

Who's Looking for healthier Soil?

- Charles Kahl – Technical Project & EH&S Leader
- AgSource Laboratories - Stratford, WI
- (715) 318-7629



What is the objective of Soil Health?

The objective of managing Soil Health is to promote:

“The continued capacity of soil to function as a vital living ecosystem that sustains plants, animals and humans.”

Why should we be concerned?

- The productivity of many lands worldwide threatened due to topsoil erosion & desertification
- Estimated loss due to erosion of soils in the USA is \$44 billion per year
- Globally the estimated annual loss of topsoil is 75 billion tons
- Comparison of “native prairie” soils adjacent to intensively cropped soils in the U.S. reflect up to 50% loss of SOM



What is a healthy soil?



But how do we manage it?



Healthy Crops



Managing personal health

- Healthy living habits:
 - Diet - i.e. an apple a day...
 - exercise
 - reduce exposure to disease
 - medical examination and advice
 - intervention or treatment
 - What about the life within us?





Living things
have health.

Soil Health relates to
living qualities of the soil.



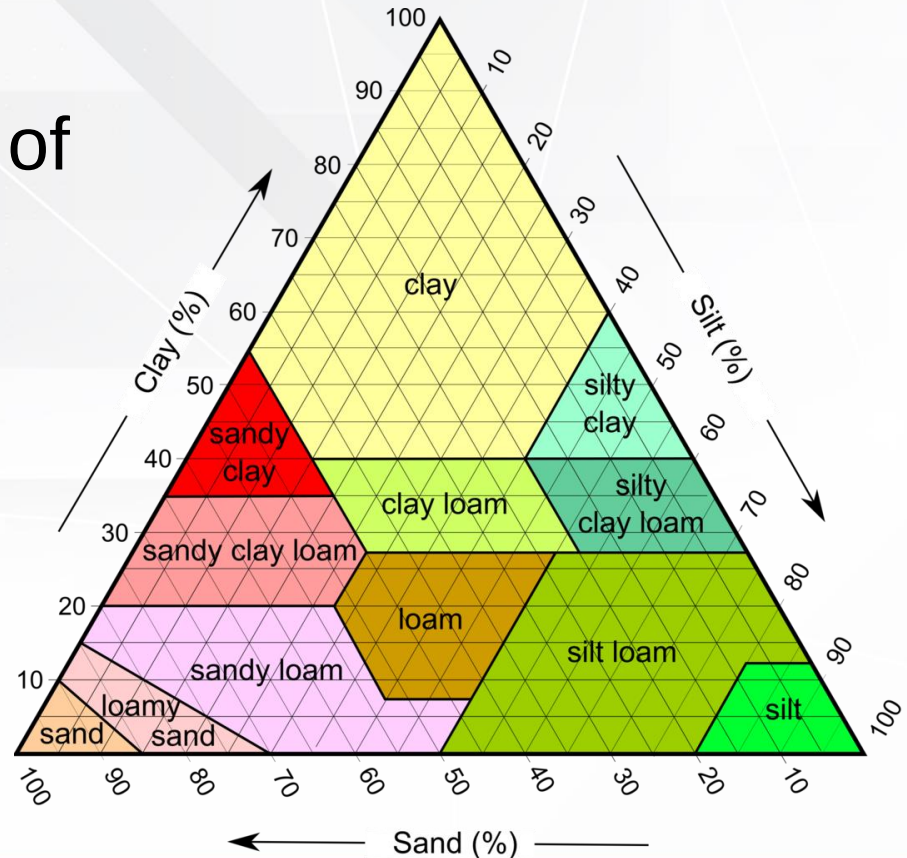






Physical Components

- Size and distribution of mineral particles
 - Sand
 - Silt
 - Clay
- Soil structure
 - air and water movement





Physical Components

- Soil structural properties
 - Porosity = Aeration
 - Water Infiltration
 - Water Availability
- Interactions with OM



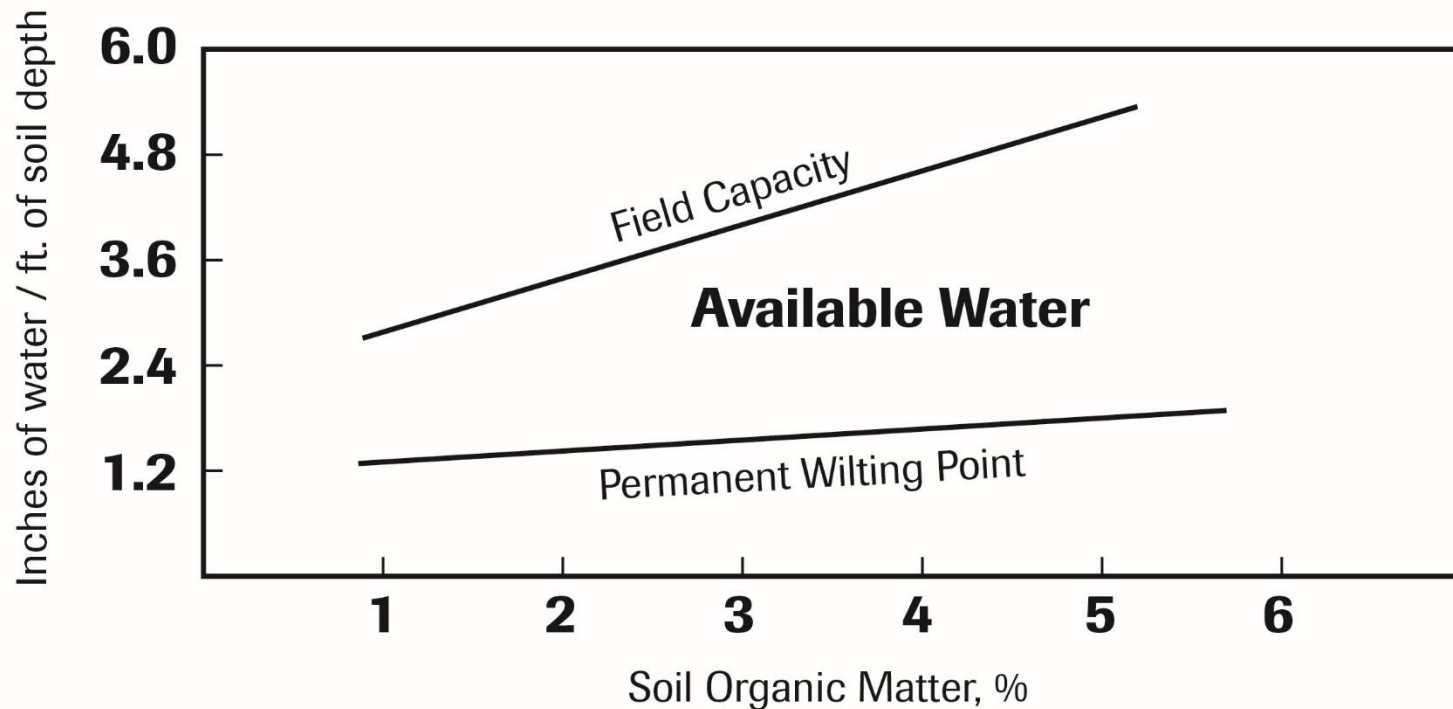


Physical Components

- Management concerns
 - Compaction
 - Drainage
 - Erosion
 - Loss of organic matter

