Precision Nutrient Management

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How do You do Nitrogen

Option 1:

- Model – Climate, Encira, Adapt-N

Option 2:

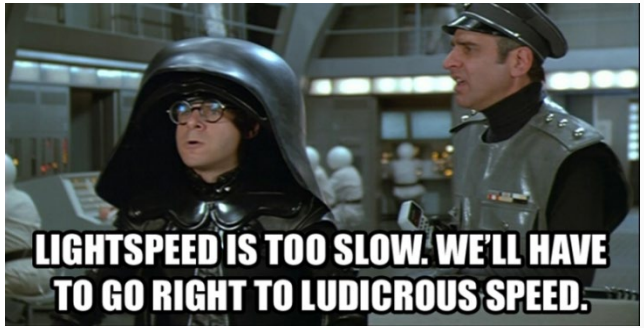
- Yield Maps

Option 3:

- Yield Goal

Option 4:

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

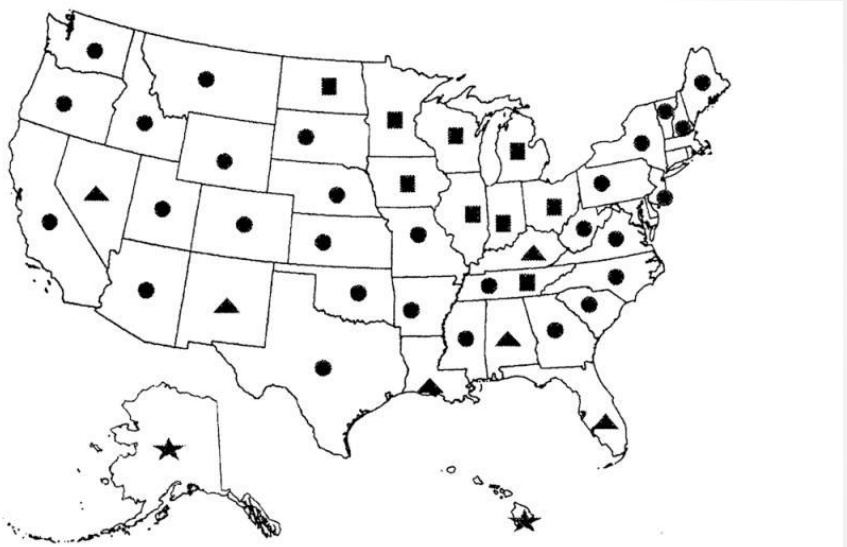


How “we” Do Nitrogen

- I am not, can not tell you how to do it right.
- I am not going to say anyone is doing it wrong.
- I do hope I make you think.
- It just may not be today.

How N is done.

- Yield goal * (factor)
  - -
- Soil and credits



Morris et al 2017

How N is done.

