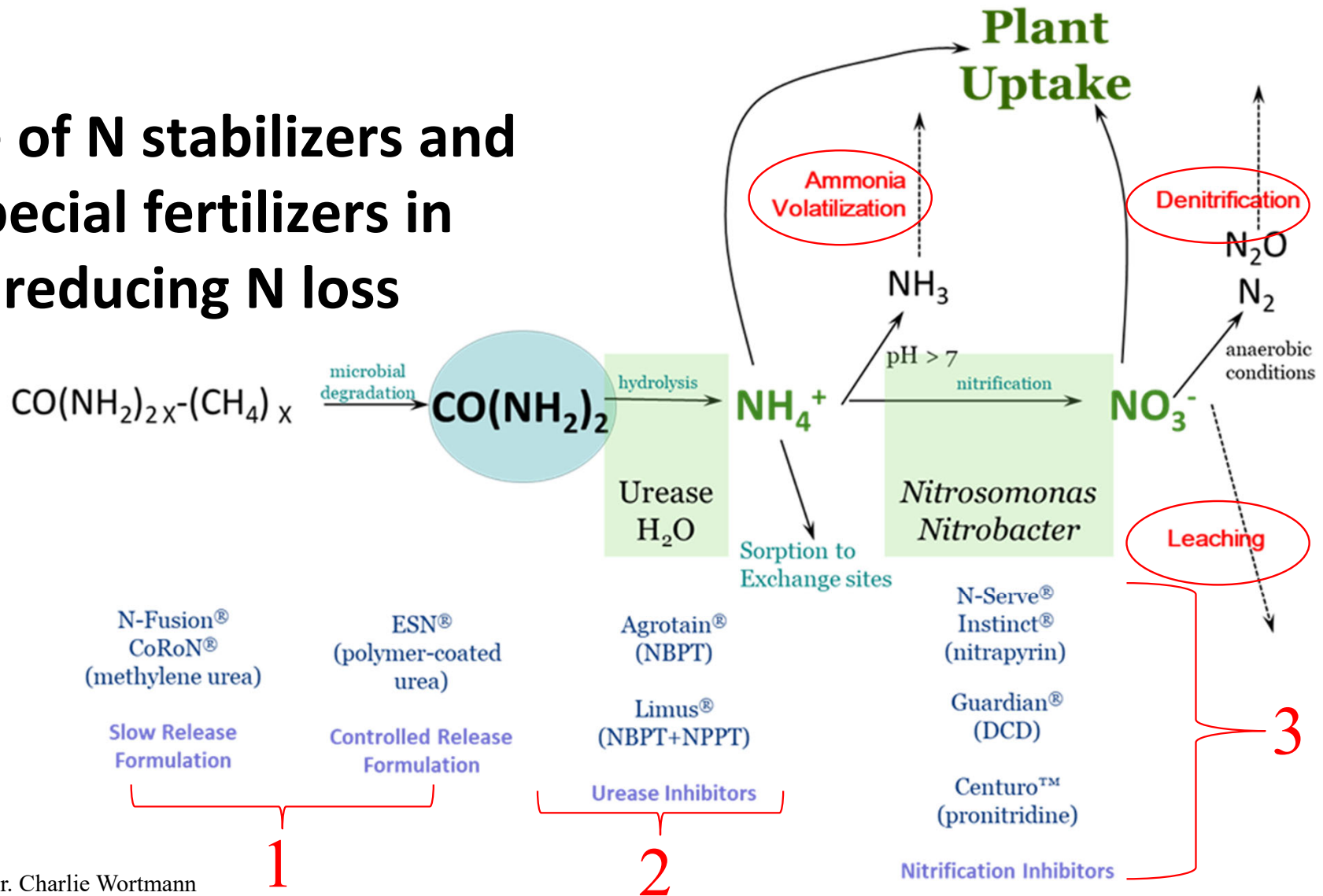


On-Farm Research Inhibitor Studies for Nitrogen Management

Jenny Rees, Extension Educator

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Role of N stabilizers and special fertilizers in reducing N loss



Inhibitor Introduction

- These compounds protect against both denitrification and leaching by retaining fertilizer N in the ammonium form.
- Ammonium (NH_4^+) is a positively charged ion (cation) that can be held on negatively charged exchange sites in soils (such as in clays and organic matter); in comparison, nitrate (NO_3^-), which is negatively charged, can be converted to nitrous oxide (N_2O) or nitrogen gas (N_2) in waterlogged conditions, or can leach below the root zone with rain in well drained soils.