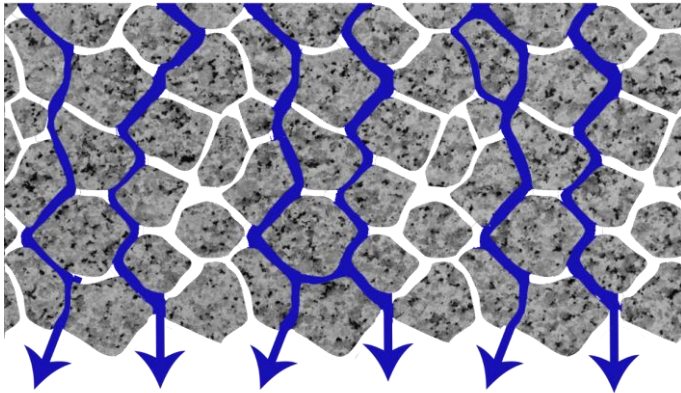


Increasing OM by 1% increases water availability 1 inch



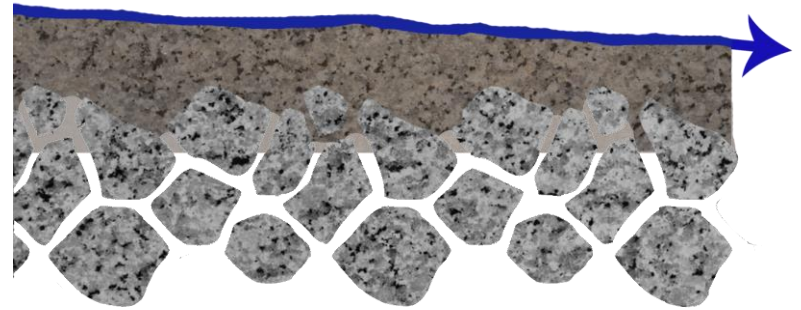
Erosion and Soil Health

Infiltration



Aggregated Soil

Runoff



Soil Seals and Crusts after
Aggregates Break Down

Modified from Topp et al. (1995).

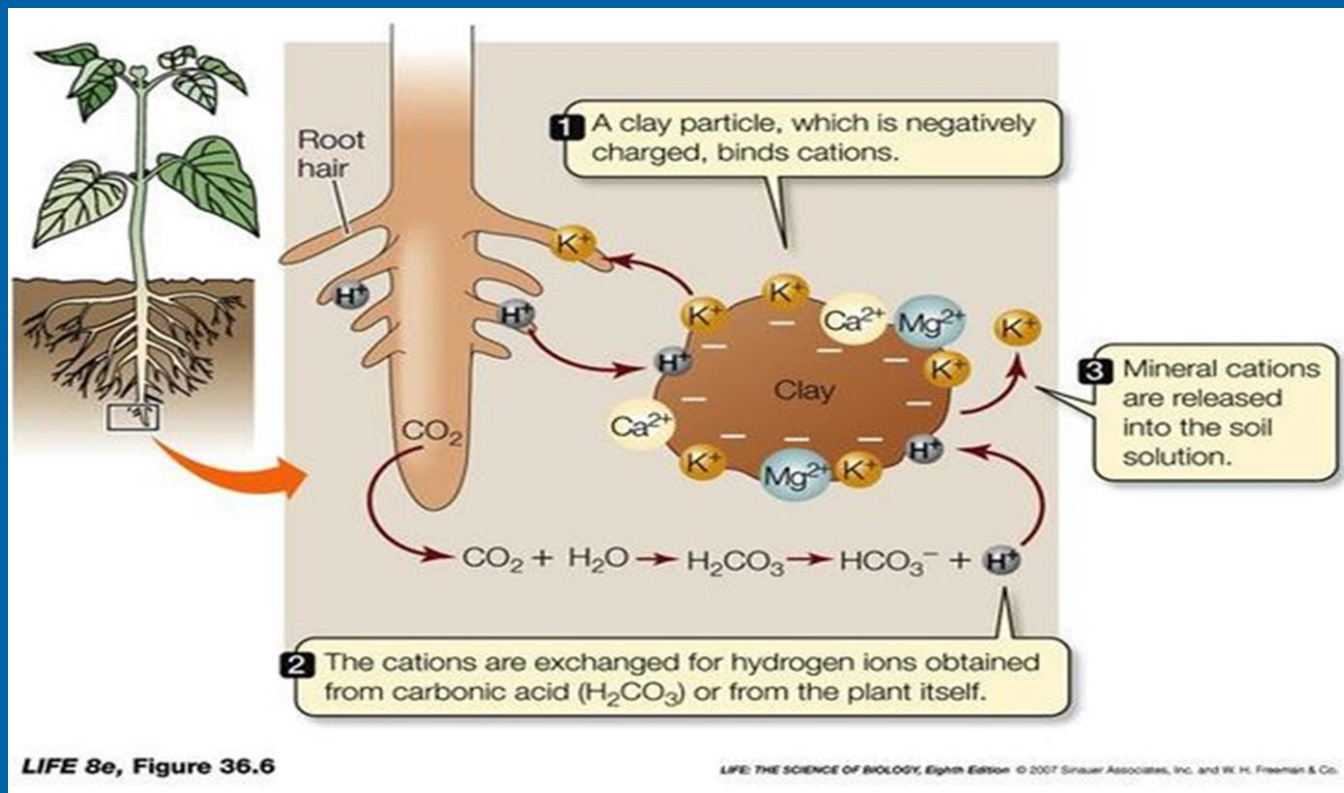


Chemical Components

- Traditional Soil Testing has always focused on the chemical components
- Soil Tests evaluate nutrient supply:
 - pH, BpH, P, K, OM,
 - CEC (Ca, Mg, Na), S, Zn,
 - Micronutrients (Cu, Fe, Mn, B)



