

Looking Ahead: Precision Nutrient Management

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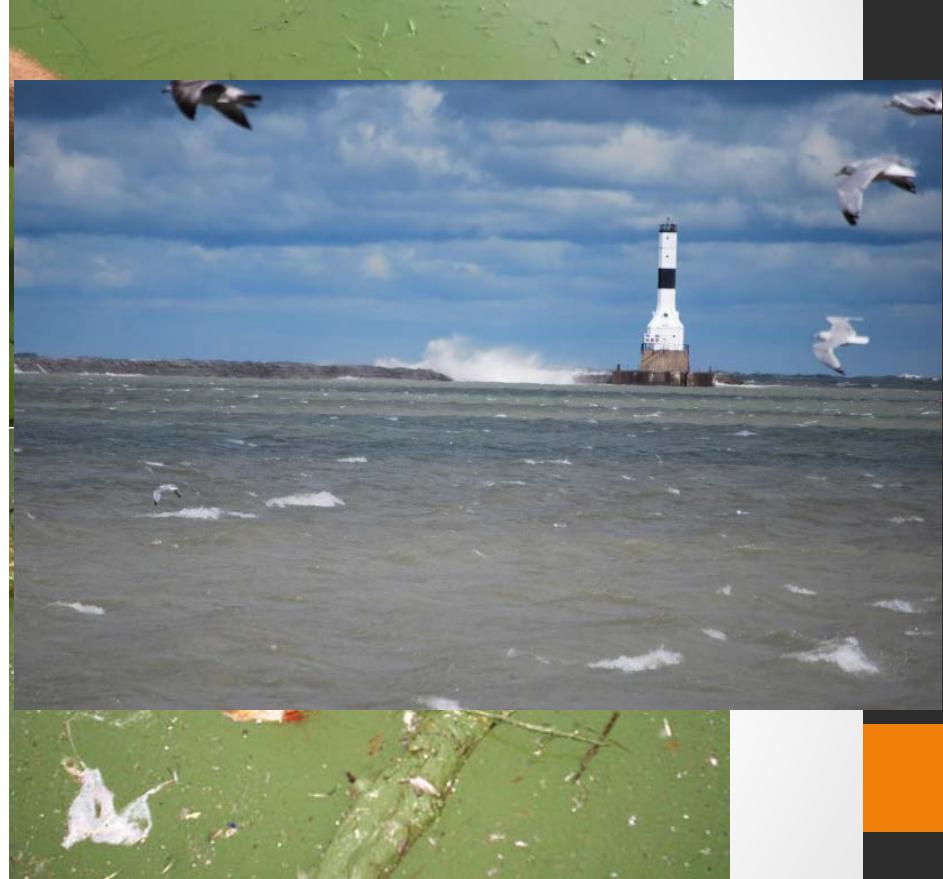
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www.AgLandLease.info

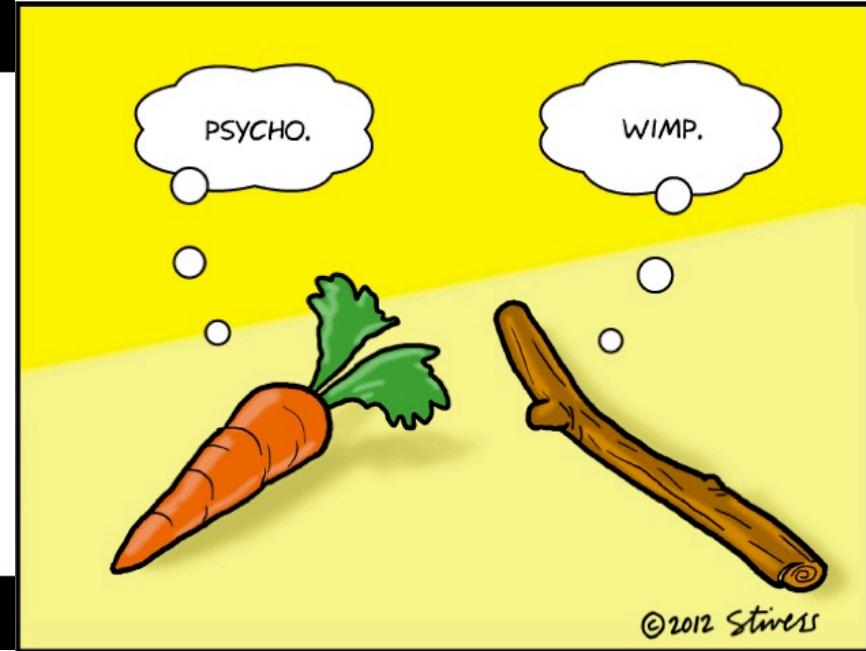
A website to bridge the gap between Landlords and Leesess

