Use of in-season response and active sensors for improved nutrient management.

BRIAN ARNALL

PRECISION NUTRIENT MANAGEMENT EXTENSION

OKLAHOMA STATE UNIVERSITY

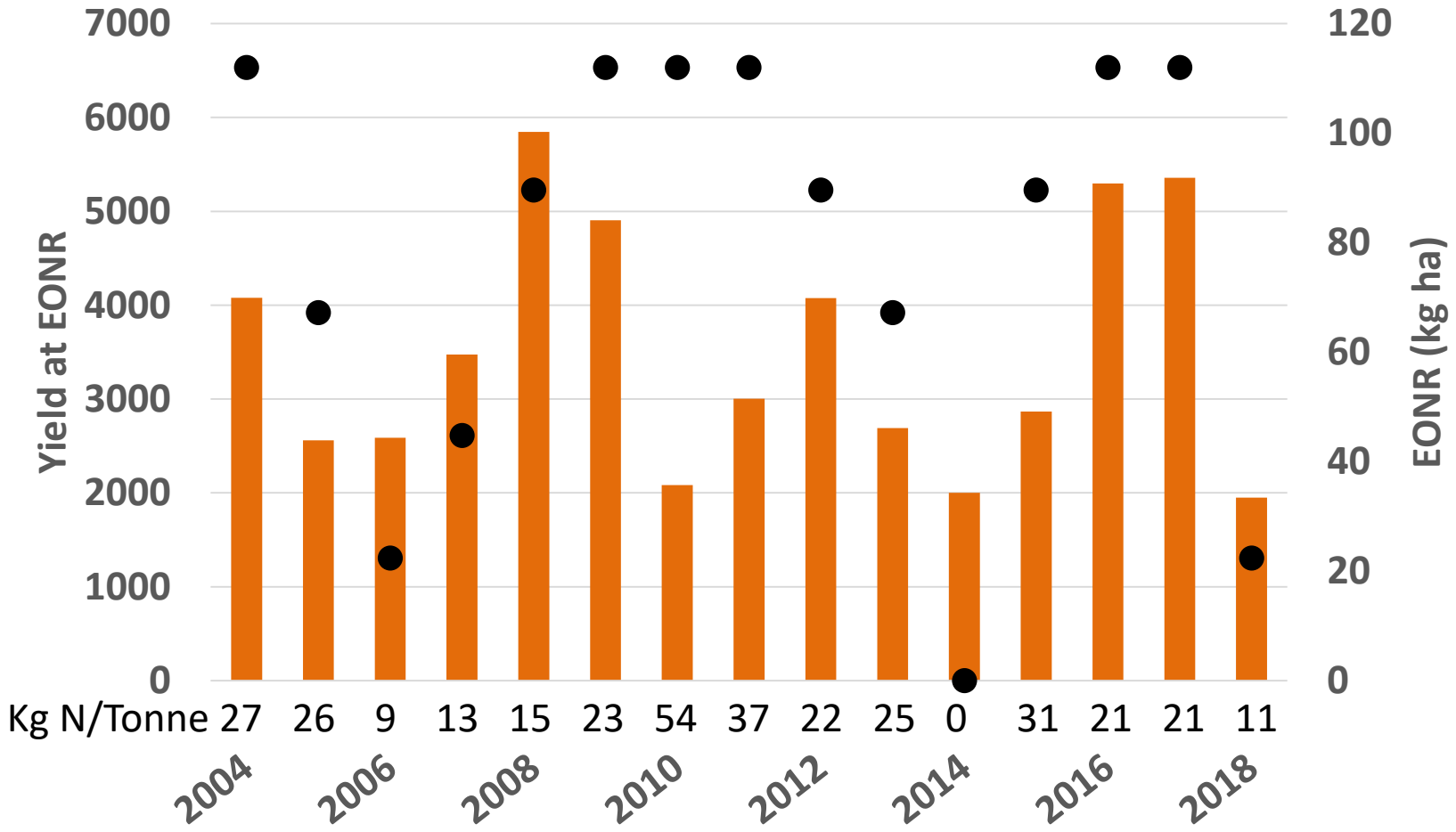
Optimizing Nitrogen Use Efficiency

Oklahoma dominated by dryland winter wheat production

Yields of 2-7 ton/ha

Tradition is 30 kg/tonne

22 kg/tonne Ave.