Cation Exchange Capacity





Chemical Components

- Management with Soil Testing
 - Recommendations for fertilizer or
 - Data only for mapping

Soil Analysis

Submitted By: BN88888
AgSource Test Account
106 NORTH CECIL STREET
PO BOX 7
BONDUEL, WI 54107

Date Received:
11/17/2017

Submitted For:
AgSource No Rec Plain Report Example



Laboratory Sample #
BE36097 - BE36133
Information Sheet #
S0801-018

Date Processed:
11/20/2017

Field Id	Sample #	Soil pH	Buffer pH	OM %	P	K	Ca	Mg	B	Mn	Zn	S	Cu	Fe	60 - 69 Tons CEC		Est Total CEC		% Base Saturation			
																			K %	Ca %	Mg %	H %
TEST 1	TEST 33	6.9	---	2.6	15	68	1894	671	---	---	---	---	---	---	---	15.1	15.1	1.1	62.5	36.3	100.0	0.0
TEST 2	TEST 34	6.9	---	2.9	18	101	1930	665	---	---	---	---	---	---	---	15.4	15.4	1.7	62.8	35.5	100.0	0.0
TEST 3	TEST 35	6.7	---	3.0	20	95	1656	514	---	---	---	---	---	---	---	12.7	13.1	1.9	63.1	32.1	97.0	3.0
TEST 4	TEST 36	7.0	---	3.2	15	84	1630	580	---	---	---	---	---	---	---	14.1	14.1	1.5	64.8	33.7	100.0	0.0
TEST 5	TEST 37	7.1	---	3.0	30	97	2041	712	---	---	---	---	---	---	---	16.3	16.3	1.5	62.7	35.8	100.0	0.0
TEST 6	TEST 38	6.8	---	3.1	25	108	1749	589	---	---	---	---	---	---	---	13.8	14.1	2.0	62.2	34.3	98.5	1.5
TEST 7	TEST 39	6.8	---	3.2	11	93	1807	572	---	---	---	---	---	---	---	14.0	14.1	1.7	64.3	33.4	99.4	0.6
TEST 8	TEST 40	7.0	---	3.1	31	129	2089	725	---	---	---	---	---	---	---	16.7	16.7	2.0	62.5	35.5	100.0	0.0
TEST 9	TEST 41	7.1	---	2.9	27	123	1802	638	---	---	---	---	---	---	---	14.6	14.6	2.2	61.9	35.0	100.0	0.0
TEST 10	TEST 42	7.2	---	2.9	26	127	1770	562	---	---	---	---	---	---	---	13.8	13.8	2.4	64.2	33.4	100.0	0.0
TEST 11	TEST 43	7.3	---	2.7	16	88	1732	645	---	---	---	---	---	---	---	14.2	14.2	1.6	61.1	37.3	100.0	0.0
TEST 12	TEST 44	7.2	---	2.9	39	129	1920	692	---	---	---	---	---	---	---	15.6	15.6	2.1	61.5	36.4	100.0	0.0
TEST 13	TEST 45	7.3	---	2.9	34	112	1892	655	---	---	---	---	---	---	---	15.1	15.1	1.9	62.6	35.5	100.0	0.0
TEST 14	TEST 46	7.1	---	3.0	21	126	2209	772	---	---	---	---	---	---	---	17.7	17.7	1.8	62.4	35.8	100.0	0.0
TEST 15	TEST 47	6.9	---	2.7	25	100	1731	584	---	---	---	---	---	---	---	13.7	13.7	1.9	63.2	34.9	100.0	0.0
TEST 16	TEST 48	6.8	---	2.7	27	103	1848	628	---	---	---	---	---	---	---	14.6	14.7	1.8	62.7	34.9	99.5	0.5
TEST 17	TEST 49	7.0	---	2.8	23	102	1695	570	---	---	---	---	---	---	---	13.4	13.4	1.9	63.2	34.8	100.0	0.0
TEST 18	TEST 50	7.0	---	2.3	22	96	1333	401	---	---	---	---	---	---	---	10.2	10.2	2.4	65.4	32.2	100.0	0.0
TEST 19	TEST 01	7.1	---	2.7	48	142	1581	525	---	---	---	---	---	---	---	12.6	12.6	2.9	62.9	34.2	100.0	0.0
TEST 20	TEST 02	7.2	---	3.0	32	151	1321	363	---	---	---	---	---	---	---	10.0	10.0	3.9	66.3	29.9	100.0	0.0
TEST 21	TEST 03	7.1	---	2.5	27	103	1410	474	---	---	---	---	---	---	---	11.2	11.2	2.4	63.0	34.7	100.0	0.0
TEST 22	TEST 04	7.1	---	2.6	25	97	1431	453	---	---	---	---	---	---	---	11.1	11.1	2.2	64.4	33.4	100.0	0.0
TEST 23	TEST 05	7.0	---	2.7	16	80	1592	504	---	---	---	---	---	---	---	12.3	12.3	1.7	64.7	33.6	100.0	0.0
TEST 24	TEST 06	7.0	---	2.6	17	82	1600	556	---	---	---	---	---	---	---	12.8	12.8	1.7	62.7	35.7	100.0	0.0
TEST 25	TEST 07	7.0	---	3.1	16	75	1910	651	---	---	---	---	---	---	---	15.1	15.1	1.3	63.3	35.4	100.0	0.0
TEST 26	TEST 08	7.1	---	2.9	27	112	1772	599	---	---	---	---	---	---	---	14.1	14.1	2.0	63.0	34.9	100.0	0.0

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Soil Analysis

Submitted By: BN88888
AgSource Test Account
106 NORTH CECIL STREET
PO BOX 7
BONDUEL, WI 54107

Date Received:
07/31/2018

Submitted For:
AgSource UW Recs Report Example

Date Processed:
08/01/2018



Laboratory Sample #
BH66880 - BH66886
Information Sheet #
S0807-018

County: ANSON		NUTRIENT RECOMMENDATIONS											
Fond du Lac: BNC8888		Cropping Sequence	Yield Goal	Crop Nutrient Needs			Fertilizer Credits			Nutrients to Apply			
Field: Test Field 1				N	P ₂ O ₅	K ₂ O	Legume N	Manure N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
Acre 0.0			- per acre -	- lbs/a -			- lbs/a -			- lbs/a -			
Soil Name/Subsoil group: unknown		Apple, establishment	all	0	0	0	0	0	0	0	0	0	
Flow Depth: Previous Crop		(no crop)	n/a	0	0	0	0	0	0	0	0	0	
7.00		(no crop)	n/a	0	0	0	0	0	0	0	0	0	
Drops: Irrigated: Tied:		(no crop)	n/a	0	0	0	0	0	0	0	0	0	
Yes No													
There is no lime recommendation for this rotation. Please see additional information below													