**INTERESTED IN AN
INHIBITOR STUDY?**

[HTTPS://GO.UNL.EDU/4RVW](https://go.unl.edu/4rvw)

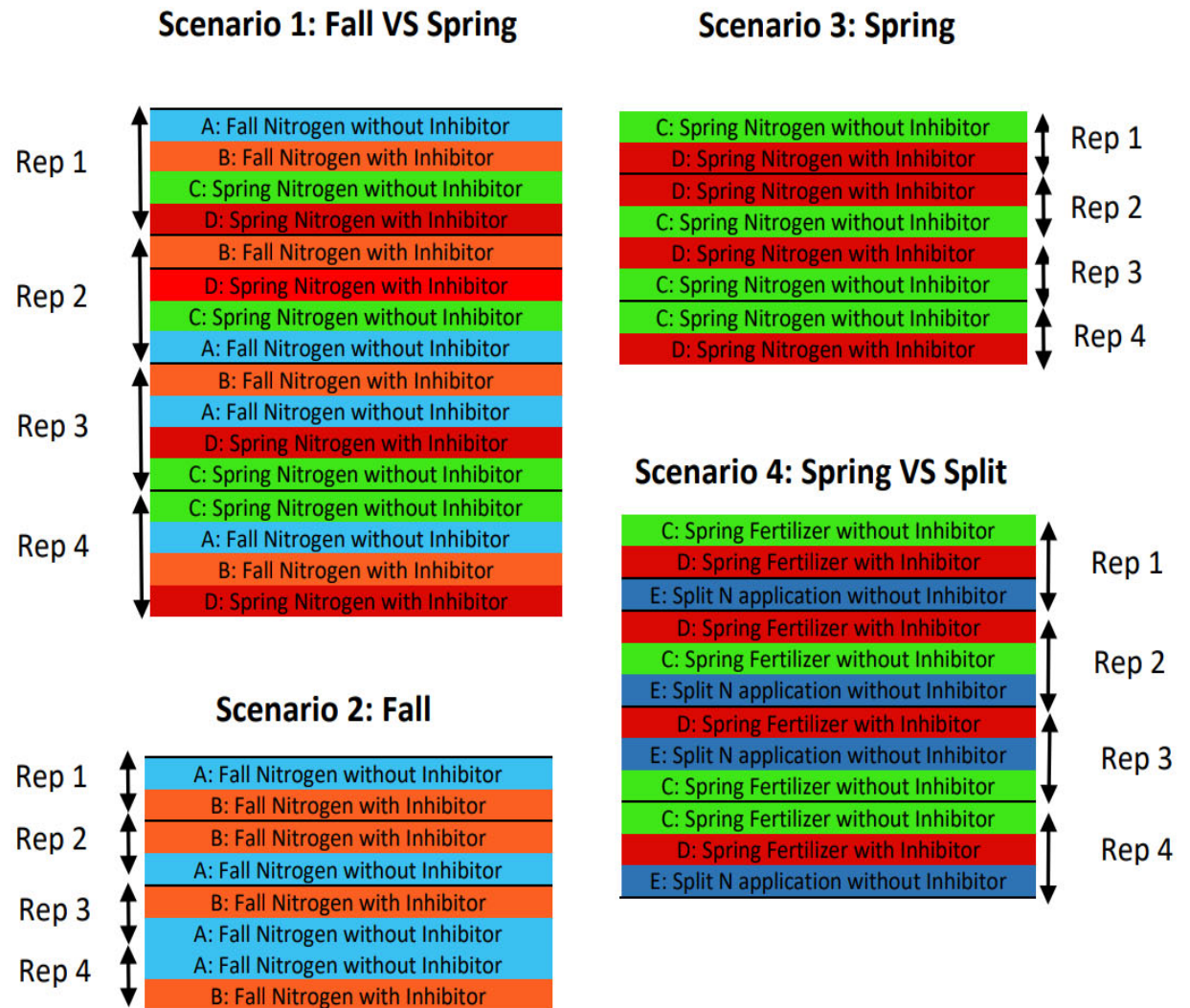


Figure 1. Possible scenarios for comparing nitrogen application with and without inhibitors

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- N-Serve® by Corteva Agriscience™, is a product with known efficacy for inhibiting nitrification (product information is provided at right).
- The chemical compound nitrapyrin in N-Serve® temporarily inhibits populations of the bacteria that convert ammonium to nitrite (*Nitrosomonas*) and nitrite to nitrate (*Nitrobacter*).