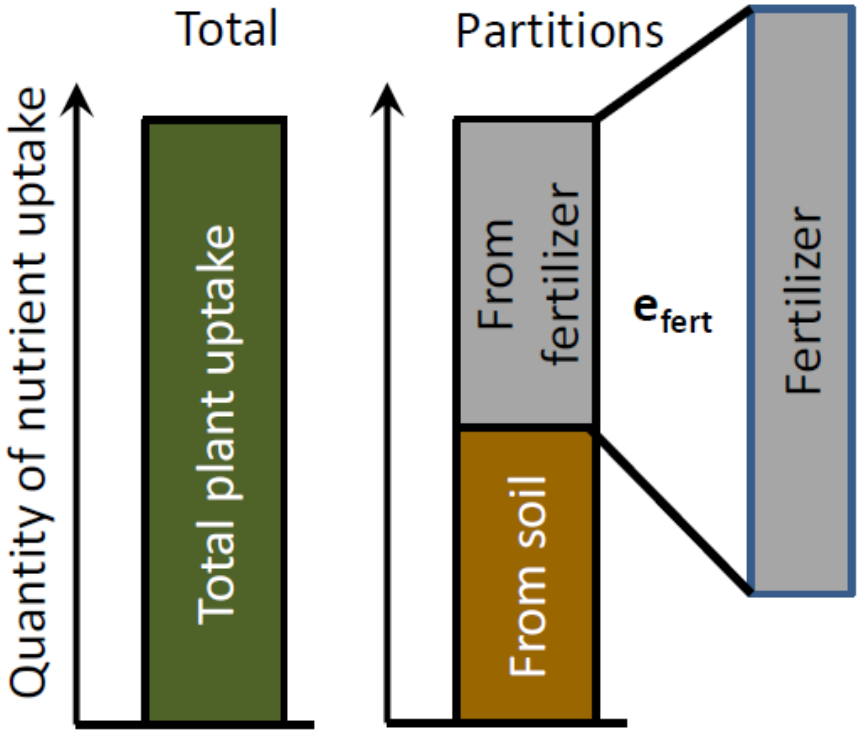


Stanford Equation

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

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



Yield is highly variable

Long term trials show annual variability in yield.

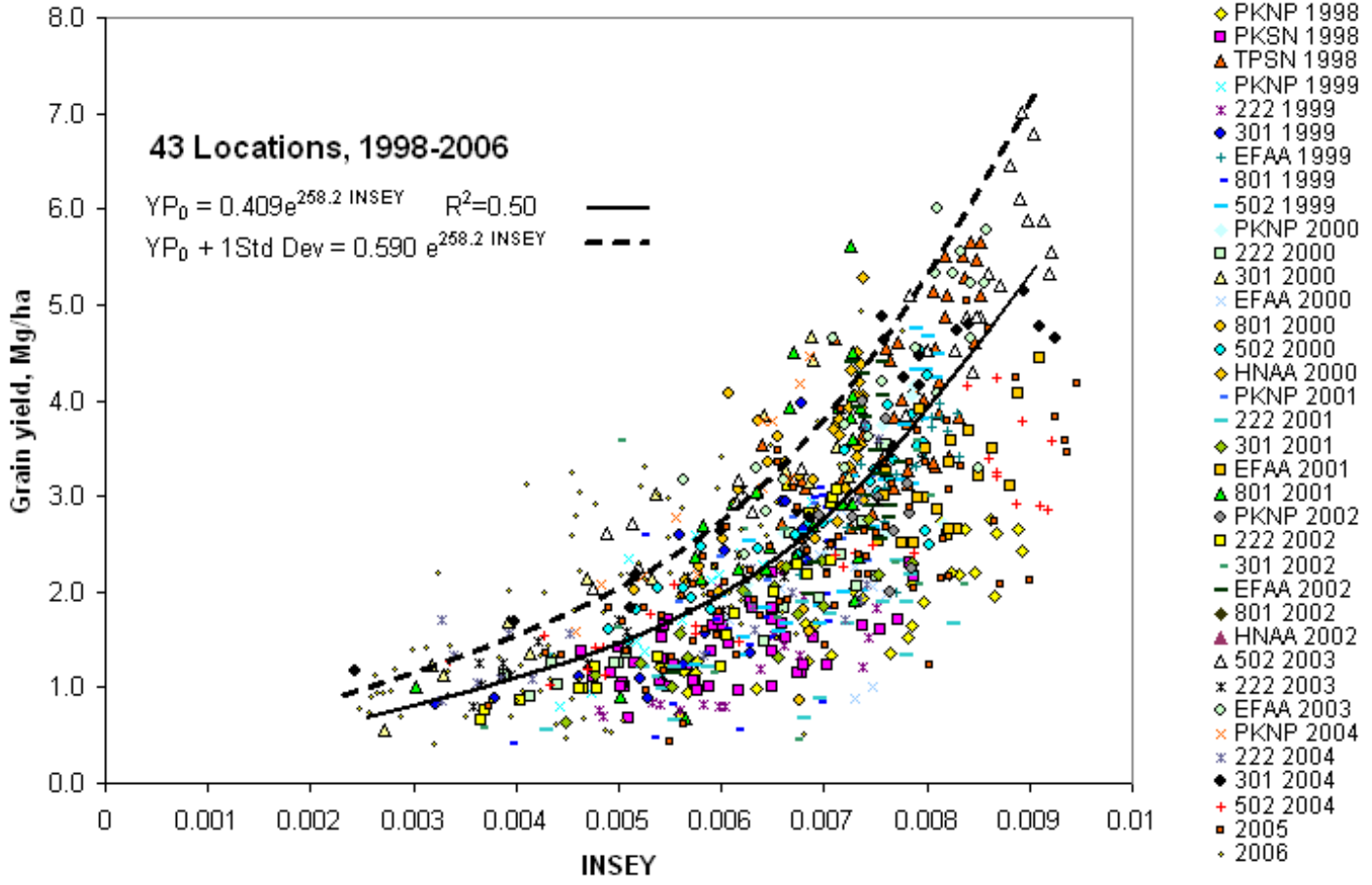
$$N_{fert} = (N_{crop} - N_{soil}) / e_{fert}$$

