Steps to Success with Cover Crops

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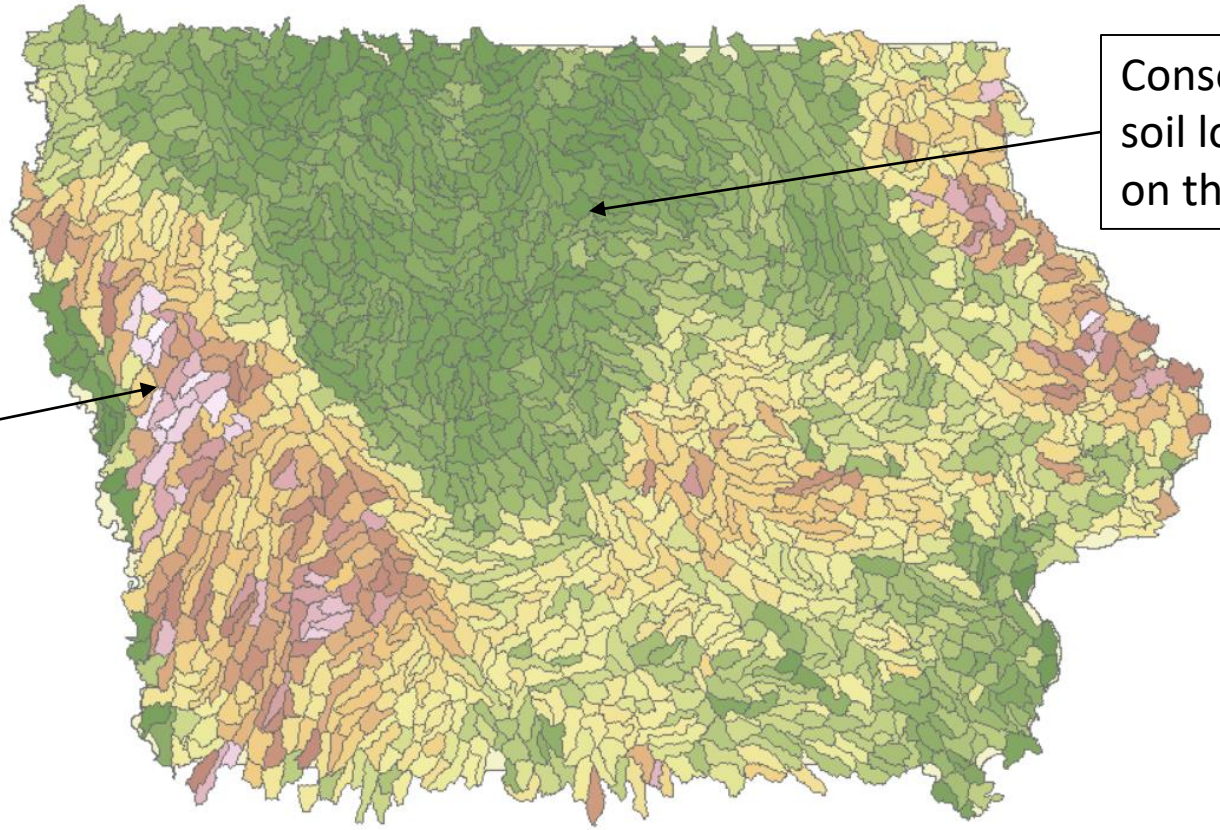
Center for Farming Innovation

Advancing Profitability and Stewardship

Why Care About Cover Crops?

#1. Reduce Erosion/Improve Soil Health

Cumulative Soil Loss from 2008 to 2019 (Dump trucks/Acre)



Consequences of soil loss are greater on these soils.

Areas of high soil loss

Source: calculated from Daily Erosion Project, ISU

Average Soil Loss in Iowa: 4.3 Dump Trucks of Soil Loss per Acre/Decade

AVERAGE TOPSOIL LOSS IN IOWA OVER THE PAST DECADE

Source: Calculated from Daily Erosion Project data sets.

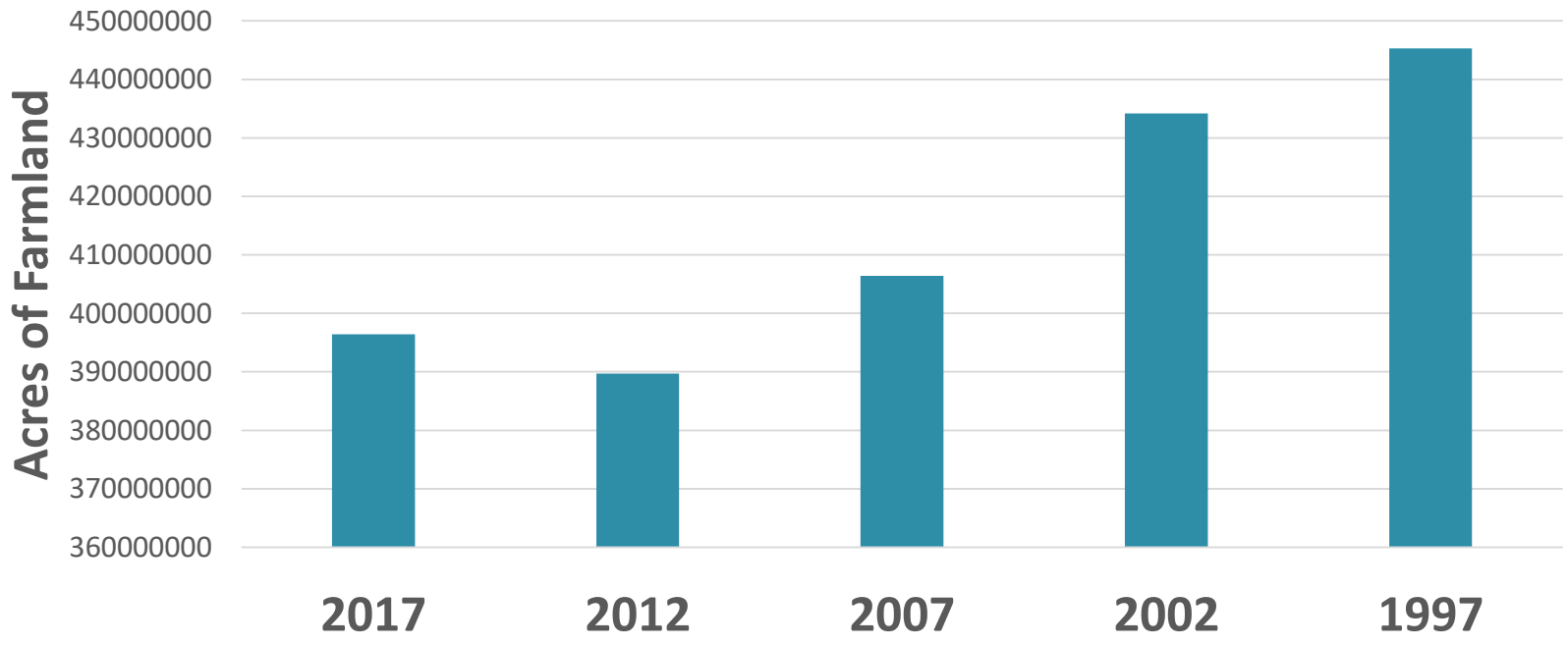
Topsoil

US is losing topsoil 10 times faster than it is being replaced.

