

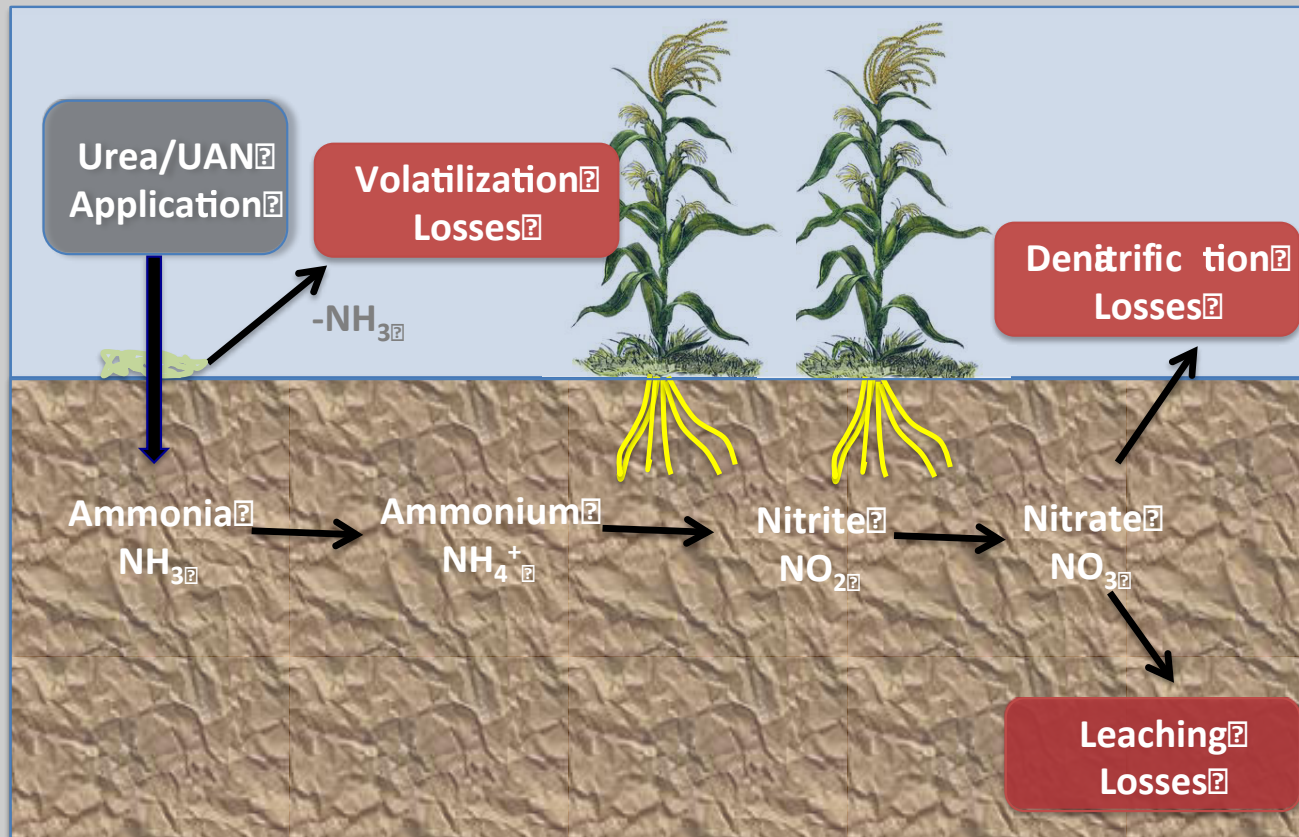
# NITROGEN STABILITY: PROTECTING YOUR NITROGEN INVESTMENT



Raj Pazhianur  
Ametech LLC



# APPLIED NITROGEN LOSSES



About 30-50% of unprotected nitrogen can be lost.

# WHY PROTECT?

- **Economic Reasons**
  - Fertilizer expenditures
    - 35% of variable costs in corn production
  - Improved crop yields
    - Better plant nutrition and overall health

# WHY PROTECT?

- **Application Limitations**
  - Maximum application rates
- **Stewardship**
  - Want to efficiently use our nitrogen to reduce greenhouse gases and leaching to waterways.

