

Proceedings of the 5th Annual Nitrogen: Minnesota's Grand Challenge & Compelling Opportunity Conference

**5th Annual
NITROGEN:
MINNESOTA'S GRAND
CHALLENGE & COMPELLING
OPPORTUNITY CONFERENCE**



**Tuesday,
February 5, 2019**

**Verizon Wireless Center,
Mankato, MN**

 UNIVERSITY OF MINNESOTA | EXTENSION

**5TH ANNUAL
NITROGEN: MINNESOTA'S GRAND CHALLENGE
& COMPELLING OPPORTUNITY CONFERENCE**

Sessions 9:05 a.m.-3:40 p.m.

■ GENERAL SESSION

8:15 a.m.	<i>Registration</i>	
9:00 a.m.	<i>Welcome</i> Tom Rothman	University of Minnesota
9:05 a.m.	<i>Lessons Learned in 2018, Opportunities for 2019</i> Brad Carlson Dave Nicolai Brandon Fast	University of Minnesota Extension University of Minnesota Extension Minnesota Corn Research & Promotion Council
9:55 a.m.	<i>An Industry Perspective on Nitrogen: Beginning with 4R Nutrient Stewardship</i> Dr. Tai Maaz	International Plant Nutrition Institute
10:50 a.m.	<i>Break</i>	
11:05 a.m.	<i>NUE and Potential Environmental Outcomes Associated with N Application Timing</i> Dr. Carrie Laboski	University of Wisconsin-Madison
12:00	<i>Lunch</i>	

■ BREAKOUT SESSION #1

1:00 p.m.	<i>Managing Corn for High Yield and Environmental Stewardship While Controlling Costs</i> Dr. Jeff Coulter	University of Minnesota
1:55 p.m.	<i>N loss from Midwest cropping systems: What can we do about it?</i> Dr. Dan Jaynes	USDA ARS, Ames, IA
2:50 p.m.	<i>Urea Fertilizer Do's and Don'ts</i> Dr. Fabián Fernández	University of Minnesota

■ BREAKOUT SESSION #2

1:00 p.m.	<i>Improving Nitrogen Mineralization Predictions</i> Dr. Jason Clark	South Dakota State University
1:55 p.m.	<i>Soil Health and Implications for Nitrogen Management</i> Dr. Anna Cates	University of Minnesota
2:50 p.m.	<i>Nitrogen Management with Manure</i> Dr. Melissa Wilson	University of Minnesota
3:40 p.m.	<i>Adjourn</i>	

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Extension

UNIVERSITY OF WISCONSIN-MADISON

NUE and potential environmental outcomes associated with N application timing for corn

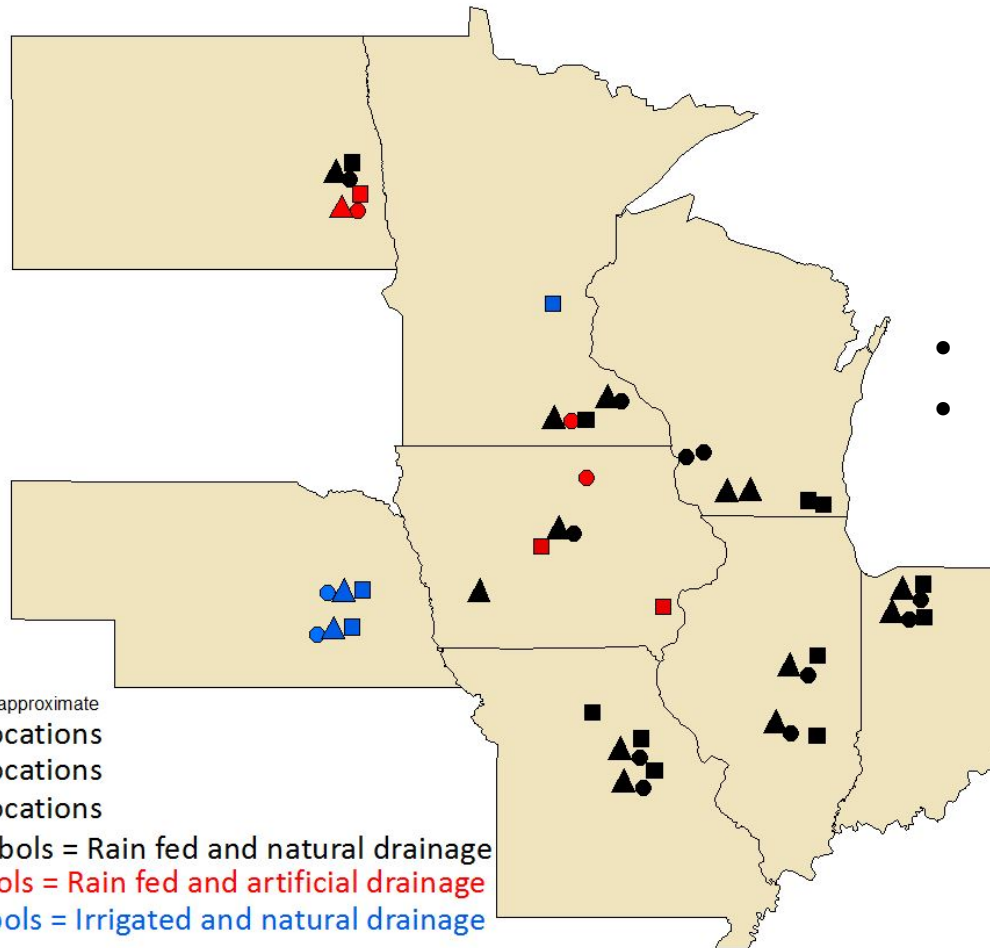
Carrie Laboski, Chris Bandura,
J. Camberato, P. Carter, R. Ferguson, F. Fernandez,
D. Franzen, N. Kitchen, E. Nafziger, J. Sawyer, J. Shanahan