Overview

- In past
 - Chesapeake Bay
 - Oklahoma Sues Arkansas
 - City of Des Moines
- News is about Lake Erie
 - Was bad,
 - Then good
 - No bad again
 - The Problem
 - The Fix?
- Impact elsewhere



The Future will be either



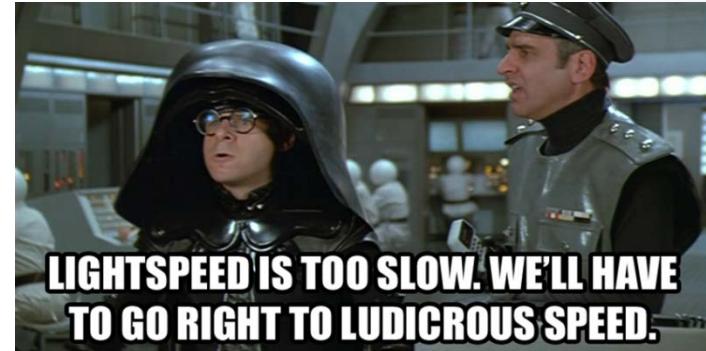
How we Do Nitrogen – Corn

Option 1:

- Well, _____ (fill in name) did it this way.

Option 2:

- What did _____ (fill in name of guy down the road that grows good corn) do?



How N is done.

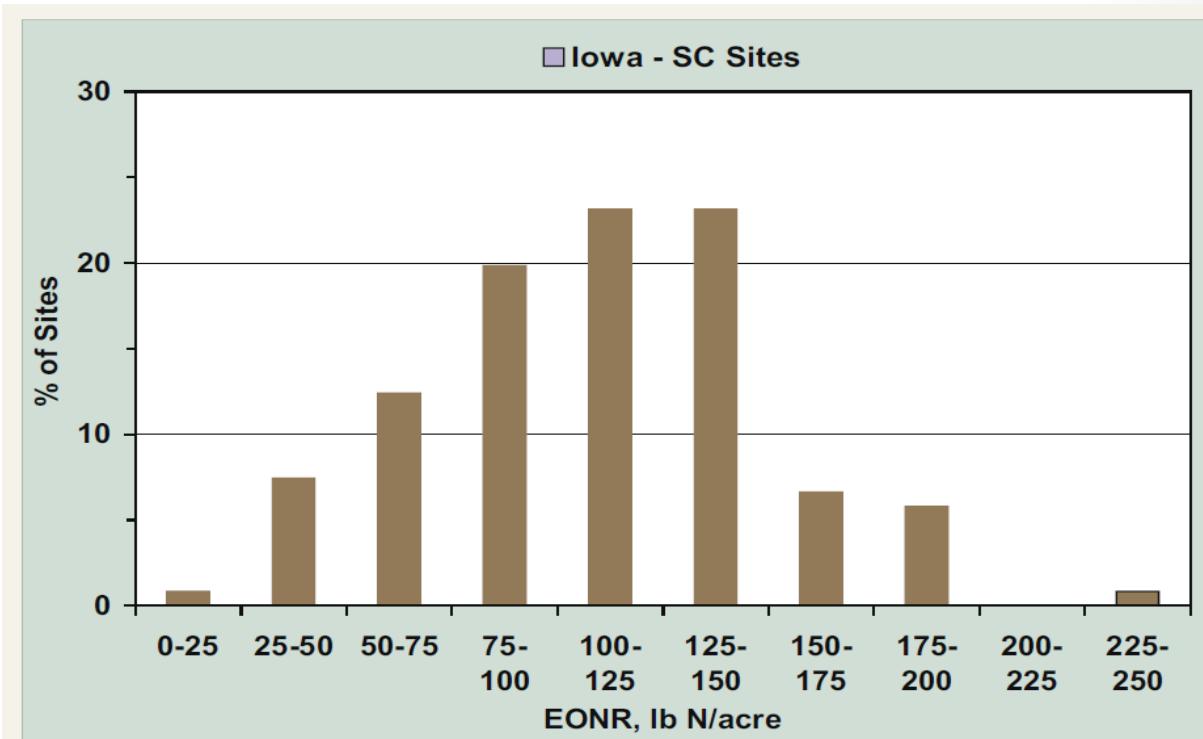


Figure 6. Frequency distribution of EONR (0.10 price ratio) for SC sites in Iowa.