# IDEAL WORLD

Apply the appropriate amount of nitrogen exactly when the plant will consume it.

Numerous external factors prevent this

- Weather
- Equipment availability
- Labor
- Crop height
- Nitrogen losses
  - Today's talk



# CURRENT PROTECTION METHODS

## Timing/Method

- Ideally, apply nitrogen at time of plant needs
- Practical:
  - Split applications, delayed applications
  - Tillage/irrigation

## Slow Release

- Nitrogen gradually becomes available
- Specialty crops, horticulture
- Example: Urea formaldehyde

## Controlled Release

- Polymer-coated
- Delayed release based on coating thickness and environmental factors (temperature, moisture)
- Example: ESN

## Stabilizers

- Efficacy enhancers
- Treatment of urea-based fertilizer
- Example: NBPT and DCD
- N-Forced NBPT and N-Forced Plus

U  
A

**For Above Ground Losses**

NBPT

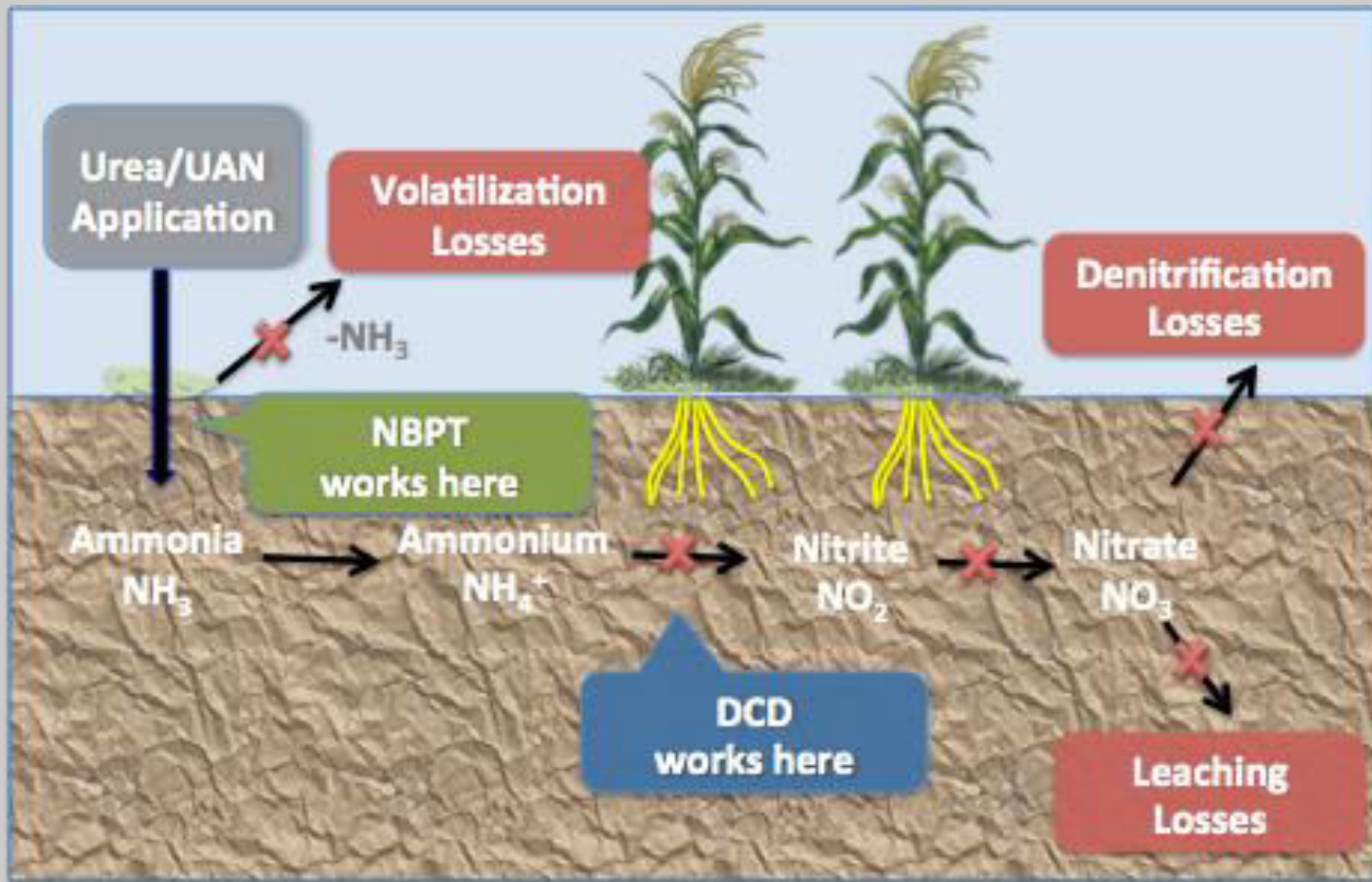
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**For Below Ground Losses**