Nitrogen: Minnesota's Grand Challenge and Compelling Opportunity Conference
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Carrie Laboski, Professor & Extension Soil Scientist
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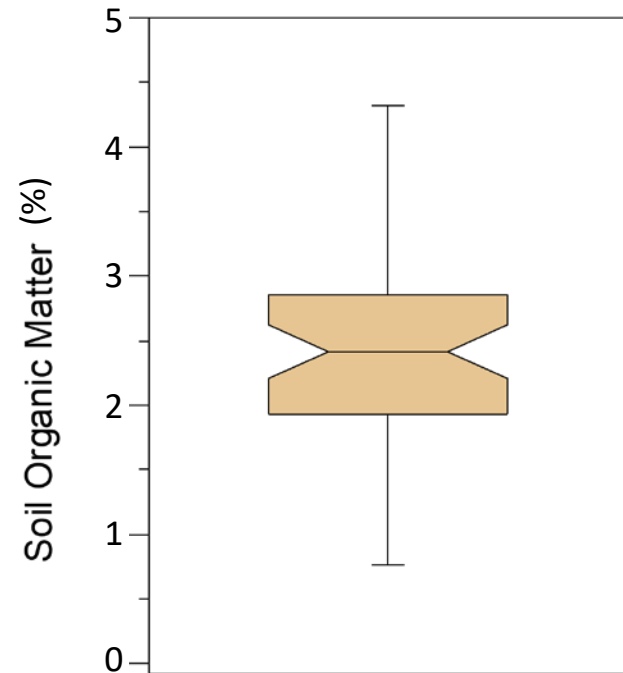
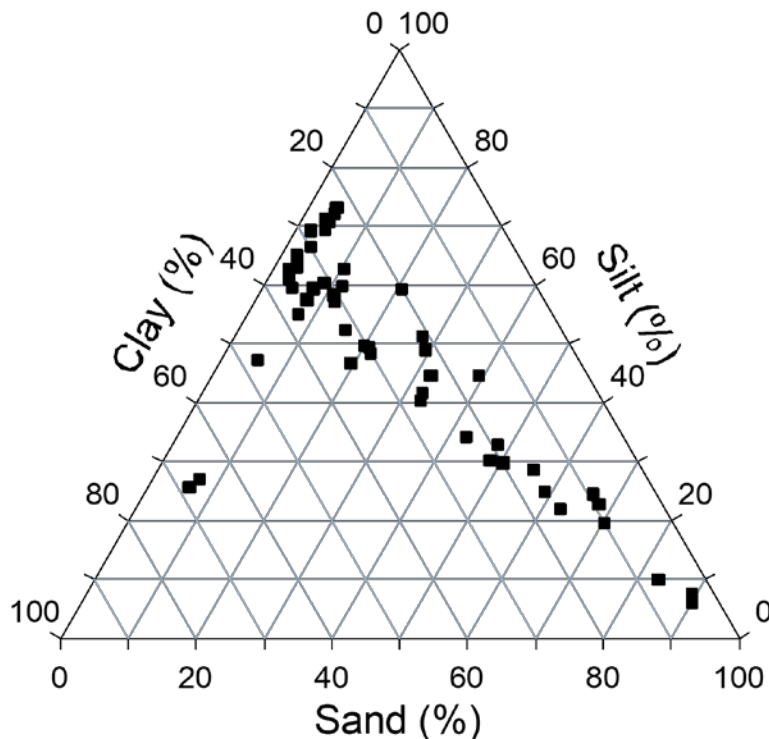
Research Sites



- 49 site-years
- Site selection
 - Site productivity
 - Prev. crop soybean, except for 5 corn, 1 sunflower
 - No recent manure history
 - Tillage: no-till and reduced
- Standardized protocol
- Treatments
 - 0-280 lb N/a
 - At plant
 - Split = 40 lb N/a at plant + V9 sidedress

