
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.  Registration
9:00 a.m.  Welcome  
Tom Rothman  
University of Minnesota
9:05 a.m.  Lessons Learned in 2018, Opportunities for 2019  
Brad Carlson  
University of Minnesota Extension
Dave Nicolai  
University of Minnesota Extension
Brandon Fast  
Minnesota Corn Research & Promotion Council

9:55 a.m.  An Industry Perspective on Nitrogen: Beginning with 4R Nutrient Stewardship  
Dr. Tai Maaz  
International Plant Nutrition Institute

10:50 a.m.  Break

11:05 a.m.  NUE and Potential Environmental Outcomes Associated with N Application Timing  
Dr. Carrie Laboski  
University of Wisconsin-Madison

12:00  Lunch

**BREAKOUT SESSION #1**

1:00 p.m.  Managing Corn for High Yield and Environmental Stewardship While Controlling Costs  
Dr. Jeff Coulter  
University of Minnesota

1:55 p.m.  N loss from Midwest cropping systems: What can we do about it?  
Dr. Dan Jaynes  
USDA ARS, Ames, IA

2:50 p.m.  Urea Fertilizer Do’s and Don’ts  
Dr. Fabián Fernández  
University of Minnesota

**BREAKOUT SESSION #2**

1:00 p.m.  Improving Nitrogen Mineralization Predictions  
Dr. Jason Clark  
South Dakota State University

1:55 p.m.  Soil Health and Implications for Nitrogen Management  
Dr. Anna Cates  
University of Minnesota

2:50 p.m.  Nitrogen Management with Manure  
Dr. Melissa Wilson  
University of Minnesota

3:40 p.m.  Adjourn

Thank you to all of our Supporters!

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The Minnesota Office for Soil Health is a collaborative of the Minnesota Board of Water and Soil Resources and the University of Minnesota Water Resources Center.
Decomposition food web = soil C

- root-feeders
- shredders
- fungi and bacteria
- microbial feeders
- predators
Soil texture determines habitat
Clay surface area holds carbon
Carbon-coated clay builds aggregates

Based on work by Tisdall and Oades, Six
Soil aggregation increases available soil water
Yield increases with clay-associated C

Cates & Ruark 2017
Decomposition food web releases nutrients

- root-feeders
- shredders
- fungi and bacteria
- microbial feeders
- predators
Decomposition food web releases nutrients
Soil nitrogen pools: “plant-available”

Large soil organic matter

Nitrate, ammonia

Potentially available N = Rate of processing organic N

Organic N, protein N

Jilling et al. 2018
Yield increases with large organic N

Cates et al., unpublished
Yield increases with plant-available N

Franzleubbers 2018
Fertilizer needs decreases with active C

Economically Optimum N Fertilizer (kg N \cdot ha^{-1})

Soil-Test Biological Activity

EONR = 248 - 0.43 \cdot STBA

r^2 = 0.45, p < 0.001, n = 33

Franzleubbers 2018
Soil nitrogen pools: “plant-available”

Potentially available N = Rate of processing organic N
Soil Health Principles

• Keep the ground covered
Soil Health Principles

• Minimize disturbance
No-till increases aggregates and microbes

Helgasen et al. 2010
No-till may reduce N supply (at first!)

Giambalvo et al. 2018

Pittelkow et al. 2015
Soil Health Principles

• Keep living roots in the ground
Soil Health Principles

• Diversify aboveground

“Save the Soil”, a 1935 Special Circular from UW-Extension by O.R. Zeasman and J.W. Clark
Cover crops provide more living roots
Legume cover crops can slowly release N
Cover crops mineralize N at different rates

O’Connell et al. 2015
Cover crops reduce nitrate leaching

In the shaded areas, the soil produces nitrate, but there is no crop to use it. As a result, some nitrate is lost to waterways.

Cover crops can use nitrate when corn and beans are not growing, thus reducing the asynchrony between soil nitrate production and crop nitrate uptake.

Mike Castellano, ISU
Soil Health Principles

• Integrate livestock
Grazing increases fungi

Stark et al. 2014

Grazed

Ungrazed

Fungal PLFAs

Two soil types
Soil health principles work together

• Keep the soil covered
• Minimize disturbance
• Increase crop diversity
• Keep living roots in the ground
• Integrate livestock
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