**works here**

**Leaching Losses**

# NITROGEN PATHWAY: OVERVIEW





**N-STABLE**

For Above Ground Losses

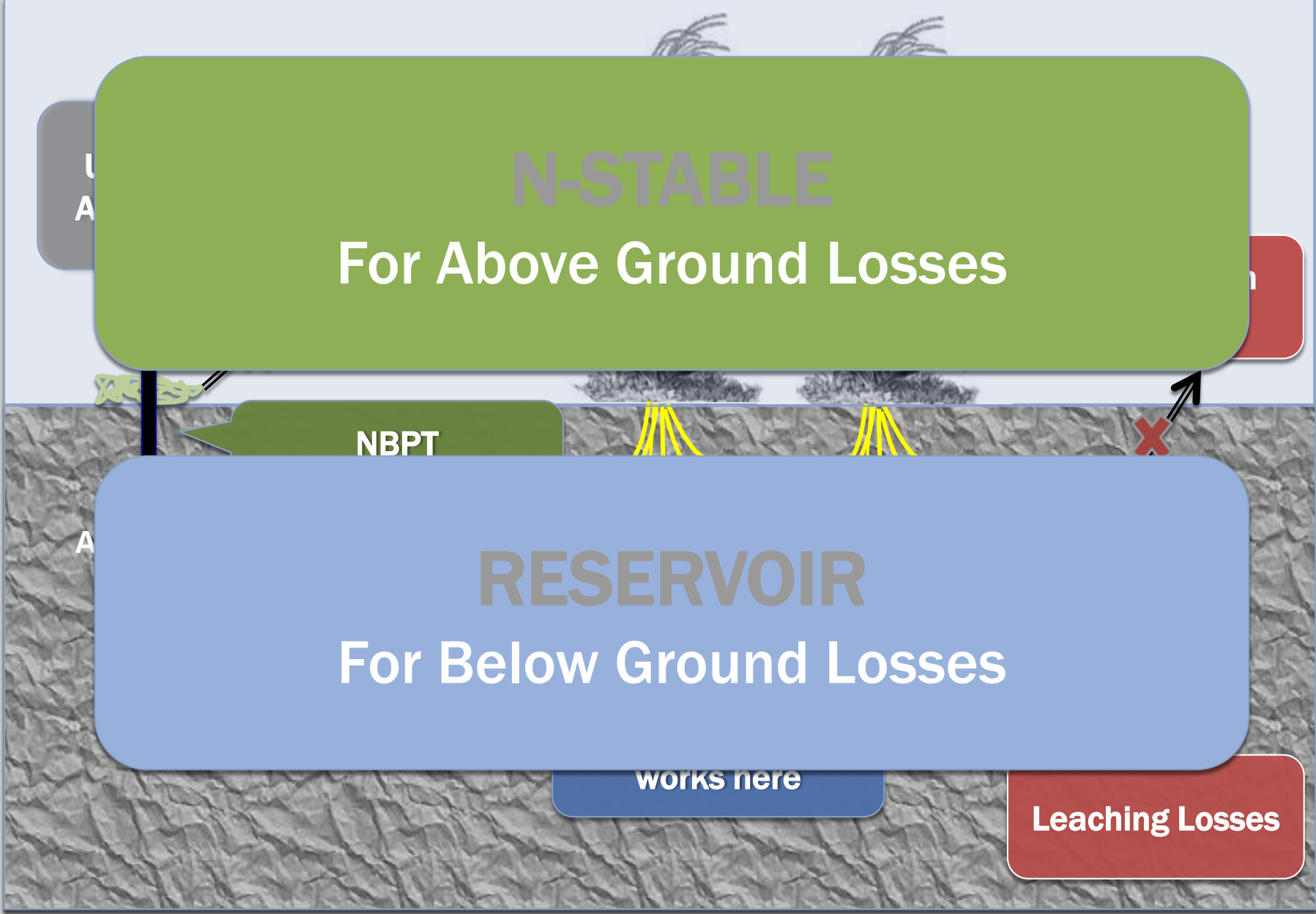
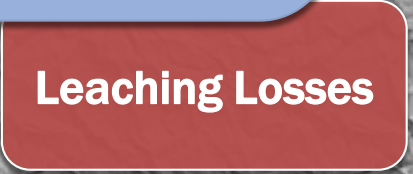
NBPT