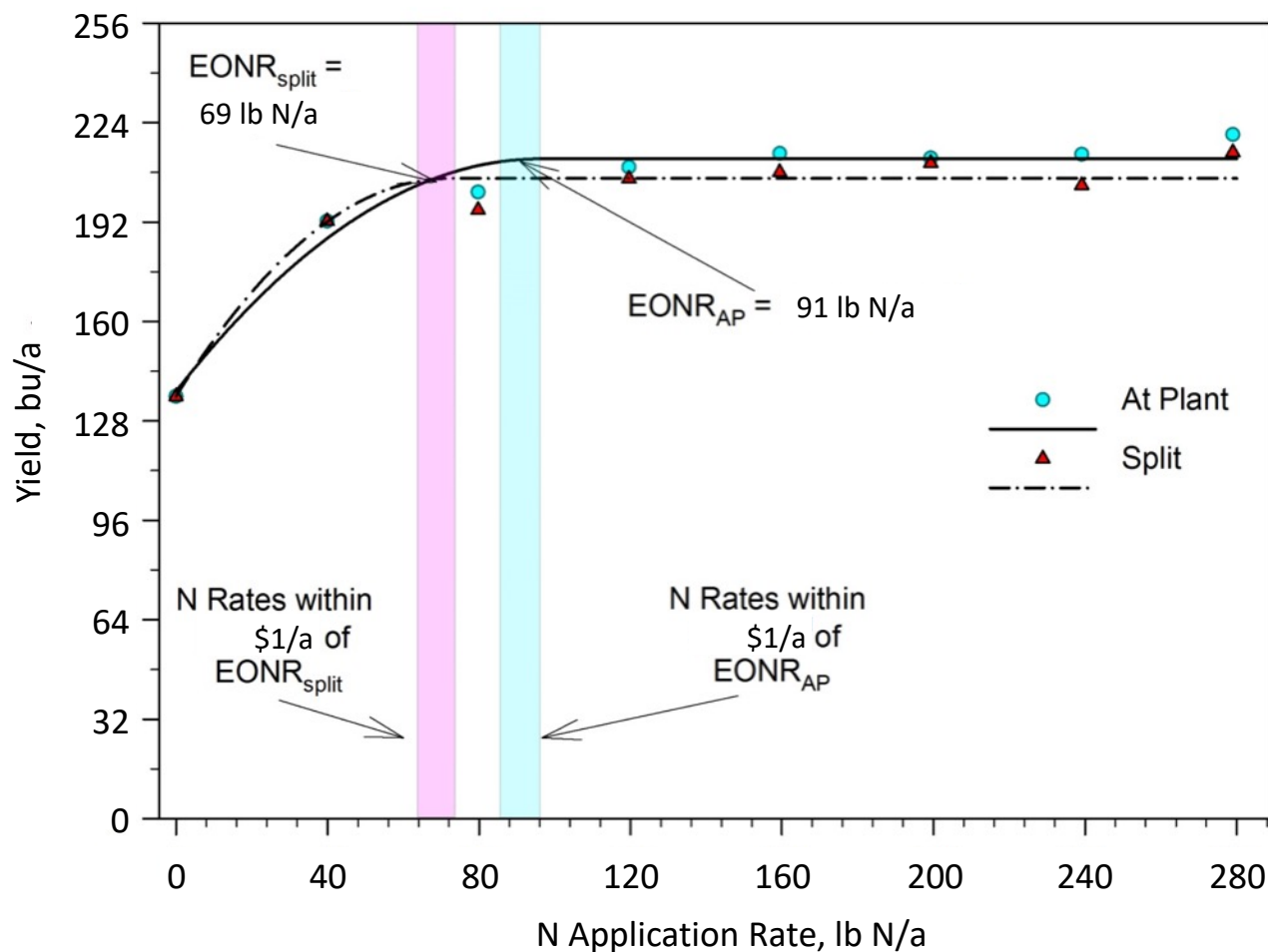
Research funded by Pioneer

Very brief summary of soil characteristics



Natural drainage class ranged from poorly to excessively drained

Yield Response to N and EONR