TEST INTERPRETATION					
Cropping Sequence	Very Low	Low	Optimum	High	Very High
pH					
K					
Rotation pH					

LABORATORY ANALYSIS									
LAB USE									
Adjusted Avg:	6.9	2.7	36	147	1885	577	0.9	3	11.3
Response to added Ca is unlikely.									
Response to added Mg is unlikely.									
See Chapter 8, page 63 of publication A2808 for information on the sulfur application guidelines for Wisconsin.									
Year 1,2,3,4 Response to B is unlikely.									
Year 1,2,3,4 Response to Mn is unlikely.									
Year 1,2,3,4 Response to Zn is unlikely.									

SECONDARY & MICRONUTRIENT RECOMMENDATIONS									
Interpretations: Ca-H Mg-H B-Opt Mn-L Zn-Opt S-M									
Response to added Ca is unlikely.									
Response to added Mg is unlikely.									
See Chapter 8, page 63 of publication A2808 for information on the sulfur application guidelines for Wisconsin.									
Year 1,2,3,4 Response to B is unlikely.									
Year 1,2,3,4 Response to Mn is unlikely.									
Year 1,2,3,4 Response to Zn is unlikely.									

ADDITIONAL INFORMATION									
N.R. - Not required for calculation of lime requirement when soil pH is 6.6 or higher.									
Year 1 These rates are in ounces per plant, not pounds per acre. The rates apply for the establishment year only. The rate to apply is 1 oz/plant two times during establishment.									
Lime recommendations for apples and cherries apply only to pre-plant tests. Adjustment of pH is impractical once an orchard is established. Other perennial fruit crops and nut trees are provided for establishment of fruit crops. Nutrient application rates after the establishment year should be based on soil information.									
No soil information was provided, therefore generic, less precise nutrient application guidelines are being given. In the future, please submit samples with county information.									
A lime recommendation is calculated only when soil pH is more than 0.2 units below the optimum pH. Starter fertilizer (e.g. 10-20-20 lbs N + P ₂ O ₅ + K ₂ O) is advisable for row crops on soils slow to warm in the spring.									
A soil nitrate test may better estimate actual com N needs. If conservative tillage leaves more than 50% residue cover when corn follows after corn, add an additional 30 N lbs/a.									
If alfalfa will be maintained for more than three years, increase recommended K ₂ O by 20% each year.									

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Soil Health is Soil Centered

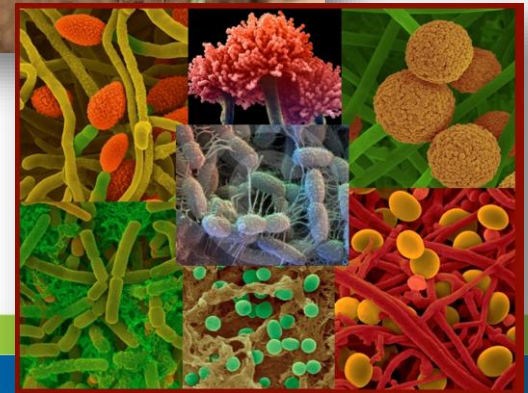
- Living things have health.
- Soil Health is a measure of the living qualities of the soil.





Biological Components

- How do we manage our soil livestock?





Biological Components

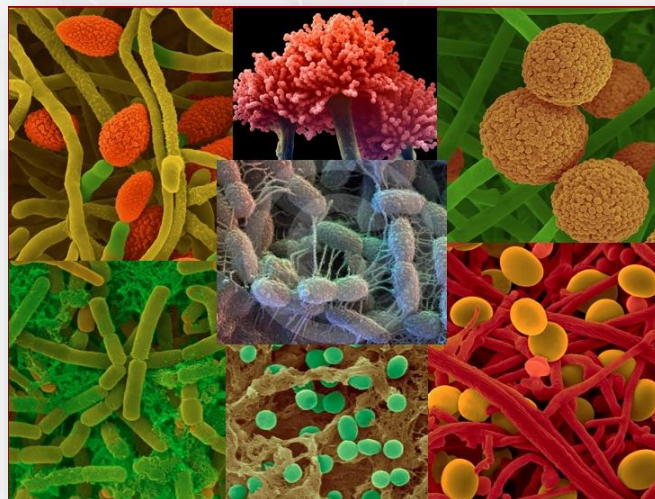
- Soil Biology
 - Plant cover and crop influences





Biological Components

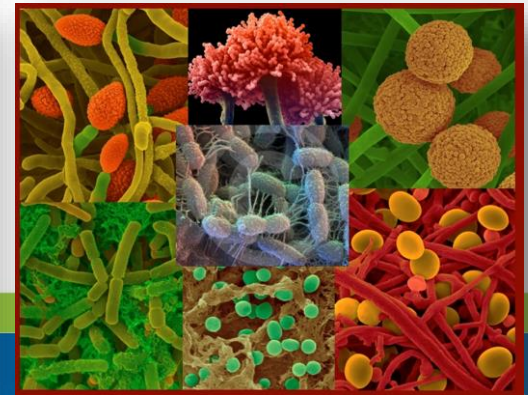
- Soil Biology
 - Macro and Microbiological influences





Biological Components

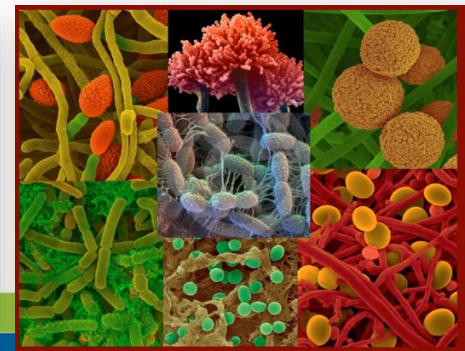
- Reactions in the soil are regulated by moisture and temperature, and nutrient sources.
- Are a function of the size and diversity of the microbiological population.





Biological Components

One gram of soil (enough to fit on top of a nickel) can contain one billion (1,000,000,000) living organisms and over ten thousand species.



