural research sites** in the U.S., Canada, and Mexico evaluated

over 30 soil health measurements at each site

cost, practicality, availability, redundancy, and other filters

North American Project to Evaluate Soil Health Measurements

Tier 1 measures endorsed

1. Organic carbon,
2. pH,
3. Water-stable aggregation,
4. Crop yield,
5. Texture,
6. Penetration resistance,
7. Cation exchange capacity,
8. Electrical conductivity,
9. Nitrogen,
10. Phosphorus,
11. Potassium,
12. Carbon mineralization,
13. Nitrogen mineralization,
14. Erosion rating,
15. Base saturation,
16. Bulk density,
17. Available water holding capacity,
18. Infiltration rate, and
19. Micronutrients

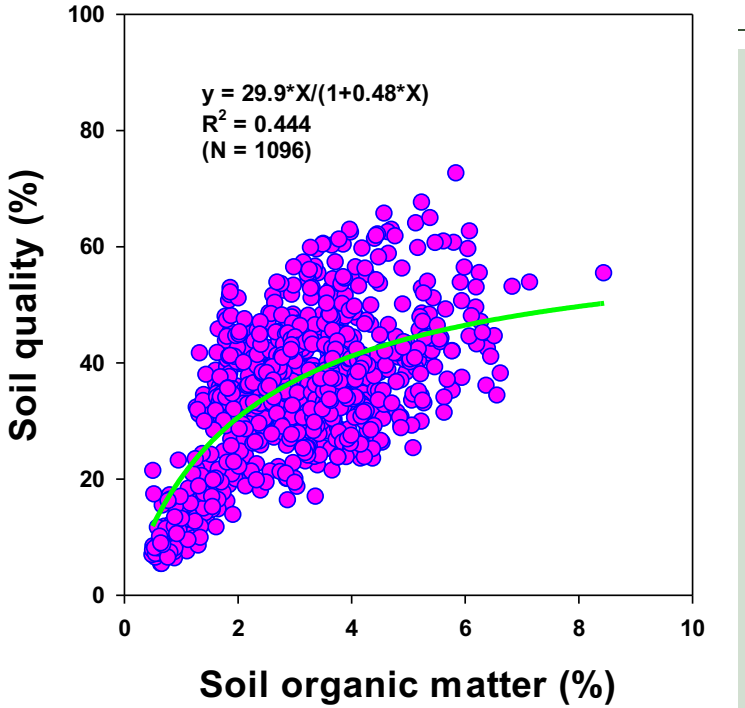
North American Project to Evaluate Soil Health Measurements

Tier 1 – minimum measurements

1) soil organic carbon concentration
2) carbon mineralization potential
3) aggregate stability

Why SOM is important?

- "...SOM is **Composite** Indicator of overall soil quality..."

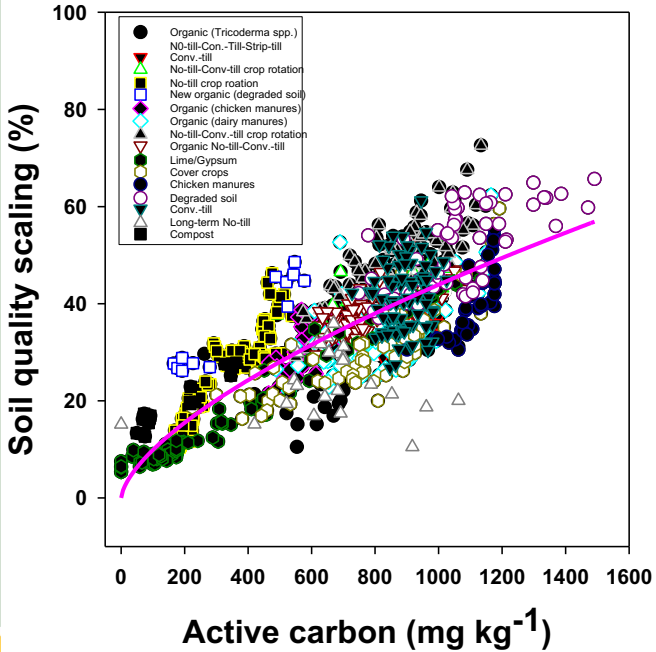


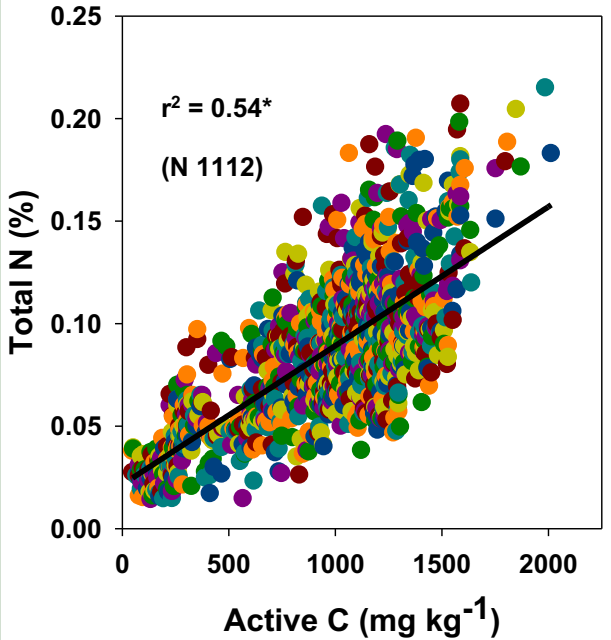
Data from: Dr. Rafiq Islam

Islam et al. (2015) – Unpublished data

Why SOM is important?

- "...Active fraction of SOM is **Core** Indicator of overall soil quality and productivity..."





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Dr. Rafiq Islam

Islam et al. (2015) – Unpublished data

Solvita CO_2 Burst Test

The Solvita CO_2 Burst Test is a new tool which easily and accurately measures soil biological CO_2 respiration.

Cost = $25.00

Indicator of soil health – The rates of CO_2 release is generally regarded as an indicator of Soil Health and is favorably improved with practices such as cover cropping

Solvita Nitrogen Mineralization,

no cover crop

Solvita Field Test Color Number, 0 to 6.5	3.64 color
Your average soil temperature	65° f
Number of days in your crop's growing season	120 days
Adjusted CO_2-C based on the entered soil temp above	13 LBS/Acre
Likely Organic Nitrogen Mineralized over growing season	44 LBS/Acre
Dollars Saved Per Acre for 200 Bushel Per Hectare for 12.5 metric tons Corn*	$21.32

Solvita Nitrogen Mineralization,

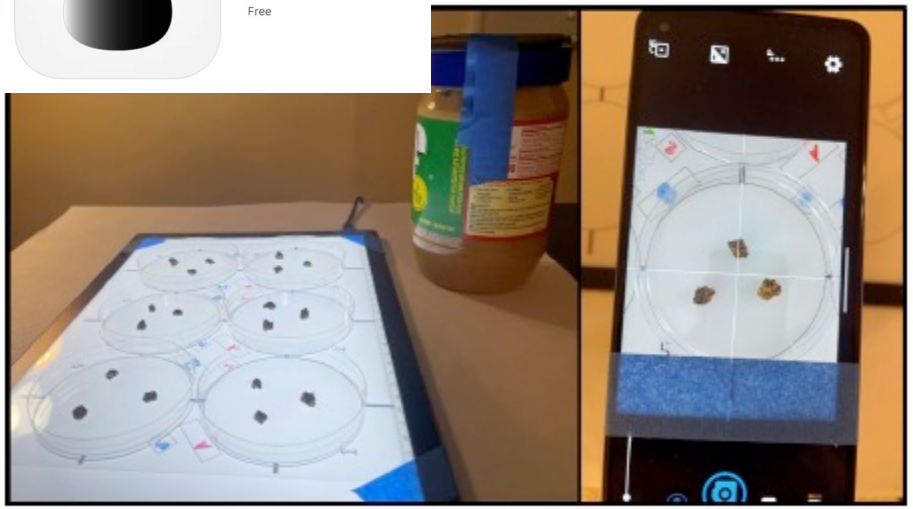
Multi-species cover crop

Solvita Field Test Color Number, 0 to 6.5	5.66 color
Your average soil temperature	65° f
Number of days in your crop's growing season	120 days
Adjusted CO_2-C based on the entered soil temp above	101 LBS/Acre
Likely Organic Nitrogen Mineralized over growing season	158 LBS/Acre
Dollars Saved Per Acre for 200 Bushel Per Hectare for 12.5 metric tons Corn*	$76.00

