Cover Crop Biomass Study
Growing your Own Nutrients?

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Disclaimer: Any use of trade names is for descriptive purposes and does not represent an endorsement by the author.

Why Does Growing Your Own Nutrient Matter?

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News

Environment | Agriculture | Science | Social Issues | WisContext | Politics | Economy | Education | Health

HEALTH

Nelsonville's water woes: Finding nitrate pollution in wells

Residents of a central Wisconsin village are finding dangerous levels of a common agricultural pollutant in their drinking water and are left trying to filter their supplies or find new sources.

By NATHAN DENZIN | Here & Now

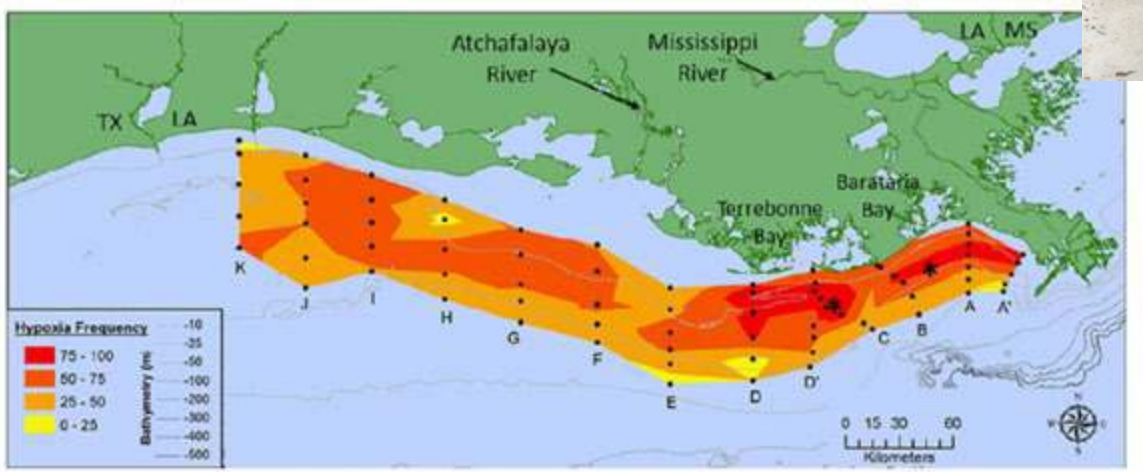
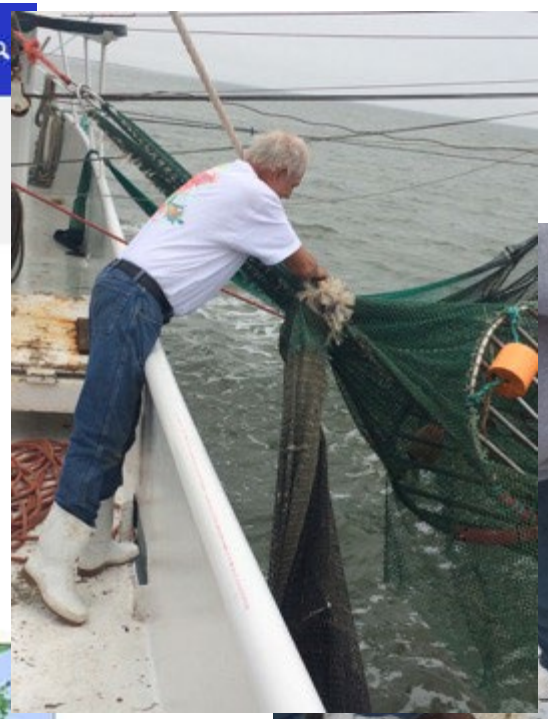


FIG. 1. The frequency of bottom-water hypoxia from shelf-wide hypoxia mapping (1985–2014) (updated from Rabalais et al. (2007b); frequency is determined from stations for which there are data for at least half of all cruises. Asterisks (*) indicate locations of near-bottom oxygen meters; transects C and F identified. Data source: N. N. Rabalais and R. E. Turner.



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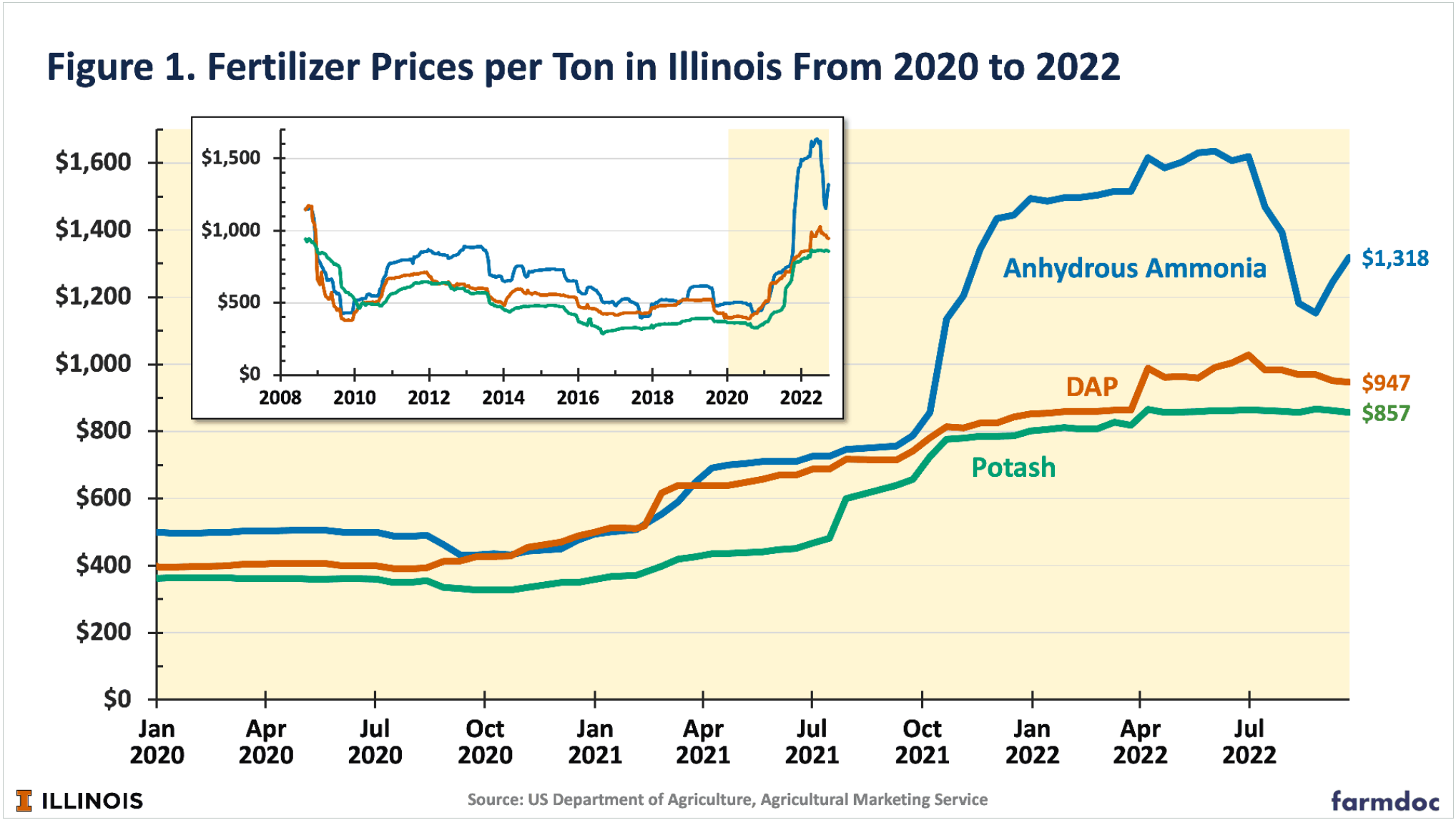
Why Does Growing Your Own Nutrient Matter?