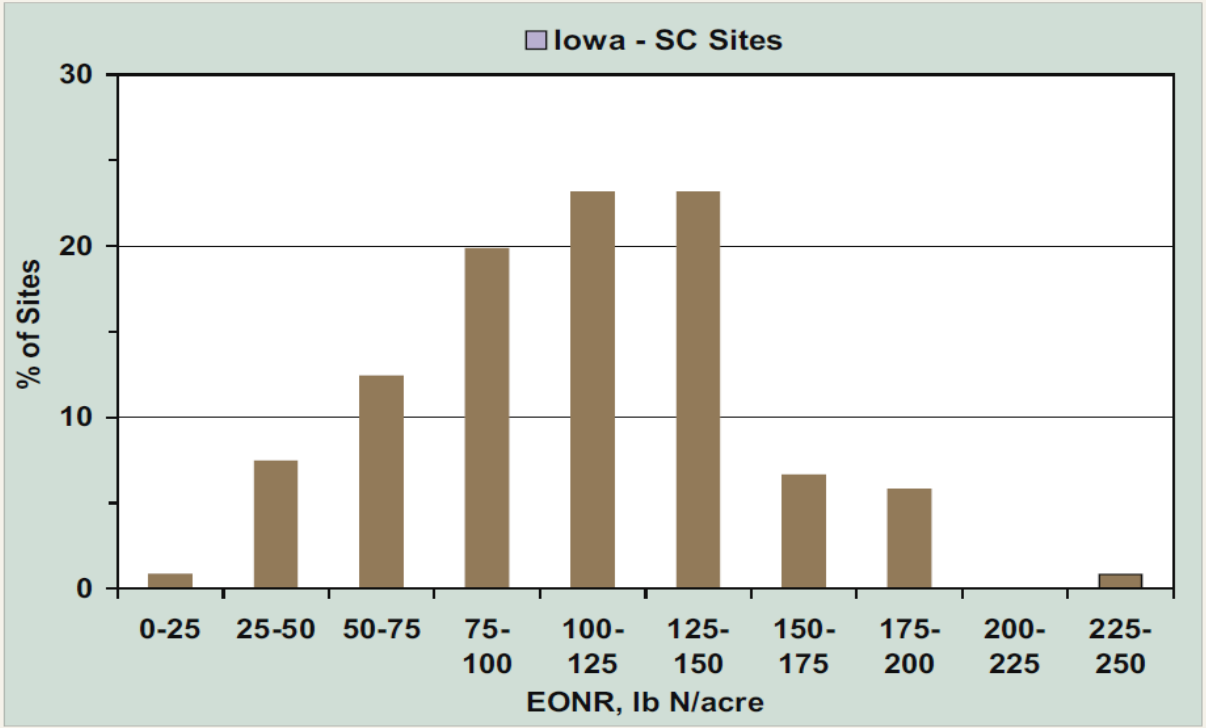


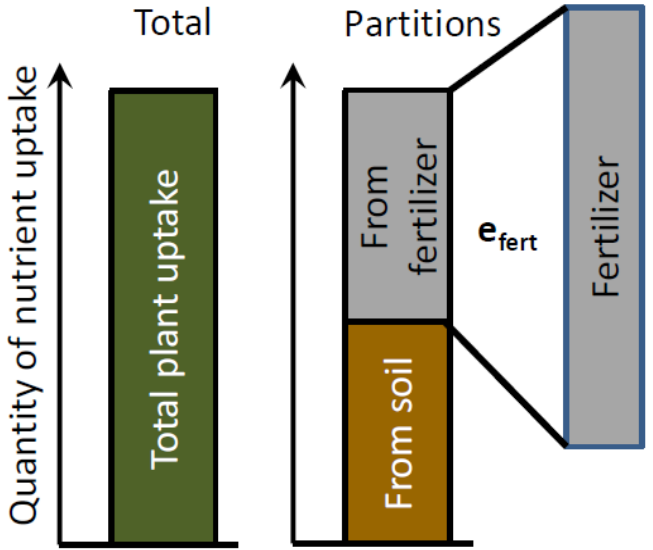
Figure 6. Frequency distribution of EONR (0.10 price ratio) for SC sites in Iowa.