Aggregate Stability

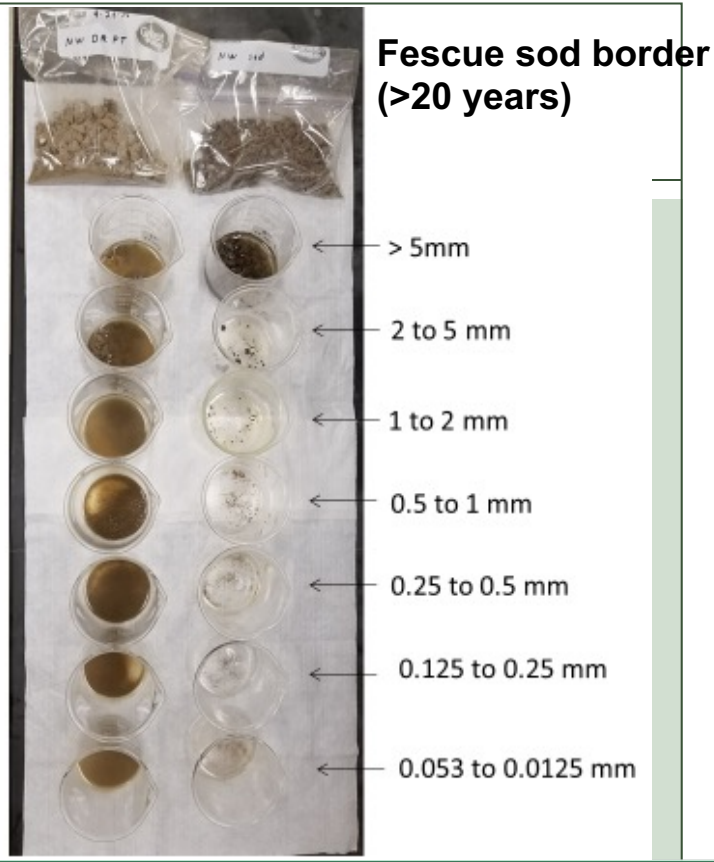
Slakes 4+
Soil aggregate stability
Mario Fajardo
Designed for iPhone
4.5 • 2 Ratings
Free

Slakes Soil Aggregate Stability App



Aggregate stability

OSU NW Ohio Research Farm
Hoytville silty clay soil
0-4 in deep samples



Simple measures

Penetrometer

Infiltration

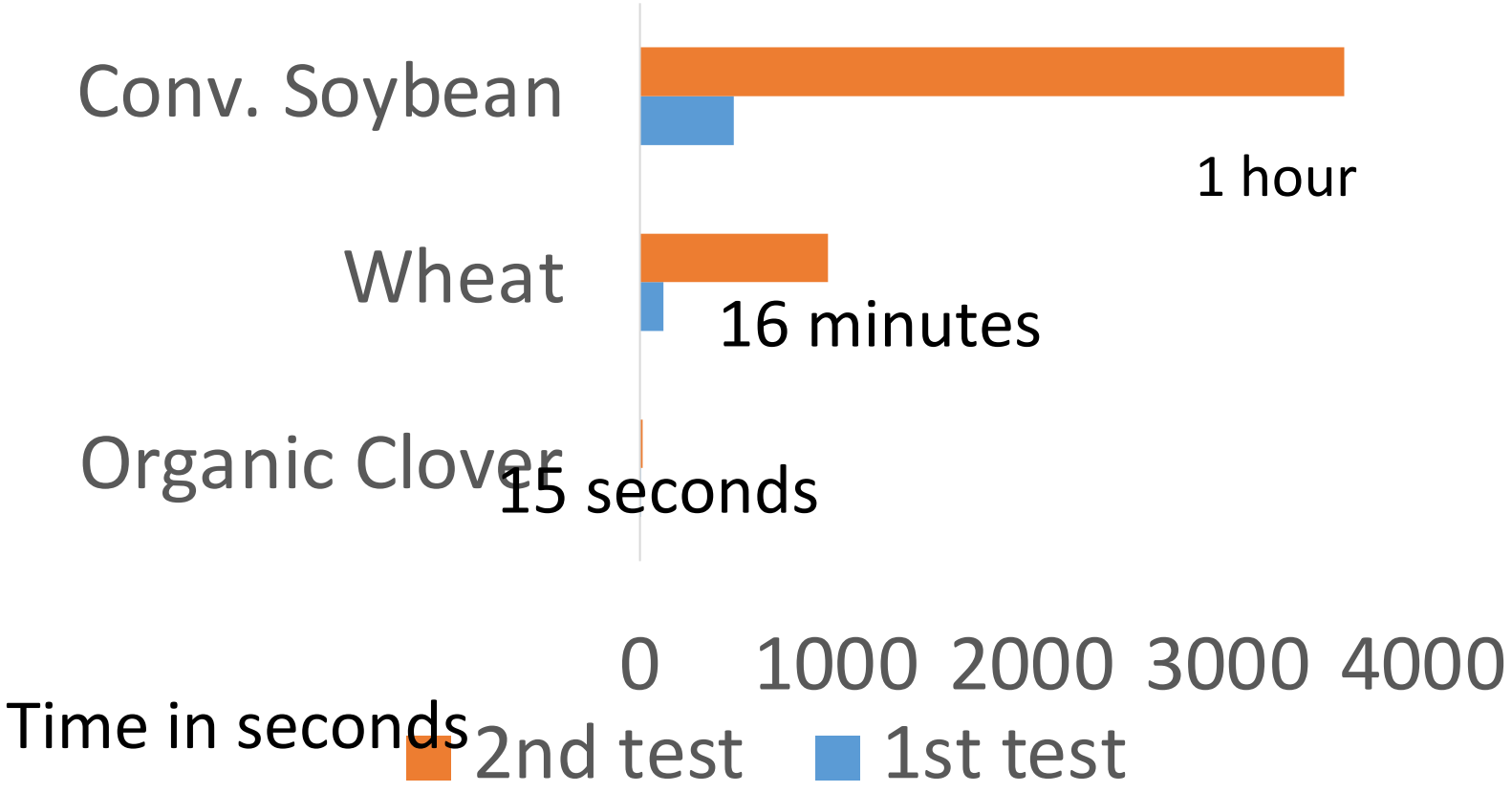
Soil temperature

Soil moisture

Infiltration

The downward entry of water into the soil. The velocity at which water enters the soil is infiltration rate.

Water Infiltration, Wood County

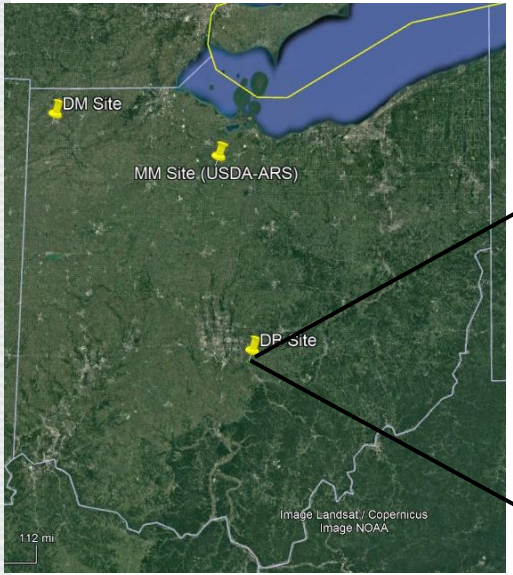


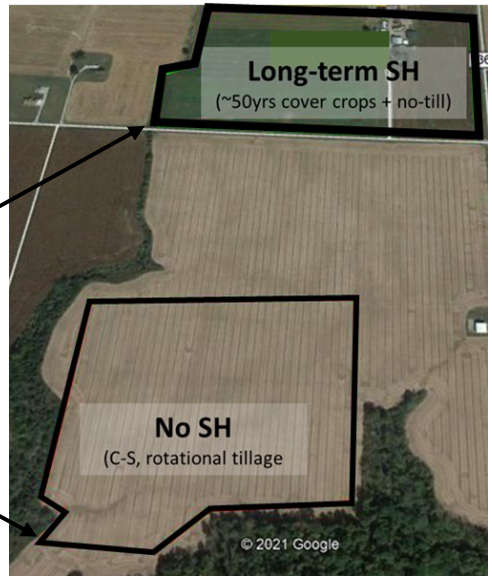
Simple measures

topsoil depth
plant residue and signs of erosion
root health
Crop yields
erosion
Water quality

NCR SARE funded Research & Extension Grant (LNC20-439)

Does it matter if the soil health systems are…
Mature or, transitional vs under No SH Practices?