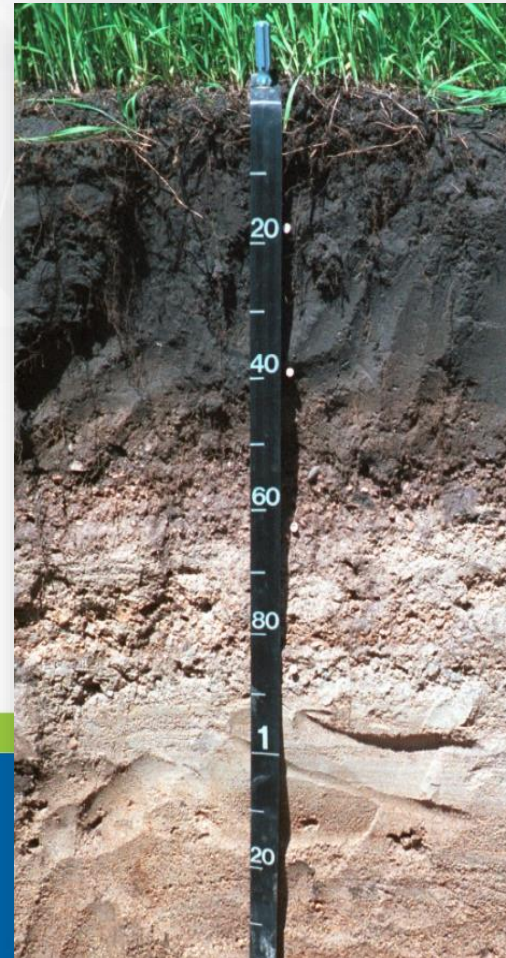
Soil Micro-organisms

- Require nutrient inputs
- Perform nutrient cycling
- Provide decomposition by-products



Soil Micro-organisms

- Concentrated in the topsoil
 - Associated with Organic Matter
 - Require energy, oxygen, nutrients
 - Respire carbon dioxide
- Extend into the subsoil



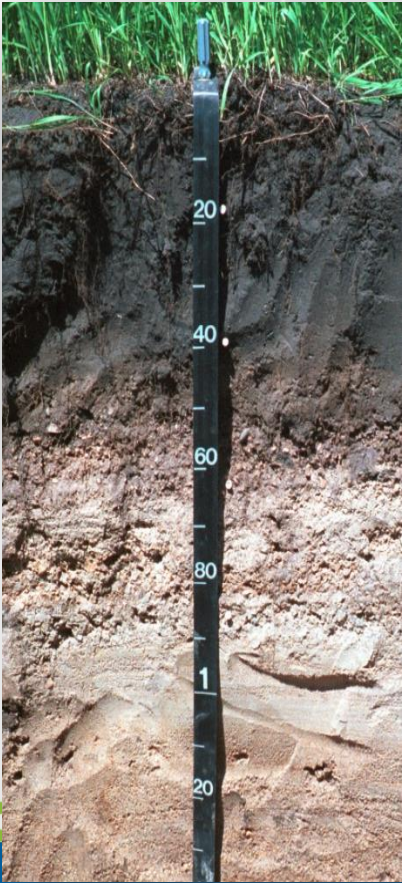
Soil Micro-organisms

- Microbial life requires inputs - soil livestock
 - Colonize food sources
 - Plant roots
 - 25% of carbon captured by plants in photosynthesis is lost to the soil. Why?
 - Beneficial microbial associations – health, nutrient cycling
 - Symbiotic relationships with soil micro-organisms.
 - N₂ fixation
 - Mycorrhizae

Soil Micro-organisms

- Colonize food sources (Cont....)
 - Plant residue,
 - Manure,
 - Easily available nutrients
 - Only 20% of applied P fertilizer is taken up by plants
 - Nitrogen can be more or less available too

Soil Organic Matter



- Vital to biological nutrient cycling
- Residue and waste products of plants, animals and micro-organisms.
- Decomposes to humus, that resists further decomposition.

Consists of 50 – 58% C
4 – 6% N

C:N Ratio

- **Indicates the stability of Organic Matter**
 - 12:1 is stable, well decomposed OM
- Soil micro-organisms have a ratio of 10:1
 - Utilize soil C for energy and
 - N for protein synthesis and cell growth
- **Bacteria** **5:1 to 8:1**
- **Fungi** **7:1 to 25:1**



C:N Ratio

- Plant Material added to the soil with C:N > 30:1
 - Soil available N will be immobilized
- If the C:N ratio is < 20:1
 - Plant material is easily mineralized
 - N is readily available to plants growing in that soil
- Crop residues:

• Corn stover	50:1
• Rye cover crop	25:1
• Legume hay	17:1



Soil Microbes and Structure

- Microbial life enhances the soil ecosystem
 - Nutrients are retained and recycled in the soil
 - Increased biological activity
- By-products of organisms bind particles
 - Worm castings and burrowing
 - Mucilage from fungi and molds
 - Forms stable aggregates



Soil Microbes and Structure

Physical components improved by Soil Biology

- Aggregate stability
- Water availability
 - Infiltration and
 - Water Holding Capacity
- Compaction reduced
 - Bulk Density lower
 - Crusting reduced



What's in a Soil Health Test?

- Biological activity evaluation
- Soil Health Score (under revision by Soil Health Institute)
- Nutrient availability
 - From organic/biological and inorganic sources
 - N, P and K (water soluble and extractable)
 - Other elements (Ca, Mg, Fe, Al) and pH

Soil Health Analysis

- Carbon Respiration Rate
- Water extraction of C, N, and P
- Organic Matter
- Traditional Soil Test
- Haney Extraction