Source	Location	Years	Time period	† (0-N) Yield Range	‡ High N Yield Range	*Optimum N rate kg ha ⁻¹				
						---- Mg ha ⁻¹ ----	Min	Max	Avg.	SD
Bundy et al. (2011)	WI	21	1958-1983	1.6-7.6	4.3-8.8	50	233	130	53	
Bundy et al. (2011)	WI	9	1984-1997	2.7-5.6	5.7-9.96	58	235	179	51	
Mallarino and Torres (2006)	IA	20	1979-2003	0.8-5.9	5.1-12.4	81	237	165	49	
Mallarino and Torres (2006)	IA	14	1985-2010	1.4-6.2	5.3-12.8	134	239	197	32	
Varvel et al. (2007)	NE	5	1995-2005	6.6-10.9	10.4-13.3	73	193	131	49	
Jokela et al. (1989) Carroll	MN	3	1982-1984	5.5-7.3	7.1-9.1	5	131	84	69	
Jokela et al. (1989) Webster	MN	3	1982-1984	1.7-5.6	1.8-8.7	70	113	91	21	
Fenster et al. (1976) Waseca	MN	5	1970-1975	3.2-7.4	7.1-10.6	60	199	135	50	
Fenster et al. (1976) Martin A	MN	7	1970-1976	3.8-8.2	4.0-9.6	23	126	69	36	
Fenster et al. (1976) Martin B	MN	6	1971-1976	6.2-11.3	6.2-12.0	0	37	18	15	
Al Kaisi et al. (2003)	CO	3	1998-2000	5.6-10.2	8.3-10.8	66	111	91	23	
Ismail et al. (1994) NT	KY	20	1998-2000	2.1-7.4	5.2-10.9	35	230	128	46	
Ismail et al. (1994) CT	KY	20	1970-1990	1.9-9.5	3.5-10.4	0	203	98	52	
Rice et al. (1986) NT	KY	15	1970-1985	3.1-4.9	5.7-9.2	102	178	144	30	
Rice et al. (1986) CT	KY	15	1970-1985	1.9-6.1	5.0-8.8	69	204	124	47	
Stecker et al. (1993) Columbia	MO	3	1988-1990	3.3-5.6	6.0-10.1	99	194	153	49	
Stecker et al. (1993) Novelty	MO	3	1988-1990	4.5-7.2	6.7-9.9	45	182	103	71	
Stecker et al. (1993) Corning	MO	2	1989-1990	5.0-6.0	8.2-8.5	90	117	104	20	
Peterson et al. (1989)	NE	4	1983-1986	2.1-6.4	3.9-10.0	11	218	104	88	
Eck (1982)	TX	2	1977-1978	2.7-4.4	5.6-5.9	59	116	88	40	
Shapiro et al. (2006) RS 51cm	NE	3	1996-1998	6.2-8.9	9.4-11.1	69	96	83	13	
Shapiro et al. (2006) RS 76cm	NE	3	1996-1998	5.0-8.9	7.1-11.0	13	114	75	54	
Meisinger et al. (1985) MT	MD	4	1974-1977	1.8-2.6	5.8-8.2	127	233	183	45	
Meisinger et al. (1985) PT	MD	4	1974-1977	2.7-4.2	5.1-8.1	36	196	142	75	
Gehl et al. (2005) Rossville	KS	2	2001-2002	6.4-7.9	11.3-12.6	182	204	193	15	
Gehl et al. (2005) Scandia	KS	2	2001-2002	2.7-7.4	3.8-11.5	51	160	105	77	
Total		198			Average	62	173	120	45	
					SD	44	55	43	20	