®™ Trademarks of Dow AgroSciences, DuPont or Pioneer and their affiliated companies or respective owners

Use to delay nitrification of ammoniacal and urea nitrogen fertilizer compositions in the soil by controlling the nitrification process.

Active Ingredients:

nitrapyrin: 2-chloro-6-(trichloromethyl)pyridine.....	22.2%
Other Ingredients.....	77.8%
Total.....	100.0%

Contains petroleum distillates
Contains 2 lb of active ingredients per gallon.

Product information from: https://s3-us-west-1.amazonaws.com/agrian-cg-fs1-production/pdfs/N-Serve_24_Label1d.pdf



2019 N-Serve Study York County

Location 1

- 180 lb/ac N anhydrous ammonia on April 10, 2019
- 1 qt/ac N-Serve® (recommended rate)
- Previous crop: soybean
- Ridge-Till
- Sampled for ammonium + nitrate at V7 (1', 2', 3') 2" off anhydrous band

Location 2

- 160 lb/ac N anhydrous ammonia on April 8, 2019
- 1 qt/ac N-Serve® (recommended rate)
- Previous crop: soybean
- No-Till
- Sampled for ammonium + nitrate at V7 (1', 2', 3') 2" off anhydrous band

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Site Information

Study ID: 0718185201901

County: York

Soil Type: Hastings silt loam, 0-1% slopes; Uly-Hobbs silt loams, 11-30% slopes

Planting Date: 4/24/19

Harvest Date: 10/22/19

Seeding Rate: 32,000

Row Spacing (in): 30

Variety: Pioneer® P1563AM™

Reps: 7

Previous Crop: Soybean

Tillage: No-Till

Herbicides: *Pre:* 2 qt/ac Medal® II ATZ and 5 oz/ac Explorer™ on 4/23/19

Seed Treatment: None

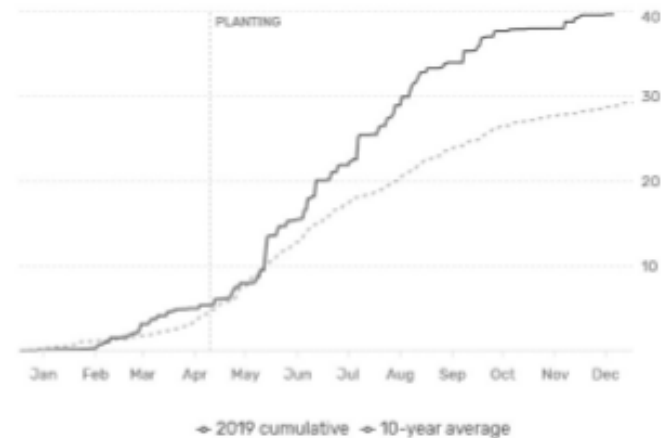
Foliar Insecticides: 6.4 oz/ac Tundra® EC on 8/4/19

Foliar Fungicides: 8 oz/ac Delaro® on 8/4/19

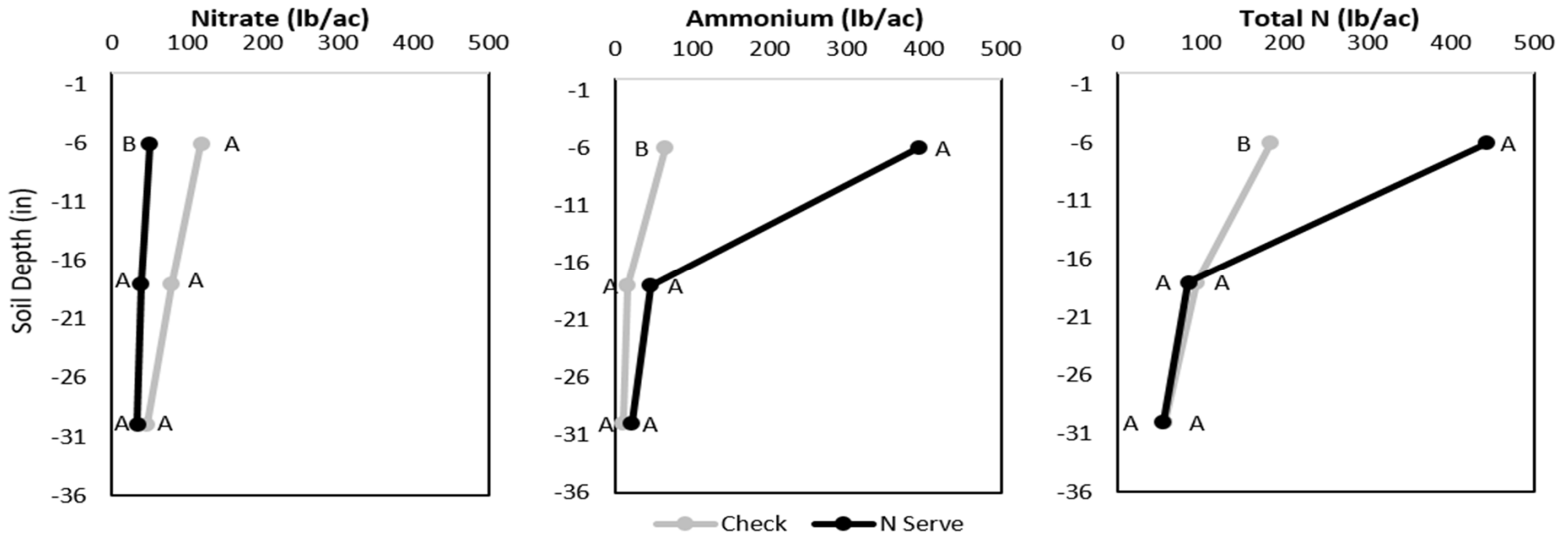
Fertilizer: 180 lb/ac N as spring applied anhydrous ammonia on 4/10/19; 5 gal/ac 10-34-0 in-furrow 4/23/19