Stanford Equation

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

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

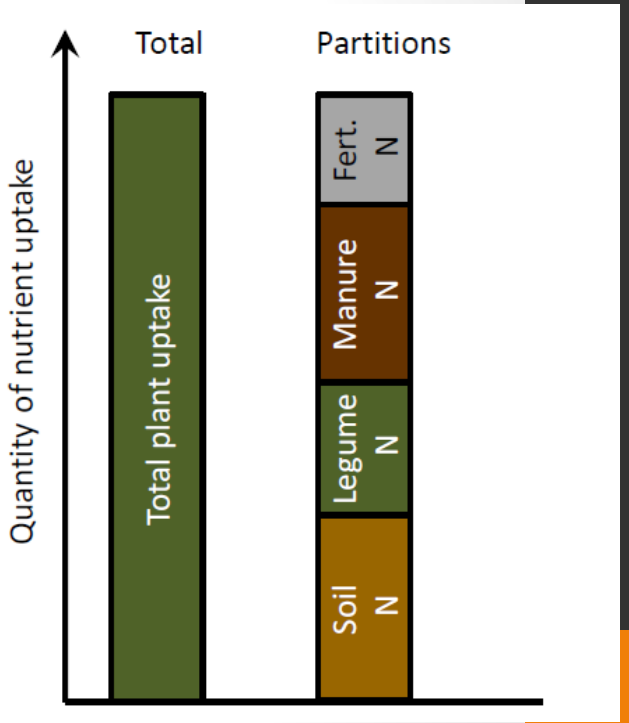
ASA Symposium
Agronomic Production Systems and Adaptive Nutrient Management Community
Strengths and Limitations of Methods, Tests, and Models for Making N Recommendations for Corn and a Framework for Improving N Recommendations



Stanford Equation

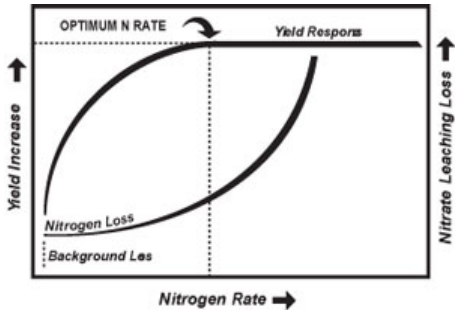
$$N_{fert} = (N_{crop} - N_{SIN} - N_{SON} - N_{CRN} - N_{manure\ RON} - N_{manure\ IN} - N_{manure\ ON} - N_{leg}) / e_{fert}$$

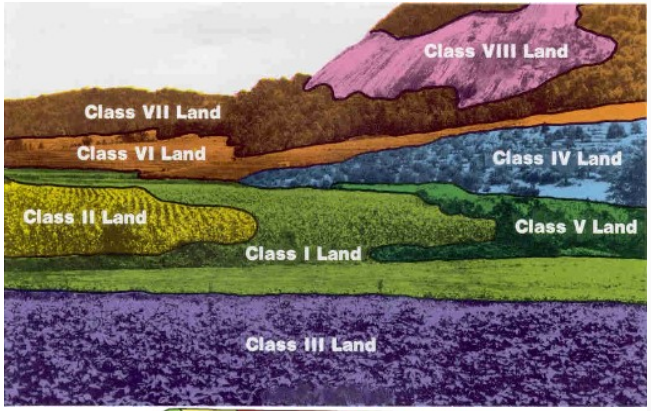
N_{fert}	= Total fertilizer N required
N_{crop}	= Total N in Crop
N_{SIN}	= Available soil inorganic N
N_{SON}	= Available soil organic N
N_{CR}	= Available crop residue N
$N_{manure\ RON}$	= Available manure residual organic N
$N_{manure\ IN}$	= Available manure inorganic N
$N_{manure\ ON}$	= Available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

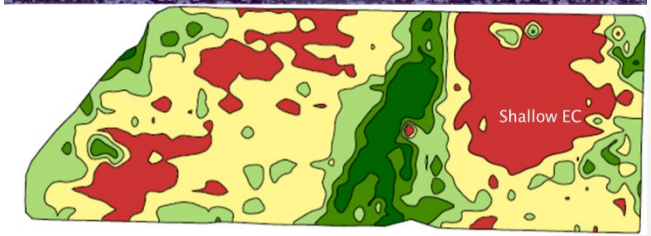


Nitrogen in the Crop

- N_{Crop}
  - Yield Goal
  - Soil Class
  - Yield Map
  - Biomass Map
  - Growth | Uptake Model