**RESERVOIR**

For Below Ground Losses

works here

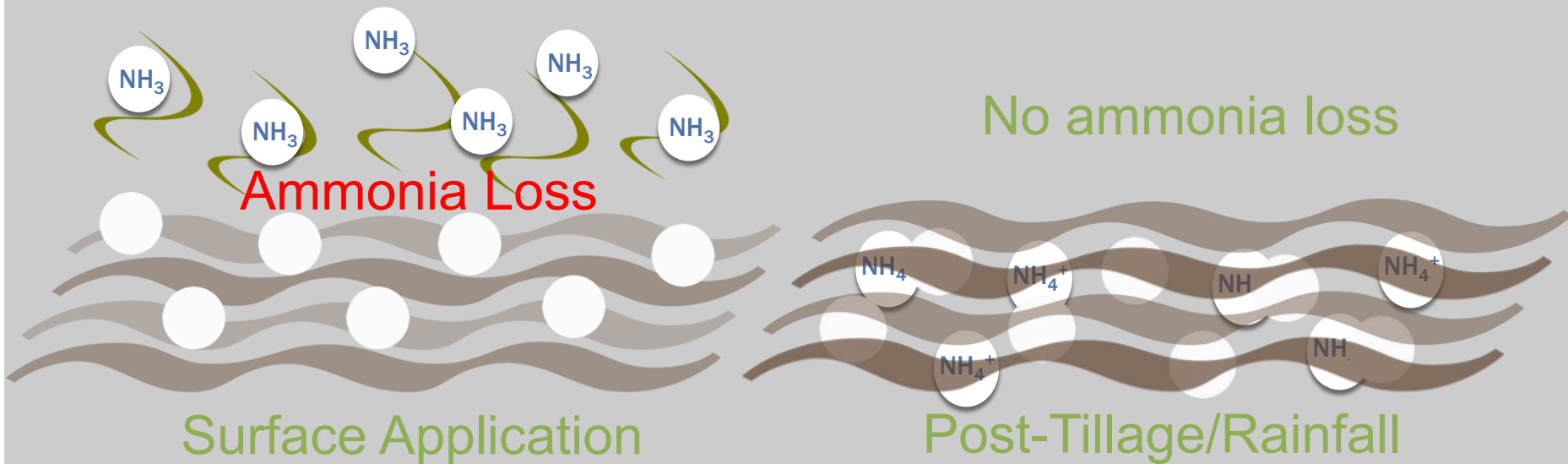
Leaching Losses



# N-STABLE: BASED ON NBPT

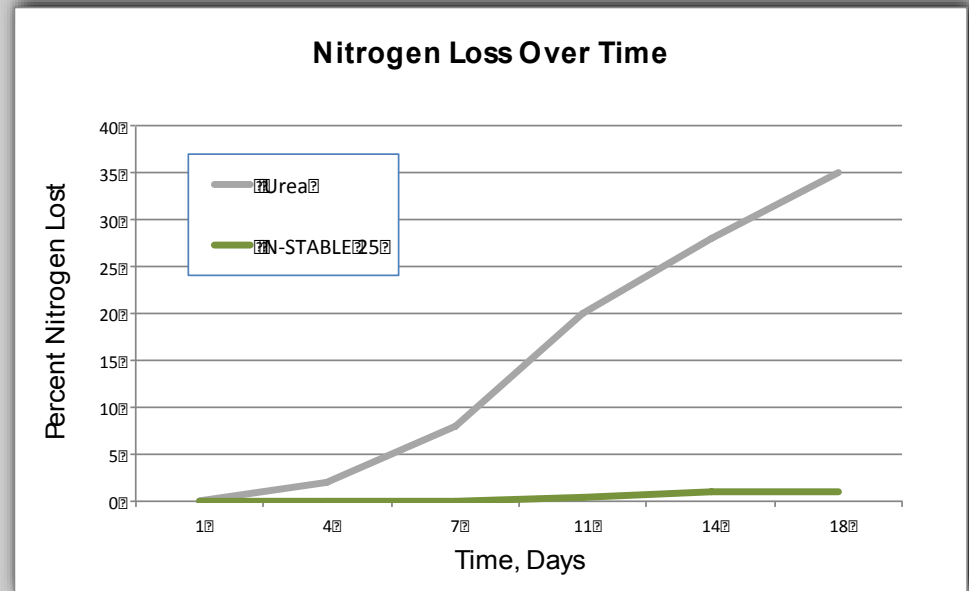
- N-STABLE contains NBPT a urease inhibitor
  - Protects against loss of nitrogen through volatilization
- Mechanism:  $(\text{NH}_2)_2\text{CO} + \text{H}_2\text{O} \rightarrow \text{CO}_2 + 2\text{NH}_3$ 

Urea Ammonia
- Urease catalyzes the breakdown of urea to ammonia

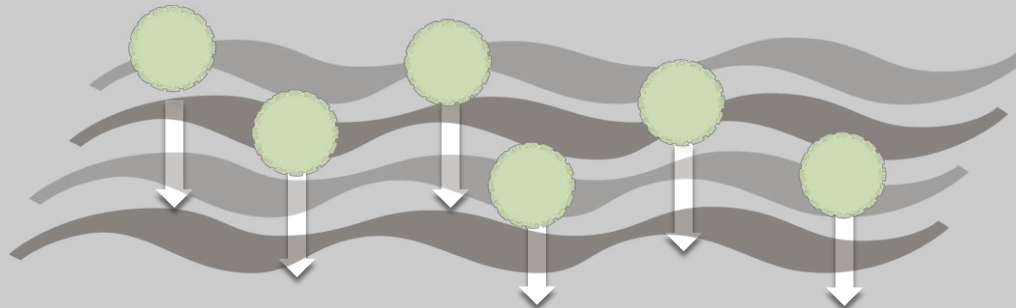


# N-STABLE : WHEN DO YOU NEED IT?

- Surface applications of urea-based fertilizer
  - Broadcast, shallow band
- Conditions that encourage volatilization and losses:
  - Wet soils
  - High pH soils
  - High soil temperatures
  - High crop residue surfaces
- Offers 2 – 3 weeks of protection



Minimal ammonia loss



# N-STABLE: HOW DO I APPLY IT

N-STABLE are liquid products that can be directly added to either Urea or UAN.  
There are two versions of N-Stable:

## N-STABLE 25

- Faster drying
- Faster Coating
- Less Inventory
- Urea: 3.1 L/Tonne
- UAN: 1.6 L/Tonne