Irrigation: Pivot, Total: 1"

Rainfall (in):



2019 York Site 1 Results



Soil ammonium-N and nitrate-N for check (180 lb N/ac anhydrous ammonia with no inhibitor) and N-Serve (180 lb N/ac anhydrous ammonia with 1 qt/ac N-Serve inhibitor) treatments on June 17, 2019 at 1', 2', and 3' depths. Within a sampling depth, points with the same letter are not statistically different at the alpha=0.1 level.



2019 York Site 1 Yield Results

	Stand Count (plants/ac)	Stalk Rot (%)	Moisture (%)	Yield (bu/ac)†	Marginal Net Return‡ (\$/ac)
Check	32,500 A*	13.21 A	17.9 A	250 A	957.74 A
N-Serve®	31,750 A	7.14 A	18.0 A	251 A	949.65 B
P-Value	0.182	0.190	0.436	0.370	0.036

*Values with the same letter are not significantly different at a 90% confidence level.

†Bushels per acre adjusted to 15.5% moisture.

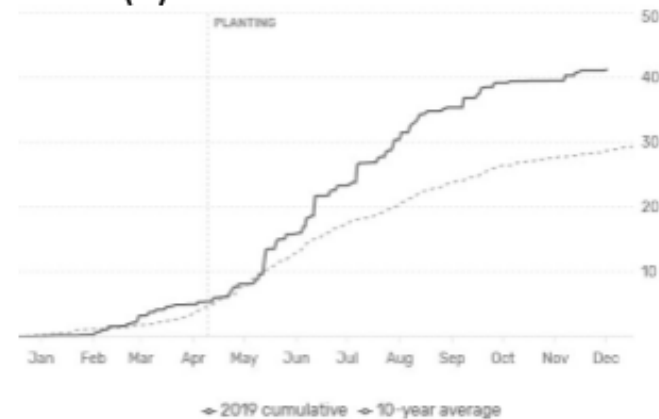
‡Marginal net return based on \$3.83/bu corn and \$11/ac (\$47.95/gal) for N-Serve.