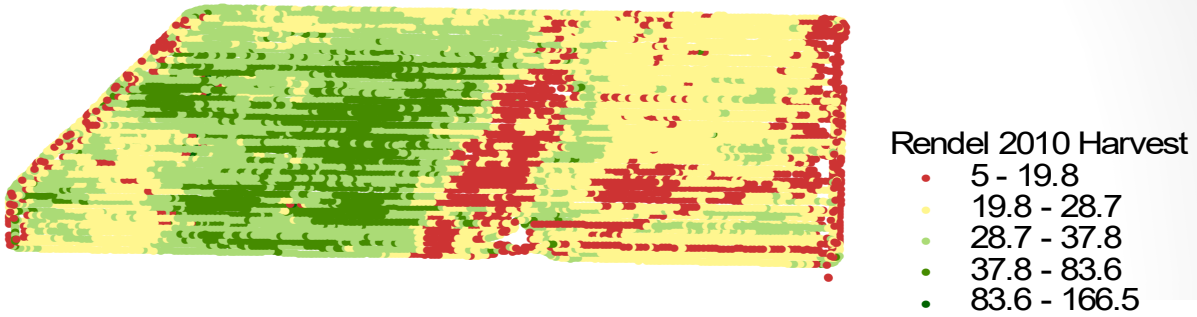


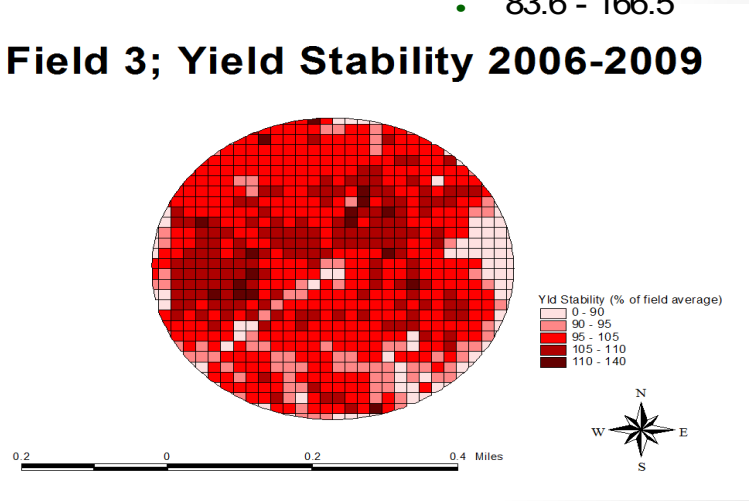
Nitrogen in the Crop – Yield Goal

- N_{Crop}
  - Yield Goal
  - Soil Class
  - Yield Map
  - Biomass Map
  - Growth | Uptake Model

Nitrogen in the Crop - Removal

- N_{Crop}
  - Yield Goal
  - Soil Class
  - Yield Map
  - Biomass Map
  - Growth | Uptake Model





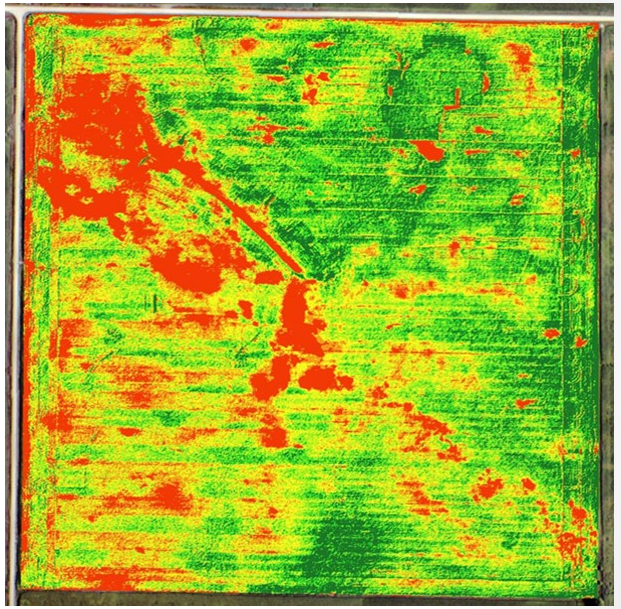
Nitrogen in the Crop - Removal

- N_{Crop}
  - Biomass Map

Biomass is a Proxy for Yield

NDVI is a Proxy for Biomass

Therefore NDVI is a Proxy for Yield.