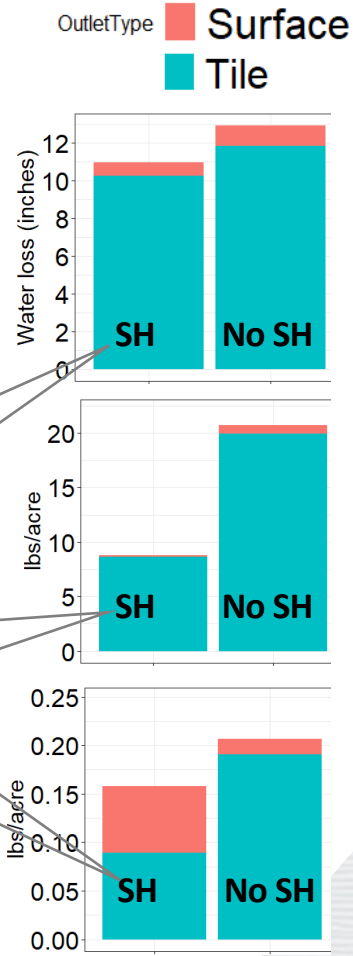


Mature SH vs No SH
Preliminary Results (2021)

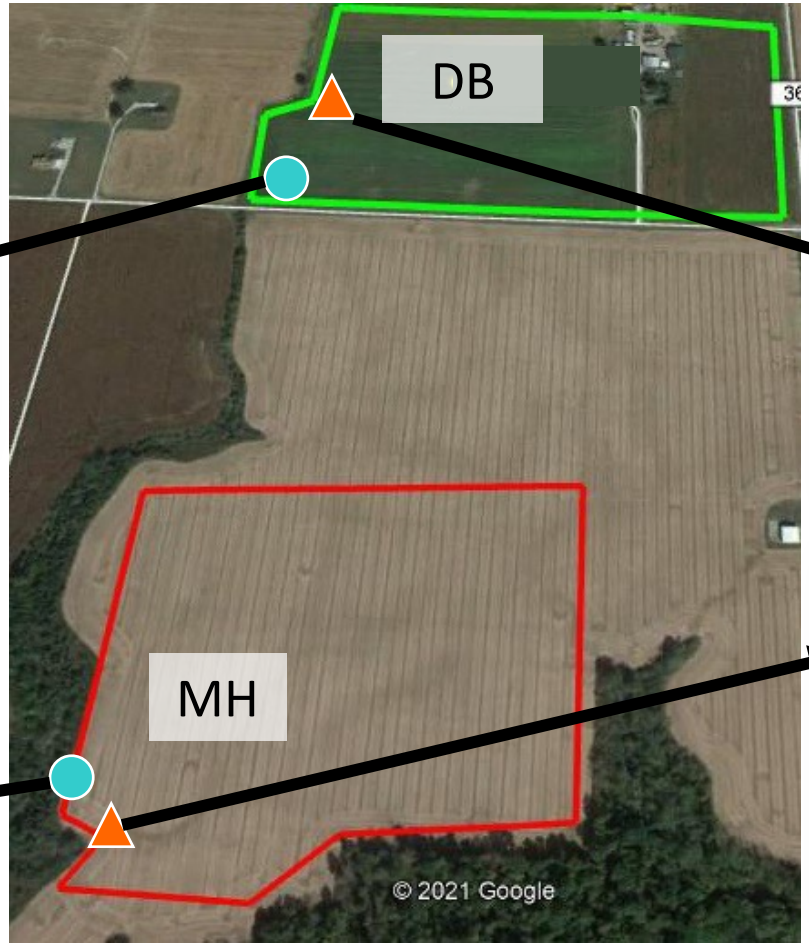
~2 in./yr (~15%)
less water discharge

12 lb/acre/yr (~50%)
less nitrate loss

0.05 lb/acre/yr (~25%)
less dissolved P loss



Tile Drainage



Surface Runoff

CFAES

USDA ARS

Soil Drainage Research Unit

Soil Loss

LT Soil Health	Conventional

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

2021

Making sense of Soil Health Reports – A partnership to develop recommendations for soil health testing, interpretation

NORTH CENTRAL SARE
Sustainable Agriculture Research & Education

NCR SARE Partnership Grant
ONC18-047

How to use soil health data for decision making?

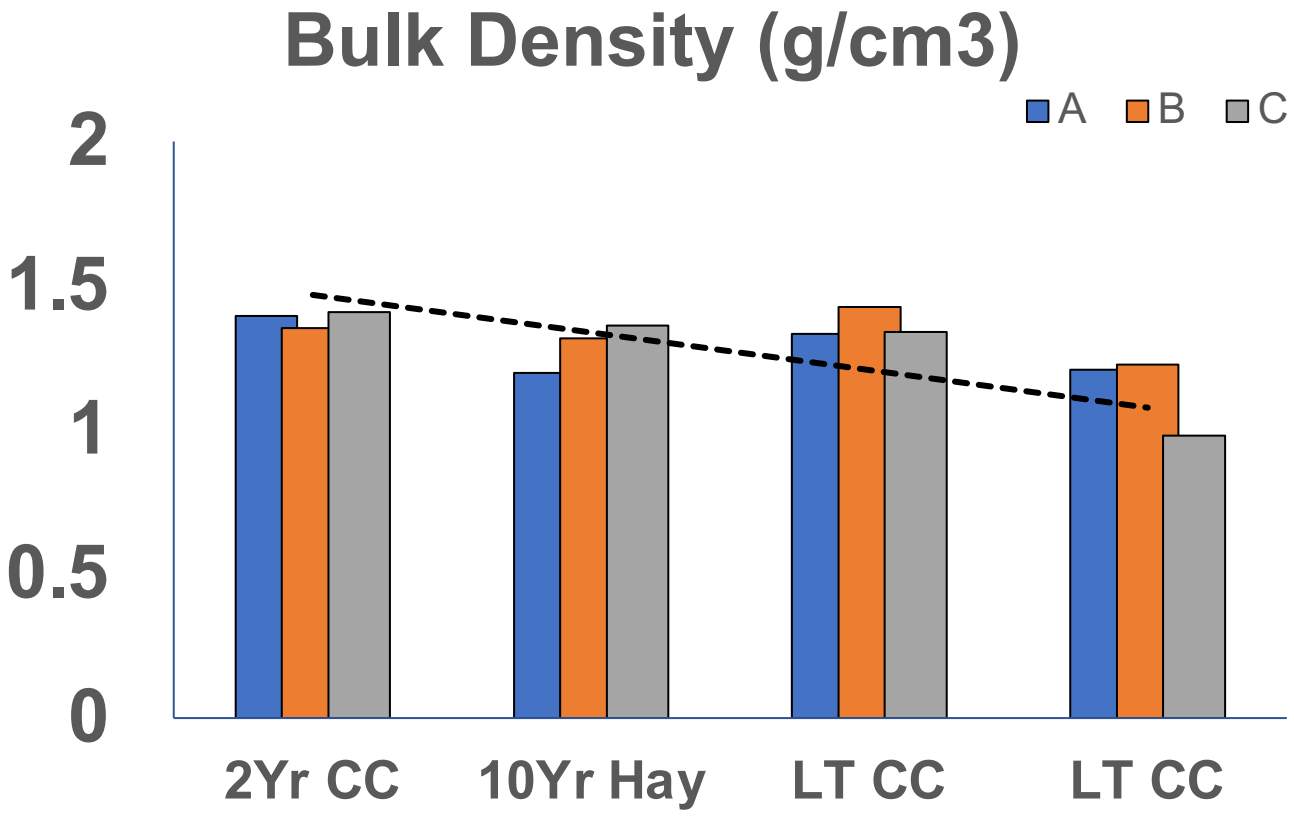
Site Summary

Five Different Fields with different history of tillage & Cover crops

1. **CT noCC:** Conventionally tilled – no Cover Crops
2. **2Yr CC:** Recently transitioned to Cover Crops
3. **10Yr Hay:** Under hay for 10 years
4. **LT CC:** ~40 years of No-till + cover crops (East Field)
5. **LT CC:** ~40 years of No-till + cover crops (West Field)

CFAES

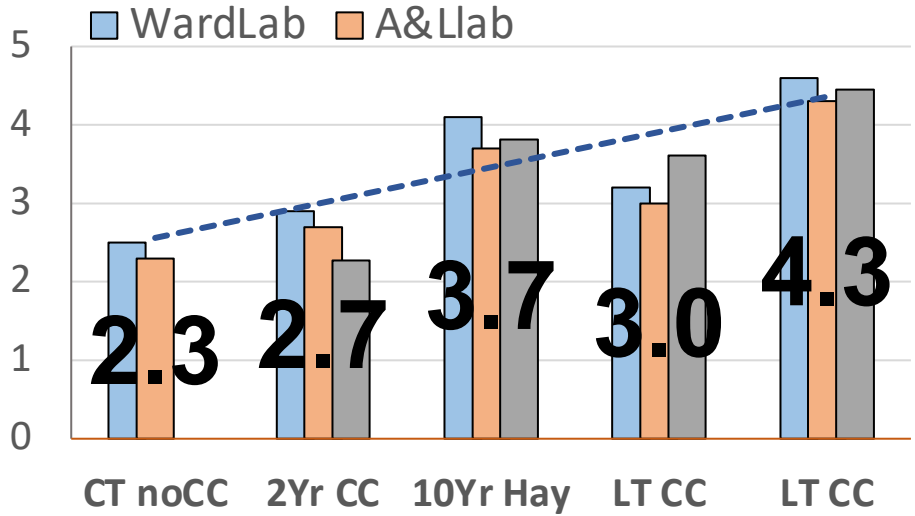
Physical Indicators



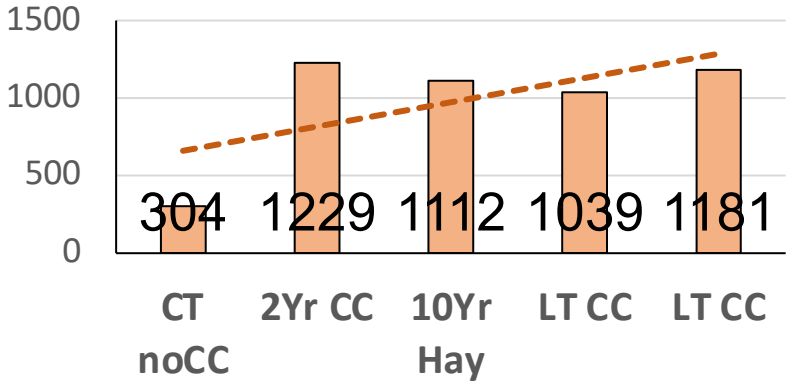
CFAES

Soil Organic Matter

SOM (%) – from Labs



Active Carbon (ppm) – in Field



www.Soil1.com

CFAES

Active C analysis conducted using a pre-commercialized version of Soil-1 Field Kit