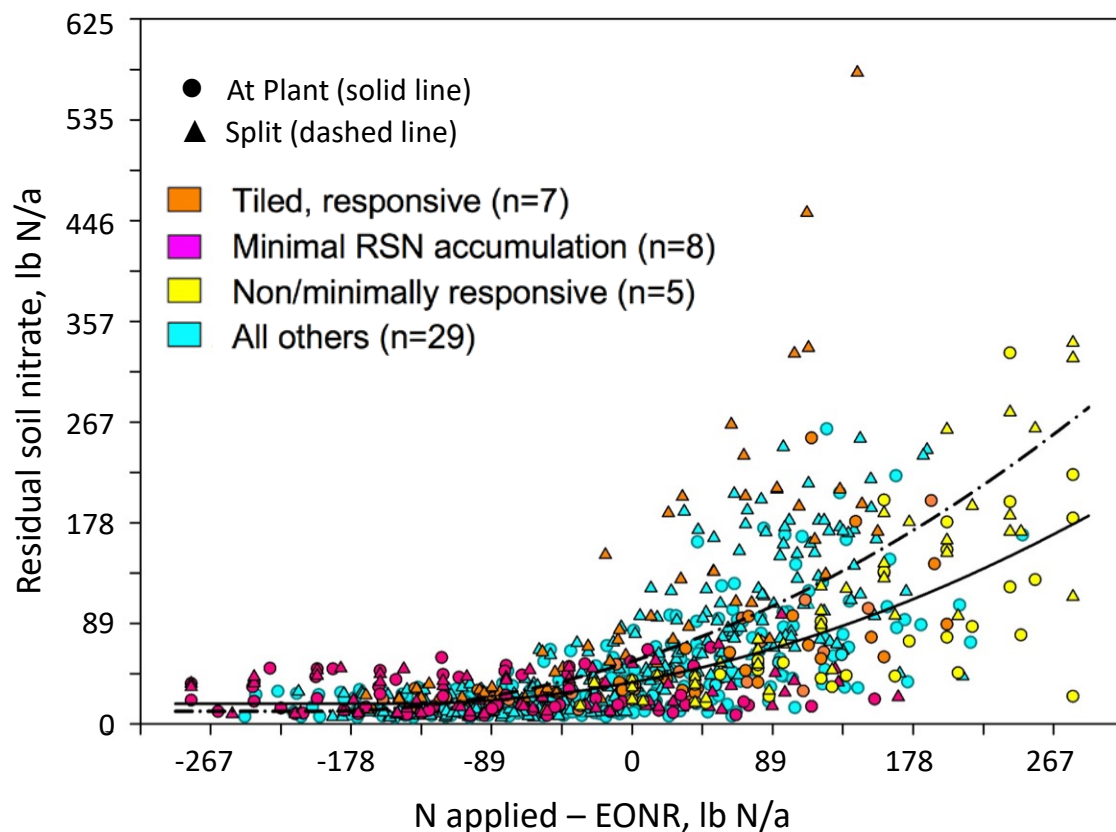
Study average: Profitability within \$1/a of EONR = $EONR \pm 9$ lb N/a

How does N application timing effect RSN?





At N rates \geq EONR, split applications leave more N in the soil profile after harvest