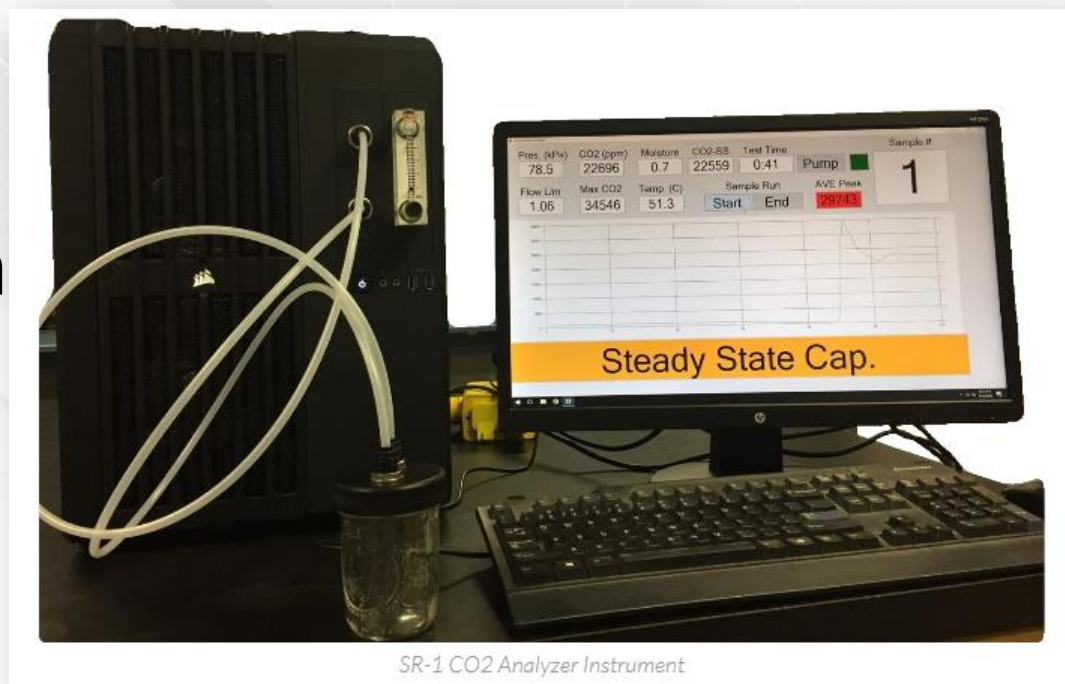


Same Prep as Traditional



Carbon Respiration Rate

Moistened soil
Incubated 24 hours
Values of 1-300 ppm



C:N Ratio

- $C:N = \frac{\text{Water Soluble Carbon}}{\text{Water Soluble Nitrogen}}$

C and N are
analyzed together.



Soil Health Score

The CO₂ Respiration, C:N Ratio and Water Soluble C and N are used to calculate:

- Soil Health Score (1 – 50 **sometimes higher**)
- N Mineralization Rate
- P Mineralization Rate

Organic Matter

- A routine part of soil tests
- Relates to all 3 components of Soil Health.



Haney Soil Extraction

- An weak acid solution similar to the solution around a growing root is used to extract nutrients.
- Comparison of these results with traditional procedures points out plant available nutrients (P, K, Ca) and reserve nutrient content.



Soil Health Assessment

- Soil Health Score provides a benchmark value to judge changes and assess “biological activity”
- Provides measures to use in managing soil
- C:N Ratio to guide Cover Crop prescriptions
- CO₂ Respiration, Soluble C & Total C
- Comparison of Nitrogen Fractions
- Water and H₃A data can assist in Fertilizer Guidelines

Reporting

- Standardized format
 - Basic
 - Routine
 - Complete
- All samples get a traditional soil test.
 - Recommendations based on the soil test and one crop.

SOIL HEALTH ASSESSMENT

Submitted by 8888888
 AgSource Test Account
 300 SPEEDWAY CIRCLE, UNIT 2
 LINCOLN, NE 68502

Submitted for
 AgSource Soil Health Report Example



Laboratory Sample #
 BG15475
 Information Sheet #
 S0304-019

Date Received
 9-Apr-2018

Date Reported
 24-Apr-2018

Laboratory Turnaround

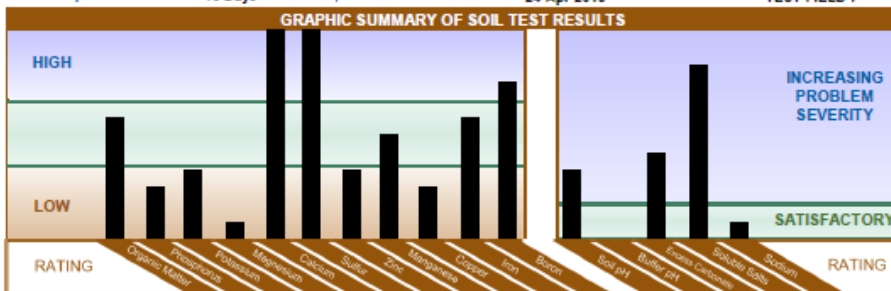
15 Days

Samples Will Be Stored Until

24-Apr-2018

Field Identification

TEST FIELD 7



REPORT OF SOIL ANALYSIS

YOUR SAMPLE NUMBER

TEST 14

Soil pH 7.7

Buffer Index --

Excess Carbonate M

Soluble Salts 3.6

Sodium ppm 28.0

% Organic Matter 6.0

ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)

Nitrate N 82.8

Phosphorus Bray 1 9

Potassium 141

Magnesium 241

Calcium 5973

Sulfate Sulfur 978

Zinc 1.0

Manganese 8.9

Copper 0.2

Iron 39.1

Boron 2.2

Bulk Density (g/cm³) 0.8

FERTILIZER GUIDELINES IN: Lbs/Acre

BASED OFF SOIL ANALYSIS

Corn

Yield Goal

150 BU

Preceding Crop

PLANT FOOD GUIDELINE RANGES CROP REMOVAL RATION

N 0.0 180

P₂O₅ 70.0 60

K₂O 55.0 45

MgO 11.8

S 0.0

Zn 4.5

Mn 0.0

Cu 1.0

Fe 0.0

B 0.0

Line Guidelines are for 100% Effective Calcium Carbonate (ECC) with a 6" Incorporation Depth.