Haney Soil Test

The Haney Test is a dual extraction procedure that allows the producer to assess overall soil health.

Used to track changes in soil health based on management decisions.

Examines total organic carbon and total organic nitrogen to determine a C:N ratio used to make general cover crop recommendations.

Includes the Solvita CO_2 Burst Test to look at microbial activity and potentially mineralizable nitrogen.

The weak acid (H3A) extraction represents some available plant nutrients.

Cost = $49.50

Haney Test

pH, excess lime rating, soluble salts

organic matter (LOI)

Soil Respiration

Total Organic C, Total N, total Organic N (WEOC/N)

Nitrate-N, Ammonium-N, Inorganic N, Total P, inorganic P, Organic P, K, Ca, Mg

Haney Test

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Results For : DAVE BRANDT
Sample ID 1 : LONG-TERM WEST (CN) EAST (CC)
Sample ID 2 : DBCC1
Lab No. : 1113
Sample ID 3 :
Sample ID 4 :
Soil Depth : 0 - 8 in

Haney - Soil Health Analysis

1:1 Soil pH	6.6	ICAP Sulfur, ppm S	3.7
1:1 Soluble Salts, mmho/cm	0.19	ICAP Calcium, ppm Ca	609
Excess Lime Rating	NONE	ICAP Magnesium, ppm Mg	88
Organic Matter, %LOI	3.2	ICAP Sodium, ppm Na	9
		ICAP Aluminum, ppm Al	117
Soil Respiration CO_2-C, ppm C	148.0	**Calculations**	
Water Extract		Microbially Active Carbon (%MAC)	172.4
Total Nitrogen, ppm N	33.4	Organic C : Organic N	8.8
Organic Nitrogen, ppm N	9.7	Organic N : Inorganic N	0.6
Total Organic Carbon, ppm C	86	Organic Nitrogen Release, ppm N	9.7
H3A Extract		Organic Nitrogen Reserve, ppm N	0.0
Nitrate, ppm NO_3-N	13.1	Organic Phosphorus Release, ppm P	7.3
Ammonium, ppm NH_4-N	2.1	Organic Phosphorus Reserve, ppm P	< 0.1
Inorganic Nitrogen, ppm N	15.3	**Soil Health**	
Total (ICAP) Phosphorus, ppm P	26	Soil Health Calculation	15.02
Inorganic (FIA) Phosphorus, ppm P	18.7	Cover Crop Suggestion	30% Legume 70% Grass
Organic Phosphorus, ppm P	7.3		
ICAP Potassium, ppm K	100		
ICAP Zinc, ppm Zn	2.64		
ICAP Iron, ppm Fe	82		
ICAP Manganese, ppm Mn	7.0		
ICAP Copper, ppm Cu	0.50		

Reviewed By : Alexis Hobbs 3/16/2021 Copy : 1 Page 1 of 2

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Results For : DAVE BRANDT
Sample ID 1 : TILLED FIELD (NORTH
Sample ID 2 : DBTIL1
Lab No. : 1122
Sample ID 3 :
Sample ID 4 :
Soil Depth : 0 - 8 in

Haney - Soil Health Analysis

1:1 Soil pH	6.2	ICAP Sulfur, ppm S	4.3
1:1 Soluble Salts, mmho/cm	0.13	ICAP Calcium, ppm Ca	472
Excess Lime Rating	NONE	ICAP Magnesium, ppm Mg	90
Organic Matter, %LOI	2.7	ICAP Sodium, ppm Na	12
WDRF Buffer pH	6.8	ICAP Aluminum, ppm Al	214
Soil Respiration CO_2-C, ppm C	79.6	**Calculations**	
Water Extract		Microbially Active Carbon (%MAC)	90.9
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Inorganic Nitrogen, ppm N	7.0	**Soil Health**	
Total (ICAP) Phosphorus, ppm P	8	Soil Health Calculation	10.85
Inorganic (FIA) Phosphorus, ppm P	3.6	Cover Crop Suggestion	40% Legume 60% Grass
Organic Phosphorus, ppm P	4.1		
ICAP Potassium, ppm K	43		
ICAP Zinc, ppm Zn	0.45		
ICAP Iron, ppm Fe	120		
ICAP Manganese, ppm Mn	4.7		
ICAP Copper, ppm Cu	0.55		

Reviewed By : Alexis Hobbs 3/16/2021 Copy : 1 Page 1 of 2

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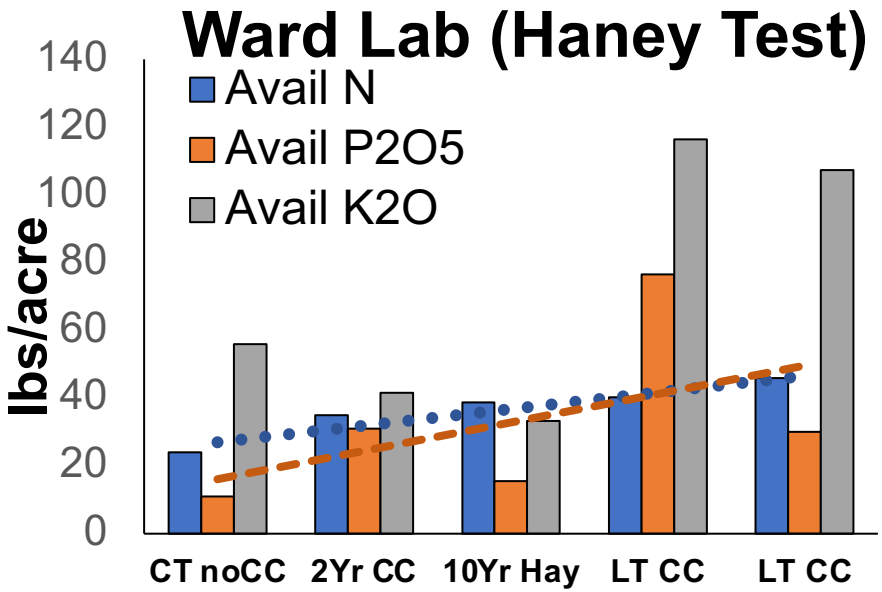
ICAP Potassium, ppm K	43		
ICAP Zinc, ppm Zn	0.45		
ICAP Iron, ppm Fe	120		
ICAP Manganese, ppm Mn	4.7		
ICAP Copper, ppm Cu	0.55		

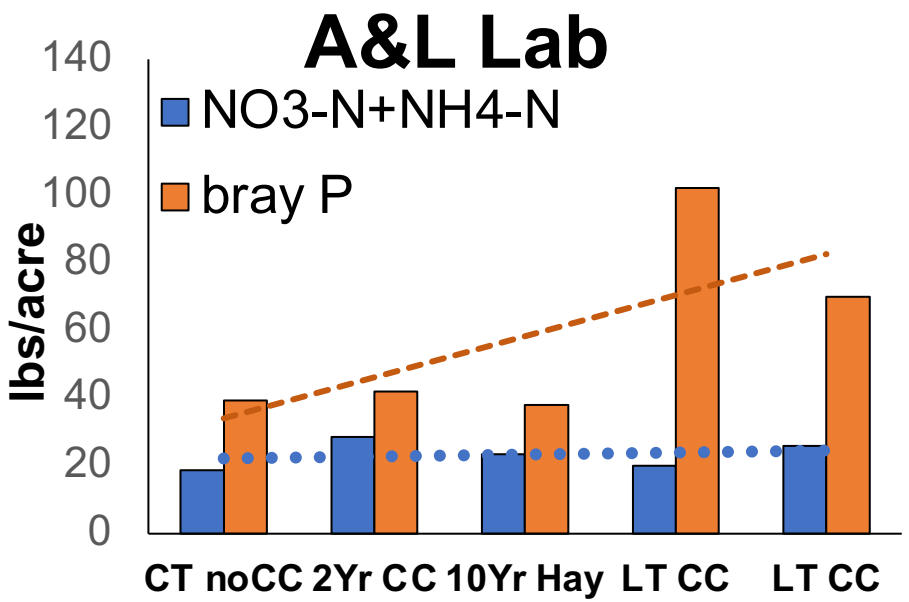
Reviewed By : Alexis Hobbs 3/16/2021 Copy : 1 Page 1 of 2