Nitrogen in the Crop - EONR

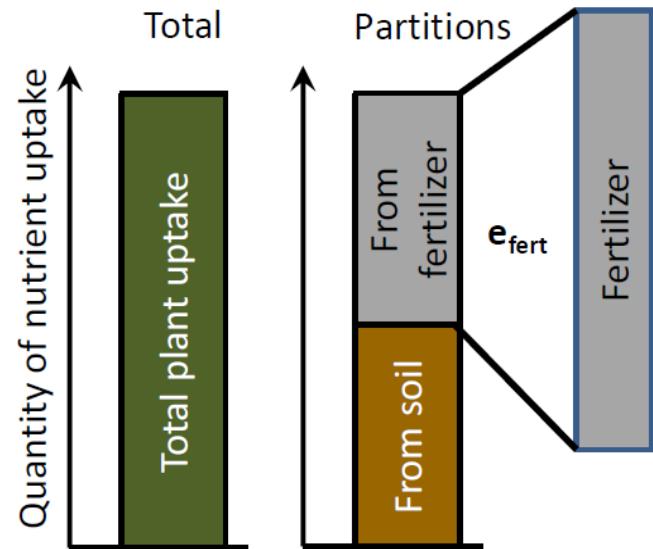
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Stanford Equation

$$N_{fert} = (N_{crop} - N_{soil}) / e_{fert}$$

Douglas Beegle, Penn State University
Scott Murrell, International Plant Nutrition Institute

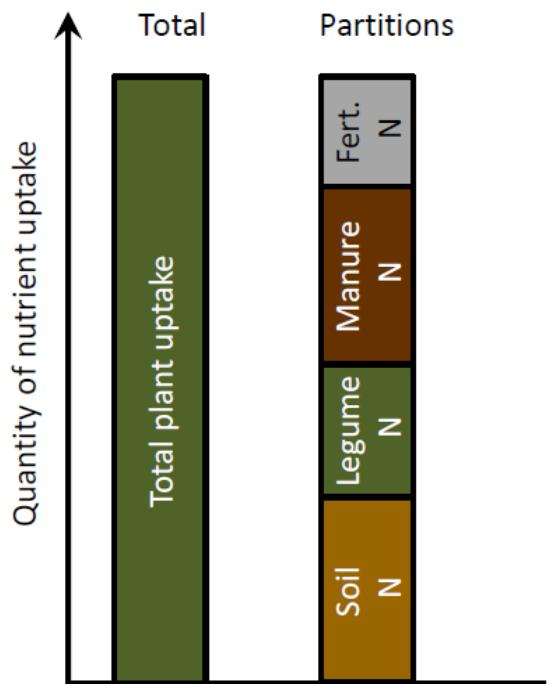
ASA Symposium
Agronomic Production Systems and Adaptive Nutrient Management Community
Strengths and Limitations of Methods, Tests, and Models for Making N Recommendations for Corn
and a Framework for Improving N Recommendations