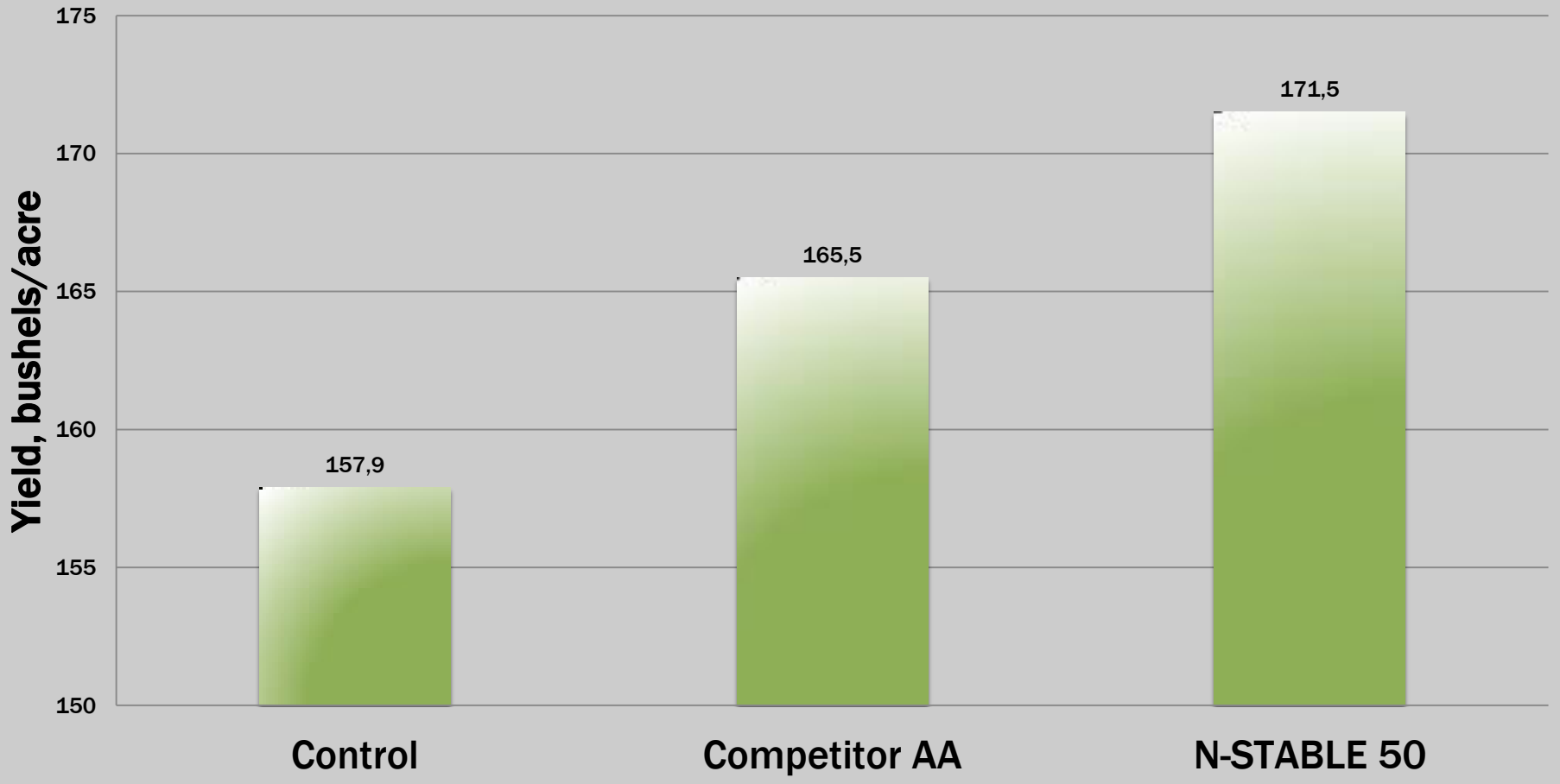


## N-STABLE 50

- 2X Concentration
- Faster drying
- Faster Coating
- Less Inventory
- Urea: 1.6 L/Tonne
- UAN: 0.8 L/Tonne