Nitrogen provide by the Soil

- N_{Soil}
  - Soil Test
    - Pre
    - In-Season
  - Mineralization
  - Losses
  - N Addition and N Loss via Weather.

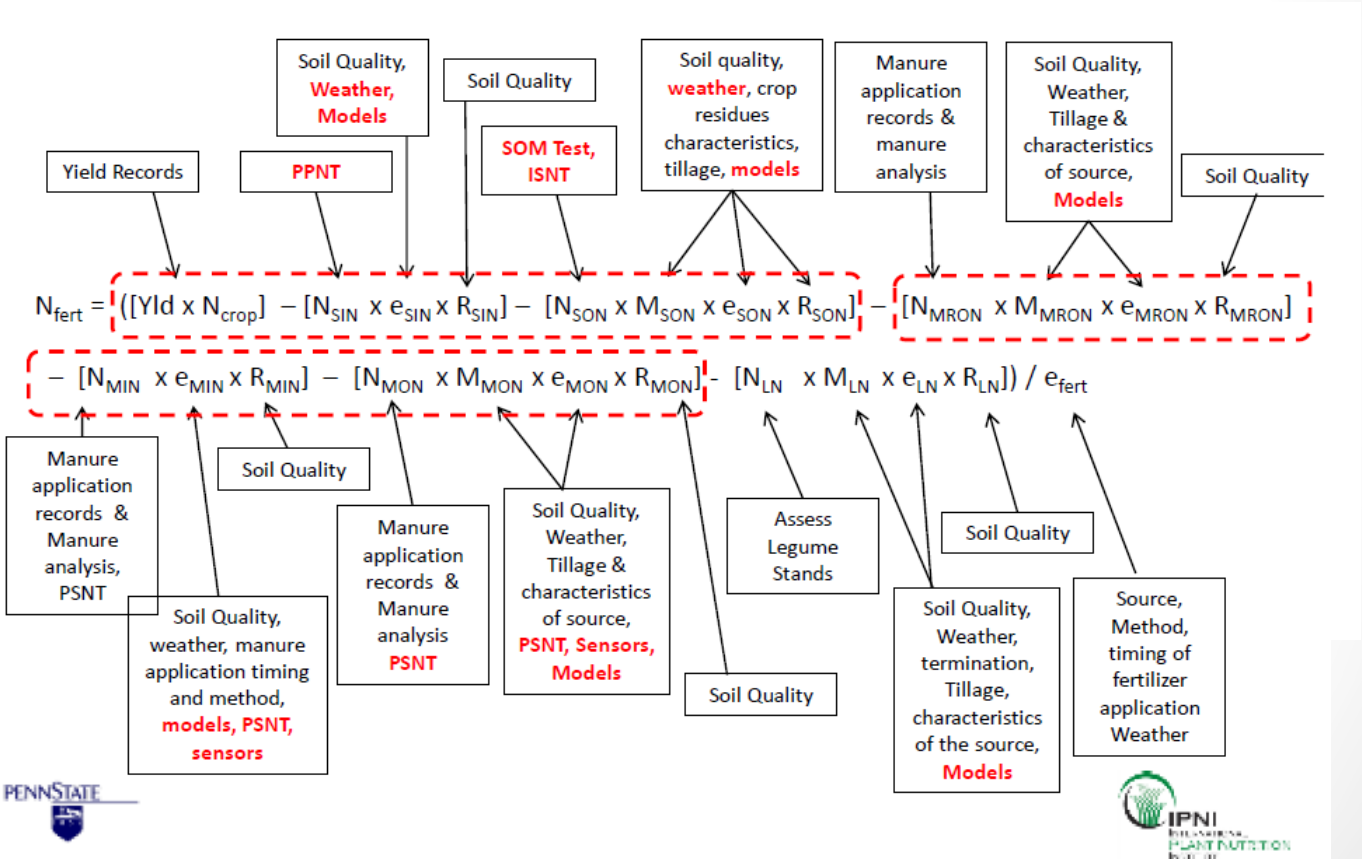
Nitrogen provide by the Soil - NRS

- N_{Soil}
  - Let the crop tell you.