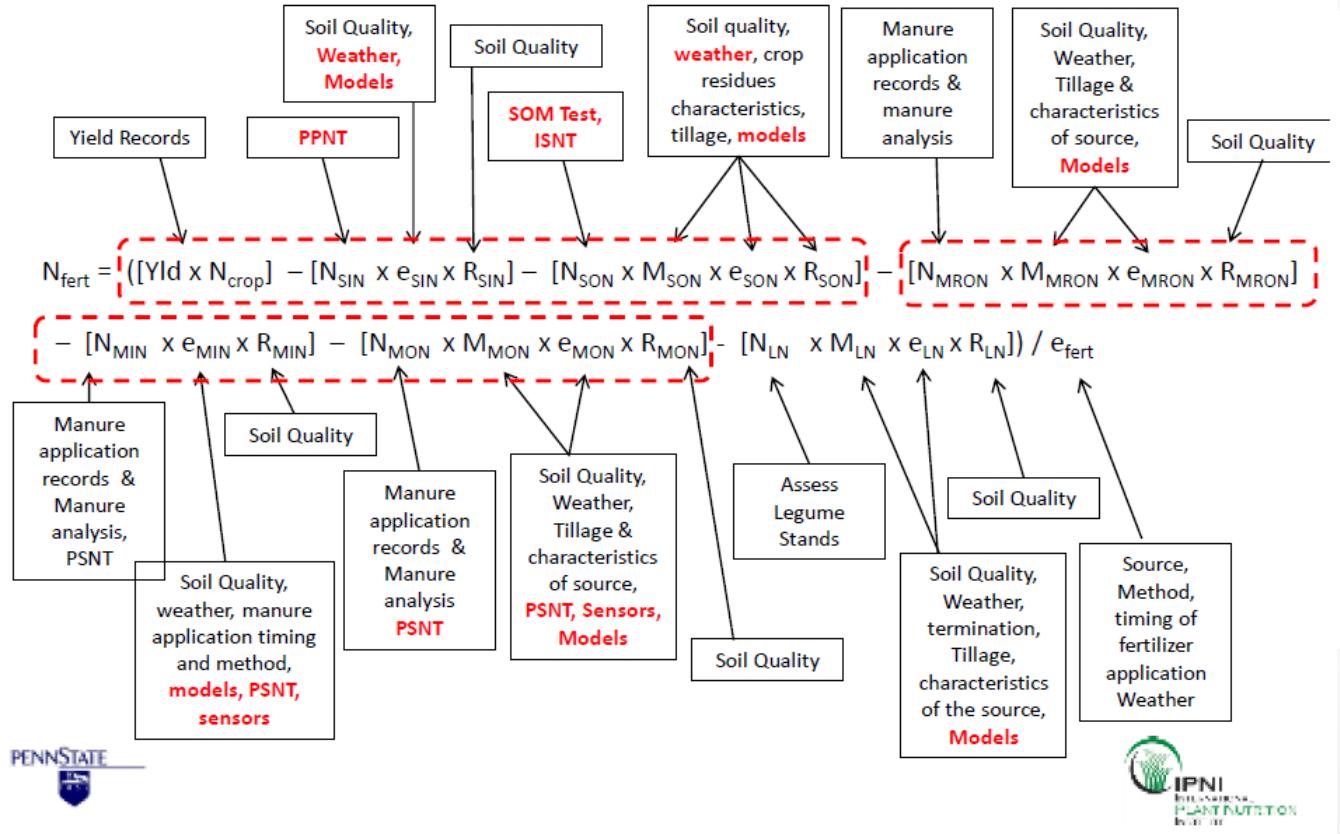
Stanford Equation

$$N_{fert} = (N_{crop} - N_{SIN} - N_{SON} - N_{CRN} - N_{manure\ RON} \\ - N_{manure\ IN} - N_{manure\ ON} - N_{leg}) / e_{fert}$$

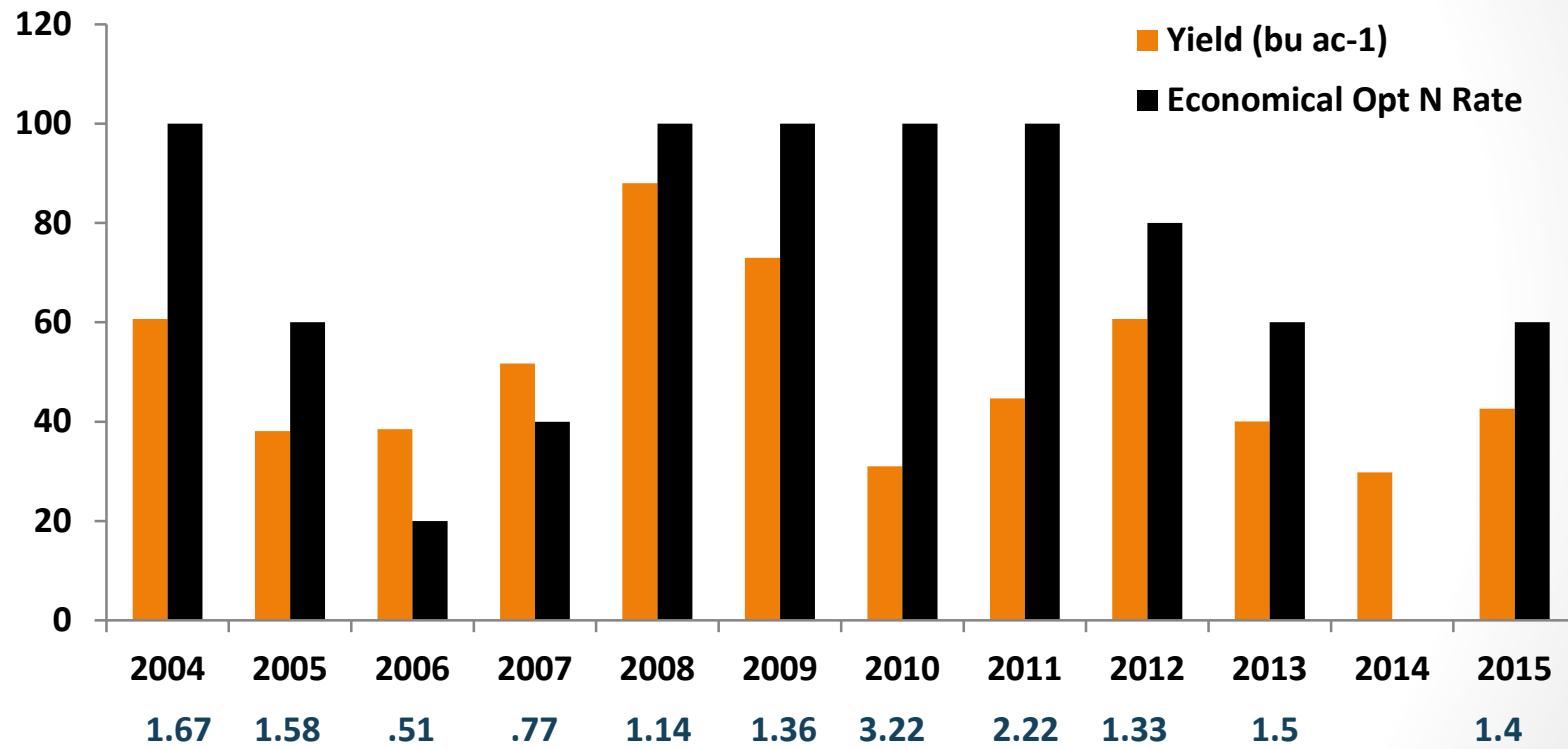
N_{fert}	= Total fertilizer N required
N_{crop}	= Total N in Crop
N_{SIN}	= Available soil inorganic N
N_{SON}	= Available soil organic N
N_{CR}	= Available crop residue N
$N_{manure\ RON}$	= Available manure residual organic N
$N_{manure\ IN}$	= Available manure inorganic N
$N_{manure\ ON}$	= Available manure organic N
N_{leg}	= Available legume N
e_{fert}	= Fertilizer N efficiency