https://farmdocdaily.illinois.edu/2022/09/fertilizer-prices-rates-and-costs-for-2023.html

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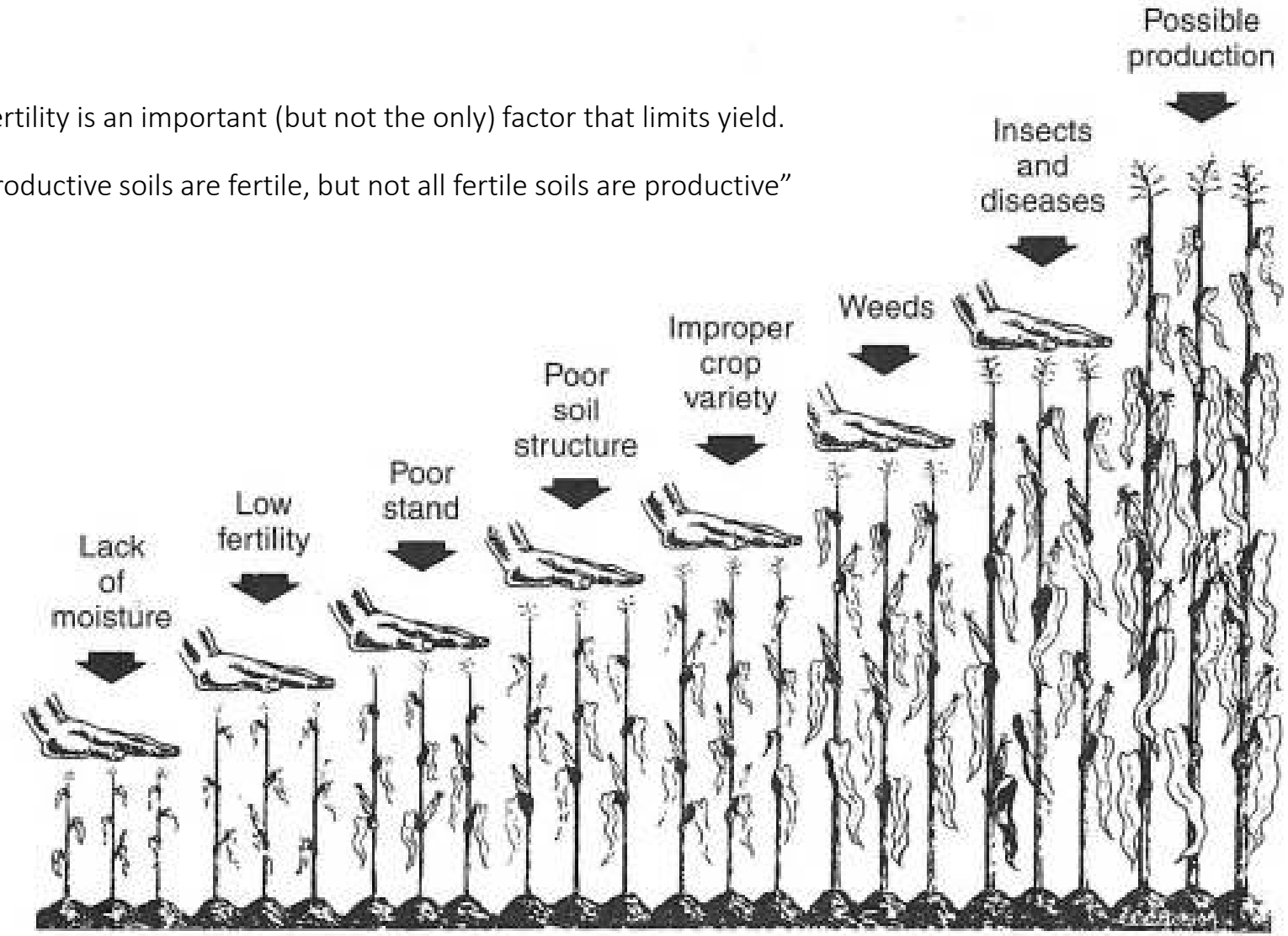
Remember Soil Fertility is a Piece of the Puzzle

Soil fertility is an important (but not the only) factor that limits yield.

"All productive soils are fertile, but not all fertile soils are productive"



Source: Potash and Phosphate Institute and Dr. Chris Baxter- UW Platteville

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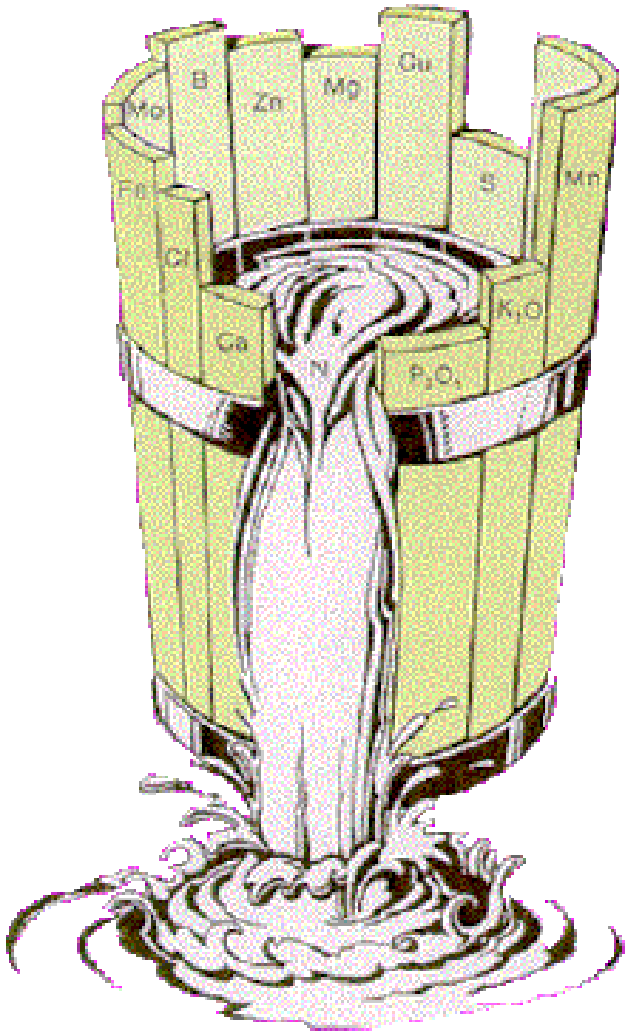

- Yield potential is like water in the barrel, nutrients (or other limiting factors) are the staves.
- The lowest stave limits yield, regardless of the other staves.