	Neighbor	Dave (2 yr CC)	Dave (10 Yr Hay)	Dave (E) 40 Yr NT+CC	Dave (W) 40 Yr NT+CC
Organic matter (%)	2.7, 2.7, 2.5	3.3, 2.9, 2.9	4.5, 3.5, 3.6	3.2, 3.3, 2.9	4.5, 4.8, 4.8
Soil Respiration CO_2-C					
Microbially Active Carbon (%MAC)					
Water Extractable – Org. C					

	Neighbor	Dave (2 yr CC)	Dave (10 Yr Hay)	Dave (E) 40 Yr NT+CC	Dave (W) 40 Yr NT+CC
Water Extractable – Org. C	88, 93, 128	91, 87, 83	142, 125, 106	86, 99, 121	106, 125, 122
Water Extractable – Org. N					
Traditional N					
Haney Test N					

Chemical Indicators





CFAES

Lab No. : 1113

Haney - Soil Health Analysis Contd.

Nutrient Quantity Available for Next Crop		Nitrogen Savings by using the Haney Test	
Nitrogen, lbs N/A	60.0	Traditional evaluation, lbs N/A	31.5
Phosphorus, lbs P_2O_5/A	59.8	Haney Test N evaluation, lbs N/A	60.0
Potassium, lbs K_2O/A	120.5	Nitrogen Difference, lbs N/A	28.4
Nutrient Value, $/A	121.95	N savings, $/A	18.20

Compared to traditional test, Haney Test would help save **$18/acre in N cost**

40Yr NT+CC field has Nutrients worth **$122/acre vs $61/acre** in field with Tillage + NoCC

Lab No. : 1122

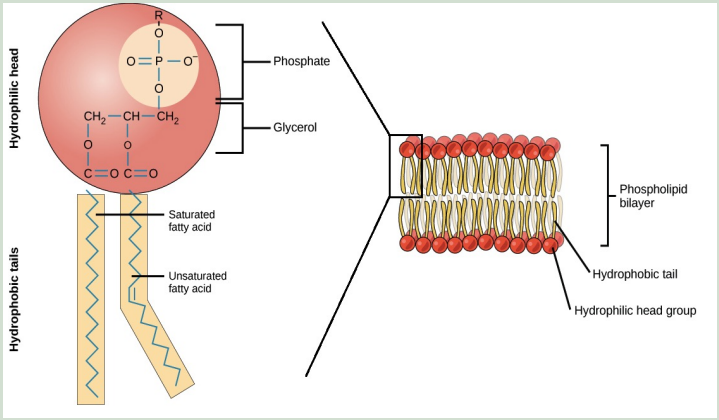
Haney - Soil Health Analysis Contd.

Nutrient Quantity Available for Next Crop		Nitrogen Savings by using the Haney Test	
Nitrogen, lbs N/A	44.2	Traditional evaluation, lbs N/A	14.9
Phosphorus, lbs P_2O_5/A	17.7	Haney Test N evaluation, lbs N/A	44.2
Potassium, lbs K_2O/A	52.1	Nitrogen Difference, lbs N/A	29.2
Nutrient Value, $/A	61.24	N savings, $/A	18.71

PLFA test

Soil biological testing at Ward Laboratories is conducted by analyzing phospholipid fatty acids (PLFA). It allows us to identify various functional groups of interest through known PLFA biomarkers with respect to microbial community.

Cost = $ 59.50



PLFA Test

Total bacteria (gram +, gram -), total Fungí (arbuscular Mycorrhizae, Saprophytes), Protozoa, undifferentiated microorganisms.

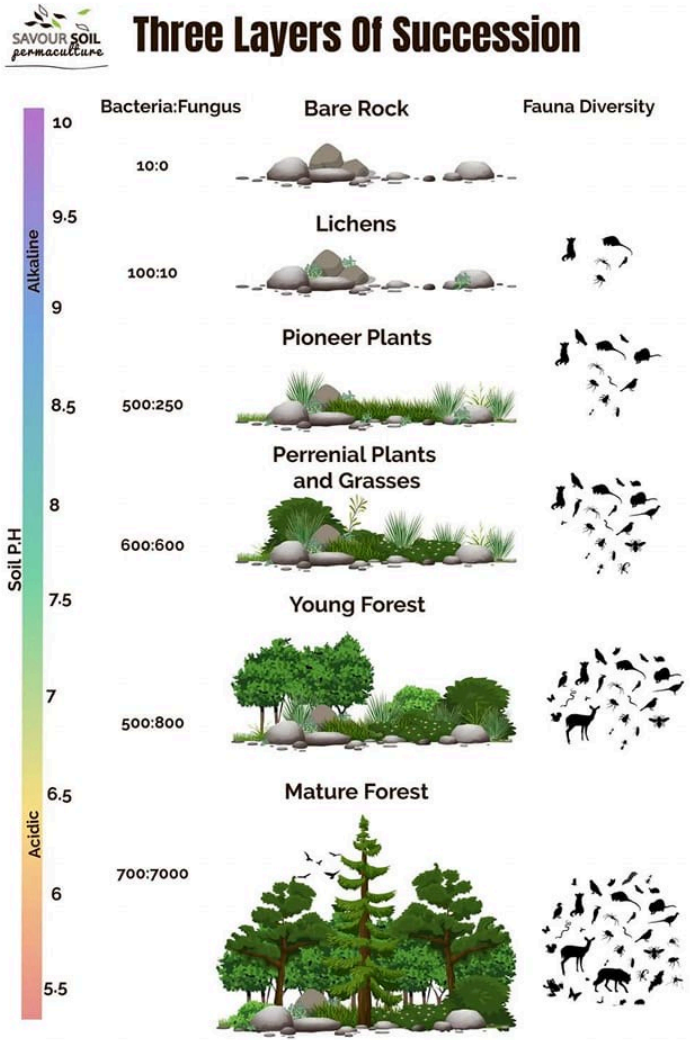
Total bacteria (gram+, gram -)

total fungi (arbuscular mycorrhizae, saprophytes)

Protozoa

undifferentiated microorganisms

https://www.facebook.com/photo/?fbid=499577665704684&set=a.493610412968076



PLFA Soil Microbial Community Analysis

Functional Group Biomass & Diversity

Total Living Microbial Biomass, Phospholipid Fatty Acid (PLFA) ng/g	**5021.18**
Functional Group Diversity Index	**1.581**