Takes 500 years to replenish one inch of lost topsoil.

Soil is not a renewable resource.

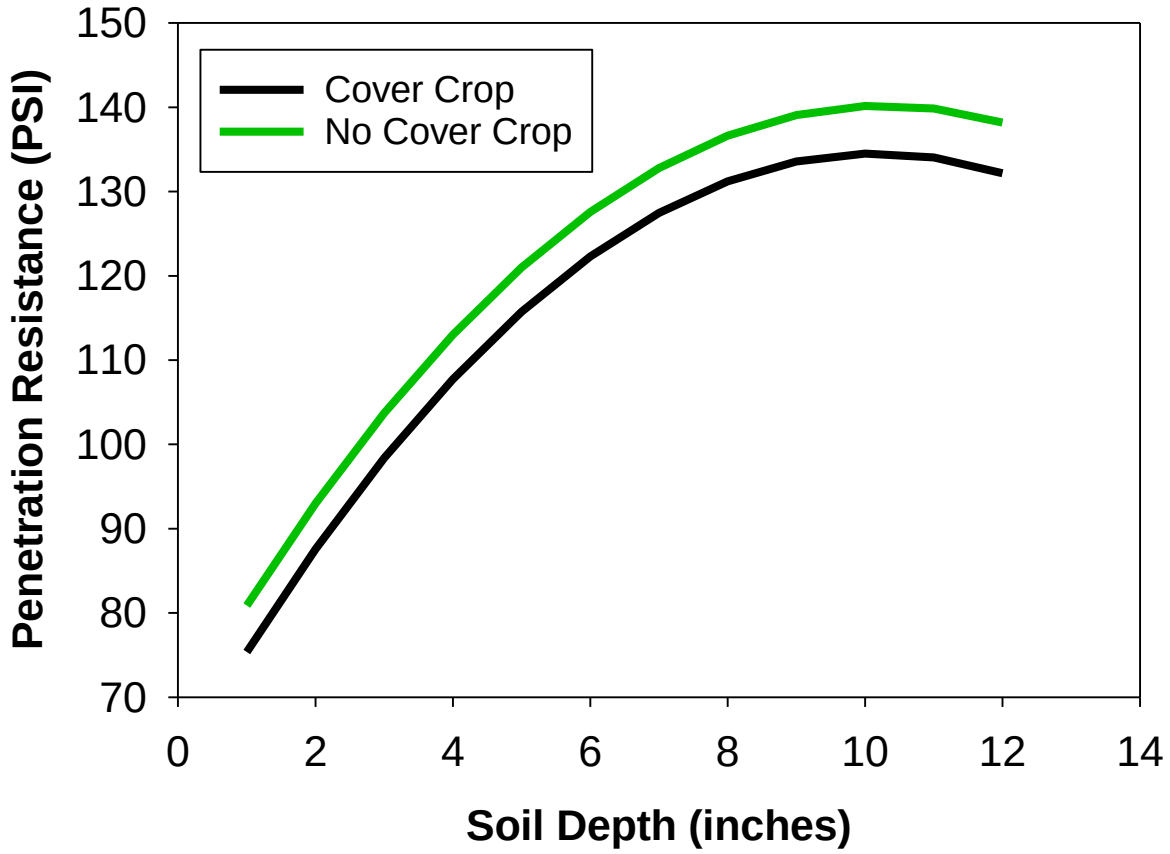
Acres of US Farmland Over Time (US Census of Agriculture)



With declining acres of farmland, protecting our farmland is more important than ever.

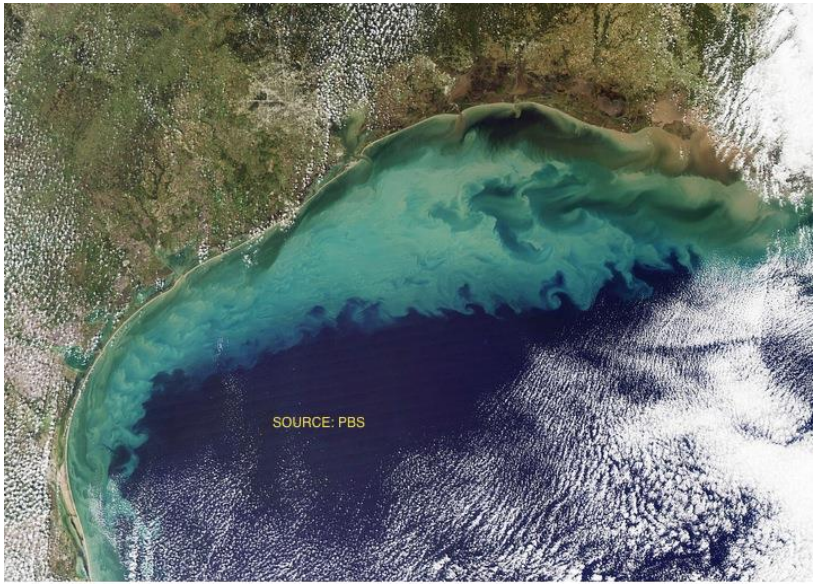
Improve Soil Health

Cover Crops Significantly Reduced Soil Compaction across all depths.
Data is across 5 environments after three years of continuous cover cropping.