Source: Liebig's Law of the Minimum and Dr. Chris Baxter- UW Platteville

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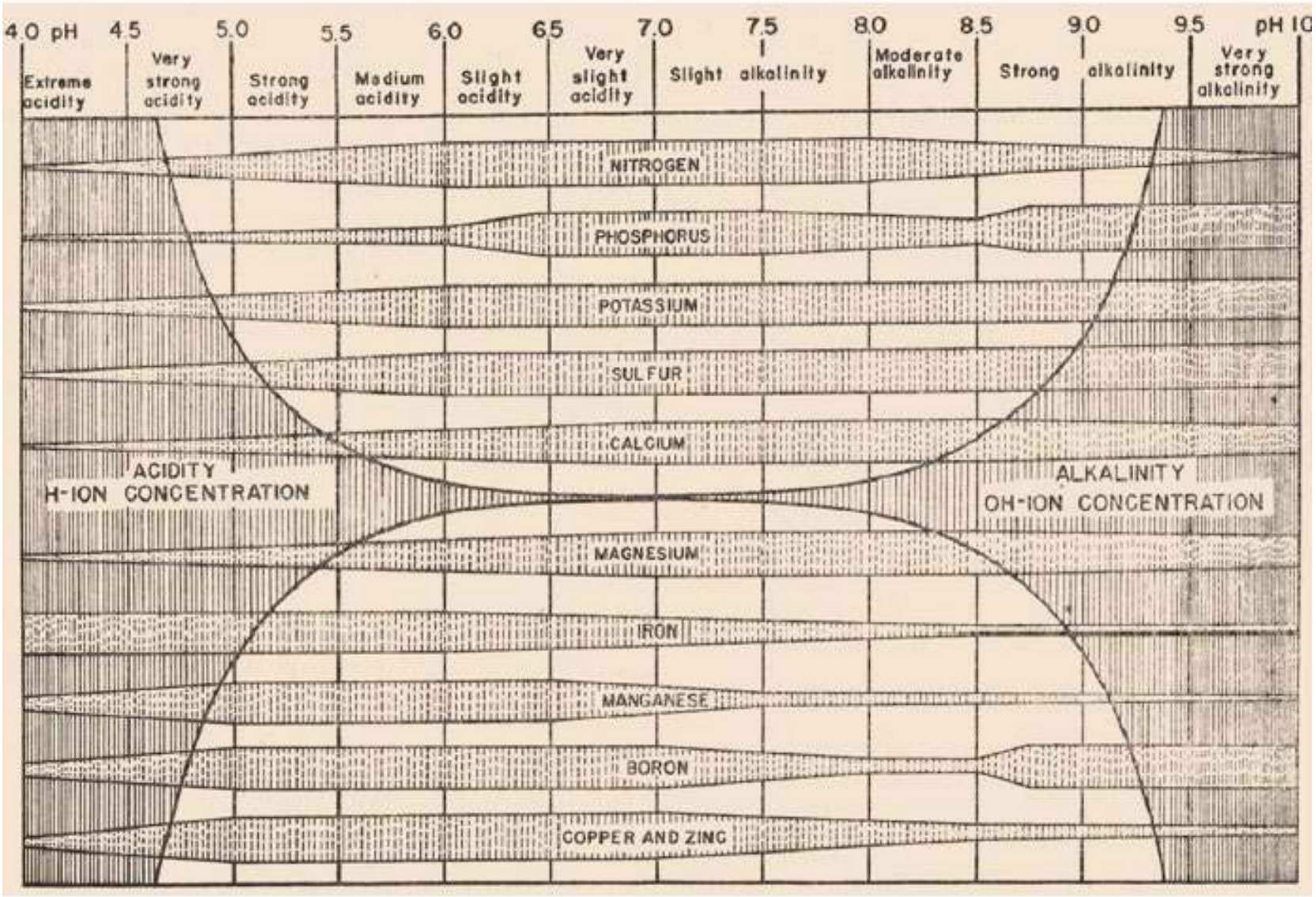
Prioritize Soil pH



- Alfalfa: 6.8
- Soybean: 6.3
- Corn, Pastures, Wheat: 6.0
- Prioritize highest target pH crop in rotation

Truog E (1946b) Soil reaction influence on availability of plant nutrients. Soil Sci Soc Am Proc 11:305–308

Hartemink, A.E., Barrow, N.J. Soil pH - nutrient relationships: the diagram. *Plant Soil*(2023). https://doi.org/10.1007/s11104-022-05861-z

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What about Cover Crop Nutrient Credits?

- **Current legume/green manure credits are for entire growing season!**
- **Help reduce erosion (P and K losses)**
- **Frost seed red clover into winter grain for nitrogen credit!**

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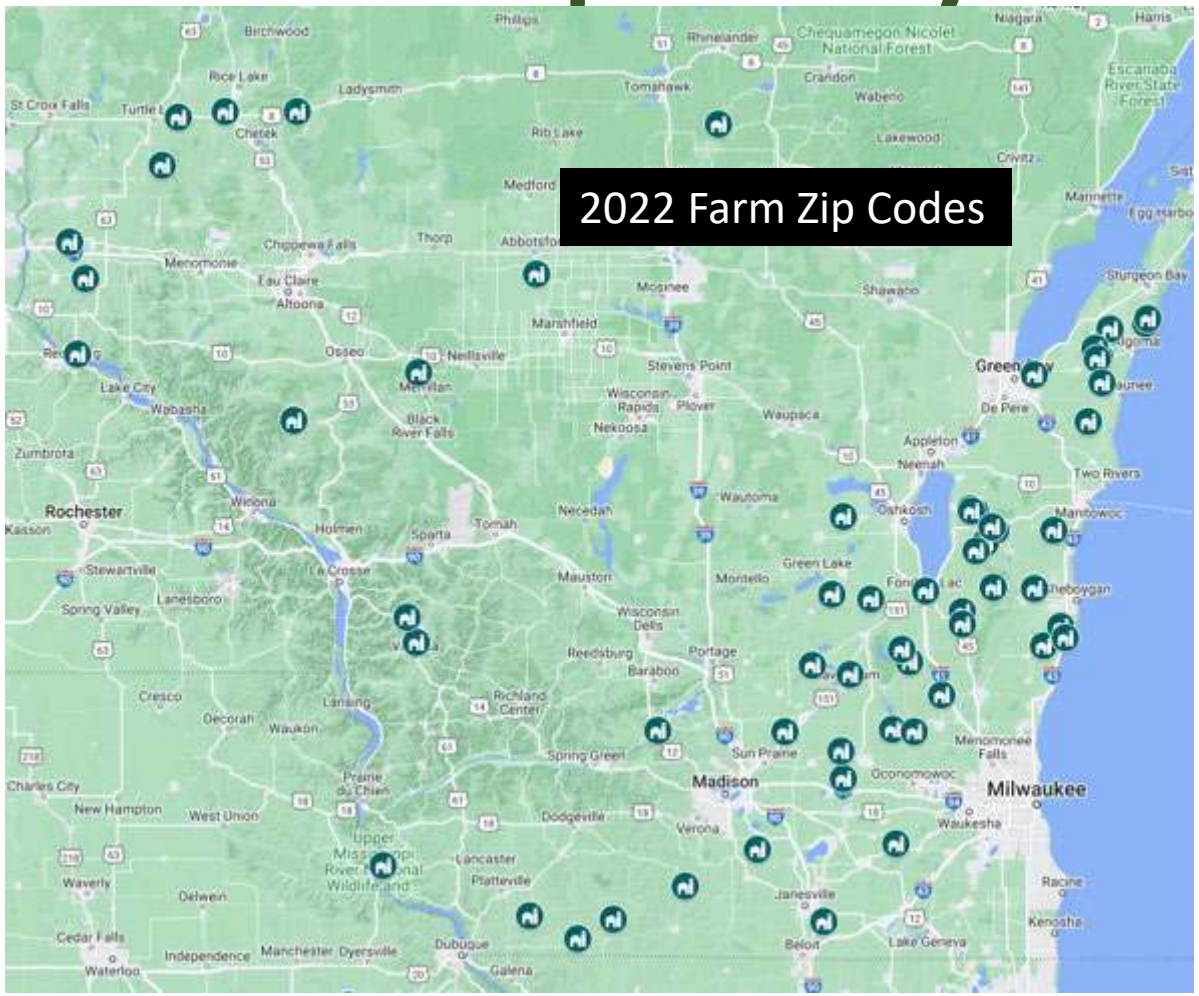
2020-2022 Wisconsin Cover Crop Survey



Almost 100 Participants over 3 years!