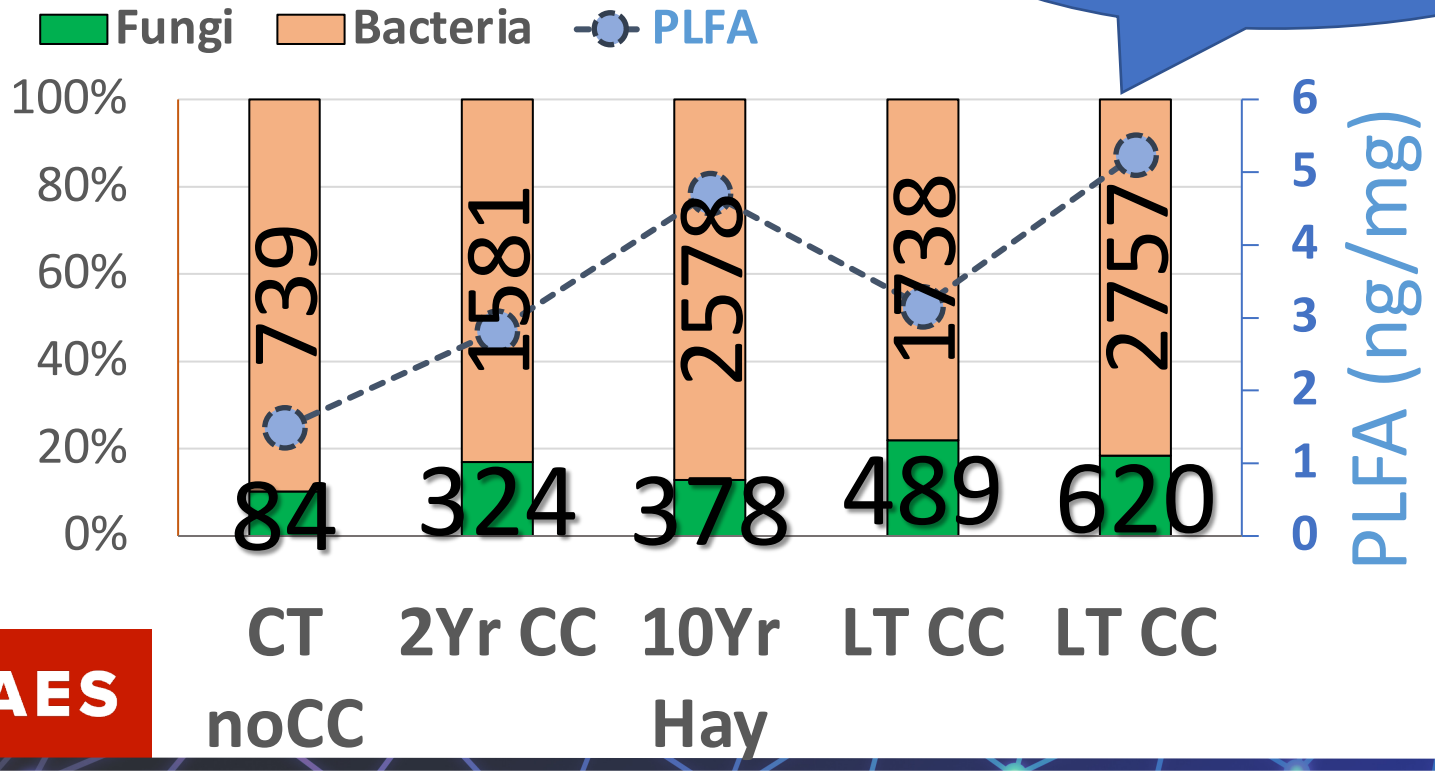
Total Biomass	Diversity	Rating
< 500	< 1.0	Very Poor
500+ - 1000	1.0+ - 1.1	Poor
1000+ - 1500	1.1+ - 1.2	Slightly Below Average
1500+ - 2500	1.2+ - 1.3	Average
2500+ - 3000	1.3+ - 1.4	Slightly Above Average
3000+ - 3500	1.4+ - 1.5	Good
3500+ - 4000	1.5+ - 1.6	Very Good
> 4000	> 1.6	Excellent

Functional Group	Biomass, PLFA ng/g	% of Total Biomass
Total Bacteria	**1881.75**	**37.48**
Gram (+)	**1182.99**	**23.56**
Actinomycetes	358.71	7.14
Gram (-)	**698.76**	**13.92**
Rhizobia	50.72	1.01
Total Fungi	**399.36**	**7.95**
Arbuscular Mycorrhizal	**123.64**	**2.46**
Saprophytes	**275.72**	**5.49**
Protozoa	**45.75**	**0.91**
Undifferentiated	**2694.32**	**53.66**

Biological Indicators – PLFA Test

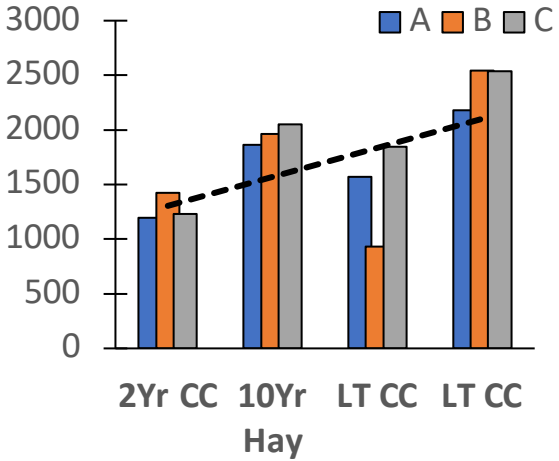
Analysis by Ward Lab

4 times more bacteria
8 times more fungi

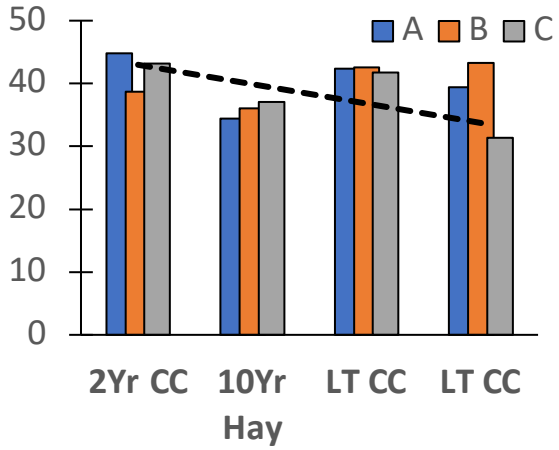


CFAES

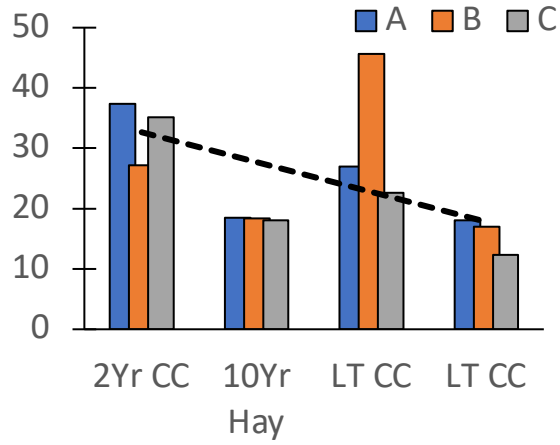
Biological Indicators – OSU Lab



Total Soil Microbial Biomass (lbs/ton)



Microbial basal respiration (lbs/ton/day)



Specific maintenance respiration (mg/g/day)

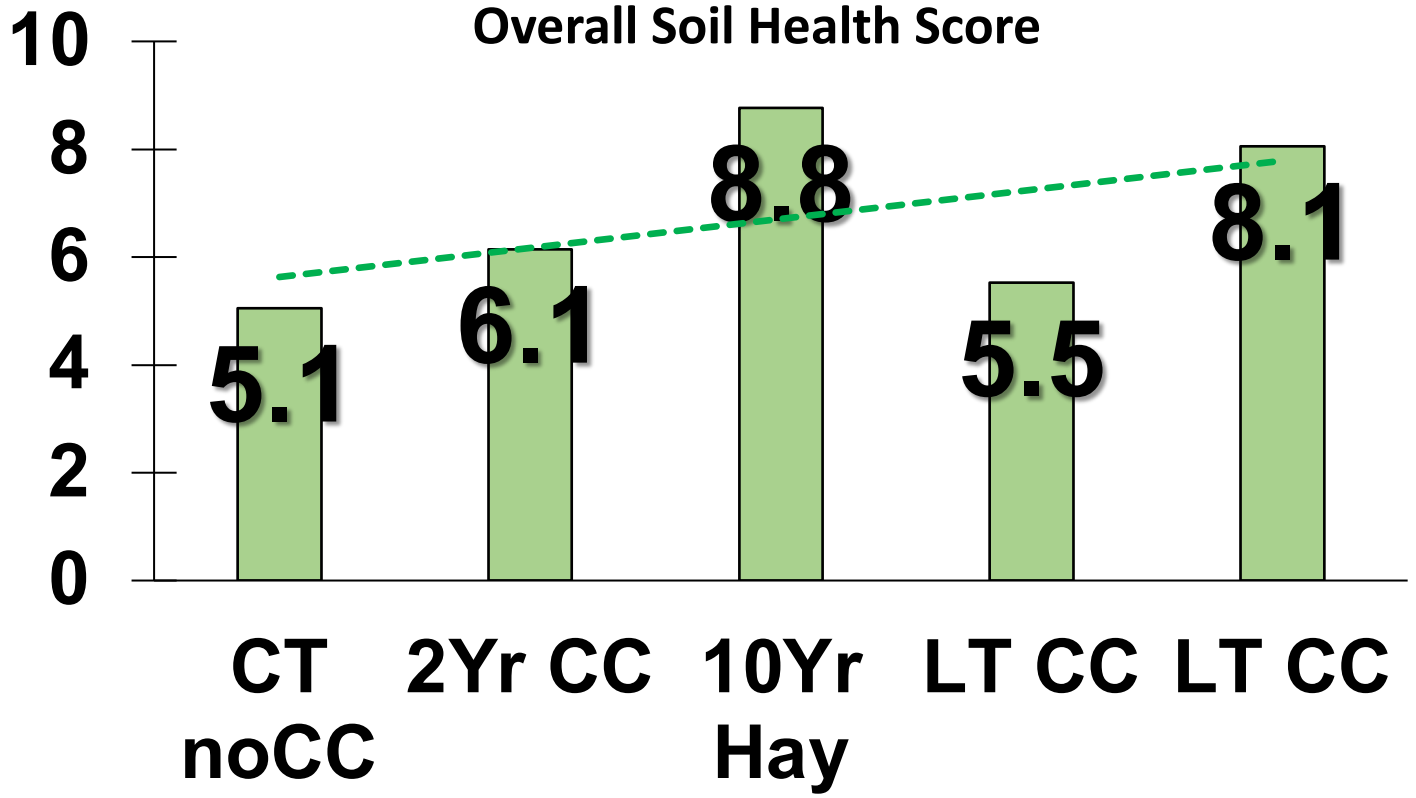
(C catabolized per unit of microbes)