#2. Reduce Nutrient Losses

GULF COAST HYPOXIA



N- LOST ANNUALLY TO THE MISSISSIPPI

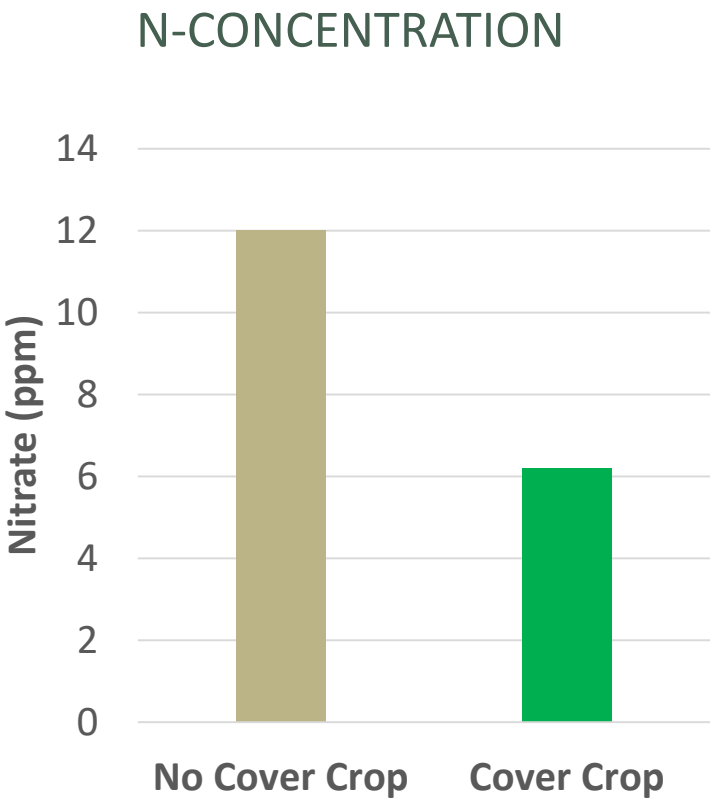
5.1 billion pounds

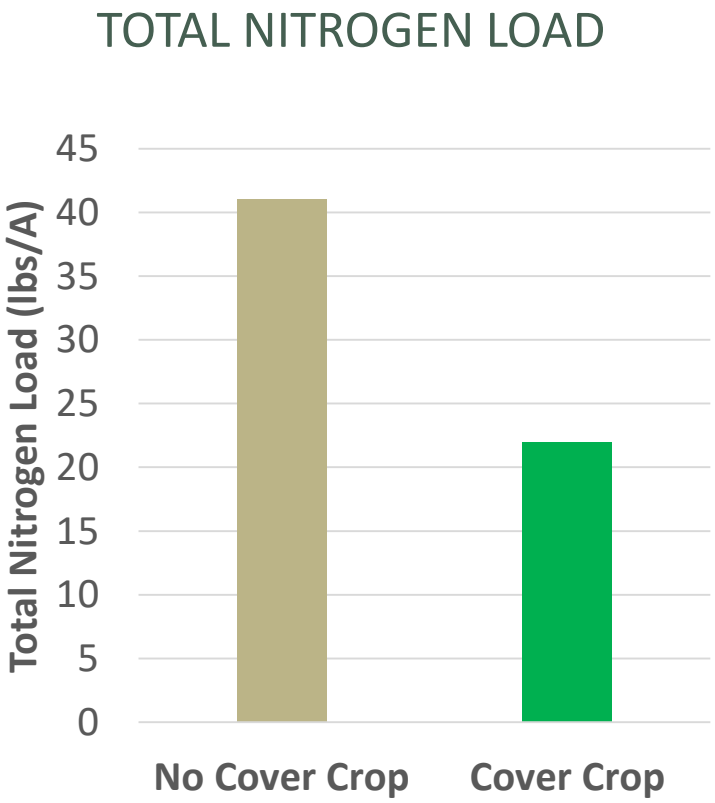
$969M in fertilizer value

5.1 billion pounds = 18,000 rail cars of fertilizer.

Cover Crops Reduce Nitrogen from 30 to 50%

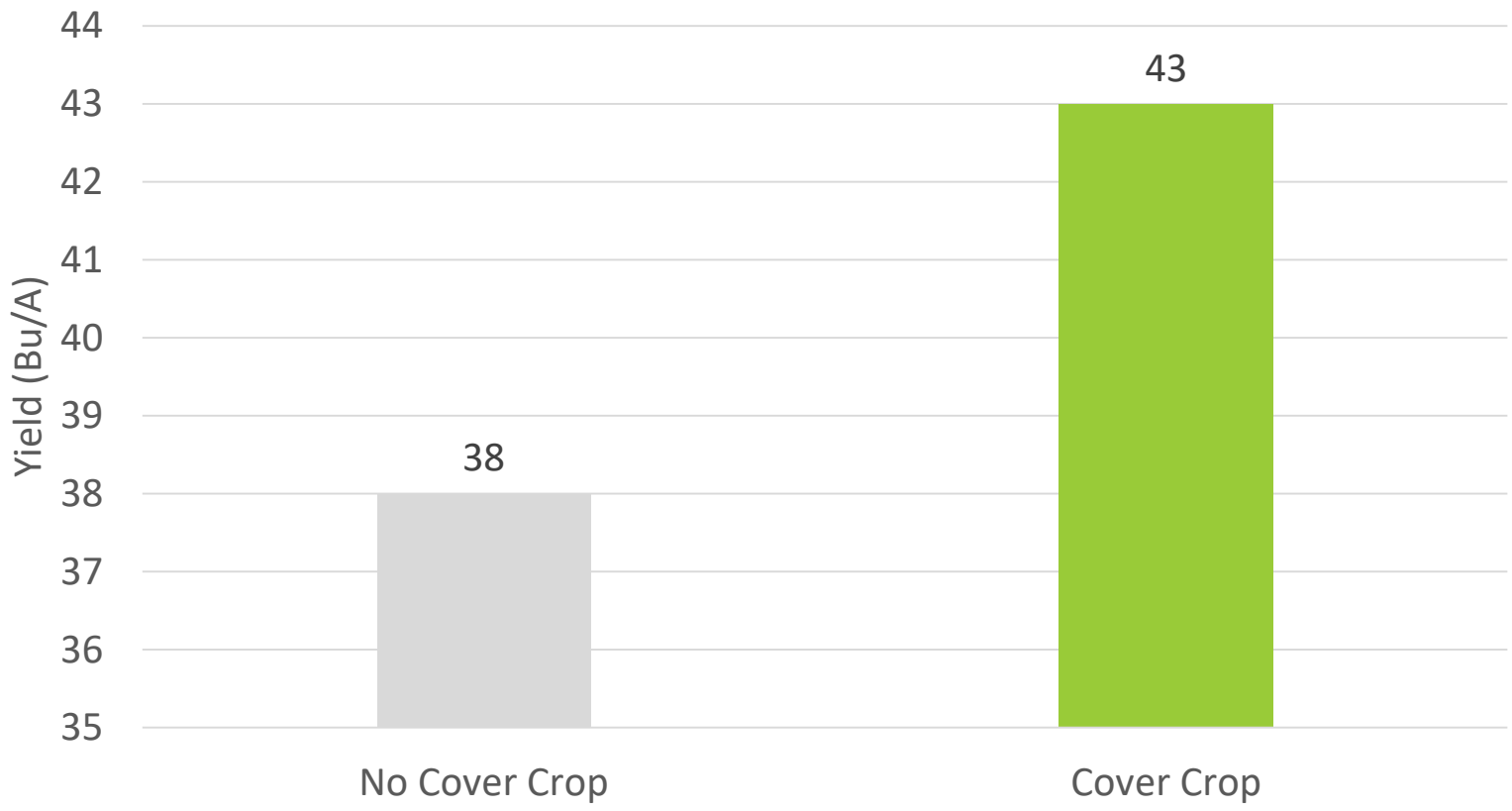
Cover Crops and Water Quality 5 year Study