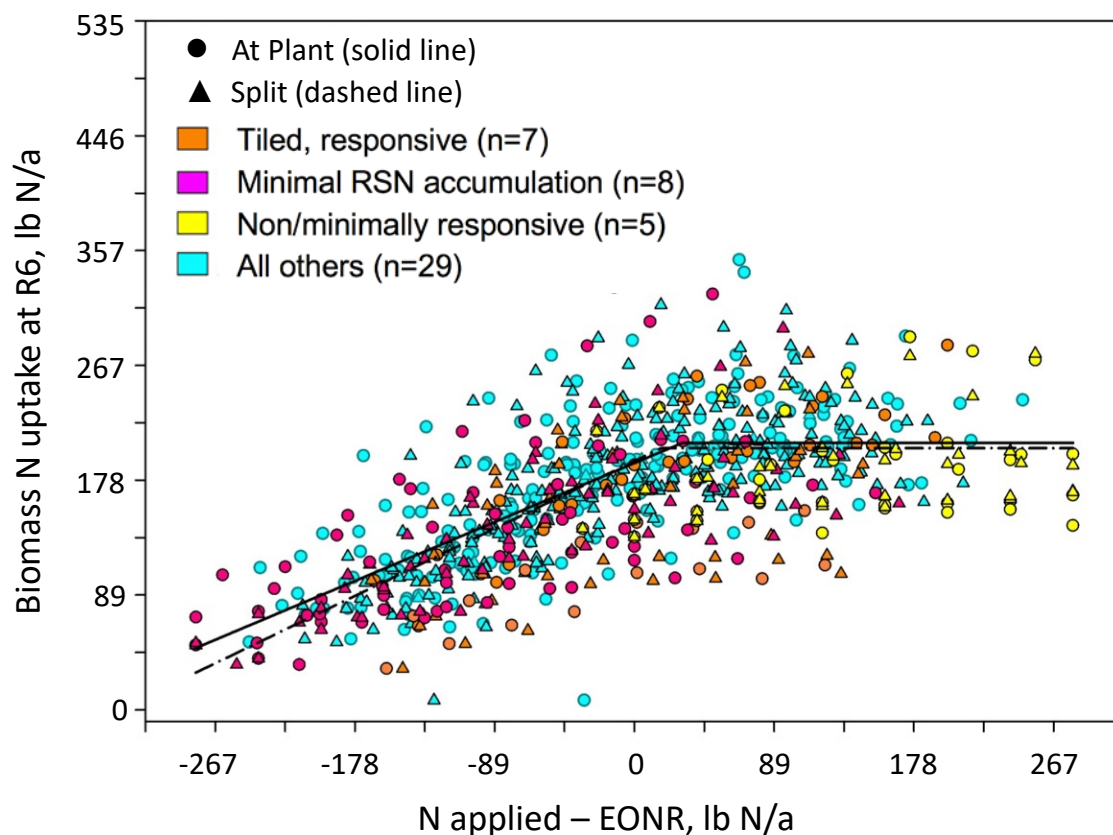


At EONR, estimated RSN was
18 lb N/a greater for split
application
(55 vs 37 lb N/a)

PPNT background = 50 lb/a



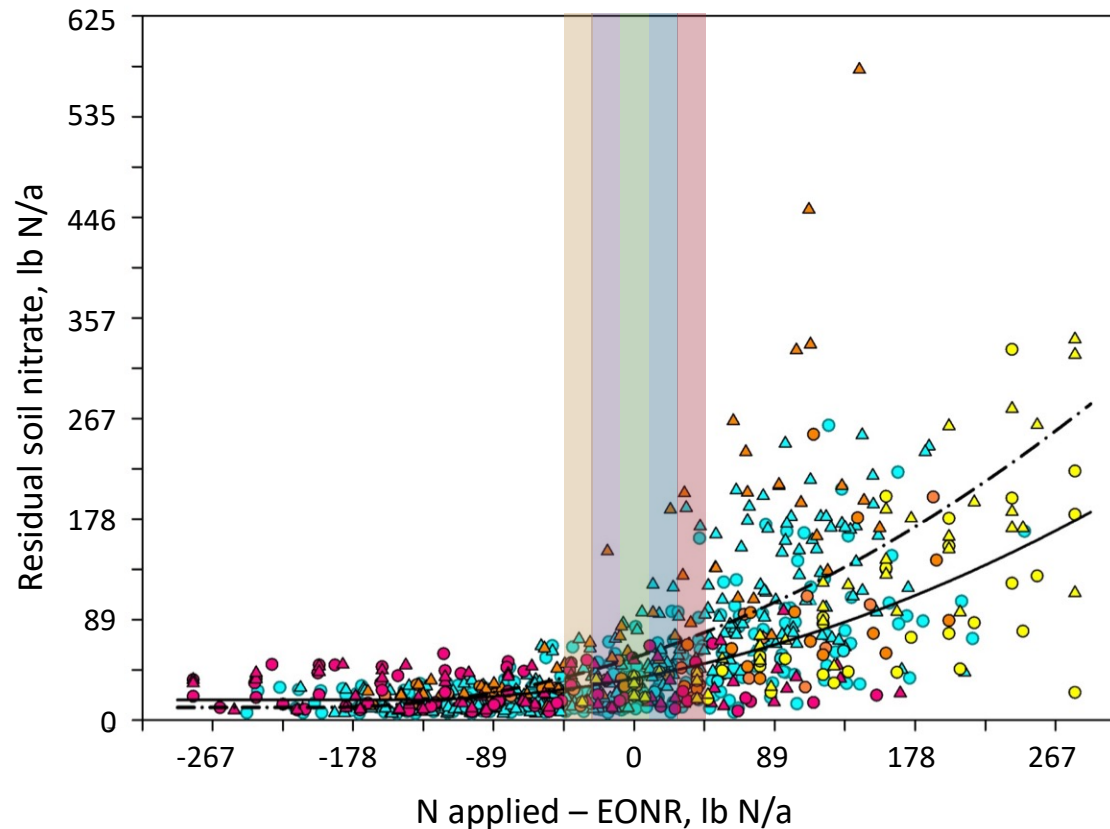
No difference in biomass N uptake at EONR