Analysis by OSU Lab

CFAES

Analysis by Ward Lab

Overall Soil Health Score



CFAES

Sampling is the key

Separate samples should be collected whenever there is a difference in soil type or Management

Soil biological activity etc. are sensitive to moisture and temperature and so collect samples at similar times each year

Do not sample saturated soils

Carbon stock calculations require both SOC and bulk density to a depth of 30 cm

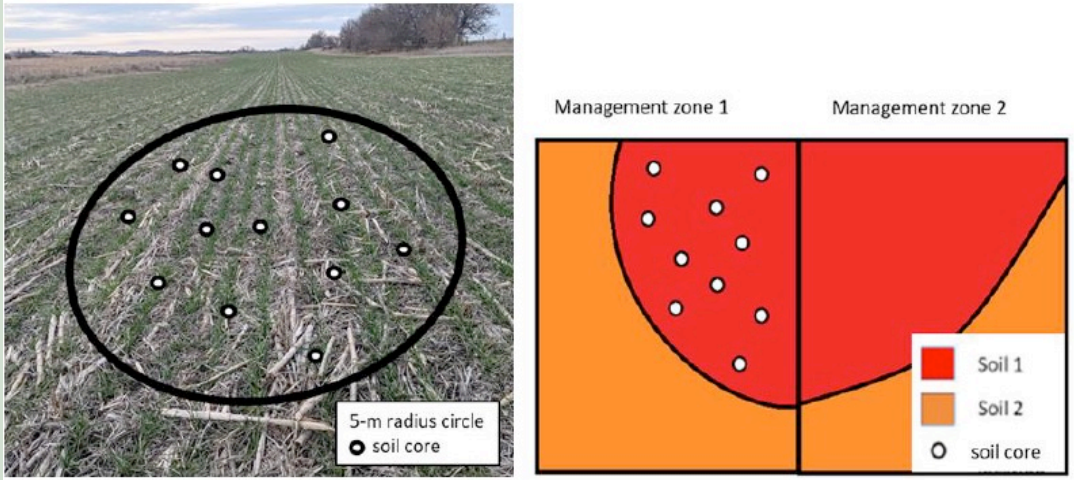


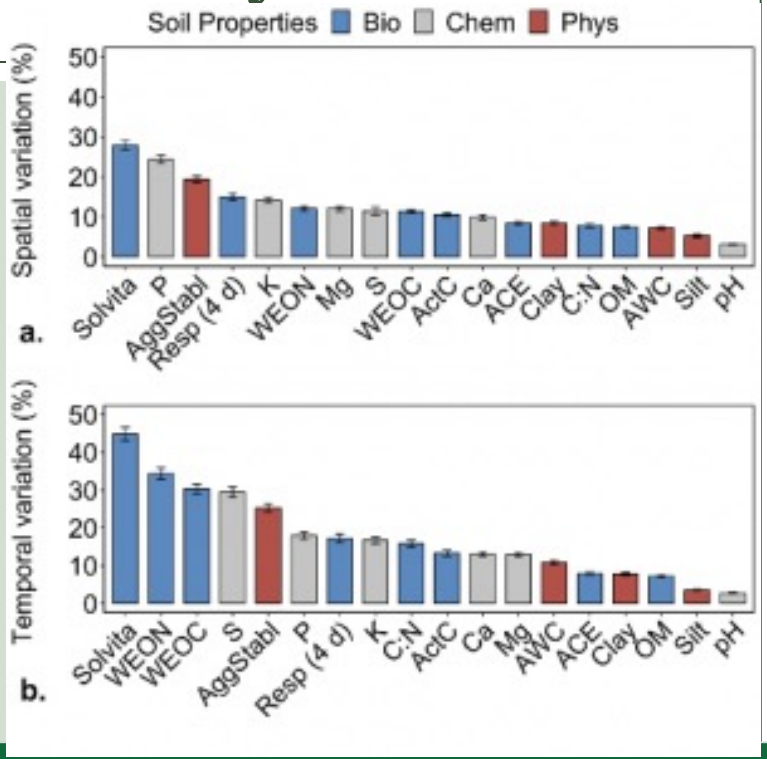
Figure 1. Diagram of a composite of soil cores for a point sample (left and a composite of soil cores for zone sampling .

https://soilhealthinstitute.org/app/uploads/2022/06/SOP_SoilSampling-v3.pdf

Sample same locations every time

Spatial (a) and temporal (b) variation calculated at each SHP member site for biological, chemical, and physical soil health indicators

https://www.soilhealthpartnership.org



Soil health tests should provide consistent, reliable results (be reproducible), and they should measure important attributes of soil functions that respond relatively quickly to management.

AY-366-W

PURDUE EXTENSION

Indiana Soil and Water

Authors
Stacy Zuber and
Eileen Kladivko

How to Understand and Interpret Soil Health Tests

Soil health has received increased attention during the past few years — and for good reason. The USDA-Natural Resources Conservation Service (NRCS) defines soil health as the "capacity of the soil to function as a vital, living ecosystem that sustains plants, animals, and humans."

It is important for us to protect and improve the soil health on our agricultural lands for both short- and long-term productivity. Soil health matters to farmers, consumers, and society as a whole. So clearly, finding ways to improve soil health on our nation's croplands should be a high priority.

But the question of how to adequately measure soil health arises. Soil health intertwines many aspects that function together as a system: soil biology, fertility/chemistry, and physical properties. Ideally, we would have a few simple measurements that indicate a field's current level of soil health. And these measurements would help us identify management practices to increase the soil health.

A soil health test should be much like a "wellness exam" for human health that finds areas that need some attention and provide us with an overall "health rating." In the same way, a soil health test should identify areas

Purdue Agronomy
ag.purdue.edu/AGRY

Plant / Cover crop Tissue Testing

McClarren Farm, NW Ohio
Sampling date: 10/25/2022

1.3 Tons DM/acre
C:N ratio of 19.6

1.26 Tons DM/acre
C:N ratio of 19.6

Photos by Alan Sundermeier (Oct. 2022)

Plant / Cover crop Tissue Testing

Cover crop planted	8/12/2022
A.Winter Pea	10 lb/a
Cow Pea	9 lb/a
Balansa Clover	0.72 lb/a
Med.Red Clover	1 lb/a
Berseem Clover	1.25 lb/a
Crimson clover	2 lb/a
Oats	6 lb/a
Cereal Rye	12 lb/a
TOTAL COST	**$36.41 /acre**

McClarren Farm (Sand A Field), NW Ohio

Nutrient	Nutrient Content	Nutrient Price	Nutrient Value
	lb/acre	$/lb	$/acre
Carbon	1146	$0.02	$22.92
Nitrogen	58	$0.30	$62.14
Phosphorus P2O5	9.7	$0.50	$9.33
Potassium K2O	62.1	$0.44	$45.54
Calcium	18.7	$0.03	$1.48
Magnesium	5.8	$0.03	$0.29
Sulfur	3.1	$0.55	$1.89
Zinc	0.047	**TOTAL VALUE**	**$143.59 /acre**
Iron	0.514		
Manganese	0.067		
Copper	0.014		
Boron	0.028		
Molybdenum	0.005		
Aluminum	0.322		

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Molybdenum	0.005		
Aluminum	0.322		
Tons DM/acre	1.26		
C:N ration	19.6		

Take home message

Treat soil health testing as your own “wellness testing”

Choose tests based on where you are at in your transition to no-till

Stick to simple measurements

Pay for $$ tests – they will pay off!!

Find a university/research/non-research friend!

Questions?

VINAYAK SHEDEKAR
Shedekar.1@osu.edu | soilhealth.osu.edu

SARE PROJECTS

LNC20-439 ("Soil health and water quality nexus in sustainable agroecosystems"**)**

ONC18-047 ("Making sense of Soil Health Reports – A partnership to develop recommendations for soil health testing, interpretation"**)**

Resources

Podcast:
https://www.soilhealthpartnership.org/podcast/10-wayne-honeycutt-farmer-adoption-of-best-soil-health-practices-is-key/

Wayne Honeycutt, Farmers and Soil Health

Resources - SARE

https://www.sare.org/resources/what-is-soil-health/

farmers need practical, effective measurements for assessing the current status of their soil and evaluating progress at improving its health

topsoil depth
water infiltration
plant residue and signs of erosion
root health
soil aggregate stability

Simple measures

topsoil depth
water infiltration
plant residue and signs of erosion
root health
soil aggregate stability

Turning over a vigorous ryegrass, hairy vetch, oat cover crop blend prior to planting tomatoes in Davis, CA.