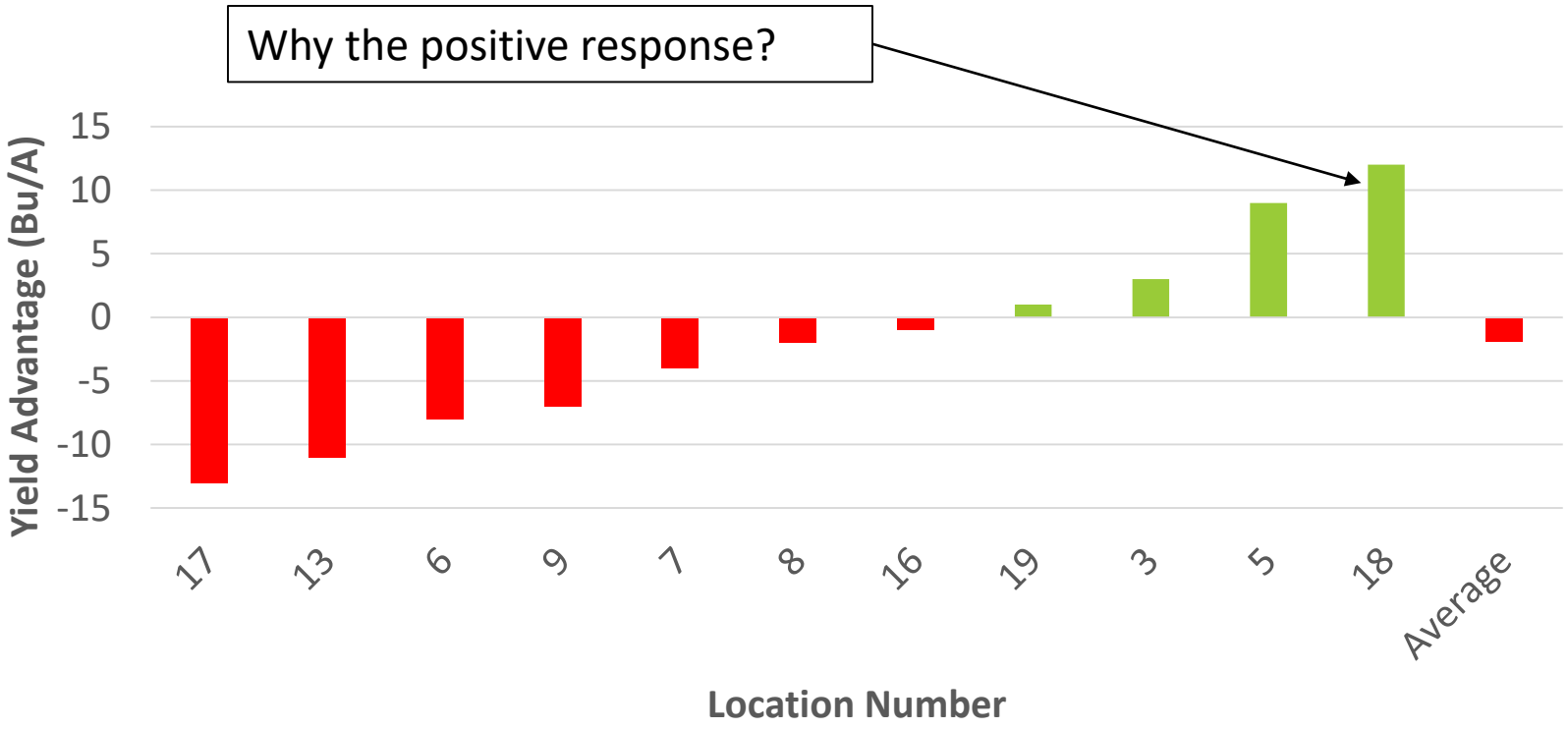


Ag Water Mnmnt 110:25-33, 2012

#3. Sometimes there is a yield advantage to cover crops.