Data base of yield x NDVI

Normalized by weather data.
Day's of Growth post planting.

INSEY – In season Estimate of Yield

Yield Potential no Yield Prediction.

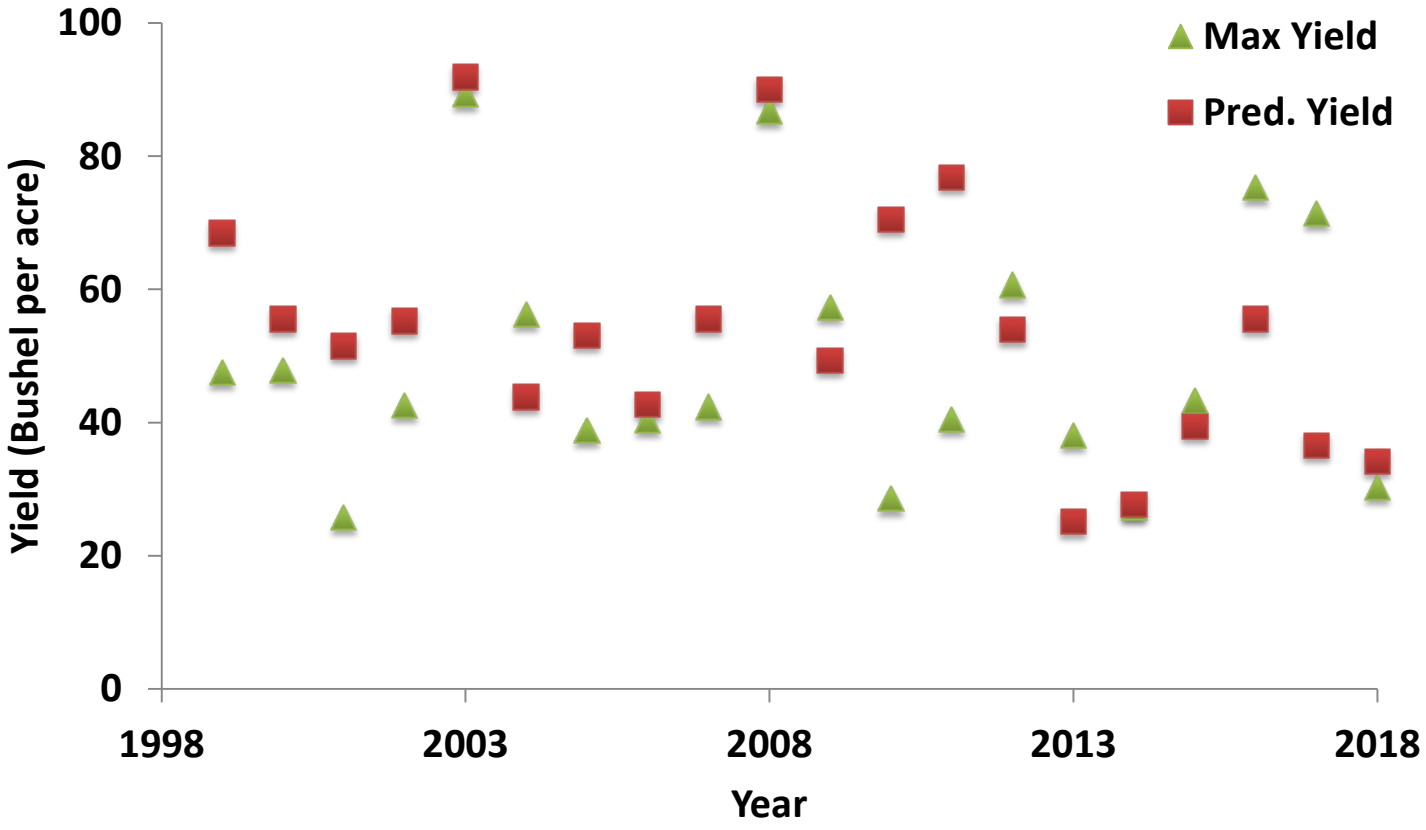


Predicting yield Potential at Feekes 5

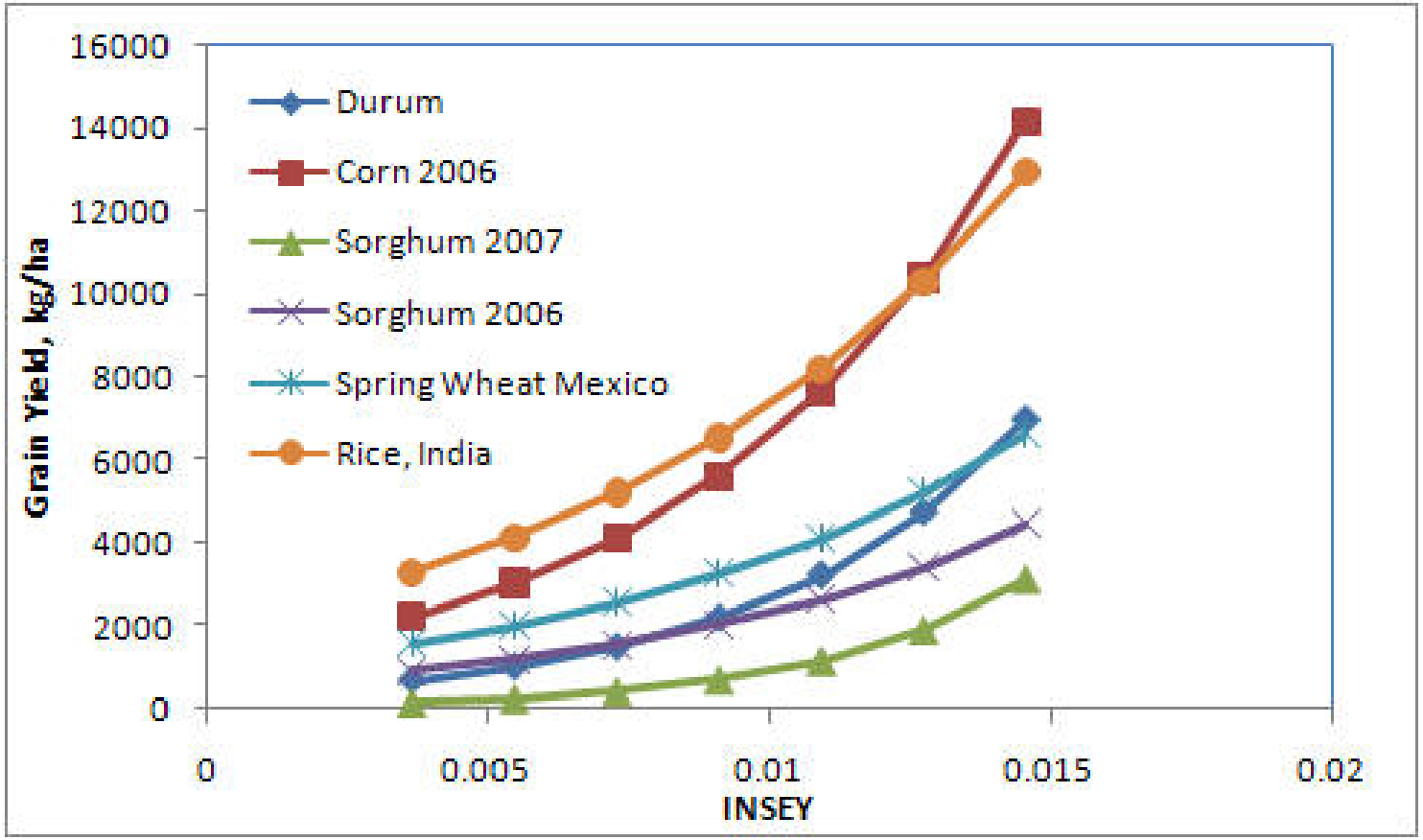
Have done a far job of predicting potential yield in-season.

Over prediction is typically preferred

This data uses a single point in time, farmers are not.



Yield Prediction Models



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

N_{soil}

Pre-plant NO_3 occurs 5 months prior to Top-dress

In-Season NO_3 time consuming and slow.

Why not let the crop tell you.