SOIL HEALTH SERIES

Assessing Soil Health: Putting It All Together

By Cristine Morgan, Ph.D., and Shannon Cappellazzi, Ph.D., Soil Health Institute

The following article is the last in a six-part series on assessing soil health. It synthesizes measurement information and provides an example of how a minimal set of soil health measurements can reflect multiple aspects of soil functioning. It is part of a larger Soil Science Society of America webinar series produced in partnership with The Soil Health Institute and sponsored by The Walton Family Foundation. Earn 0.5 CEUs in Soil & Water Management by reading the article and taking the quiz at www.certifiedcropadviser.org/education/classroom/classes/1010.

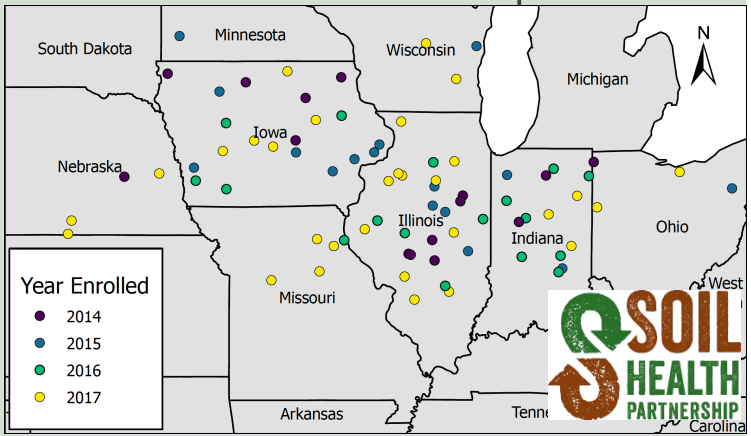
DOI: 10.1002/crso.20125

American Society of Agronomy

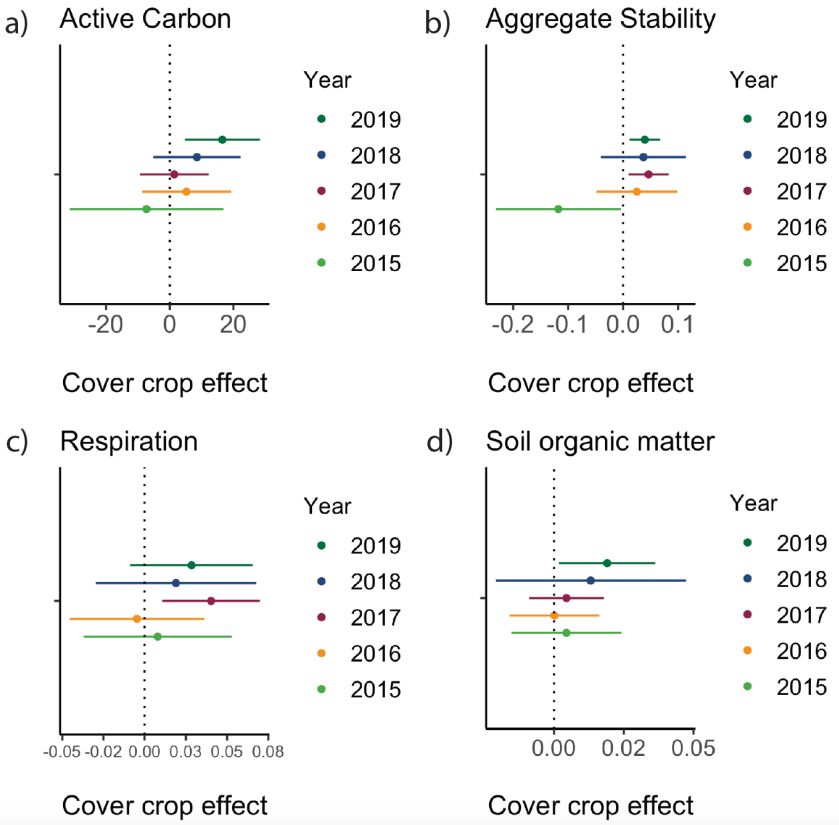
NORTH CENTRAL SARE
Sustainable Agriculture Research & Education

Time and history make a difference

soil health management are amplified with time and experience



https://www.soilhealthpartnership.org/blog-story/tnc-and-shp-scientists-show-soil-health-indicators-increase-due-to-cover-crops/



No-Till/Cover Crop Research in Ohio

Can Long-Term Soil Health Practices Improve Water Quality?

Vinayak Shedekar

Dept. of Food, Agricultural and Biological Engineering

The Ohio State University, Columbus, Ohio

Will Osterholz

USDA-ARS Soil Drainage Research Unit

Columbus, Ohio

Edge-of-field water quantity and quality monitoring

Rain gauge

Solar panel

V-notch weir

Flow meter

Automated water sampler

Battery and heater

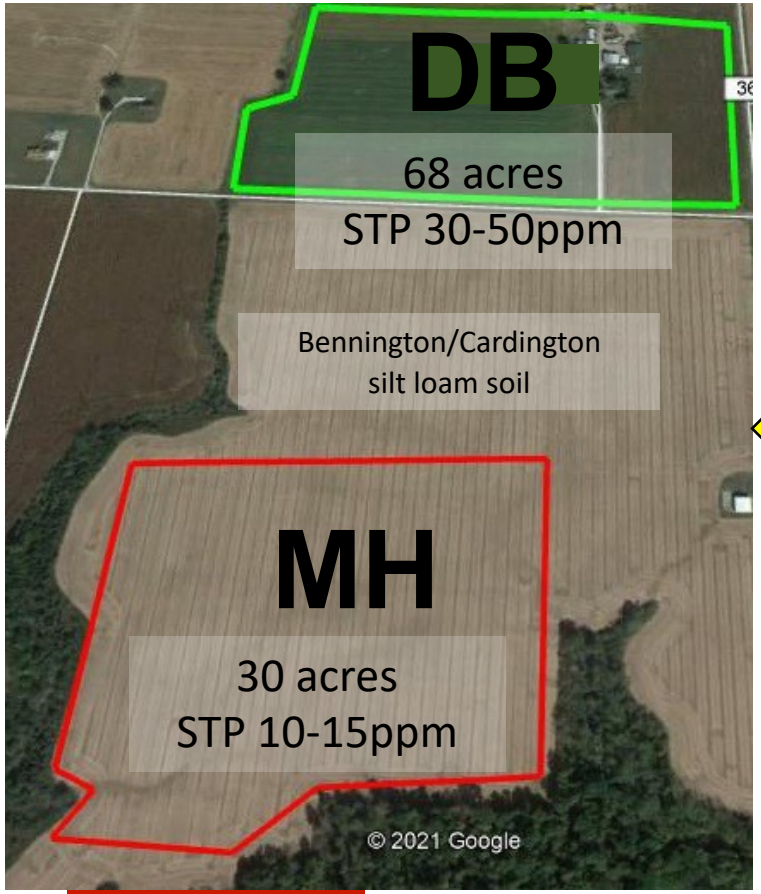
H-flume

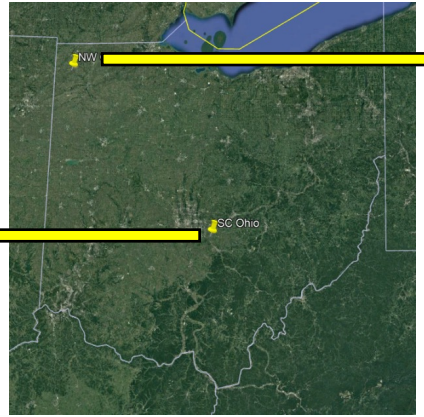
CFAES

USDA ARS

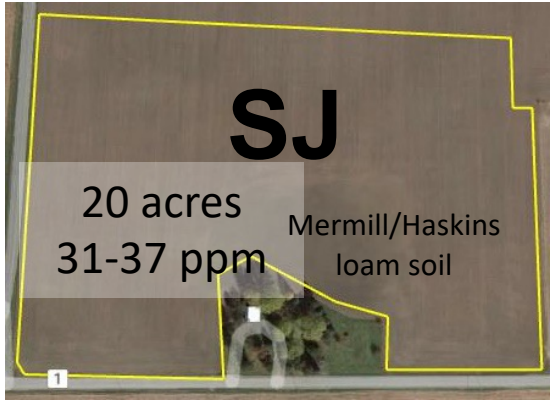
Soil Drainage Research Unit

SC Ohio





NW Ohio



Preliminary findings suggest that long-term soil health practices improve water quality:

- Less volume of water discharge through both tile drainage and surface runoff
- Lower concentrations and losses of nitrate
- Lower DRP and TP losses, despite greater DRP and TP concentrations in surface runoff
- *Working hypothesis:* Some of the water quality benefits of LT-SH may be attributed to the inherently lower input requirement and associated soil and residue management
- For conclusive evidence … **long-term monitoring** is crucial

CFAES

USDA ARS

SOIL DRAINAGE RESEARCH UNIT