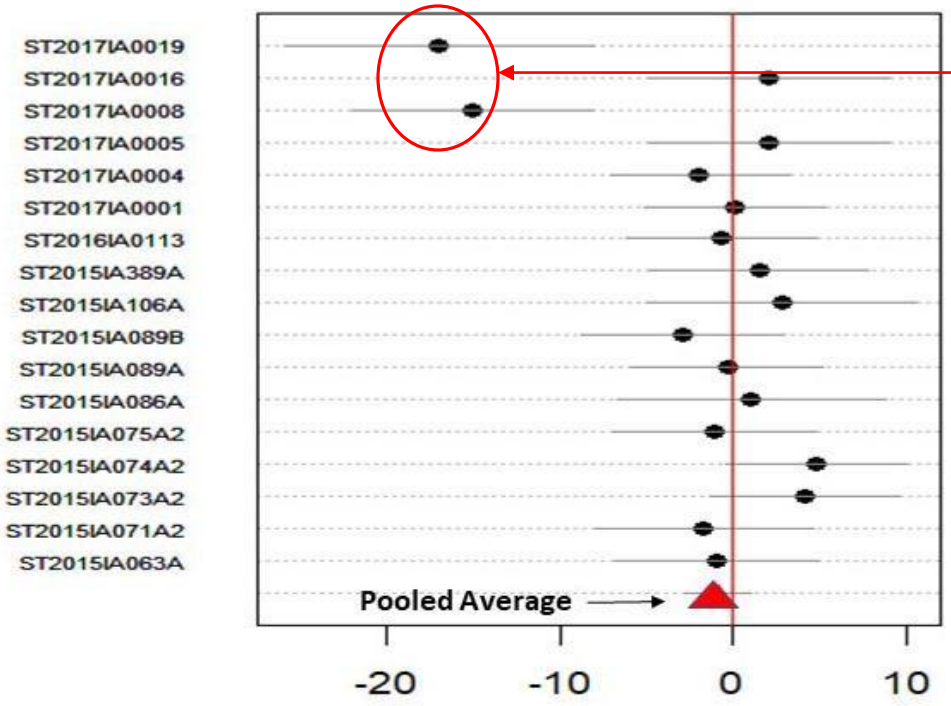


Effect of Manure + Cover Crops on Corn Yield



University of Minnesota Study

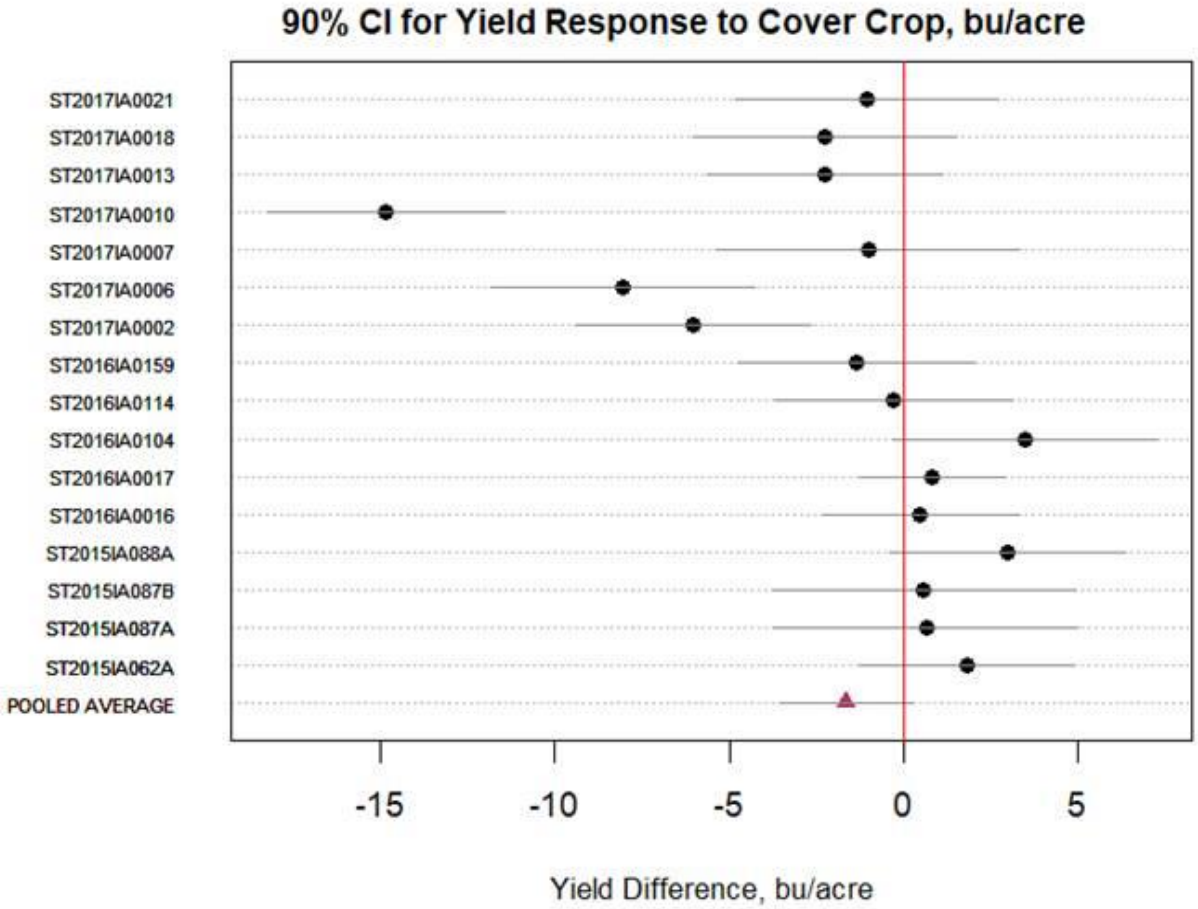
Corn Yield Results



Urea based program

90% Confidence Intervals for Corn Yield Differences for Plots With and Without Cereal Rye (bu/acre). Means on the left side of the zero line indicate yield gap.

Soybean Yield Results



#4. Simplify Weed Spectrum

1. Reduce erosion/Improve Soil Health
2. Reduce Nutrient Losses
3. Potential Profit/Yield Advantage
4. Herbicide Resistant Weeds

Steps to Success with Cover Crops

- Cereal Rye- most winter hardy and provides the most biomass
- Wheat/Triticale- less biomass, but easier on corn
- Cover Crop Mixes: probably not worth the expense unless seeded early-IMHO

Steps to Success with Cover Crops

Establishment

- Inter-seed into standing crop from mid August to mid September
- Do not inter-seed if conditions are dry and hot.
- Drill soon after harvest

Steps to Success with Cover Crops

Seeding Rates

- **30-40 lbs/A if erosion control is goal.**
- **Up to 60 lbs/A if weed control is the goal.**
- **Consider 30-40 lbs/A ahead of corn and 40-60 lbs/A ahead of soybeans**

Steps to Success with Cover Crops

Termination

- **Soybeans**: Plant green and terminate a few days before or after planting to optimize weed control.
- **Corn**: Terminate 2 weeks before planting or when cover crop < 12 inches tall.