Response Index

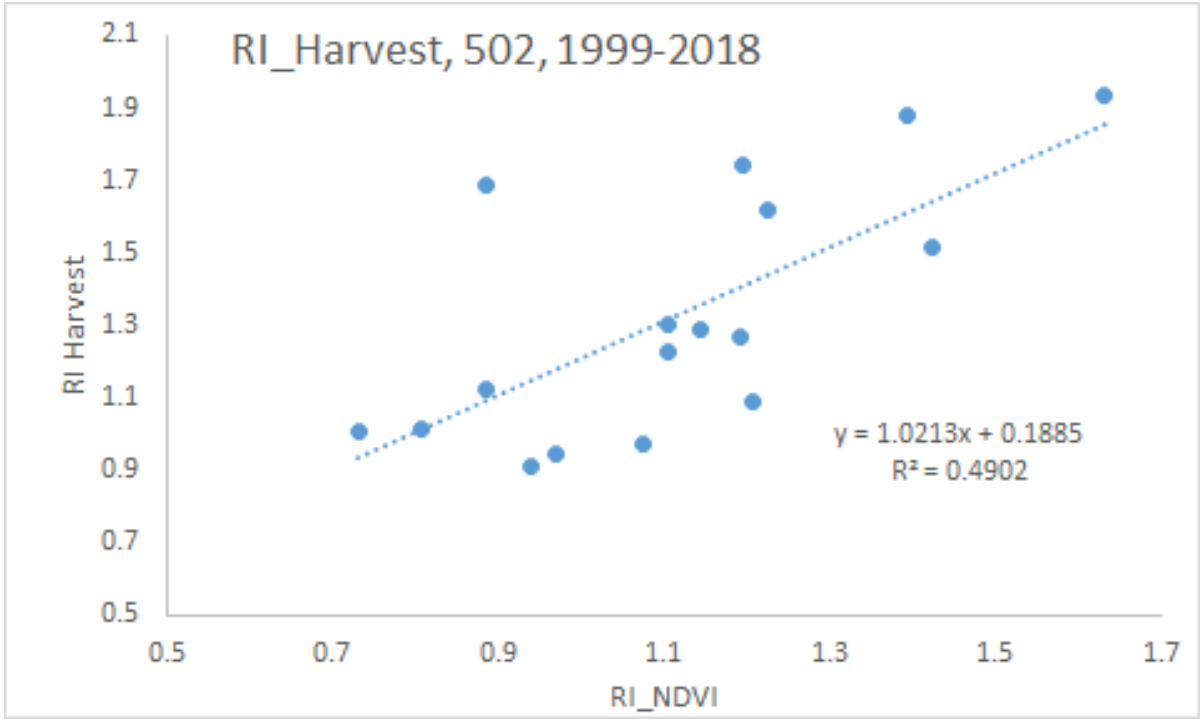
Difference between high and low N

N-Rich Applicators

RI_{NDVI} and $RI_{HARVEST}$

When measured at Feekes 6

response increases until harvest



NFOA

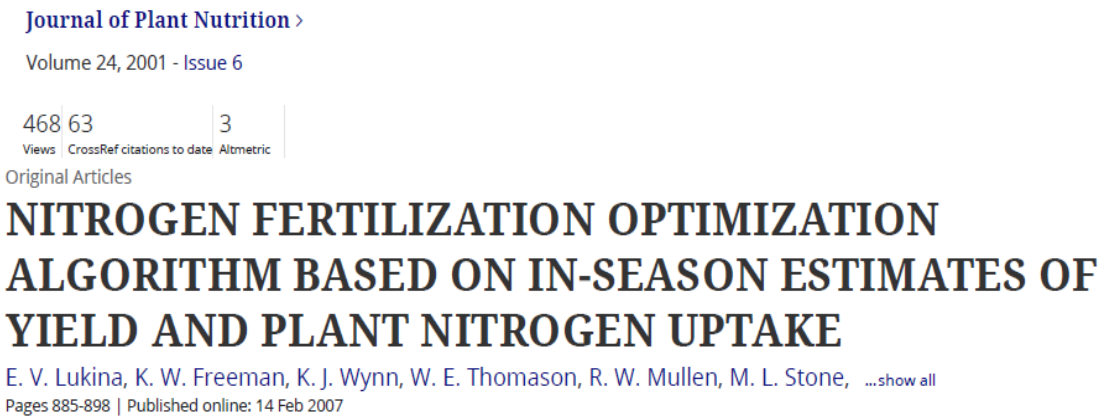
Nitrogen Fertilization Optimization Algorithm