2023 sign-up coming in summer 2023

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Cover Crop Biomass
Tissue Sampling Guide

Plan for Success

One of the biggest benefits reaped from cover crops is sequestering more nutrients out of the soil profile. Those growers who plant green into a cover crop allowed to grow as long as possible have be able to fix upwards of 100 pounds of nitrogen! It is all about capturing the nutrient in the soil, having the cover crop uptake and recycle into the soil for the next cash crop.

The AgSource cover crop biomass analysis, let's you see just how many additional nutrients the cover crop was able to sequester. Yet, the only way they know to see just how many additional nutrients have been taken up is through cover crop biomas

Cover Crop Biomass Sampling Steps:

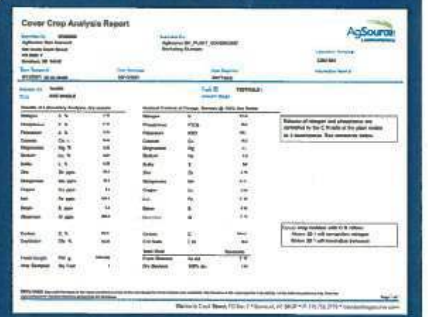
When: Just before planting or termination or for winter killed species, mple prior to a killing frost.

1. Find a representative area in the field of your cover crop.
2. Mark off an area 2 by 2 or 3 by 3 foot.
3. Cut all the above ground cover crop plant tissue in the representative area, rush off any soil residue off the leaves.
4. Make an infield wet weight and record your weight and area sized used (2x2 or 3x3) on the plant tissue form.
5. Mix up all cuttings and fill tissue bag with 0.5-1.0 lbs sub sample.
6. Ship or drop off your sample to your local AgSource Laborat

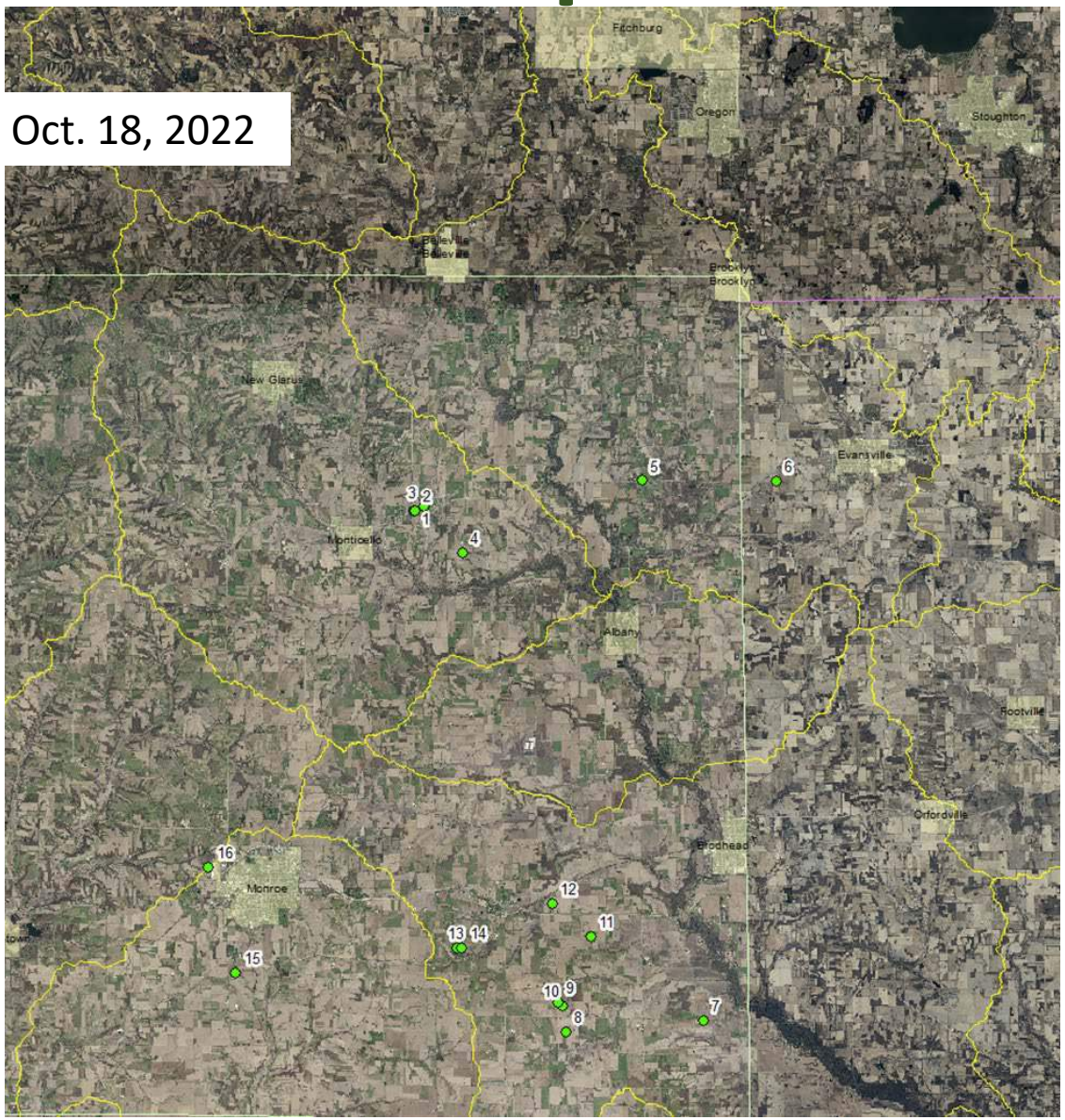
The ass Report

The AgSource Biomass report displays a complete nutrient analysis of macro, secondary and micronutrient, and % carbon and % dry matter for the cover crop. (Left side of report example) The middle reveals the nutrients the cover crop captured and over decomposition will return to the soil.