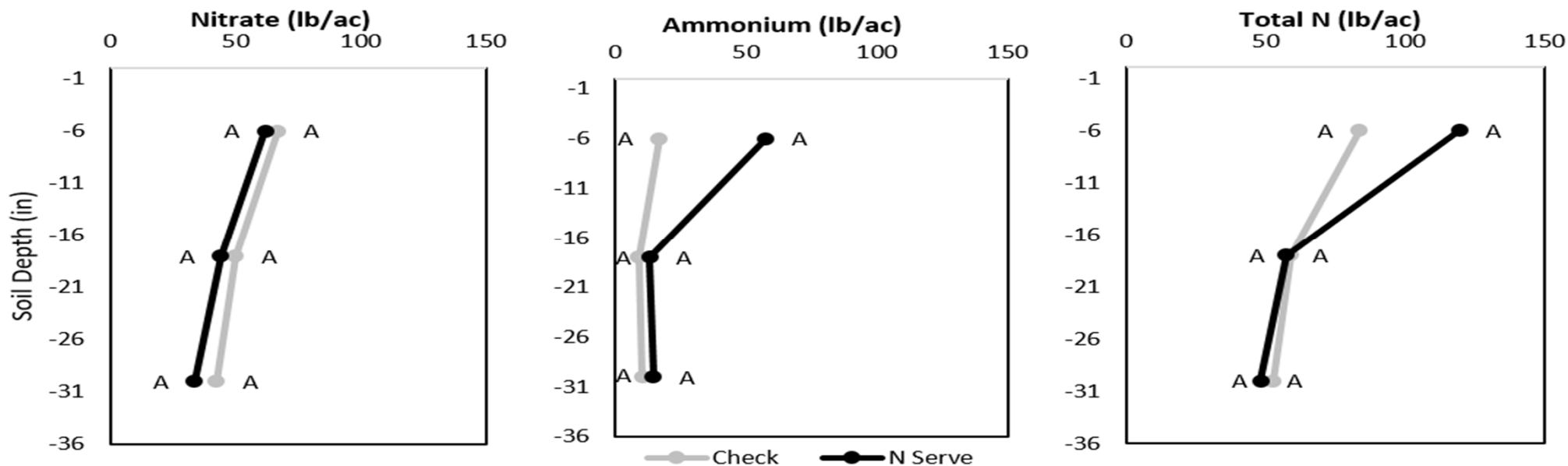
Site Information

Study ID: 0118185201902
County: York
Soil Type: Hastings silt loam, 0-1% slopes
Planting Date: 4/14/2019
Harvest Date: 11/5/2019
Seeding Rate: 32,500
Row Spacing (in): 30
Variety: CROPLAN® CP5335VT2P/RIB
Reps: 6
Previous Crop: Soybean
Tillage: No-Till
Herbicides: *Pre:* 3 pt/ac Lexar® on 5/2/2019
Fertilizer: 160 lb/ac N as anhydrous ammonia on 4/8/19

Irrigation: Pivot, Total: 1"
Rainfall (in):



2019 York Site 2 Results



Soil ammonium-N and nitrate-N for check (160 lb N/ac anhydrous ammonia with no inhibitor) and N-Serve (160 lb N/ac anhydrous ammonia with 1 qt/ac N-Serve inhibitor) treatments on June 13 at 1', 2', and 3' depths. Within a sampling depth, points with the same letter are not statistically different at the alpha=0.1 level.



2019 York Site 2 Results

	Stand Count (plants/ac)	Stalk Rot (%)	Moisture (%)	Yield (bu/ac)†	Marginal Net Return‡ (\$/ac)
Check	31,750 A*	12.08 A	15.0 A	264 A	1,010.51 A
N-Serve®	30,917 A	9.58 A	14.9 A	264 A	998.71 A
P-Value	0.080	0.638	0.084	0.908	0.131

*Values with the same letter are not significantly different at a 90% confidence level.

†Bushels per acre adjusted to 15.5% moisture.

‡Marginal net return based on \$3.83/bu corn and \$11/ac (\$47.95/gal) for N-Serve.



Take Home Points: Inhibitors

- Inhibitors may protect applied N but residual nitrate-N deep in the rooting depth is not protected and is the first lost to leaching
- Yield benefit and N leaching reduction due to a nitrification inhibitor likely to be small for SiL or SiCL soil.
- Nitrification inhibitor likely to reduce leaching for fertilizer-N applied to sandy soil in spring but less likely with fall application or with in-season application in June
- The duration of inhibitor effects depends on soil temperature and may be effective for only 2 weeks but longer with low soil temperatures.
- The Iowa Nutrient Reduction Plan credits use of a nitrification inhibitor with anhydrous ammonia with 7% reduction in nitrate loss to tile drainage
- Nitrification inhibitors can have a small role in nitrate-N reduction when use is **timely and well-targeted to high risk situations**

Slide courtesy Dr. Charlie Wortmann

Additional Resources

- Several years of on-farm research studies conducted with inhibitor products. More info. at: <http://resultsfinder.unl.edu/>
- Nitrogen Extenders and Additives for Field Crops: <https://www.ag.ndsu.edu/publications/crops/nitrogen-extendere-and-additives-for-field-crops>



<https://cropwatch.unl.edu/nebraska-farm-research-network-results-update-meetings-2021>

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Nebraska On-Farm Research Network Results Update Meetings 2021

FEBRUARY 25 AND 26, 2021

RELIABLE, RESEARCH BASED INFORMATION FOR YOUR FARM

On-Farm Research Inhibitor Studies for Nitrogen Management

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