N Rate = ({(YP0 * RI) – YP0} * %N) / NUE

YP0 = Yield potential without N

YP0*RI = YPN = Yield potential with N

%N = N concentration in grain/fiber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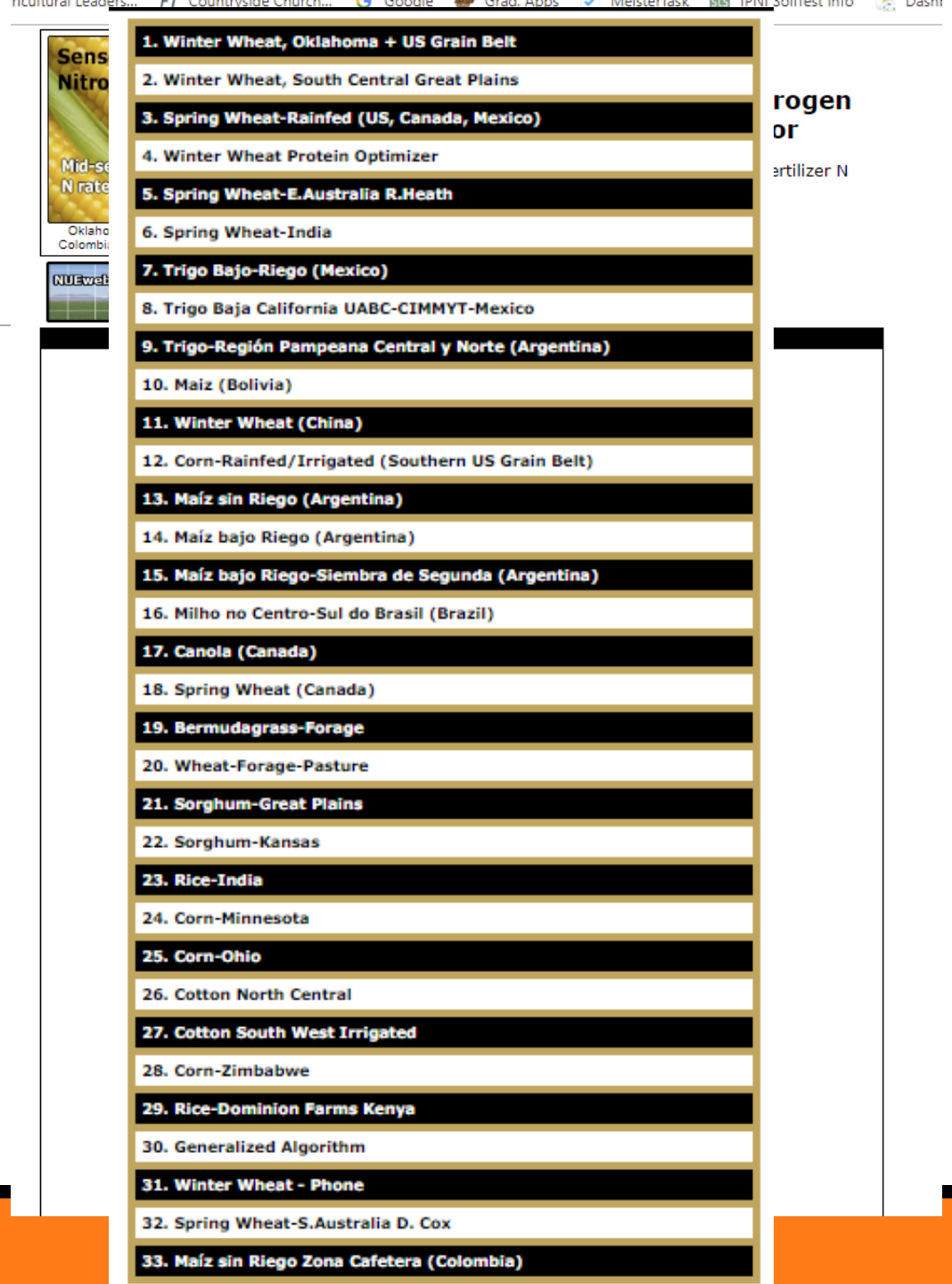
NUE.Okstate.edu