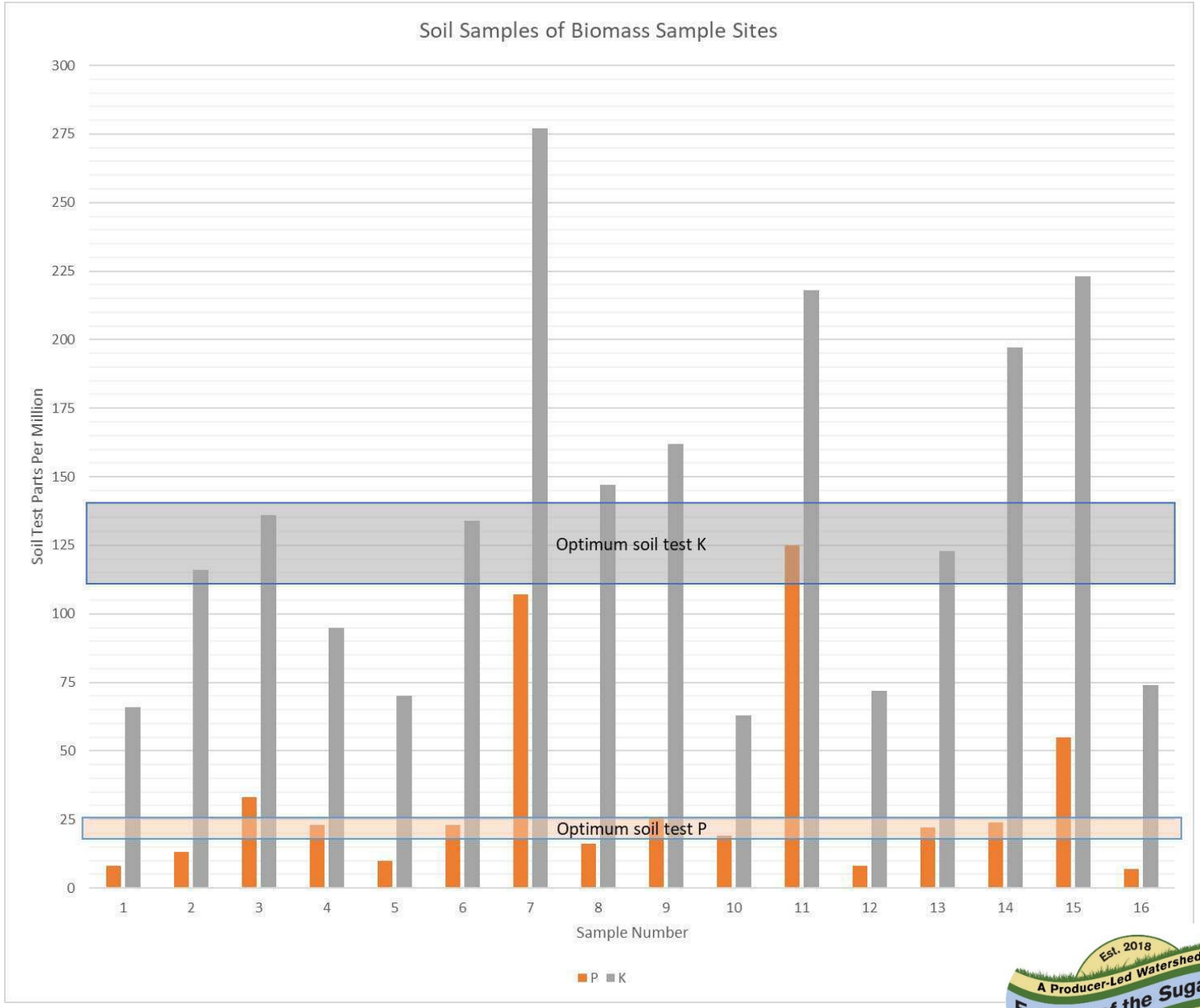
Report Example



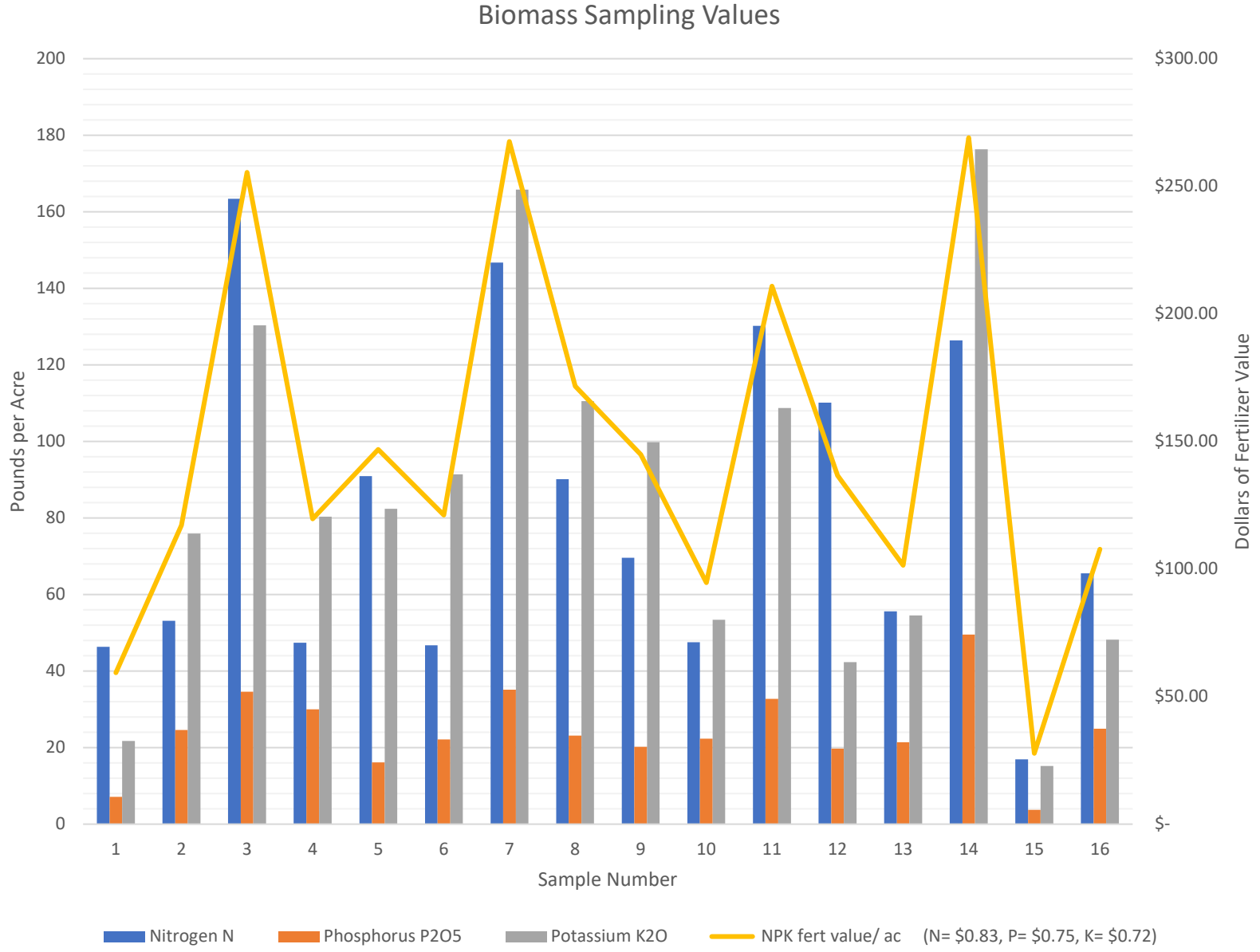
16 samples taken around the watershed



Results of soil sampling



Est. 2018
A Producer-Led Watershed Group
Farmers of the Sugar River
Promoting Conservation Practices