Theoretical Equation



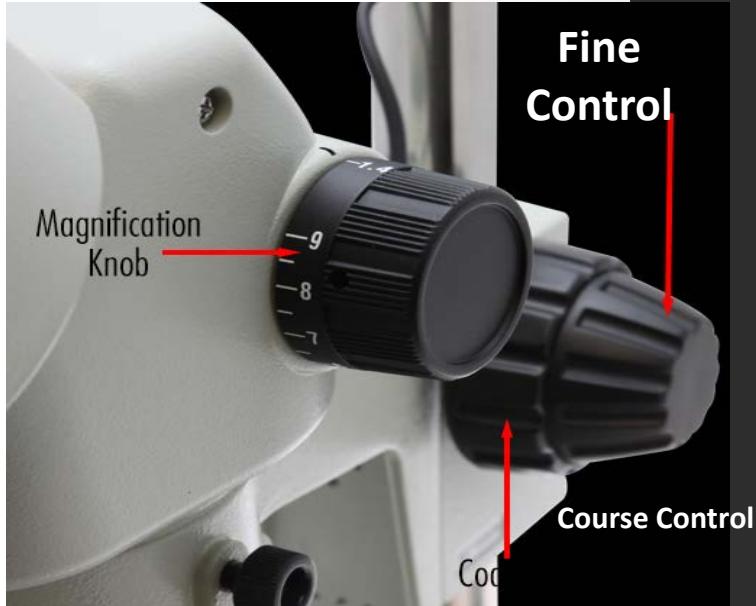
Nitrogen in the Crop - EONR



Average of 68 lbs with 49 BPA, 1.5 lbs N per bushel

Fine and Course Control

- Making high resolution decisions using low resolution recs.
- Recommendation maps are at < 1 acre resolution and critical value that represents a whole state.
- How Precise is that.



Where is the opportunity

- N-Crop: Is the yield Temporally Variable? Spatially Variable?
- N-Soil: Do you have 2% OM and inconsistent weather?
- E-Fert - is your texture or landscape spatially variable?
- Can you adjust based on Management.