At EONR, No difference in est. N uptake between N application timings

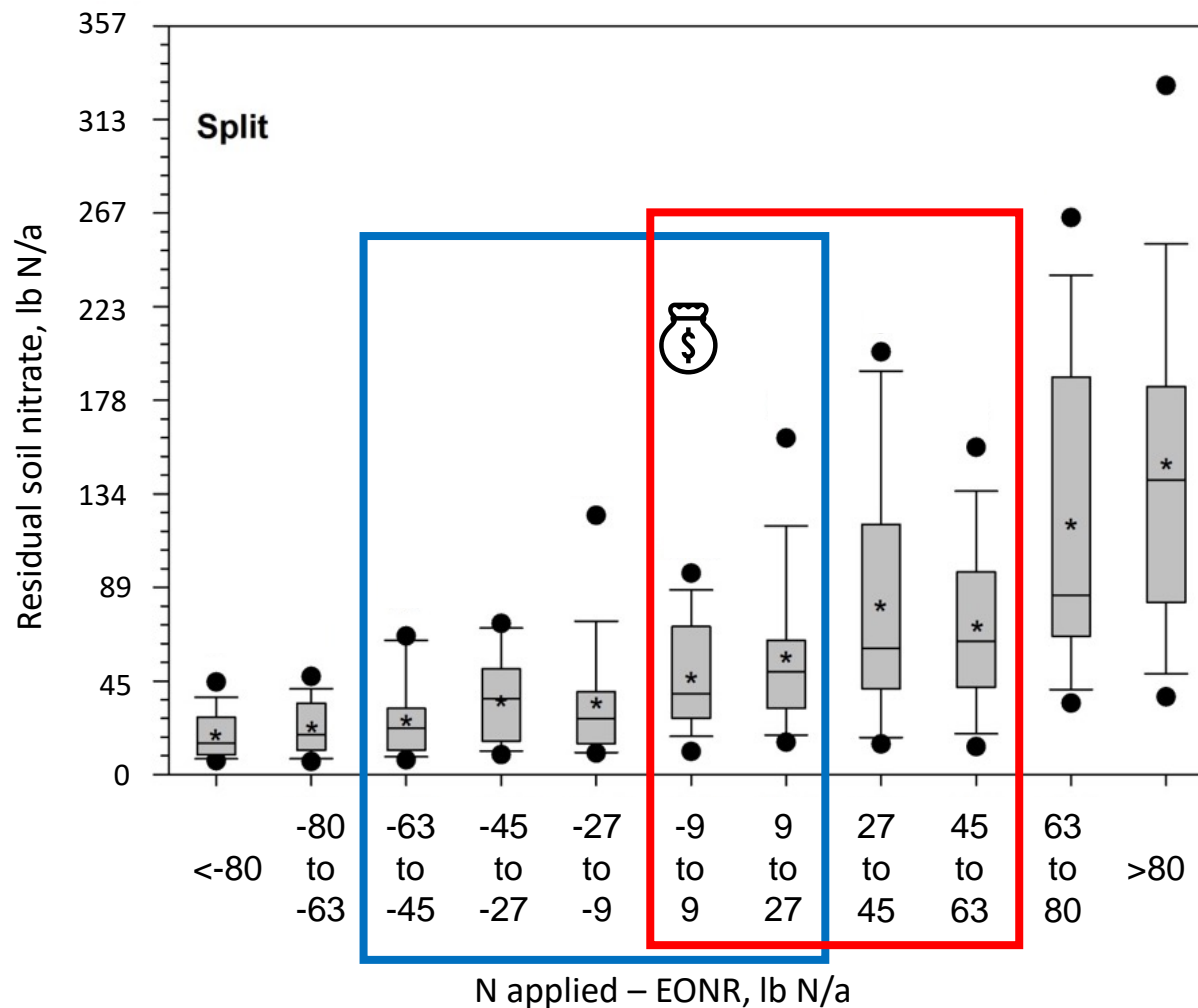
Therefore, it is not *if* N is being lost, but rather *when*

How high does N application have to be before RSN starts to increase substantially?





If N rate is >27 lb N/a over EONR, then RSN is significantly greater than under application



How does N timing effect N use efficiency?