fertilizer values range $27.75-$268.97/ ac

Est. 2018
A Producer-Led Watershed Group
Farmers of the Sugar River
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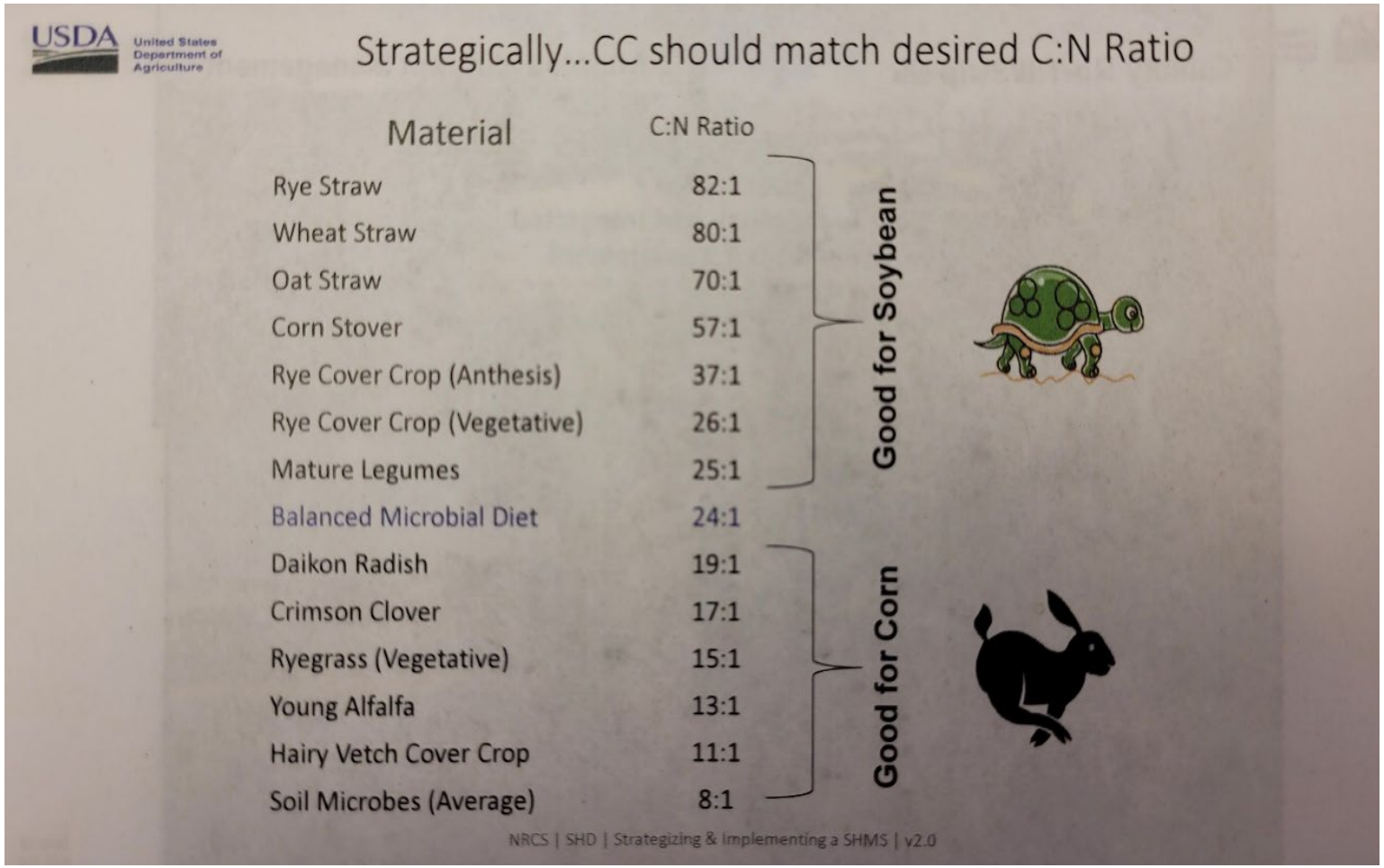
cost analysis of 4 sites

costs/ ac	site 6	site 11	Site 9 & 10
seed	80	37.2	42
seeding	20	20	16
total input costs	100	57.20	58
fertilizer value of biomass	121.14	210.86	144.77 & 94.60
-Cost/ +investment	+21.14	+153.66	+86.77 & +36.60



Borrowed from Barry Fisher, retired IN NRCS

Cover Crop Survey Site 53

- Site visited by Josh Kamps- UW Extension
- SW WI
- Planted following wheat on 8/5/2022
- 12lb. Peas and oats mix, 6 lbs. sorghum-sudangrass, 3 lb. hairy vetch on 15 inch and 3 lb. radish, 3 lb. red clover, 3 lb. alfalfa on 7.5 inch spacing
- 24+ inches of biomass

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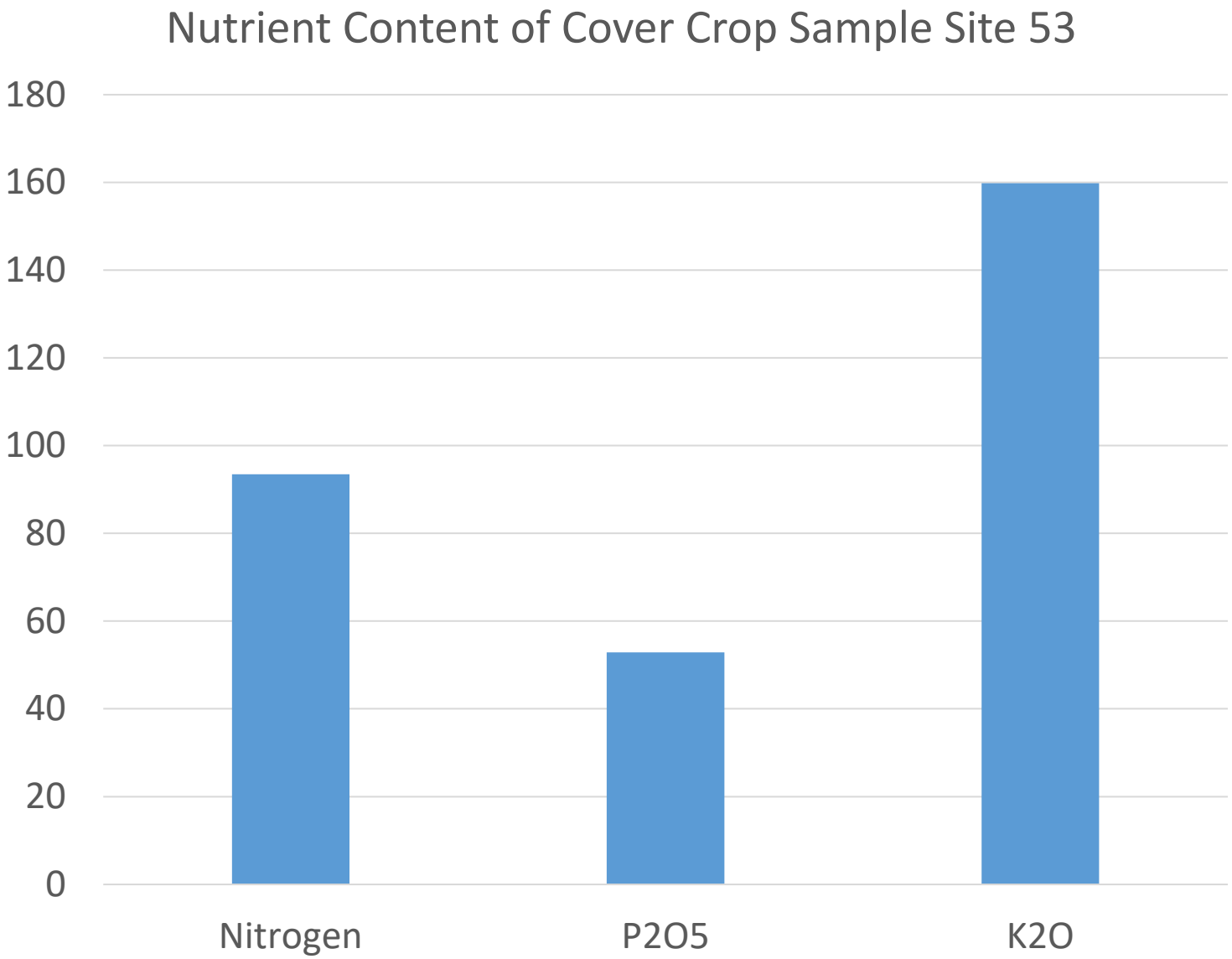
Cover Crop Survey Site 53



- **2.96 tons of dry biomass**
- **28.7 carbon to nitrogen ration**

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How Will You Use This Data?