$$N_{fert} = (N_{crop} - N_{soil}) / e_{fert}$$

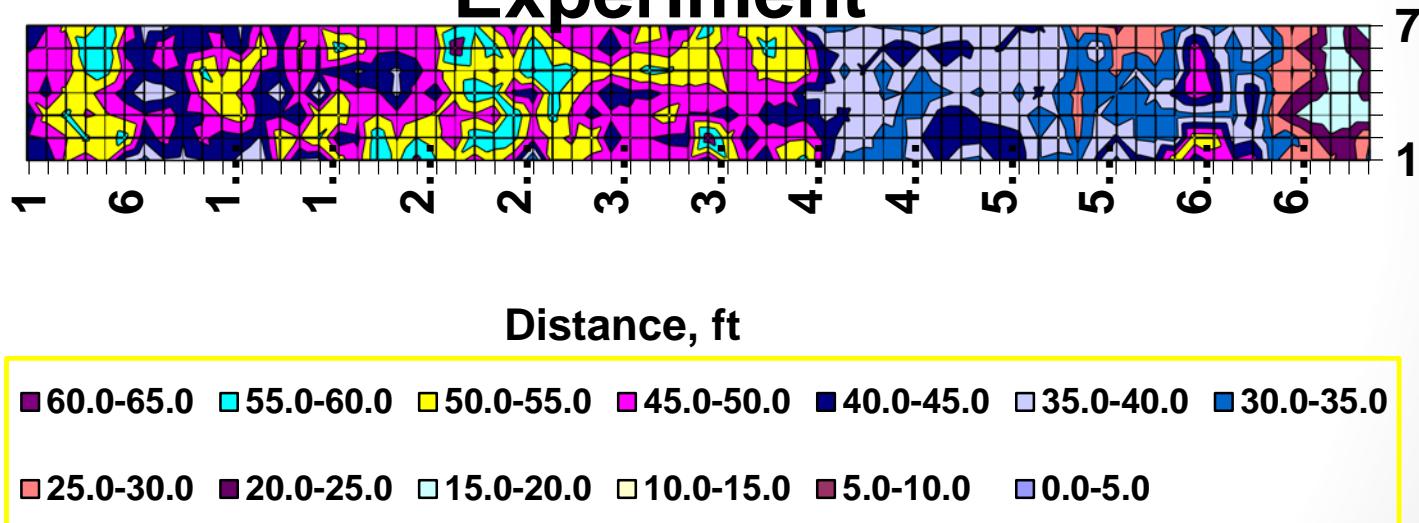
How we Do Phosphorus Recs

- Build-Maintain (Replacement)
- Apply enough P to or K to build soil test values to a target soil test value over a planned timeframe (e.g. 4-8 years), then maintain based on crop removal and soil test levels
- NOT intended to provide optimum economic returns in a given year, but minimize the probability the P or K will limit crop yields while providing for near maximum yield potential

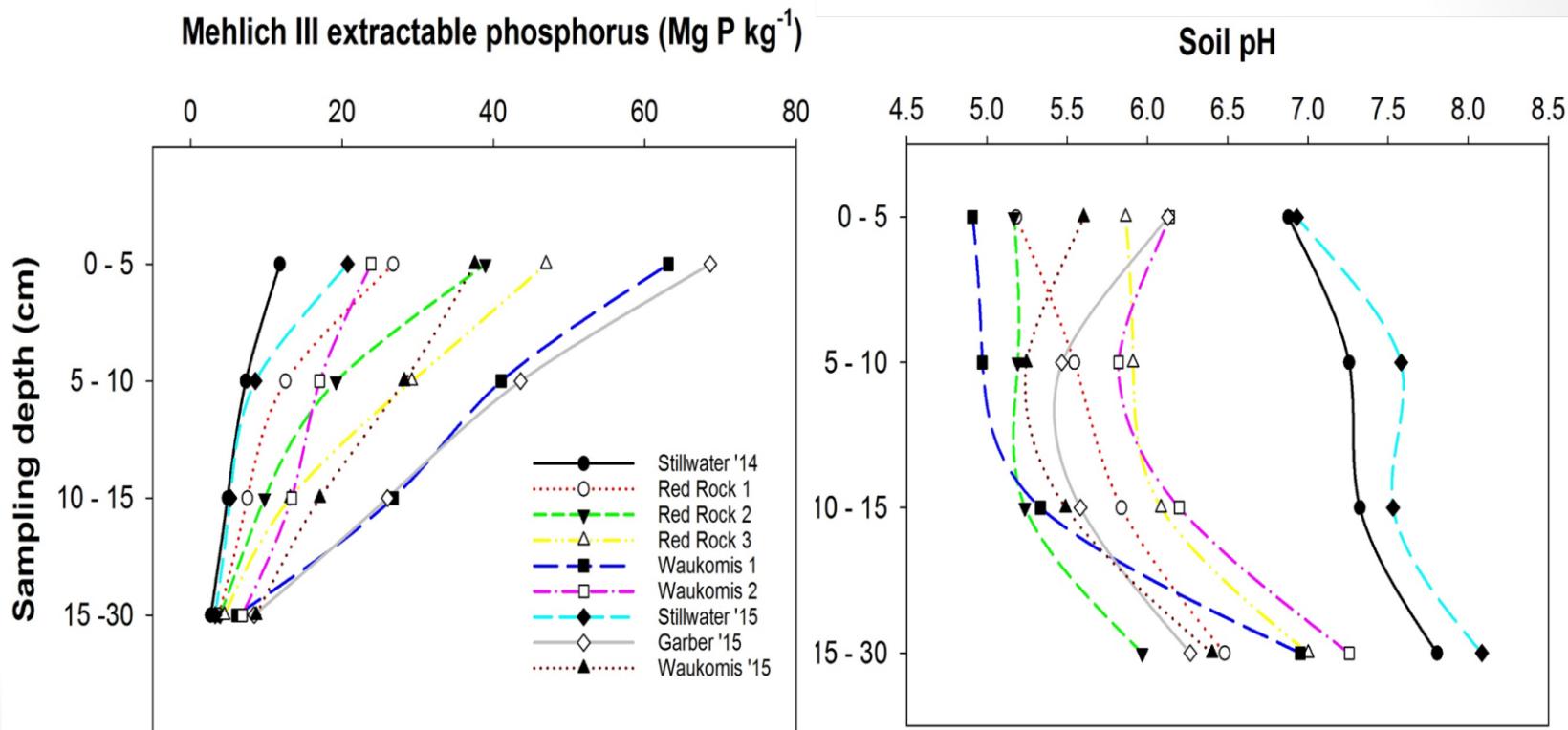
Crop	Harvest unit	P in yield
Corn	Bushel	.38
Soybean	Bushel	.8
Wheat	Bushel	.5