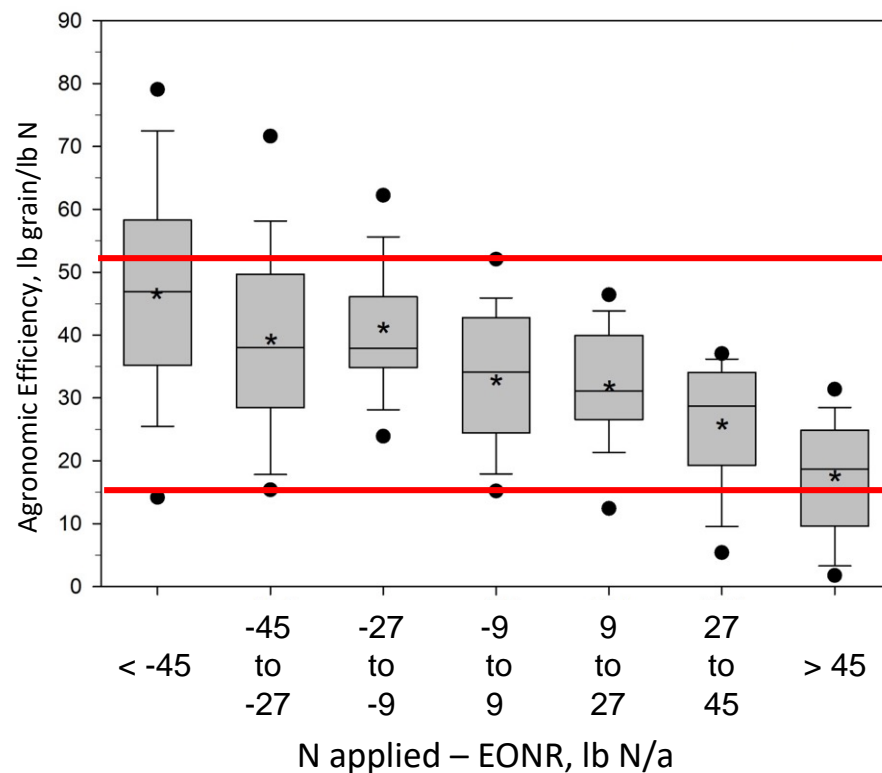
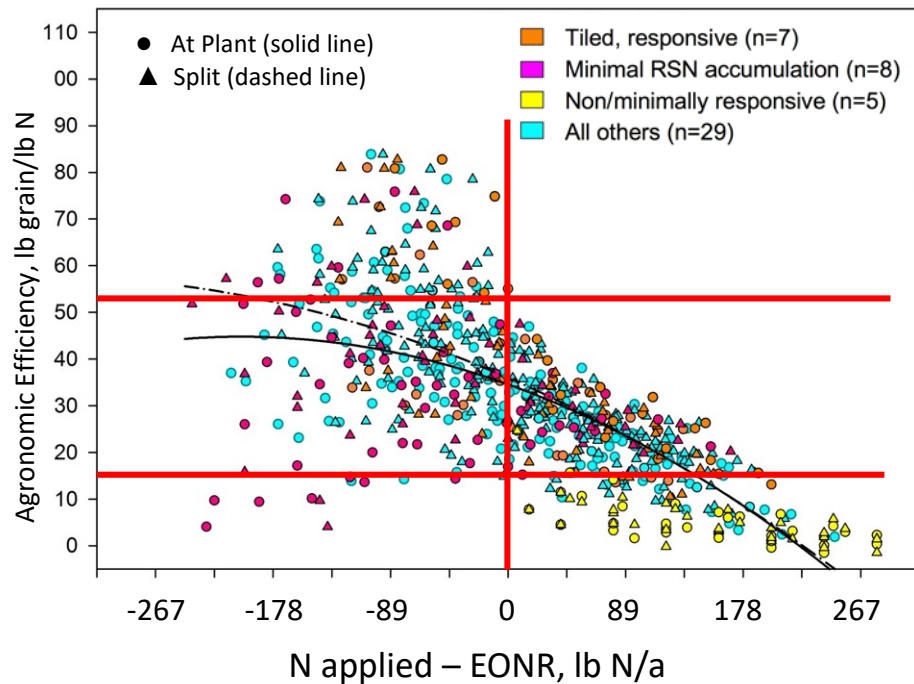
$$\text{Agronomic Efficiency} = \frac{\text{Increase in grain yield over 0 N rate}}{\text{N Application Rate}}$$





Timing does not effect NUE at the EONR

NUE highly variable

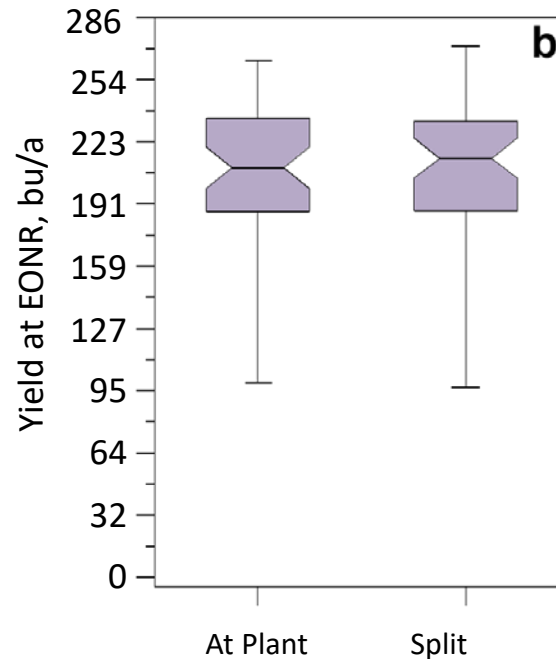
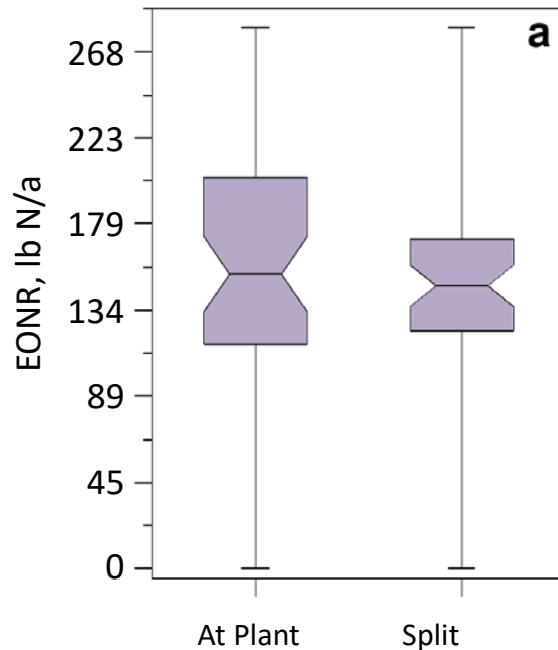