Roller Crimping the Crop

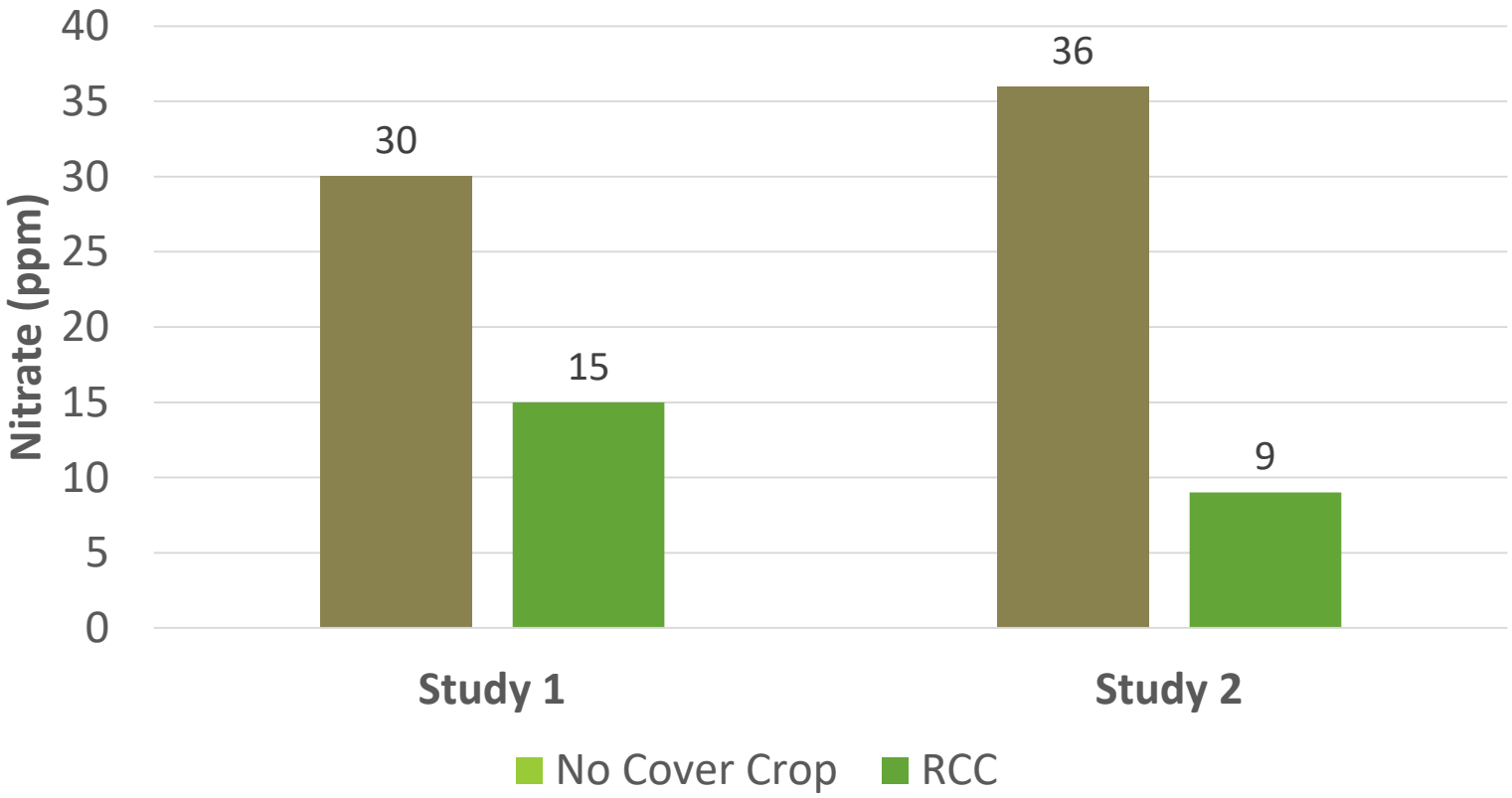
Steps to Success with Cover Crops

Planter Set Up

- No-till planter equipped with residue movers
- Hydraulic downforce pressure recommended
- Starter fertilizer is desirable but not necessary

Nitrogen Form and Placement Must be Different when Following Cover Crops

Soil Nitrate at Time of Termination



Sources: Soil Sci Society Jrn 79:1482-1495, 2015; Agronomy J 111:1-11, 2019

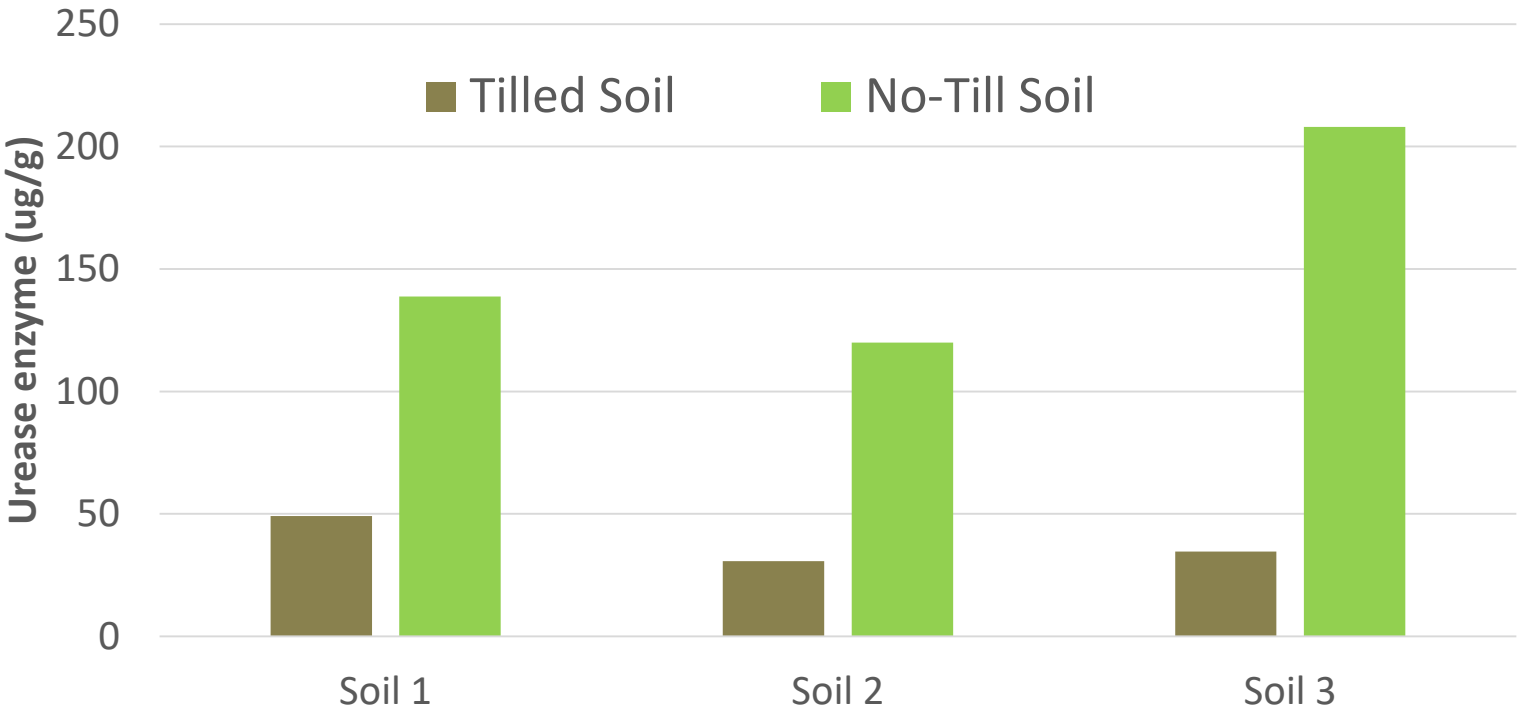
Need to Overcome Early Immobilization to Optimize Yield