How we Do VRT Phosphorus Recs

Efaw Phosphorus 1x1 Experiment



How we Do VRT Phosphorus Recs



Nutrient Rich Strips

Use Your Cover Crops



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Imagery Date: 3/29/2015 36°55'18.58" N 94°48'34.49" W elev

On Farm Testing

- Recommendations are built for states or regions at best.
- We have highly spatially specific data.
- But very little spatially specific recs.
- Yield monitor and spreader.

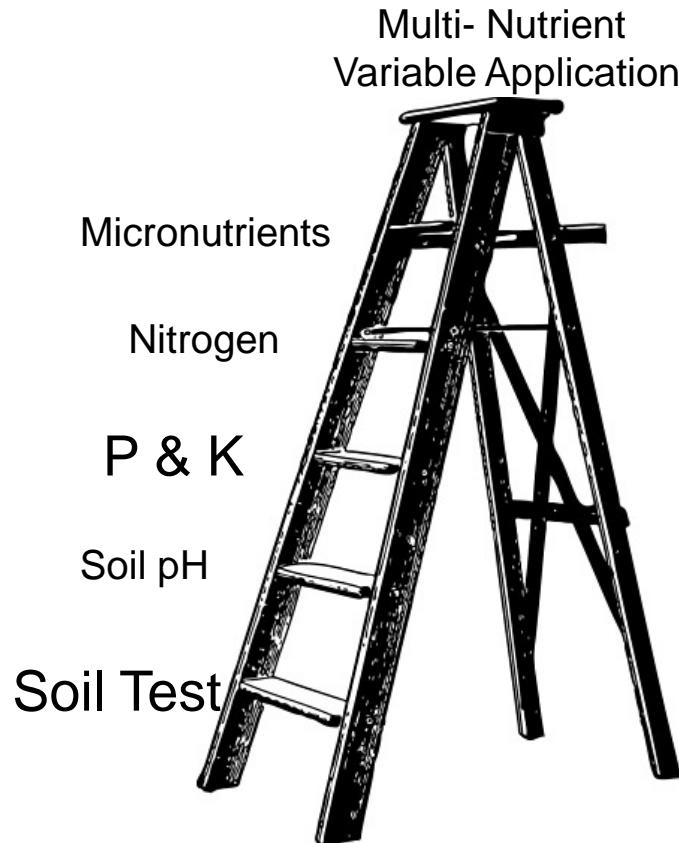


Long Term Goal

- Be Truly Site Specific for all nutrients
- Over extended period but near neutral for Mobile Nutrients
- Targets P and K recs to soils response to addition/removal



Importance of Proper Fertility



Outside the box.... drill



Thank You



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A website to bridge the gap between Landlords and Leases