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Nitrogen Availability + Consumption=Nitrogen for Next Crop?

- Nitrogen Credits
- Green Manure Credits
- Fairly simple
- NH_4 and NO_3

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Phosphorus Availability + Consumption=P and K for Next Crop?

Plants available P_2O_5 and K_2O dependent upon many factors.

Preventing erosion= reducing P and K losses

Plants are drawing down available P and K

Samples Analyzed By:
Soil & Forage Analysis Lab
2611 Yellowstone Dr
Marshfield, WI 54449
phone: (715) 387-2523

LAB #: 3477

SOIL TEST REPORT

Results also available on-line at http://not available
lab number: 3477 access code: tqpc7

COOPERATIVE EXTENSION
University of Wisconsin-Extension
University of Wisconsin-Madison
Department of Soil Science

This Report is for:
UW-Madison Nutrient and Pest Management Program - Daniel Smith ANM19- Lafayette
445 Henry Mall, Suite 318
Madison, WI 53706

County: Lafayette | Account No.: 558620
Date Received: 7/16/2019 | Date Processed: 7/17/2019
Slope: 0% | Acres: 0 | Plow Depth: 7" | Irrigated: No | Tiled: No
Soil Name: unknown, loamy soil
Field Name: Lafayette
Previous Crop: no crop

NUTRIENT RECOMMENDATIONS

Cropping Sequence	Yield Goal	Crop Nutrient Need N	P2O5	K2O	Fertilizer Credit Legume N	Manure N	P2O5	K2O	Nutrients to Apply N	P2O5	K2O
	per acre	lb/a			lb/a	lb/a			lb/a		
Corn, grain	171-190 bu	see below	35	50	0	0	0	0	see below	35	50
Soybean, grain	56-65 bu	0	25	85	0	0	0	0	0	25	85
Alfalfa, seeding	1.5-2.5 ton	0	15	105	0	0	0	0	0	15	105
Alfalfa, established	5.6-6.5 ton	0	40	360	0	0	0	0	0	40	360

The lime required for this rotation to reach pH 6.8 is 7 T/a of 60-69 lime or 5.5 T/a of 80-89 lime.

SUGGESTED N APPLICATION RATES FOR CORN (GRAIN) AT DIFFERENT N:CORN PRICE RATIOS

Previous Crop — Medium Yield Potential Soils **	N:Corn Price Ratio ($/lb N:$/bu) 0.05 Rate[1]	0.05 Range	0.10 Rate[1]	0.10 Range	0.15 Rate[1]	0.15 Range	0.20 Rate[1]	0.20 Range
	lb N/a (Total to Apply)[2]							
Corn, Forage legumes, Leguminous vegetables, Green manures[3]	145	130-160	125	115-140	115	105-125	105	95-110
Soybean, Small grains[4]	130	110-150	100	85-120	85	70-95	70	60-80

*** No soil information was provided, therefore, a medium soil yield potential was assumed for N application guidelines for corn. If you feel that you may have a high yield potential soil and may need higher N application rates, please determine your soil series and/or soil map unit then consult publication A2809. In the future, please submit samples with county and soil map unit or soil series name to obtain the nutrient application guidelines that are more appropriate for your soil.*

[1] Rate is the N rate that provides the maximum return to N (MRTN). Range is the range of profitable N rates that provide an economic return to N within $1/a of the MRTN.
[2] These rates are for total N applied including N in starter fertilizer and N used in herbicide applications.
[3] Subtract N credits for forage legumes, leguminous vegetables, green manures and animal manures. This includes 1st, 2nd and 3rd year credits where applicable. Do not subtract N credits for leguminous vegetables on sand and loamy sand soils.
[4] Subtract N credits for animal manures and 2nd year forage legumes.

Guidelines for choosing an appropriate N application rate for corn (grain)

1) If there is more than 50% residue cover at planting, use the upper end of the range.
2) If 100% of the N will come from organic sources, use the top end of the range. In addition, up to 20 lb N/a in starter fertilizer may be applied in this situation.
3) For medium and fine textured soils with 10% or more organic matter, use the low end of the range; for medium and fine textured soils with less than 2% organic matter, use the high end of the range.
4) If there is a likelihood of residual N, then use the low end of the range or use the high end of the range and subtract preplant nitrate test (PPNT) credits.
5) For corn following small grains on medium and fine textured soils, the middle to low end of the range is most appropriate.

For more information on the new N application rate guidelines for corn see http://uwlab.soils.wisc.edu/pubs/MRTN/

ADDITIONAL INFORMATION

If lime has been applied in the last two years, more lime may not be needed due to incomplete reaction.

Recommended rates are the total amount of nutrients to apply (N-P-K), including starter fertilizer.

Starter fertilizer (e.g. 10+20+20 lbs $N+P_2O_5+K_2O$/a) is advisable for row crops on soils slow to warm in the spring.

Year 1: If corn is harvested for silage instead of grain add extra 30 lbs P_2O_5 per acre and 90 lbs K_2O per acre to next crop.

If alfalfa will be maintained for more than three years, increase recommended K_2O by 20% each year.

SOIL TEST INTERPRETATION FOR CROPPING SEQUENCE

	Very Low	Low	Optimum	High	Very High	Excessive
Phosphorus	PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP					
Potassium	KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK					
Rotation pH	XXXXXXX					

LABORATORY ANALYSIS

Sample Identification	Soil pH	O.M. %	Phosphorus ppm	Potassium ppm	60-69 Lime Req (T/a)	Calcium ppm	Magnesium ppm	Est. CEC (cmol/kg)	Boron ppm	Manganese ppm	Zinc ppm	Sulfate-Sulfur ppm		Texture Code	Sample Density	Buffer pH
1	6.1	3.6	35	130	2.8									2	1.00	6.8
2	6.1	3.4	32	118	5.6									2	0.99	6.7
3	5.9	3.3	33	126	8.4									2	1.01	6.6
Adjusted Averages	6.0	3.4	33	125												