50% of total nitrogen as nitrate form at or soon after planting

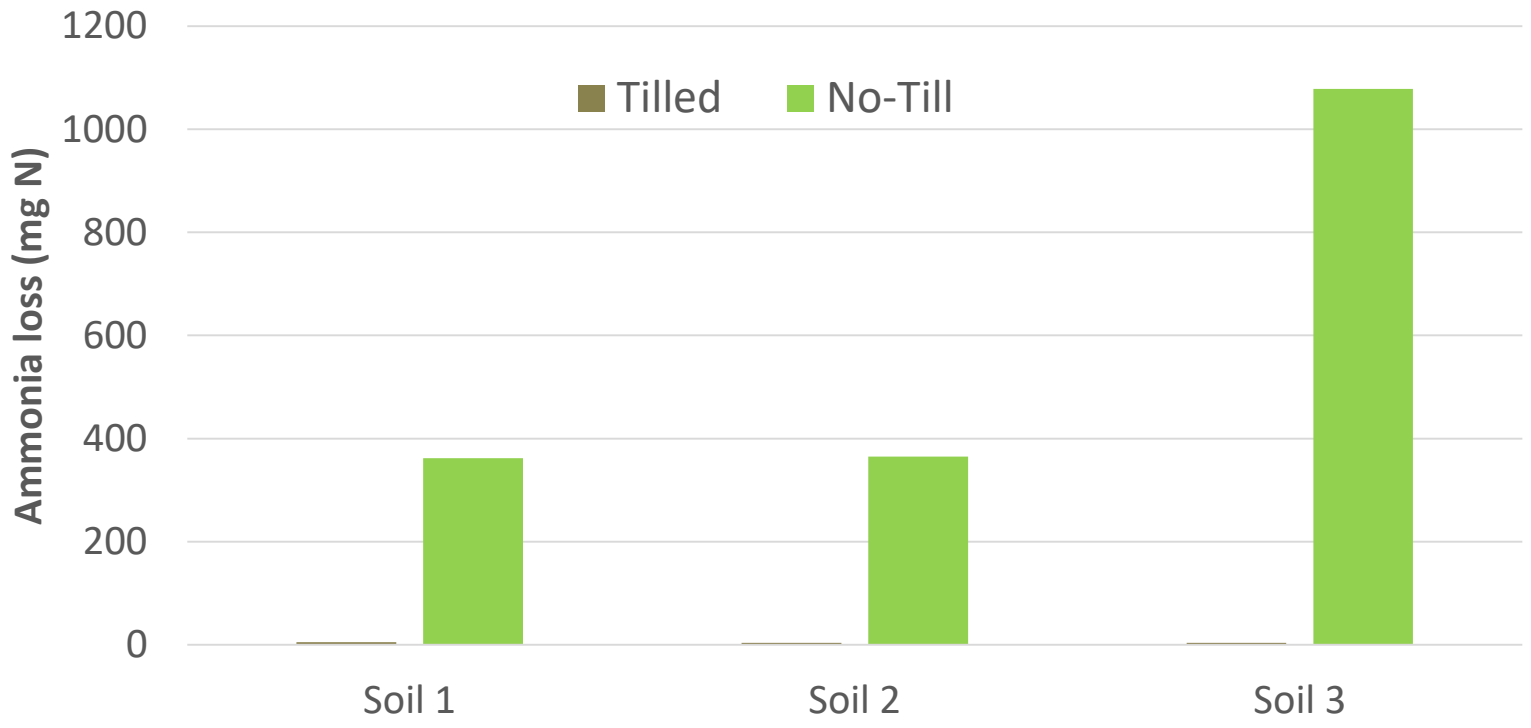
- **Coulter inject UAN preplant or early sidedress**
- **Ammonia fb Starter UAN**
- **Ammonia Nitrate Sulfate or AMS**

Fertilizer Form Matters in No-Till and Cover Crops

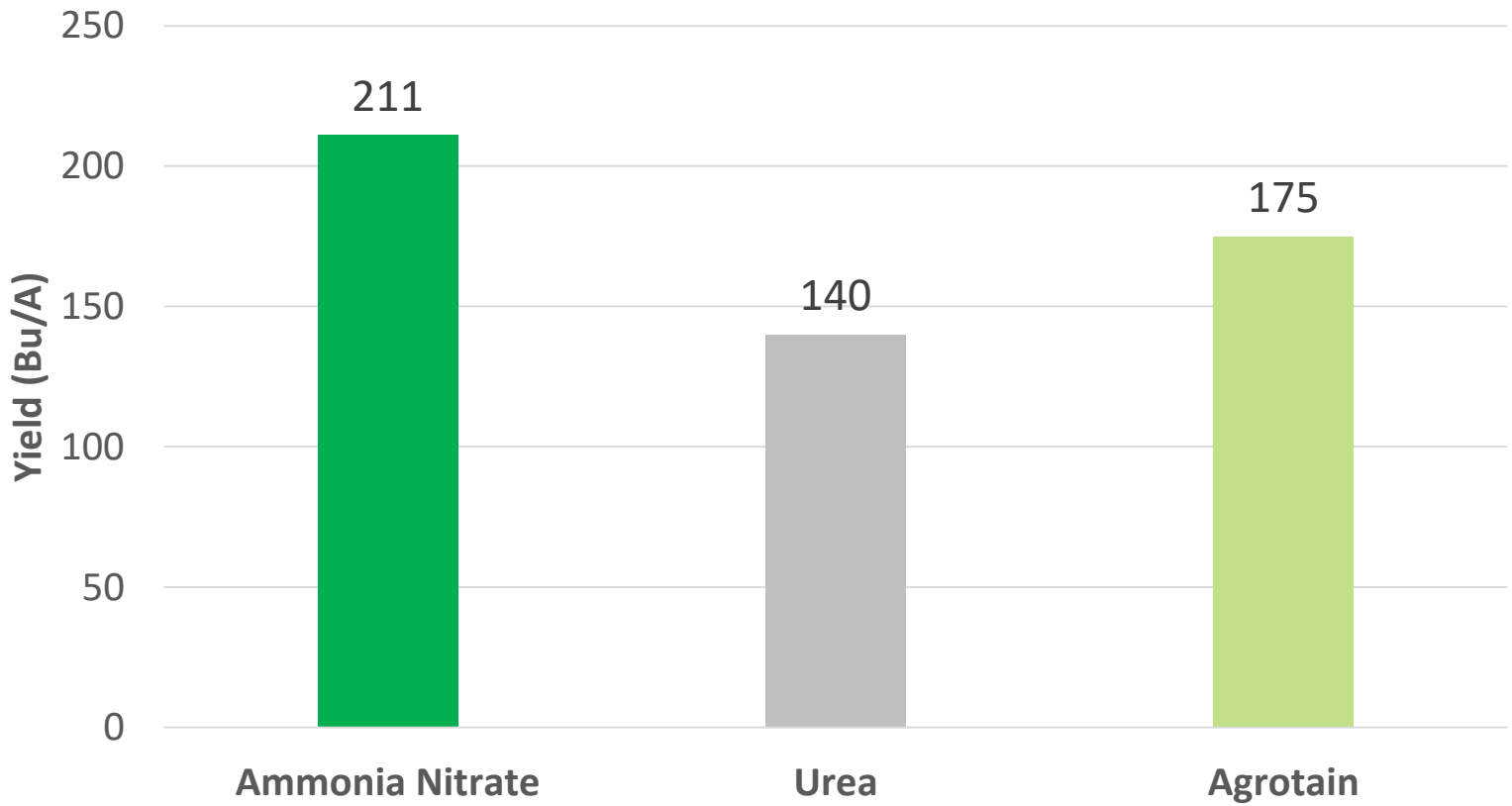
Amount of Urease Enzyme in Tilled and No-Till Field