Fertilizer Use

- eFert
- 4Rs
  - Source
  - Placement
  - Time
  - Rate
- NUE –
  Lbs of N per Bushel?????
  - Consistent low v high?

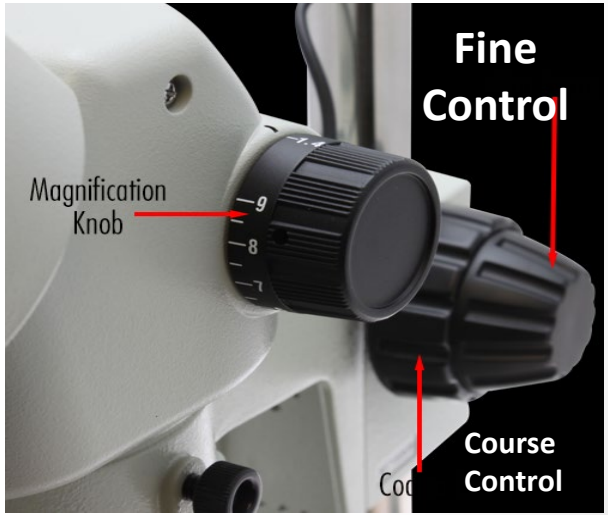
Theoretical Equation



Fine and Course Control

- e_{Fert}
- N_{Crop}
  - Yield Map
  - Yield Goal N Recs 1.0-1.1-1.2* Yield

Making high resolution decisions using low resolution recs. Recommendation maps are at < 1 acre resolution and 1.2 Lbs N per bushel grain. How Precise is that.



Fine and Course Control

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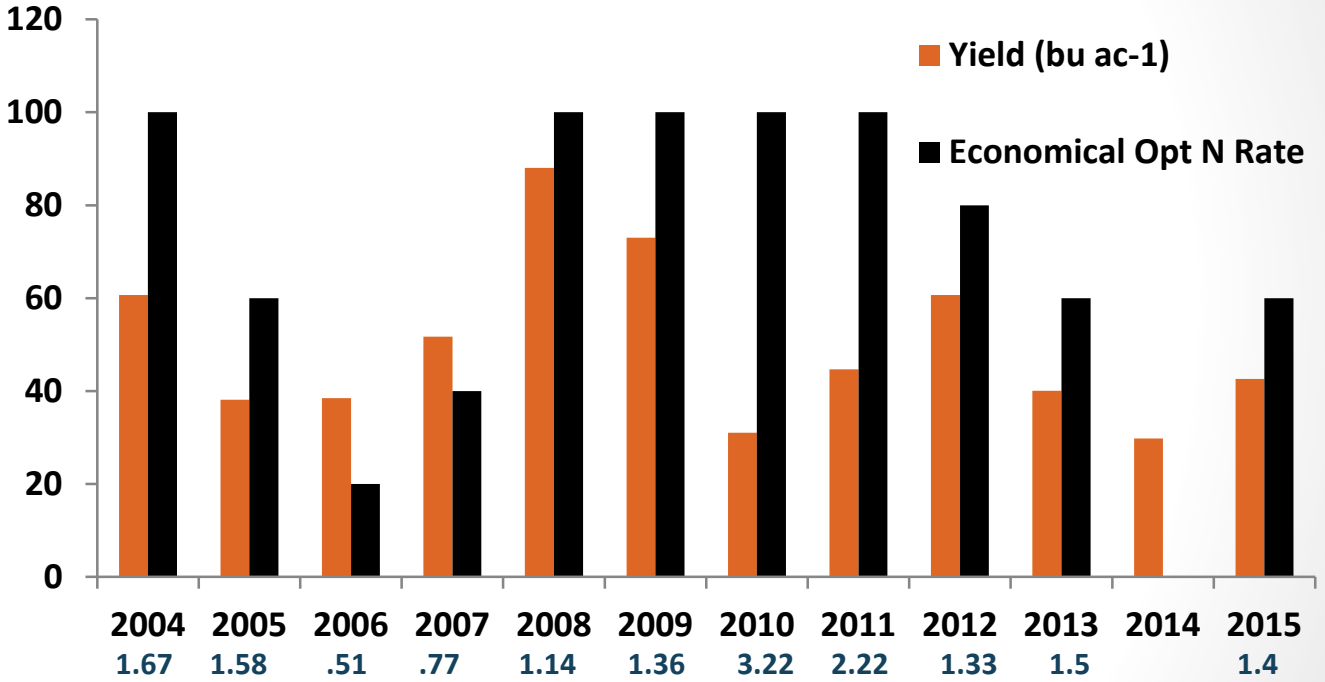