- 100% of AE ≥ 52 lb grain per lb N, under applied
- 90% of AE ≤ 15 lb grain per lb N, over applied

How does N timing influence profitability?

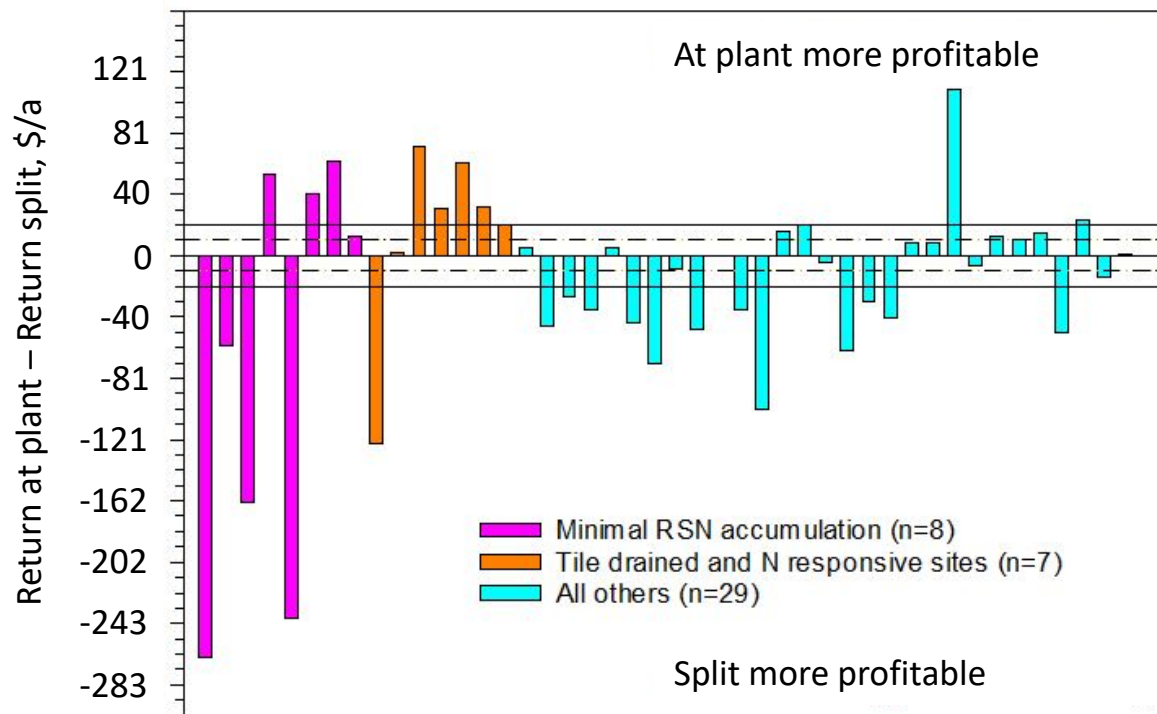


Split application has slightly lower EONR



- Study average EONR:
 - AP: 151 lb N/a
 - Split: 142 lb N/a
- Differences > 18 lb N/a in EONR:
 - $EONR_{AP} > EONR_{split}$ (n=19)
 - $EONR_{AP} < EONR_{split}$ (n=11)
 - $EONR_{AP} = EONR_{split}$ (n=19)

Profitability of N timing is based on soil/site conditions



- Study average return to N:
 - AP: \$323/a
 - Split: \$343/a
- Differences >\$10/a in return to N at EONR:
 - AP > Split (n=16)
 - AP < Split (n=18)
 - AP = Split (n=10)

Take Home Points

- Split applications do not necessarily result in less potential N loss
 - Time of application influences *when* N loss may occur
- Profitable production resulted in low potential for N loss, regardless of application timing
 - Split applications may be more profitable on poorly drained and excessively drained soils
 - At plant applications were more profitable on tile drained soils
- NUE can vary substantially at the EONR
 - NUE may be useful to compare management practices in a field, but should not be used to target a value that would be considered a nutrient management success
- Continued efforts to refine N rate decision making tools and increase grower adoption are necessary to improve water quality
 - N management tools should be considered successful if they limit over application by ~25 lb N/a



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Thank you!

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<http://ipcm.wisc.edu/>

<https://youtube.com/user/uwipm>