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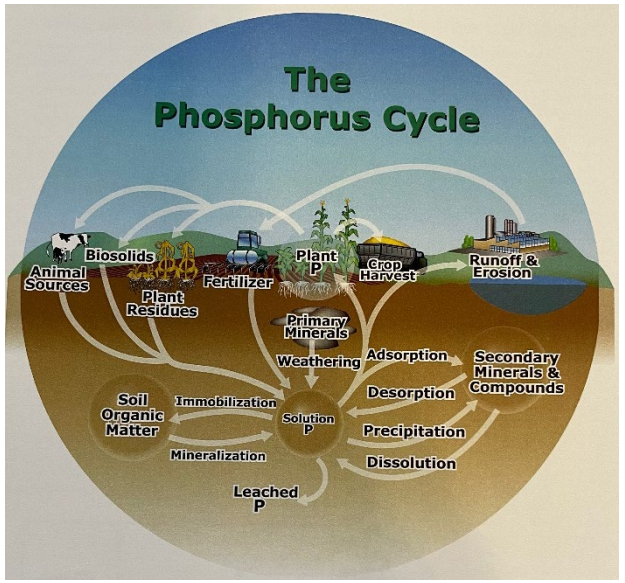
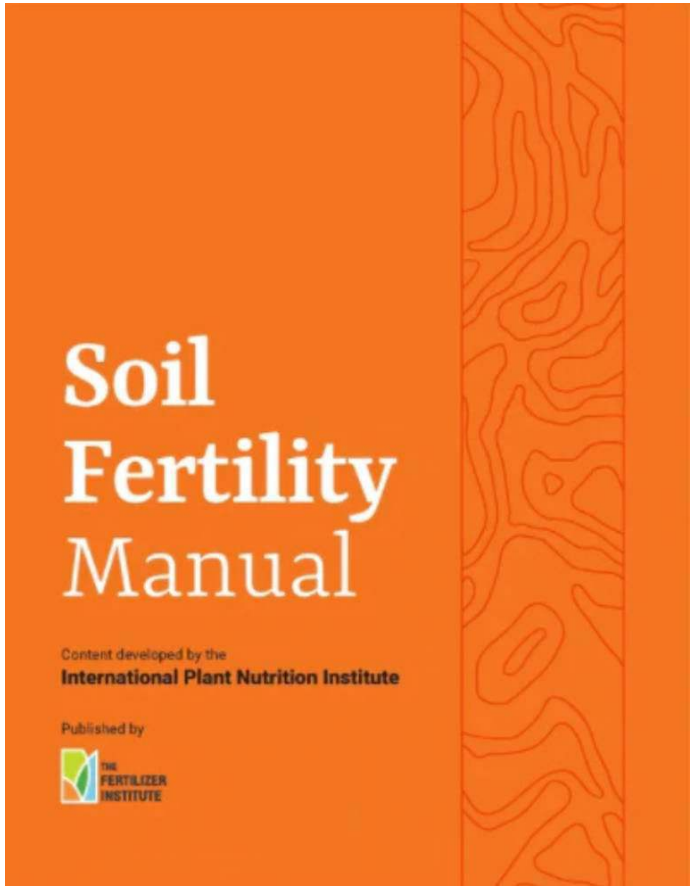
Phosphorus Availability Factors

- Clay Content and type
- Aeration
- Compaction
- Moisture
- Soil P saturation
- Temperature
- Soil pH
- Other nutrients (law of minimum)
- Crop
- Time of application
- Soil biology- mycorrhiza fungo on plant roots increase update and some microbes convert organic P





Soil Fertility Manual. 23rd Edition. International Plant Nutrition Institute

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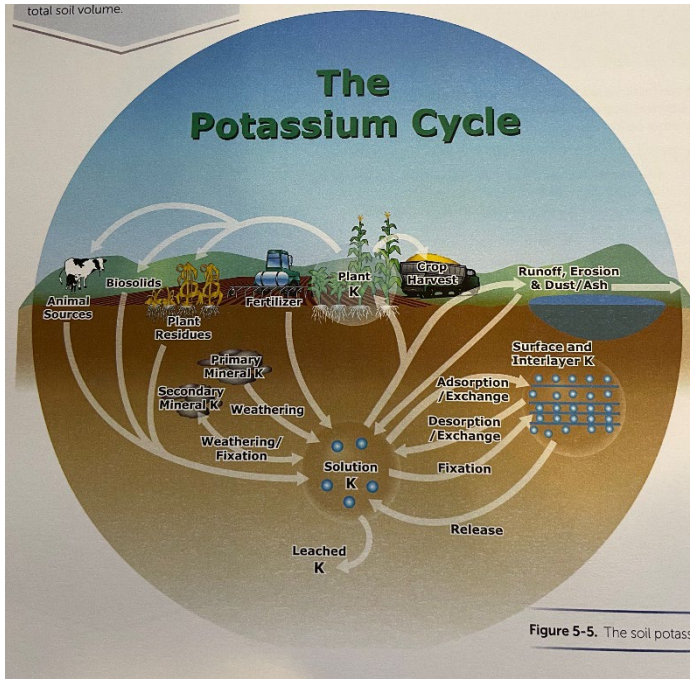
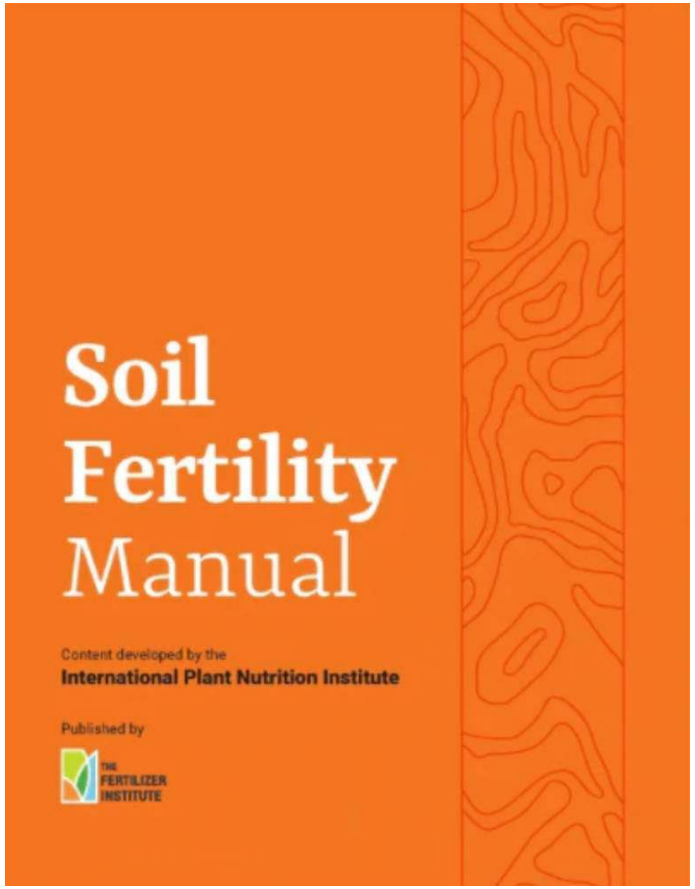
Potassium Availability Factors

- **Soil aeration**
- **Soil test K**
- **Fixation- minerals trapping K**
- **CEC- Higher= more storage**
- **Soil temperature**
- **Soil moisture**





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Measure the value of your soils savings account!

SOIL TEST INTERPRETATION FOR CROPPING SEQUENCE

	Very Low · Low · **Optimum** · High · Very High · Excessive
Phosphorus	PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP
Potassium	KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK
Rotation pH	XXXXXXX

LABORATORY ANALYSIS

Sample Identification	Soil pH	O.M %	Phosphorus ppm	Potassium ppm	60-69 Lime Req (T/a)	Calcium ppm	Magnesium ppm	Est. CEC (cmol/kg)	Boron ppm	Manganese ppm	Zinc ppm	Sulfate-Sulfur ppm		Texture Code	Sample Density	Buffer pH
1	6.1	3.6	35	130	2.8									2	1.00	6.8
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3	5.9	3.3	33	126	8.4									2	1.01	6.6
Adjusted Averages	6.0	3.4	33	125												

- **Soil test nutrients measure plant available nutrients.**
- **Cover crop biomass samples measure nutrients in above biomass- nutrients would need to make it back to the soil for the next crop.**
- **No accounting for root nutrient value.**

But what about goals and biomass production?

Plan for Success!

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Thank you!

Questions?

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