33 available Algorithms

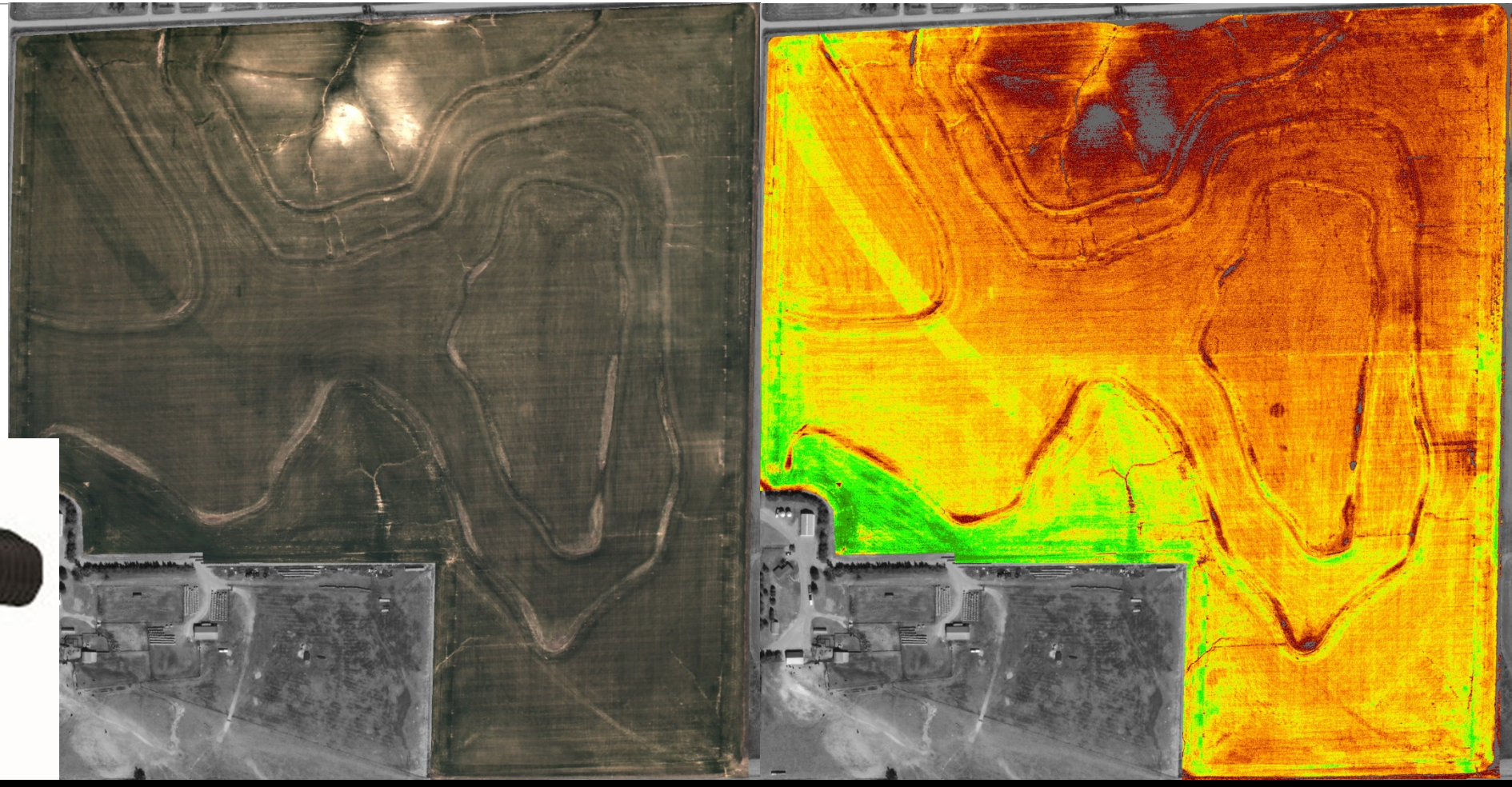
Available at http://nue.okstate.edu/Yield_Potential.htm

YP and NFOA “Cookbook”

http://nue.okstate.edu/Index_NFOA.htm



Estimated use in 2019 1 million acres.