Nitrogen lost to volatility

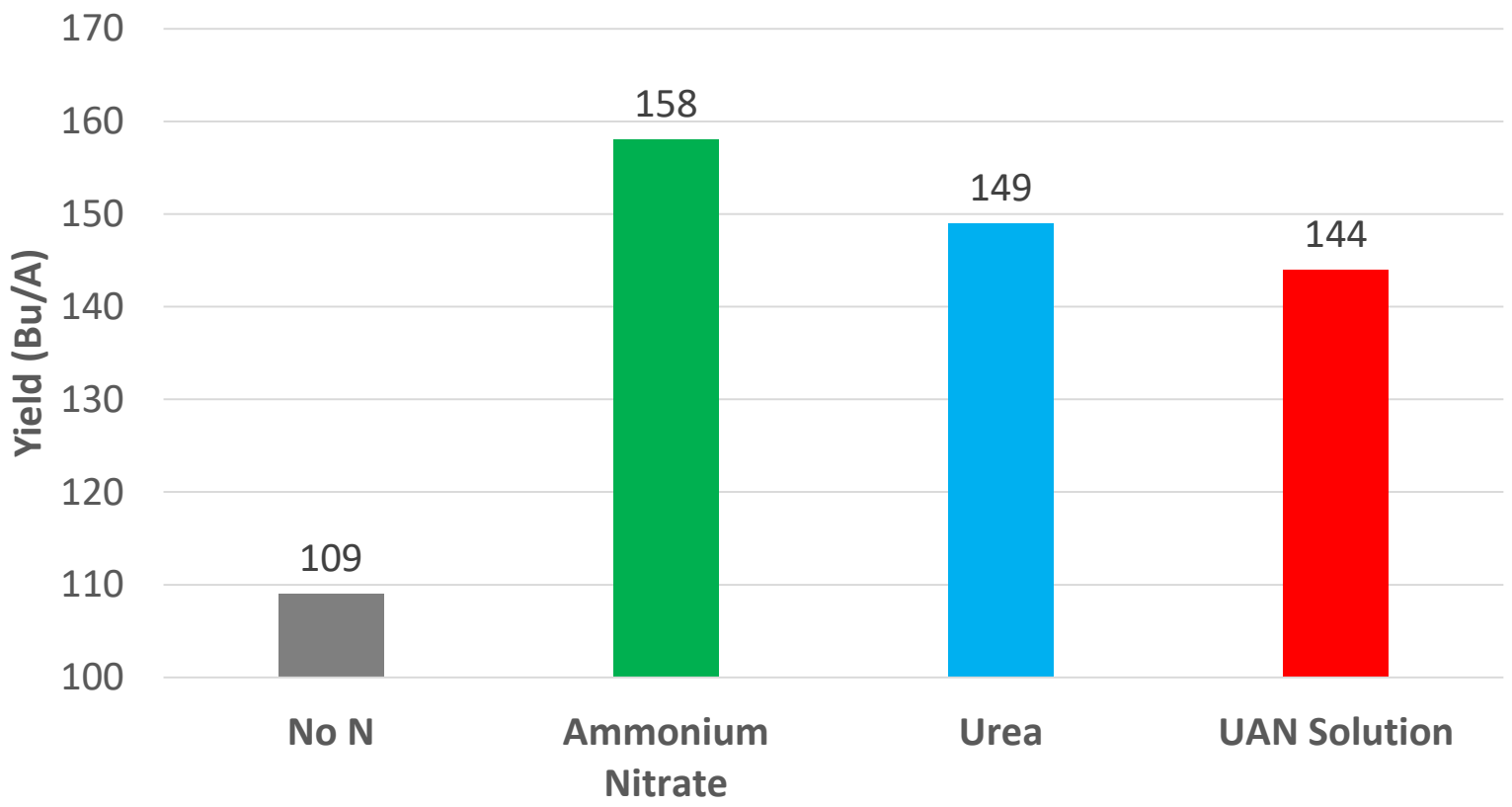


No-Till Corn Study



Averages across 6 locations and two years. Agron J. 110:1439-1446, 2018

N Form in No-till Corn



Agron. J. 85:893-897

For poorly drained soils, consider Strip Till with Cover Crops

- There remains many agronomic challenges to cover crops.

- Farmers and Society are looking to us to fix these challenges.

Using Fluid Fertilizers to Close the Yield Gap in Corn Following Cereal Rye.

- Cover Crop vs No Cover Crop
- Dual placement vs Single Starter Placement
- Starter plus Sulfur
- Nitrogen Form, Placement, Timing

Fluid Fertilizer Foundation Sponsored Research

Treatment Number	Treatment
1	Fall applied Anhydrous Ammonia at 150 lbs N/A- no cover crop
2	Fall applied Anhydrous Ammonia at 150 lbs N/A- with cover crop
3	Spring applied Anhydrous Ammonia at 150 lbs N/A- with cover crop
4	Spring apply 32% at 34 gal/A (100 lbs N) applied as coulter preplant+ Planter applied starter in a band as 32% UAN at 17 gal/A (50 lbs N/A) using 2X2 placement
5	Spring apply 32% at 34 gal/A (100 lbs) applied as coulter preplant+ Planter applied starter in a band as 32% UAN at 17 gal/A (50 lbs N/A) using Conceal System
6	Spring apply 32% at 34 gal/A (100 lbs N) applied as coulter preplant+ Planter applied starter in a band as 15-6-3-2.40s Blend at 32.3 gal/A (50 lbs N/A, 20 lbs P/A, 10 lbs K/A, 8 lbs S/A) using Conceal (Precision Planting) attachment.
7	Spring apply 32% at 34 gal/A (100 lbs N) as coulter preplant fb 25.5 gal/A (75 lbs) 32% UAN at V4 to V6 applied with coulter
8	Spring apply 32% at 34 gal/A (100 lbs N) as coulter preplant. Broadcast after planting SuperU at 110 lbs/A (50 lbs N).

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