Average of 68 lbs with 49 BPA, 1.5 lbs N per bushel

Combining the Components

- N_{Crop}
- N_{Soil}
- e_{Fert}

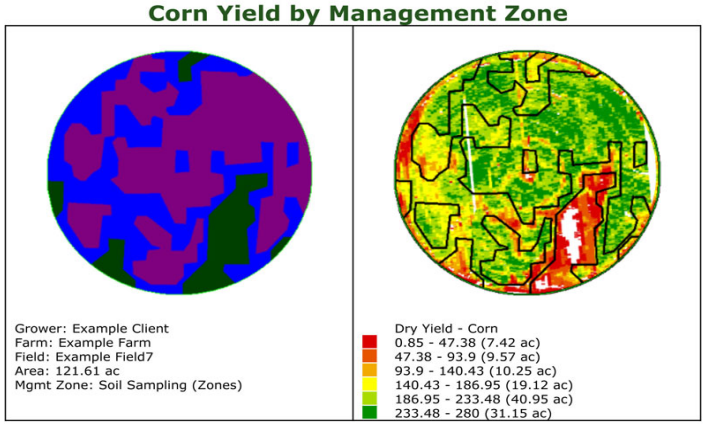
Wheat 1.3 lbs N bu^{-1} Corn .75 lbs N bu^{-1}

Combining the Components

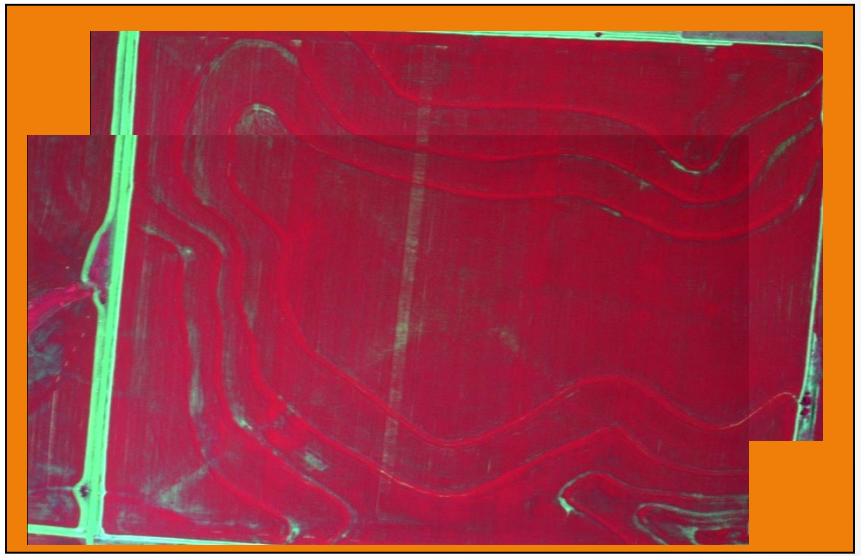
- N_{Crop}
- N_{Soil}

NDVI plus a Reference Strip.
Yield + Soil (Environment)