SOIL HEALTH ANALYSIS

Soil Health Score 107.3

Soil CO₂ Respiration ppm 85.6

C:N Ratio 1

COVER CROP RECOMMENDATION

20% Legume, 80% Grass mixture

WATER SOLUBLE

HSA EXTRACTION

Carbon 99.2 ppm

Total Nitrogen 112.0 ppm

Nitrate-N 93.4 ppm

Ammoniacal-N 1.5 ppm

Orthophosphate-P 0.6 ppm

Saturation % 63.5 %

Mineralizable N 104.0 lbs/ac

Mineralizable P

Orthophosphate-P 4 ppm

Phosphorus 4 ppm

Potassium 102.1 ppm

Calcium 6995.1 ppm

Iron 53.5 ppm

Aluminum 18.3 ppm

P:(Al+Fe) Ratio 6

P:Ca Ratio 0

Ca:(Al+Fe) Ratio 9742

FOR DETAILED SOIL HEALTH INTERPRETATIONS, SEE LAST PAGE

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)

ESTIMATED

Actual % Suggested Actual % Suggested Actual % Suggested Actual % Suggested Actual % Suggested CEC for Your Soil

0.0 0 - 5 1.1 4.1 - 7 6.2 15 - 20 92.3 65 - 75 0.4 0 - 5 32.4

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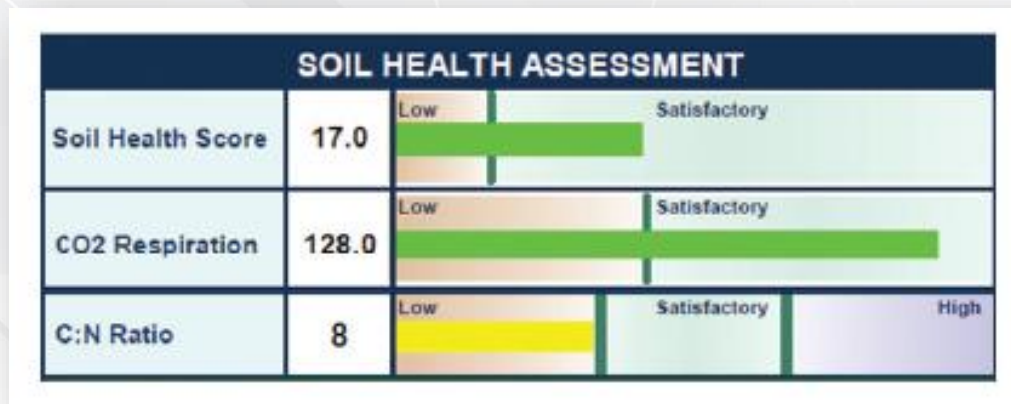
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300 Speedway Circle, Unit 2 • Lincoln, NE 68502 • P: 402.476.0300 • lincoln@agsource.com

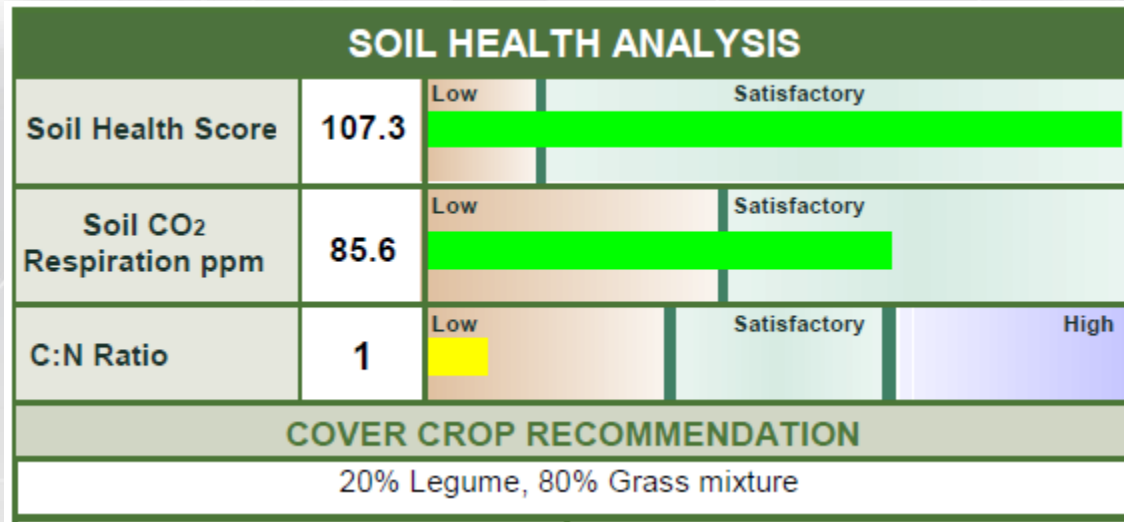


Interpreting Results

- 1 – 50, >20 is good
- 60 – 150 is good
- 10 – 15 is good



Cover Crop Recommendation



Cover Crop Recommendations	
If 0 <= SHS < 5.0 then	70% Legume, 30% Grass mixture
If 5.0 <= SHS < 10.0 then	60% Legume, 40% Grass mixture
If 10.0 <= SHS < 15.0 then	50% Legume, 50% Grass mixture

Water Soluble Values

Table 2.

Parameter	Low	Adequate	High
Carbon, ppm	<150	150 – 300	>300
Total Nitrogen, ppm	<25.0	25.0 – 60.0	>60.0
Nitrate-N (NO ₃ -N), ppm	<10.0	10.0 – 30.0	>30.0
Ammoniacal-N (NH ₄ -N), ppm	<10.0	10.0 – 30.0	>30.0
Orthophosphate-P, ppm	<1.5	1.5 – 3.0	>3.0
Water Saturation, %	<35	35 – 60	>60
Water Saturation, %	<35	35 – 60	>60

Haney (H3A) Extraction

Table 3.

Parameter	Low	Adequate	High
Orthophosphate-P, ppm	<10	10 – 20	>20
Phosphorus, ppm	<15	15 – 25	>25
Potassium, ppm	<40	40 – 60	>60
P:(Al+Fe) Ratio, %		>5	
P:Ca Ratio, %		>3	
Ca:(Al+Fe) Ratio, %		>200	

Managing Soil Health

- Maintain growing plants on the soil
- Reduce tillage
- Increase organic matter – cover crops, manure
- Balance nutrient applications with crop uptake



Cover Crop Biomass Analysis

- Cover crops have the ability to take up nutrients, hold them and recycle them back into the soil for use by your next crop.
- Provides a measurement of N and other key nutrients taken up by the cover crop
- C:N ratio used to estimate rate of decomposition.
- If cover crops are used for forage, gain understanding of nutrients to replenish for next crop.
- Utilize Cover Crop Biomass Analysis prior to terminating your cover crop

Cover Crop Analysis Report



Submitted By: **BN88888**
AgSource Test Account
106 North Cecil Street
PO BOX 7
Bonduel, WI 54107

Submitted For:
AgSource BN_PLANT_COVERCROP
Marketing Example

Laboratory Sample #

CB61854

Date Sampled:
5/13/2021 12:00:00AM

Date Received:
05/13/2021

Date Reported:
05/17/2021

Information Sheet #

Sample ID: **Test53**
Crop: **RYE WHOLE**

Field ID: **TESTFIELD 1**
Growth Stage:

Results of Laboratory Analysis, dry sample

Nitrogen	N, %	3.13
Phosphorus	P, %	0.31
Potassium	K, %	2.94
Calcium	Ca, %	0.44
Magnesium	Mg, %	0.20
Sodium	Na, %	0.01
Sulfur	S, %	0.22
Zinc	Zn, ppm	34.4
Manganese	Mn, ppm	30.6
Copper	Cu, ppm	7.6
Iron	Fe, ppm	359.3
Boron	B, ppm	8.9
Aluminum	Al, ppm	324.6
Carbon	C, %	53.13
Dry Matter	DM, %	22.93

Nutrient Content of Forage, lbs/acre @ 100% Dry Matter

Nitrogen	N	114.6
Phosphorus	P2O5	25.8
Potassium	K2O	129.2
Calcium	Ca	16.3
Magnesium	Mg	7.3
Sodium	Na	0.5
Sulfur	S	8.0
Zinc	Zn	0.13
Manganese	Mn	0.11
Copper	Cu	0.03
Iron	Fe	1.32
Boron	B	0.03
Aluminum	Al	1.19
Carbon	C	1944.5
C:N Ratio	C:N	17.0

Release of nitrogen and phosphorus are controlled by the C:N ratio of the plant matter as it decomposes. See comments below.

Cover crop residue with C:N ratios:

Above 20:1 will immobilize nitrogen
Below 20:1 will mineralize (release)

Total Yield

Tons/acre

Fresh Weight	FW, g	1496.855
Area Sampled	Sq. Feet	9

Fresh Biomass	As cut	7.99
Dry Biomass	100% dry	1.83



MANURE TESTING

Optimize crop production with the true nutrient value of manure



Stay Compliant

Get the information you need for nutrient management planning



Uncover True Nutrient Value

Manure value varies by source – don't rely on general "book" values



Certified Analysis

AgSource holds certifications from the MN department of Agriculture



Certified

AgSource Laboratories follows strict and rigorous testing standards

Manure Analysis



Submitted By
AgSource Laboratories / Test Acct BN
100 MBC Drive
Test 20181115
Shawano, WI 54166

Submitted For
BREI HILLSIDE FARM

Date Sampled
10/27/2022

Date Received
27-Oct-2022

Date Reported
14-Nov-2022

Laboratory Sample #
CK57851

Information Sheet No.
M20221027Test

Account Number
BN88888

Test Package
Comprehensive

Location Barn1

Sample ID 1

Livestock Type Dairy

Handling Type Dry

Analysis	Results as Received	Results as Dry Basis	LIQUID Application Methods Est. Available Nutrient Credits (as received, lbs / 1000 gal)						DRY Application Methods Est. Available Nutrient Credits (as received, lbs / ton)					
			Nutrients as lbs/1000 gal	In 1st Year			In 2nd Year	In 3rd Year	Nutrients as lbs/ton	In 1st Year			In 2nd Year	In 3rd Year
				Injected	Incorporated* 1-72 Hours	Broadcast**				<1 Hour	Incorporated* 1-72 Hours	Broadcast**		
Dry Matter	20.66 %								TKN	5.2	1.83	1.57	1.31	0.52
Moisture	79.34 %								NH ₄ -N	2.16				
Total N, (TKN)	0.26 %		21.83	7.64	6.55	5.46	2.18	1.09	Org N	3.1				
Ammonium, NH ₄ -N	0.11 %		9.00						NO ₃ -N	0.0				
Organic Nitrogen,%N	0.15 %		12.8						P ₂ O ₅	2.2	1.74	1.74	1.74	Residual After Uptake
Nitrate, NO ₃ -N	0.00 %		0.2						K ₂ O	5.5	4.40	4.40	4.40	Residual After Uptake
Phosphorus, P ₂ O ₅	0.05 %		9.0	7.22	7.22	7.22	Residual After Uptake		S	0.8	0.46	0.46	0.46	0.08
Potassium, K ₂ O	0.23 %		22.8	18.27	18.27	18.27	Residual After Uptake		Ca	5.6				
Sulfur, S	0.04 %		3.4	1.89	1.89	1.89	0.34	0.17	Mg	3.1				
Calcium, Ca	0.28 %	1.36 %	23.4						Na	1.4				
Magnesium, Mg	0.15 %	0.74 %	12.8						Zn	0.0				
Sodium, Na	0.07 %	0.34 %	5.8						Mn	0.1				
Zinc, Zn	22.2 ppm	107 ppm	0.2						Fe	1.6				
Manganese, Mn	42.1 ppm	204 ppm	0.4						Cu	0.0				
Iron, Fe	781.7 ppm	3784 ppm	6.5											
Copper, Cu	12.9 ppm	63 ppm	0.1											
Sol Salts, EC _(mmhos/cm)	1.04													
pH	7.3													

Estimated Value of Available Nutrients:

1st Year - \$28.26 2nd Year - \$2.16 3rd Year - \$1.08 1st Year - \$6.80 2nd Year - \$0.52 3rd Year - \$0.26

Value based on commercial fertilizer costs as of 11/11/2022.

N(Urea) \$0.9 / lb, P₂O₅(Diammonium Phosphate(DAP)) \$1.01 / lb, K₂O(Potash) \$0.71 / lb, S(Elemental Sulfur) \$0.59 / lb.

*Surface applied liquid or solid manure incorporated within 1- 72 hours after application.

**Liquid or solid manure left on the surface 4 or more days without incorporation. Wind and high temperature will result in greater loss of available nitrogen.

The Total N (TKN) values are the sum of Ammonium and Organic N. Availability estimates are corrected for ammonia volatilization loss due to each application method.

Application of this manure on the same field for 2 consecutive years increases the availability of N and S by 10%, and for 3 or more years by 15%.

References: Nutrient application guidelines for field, vegetable, and fruit crops in Wisconsin (A2809), Table 9.1

Liquid manure applied as irrigation will lose more nitrogen from volatilization. An additional 15% of the Liquid TKN value should be subtracted off the Liquid Broadcast TKN Range.

DISCLAIMER: Data and information in this report are intended solely for the individual(s) for whom samples were submitted. Reproduction of this report must be in its entirety. Levels listed are guidelines only. Data was reported based on standard laboratory procedures and deviations.

! AgSource Locations



Final thoughts...

- Nothing changes if nothing changes
- Whether you think you can or you think you can't ...YOUR RIGHT!



Thank you

Acknowledgements:

Jim Friedericks - Outreach and Education

Chris Clark, CCA – Agronomic Sales Manager