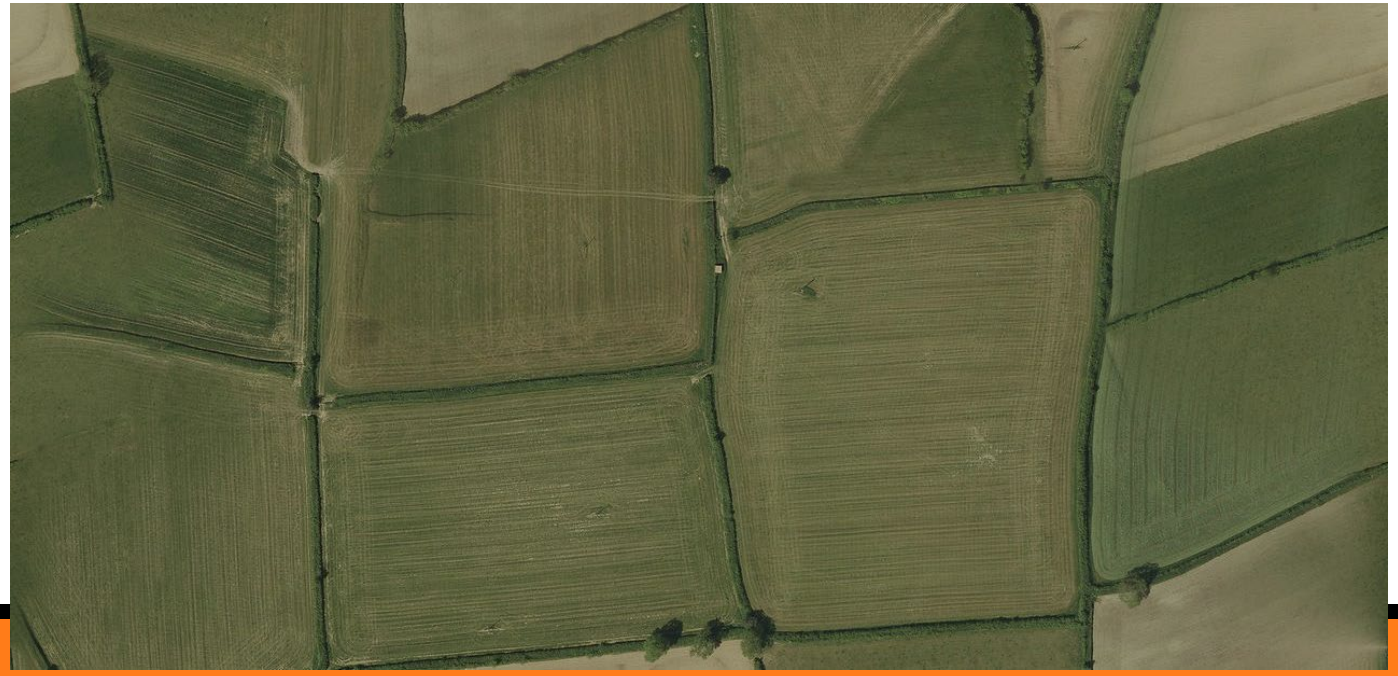
Any Scale

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.

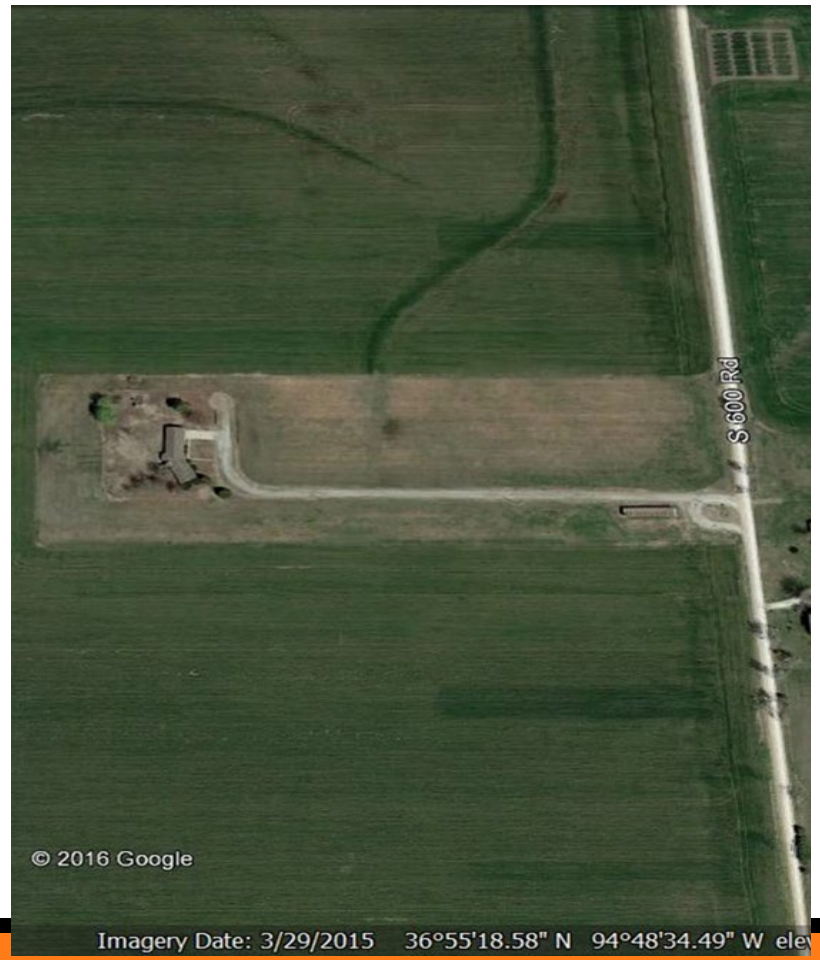
Yield monitor and spreader.

Potential is History

In 2001 we could fertilize ever .5 x .5 m at 16 kmph

We have been able to fertilize every 2 ft of row since 2003

Thank you!



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