What is Your Missing Component



Legend	Management Zone	Dry Yield Avg	Dry Yield Min	Dry Yield Max	Avg Moisture	Total Bushels	Acres
	3 High	214.90	1.20	280.00	17.40 %	12,867.27	59.87
	2 Med	173.77	0.87	280.00	17.20 %	7,789.04	44.82
	1 Low	84.79	0.85	280.00	15.75 %	1,166.43	13.76
	N/A	87.21	87.21	87.21	15.54 %	0.19	0.00
	All	184.23	0.85	280.00	16.47 %	21,822.92	118.46



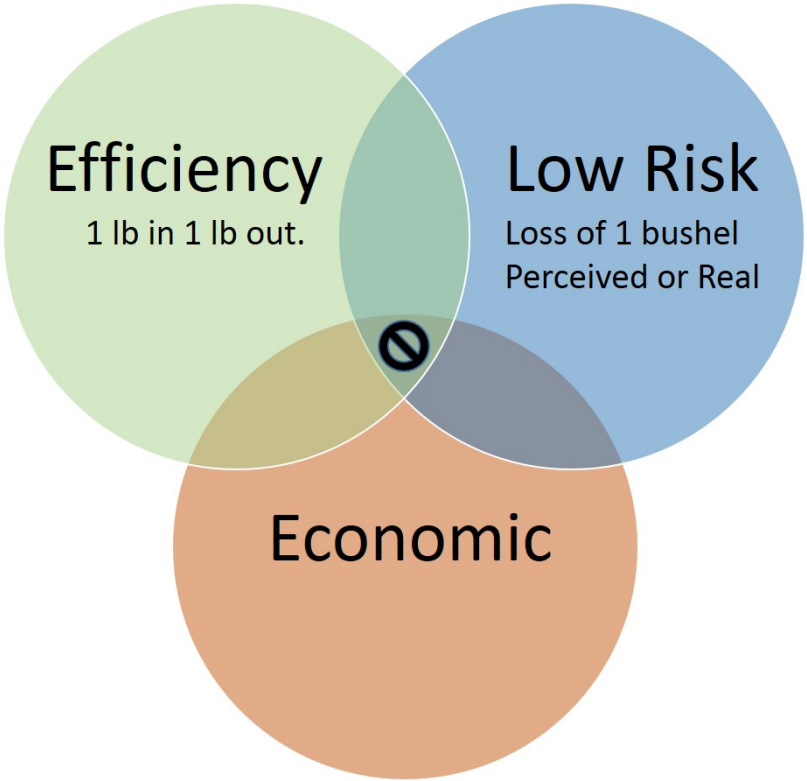
$$N_{fert} = (N_{crop} - N_{soil}) / e_{fert}$$

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.
- Can you adjust based on Weather.

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

Pick 2 Nitrogen



Pick 2,
The Nitrogen Conundrum

Efficiency: Economic ->
Limit N up front, use in-season cues/measurement.
This will often create a perceived sense of risk.

Low Risk: Economic ->
Pre-plant yield goals, proven to be economical

Efficiency: Low Risk ->
Spoon feeding, high data, high cost N.

Thank You

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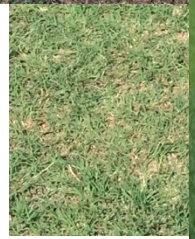
A website to bridge the gap between Landlords and Leesses

OKLAHOMA STATE UNIVERSITY
EXTENSION

Nutrient Rich Strips

Cover Crops



Create Prescription Scripts for Applicators

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

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.