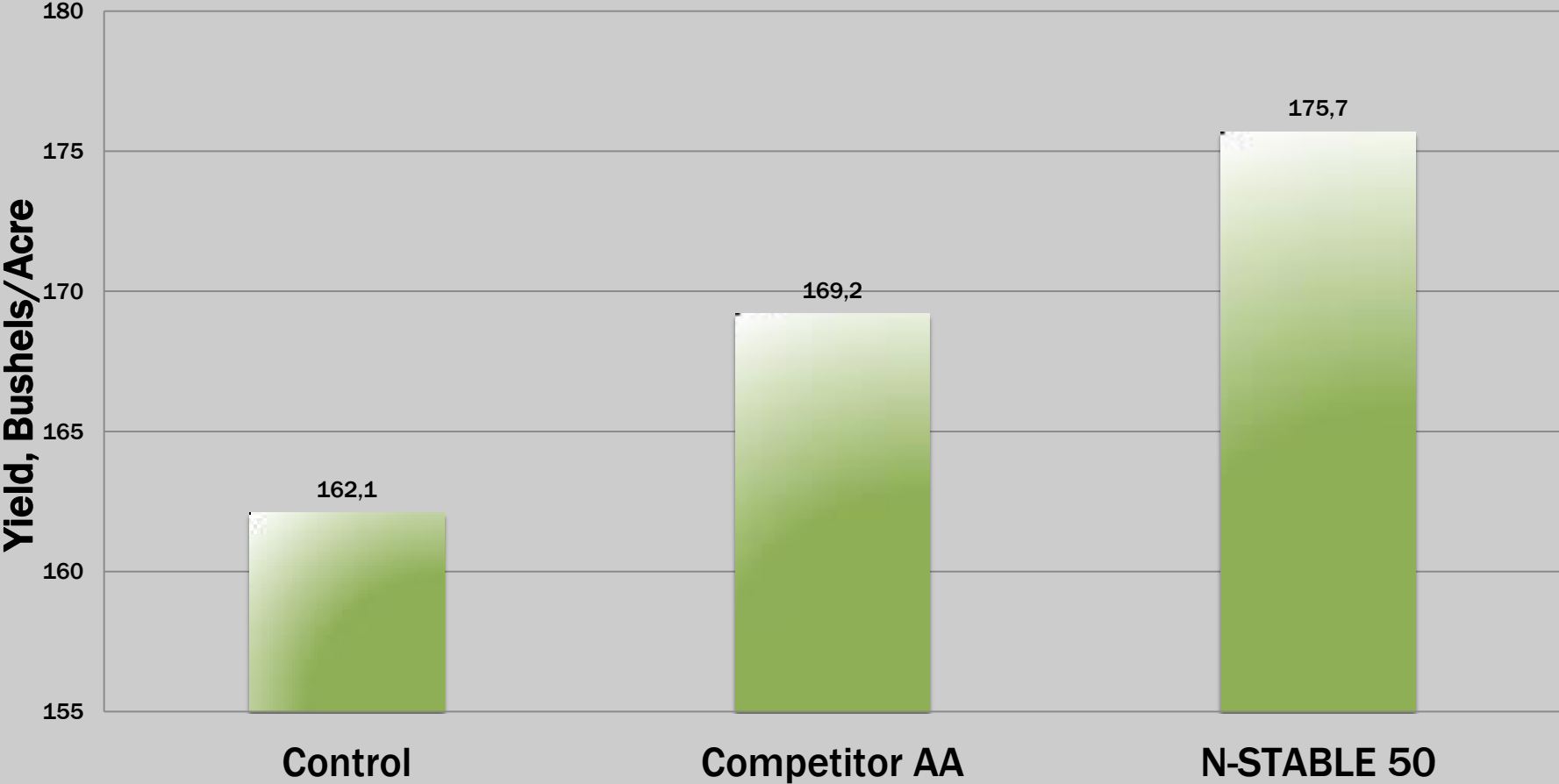
# N-STABLE 50

**UAN Corn Trials**  
Avg of Six Trials: OH, IN, NE, KS, IL, ND



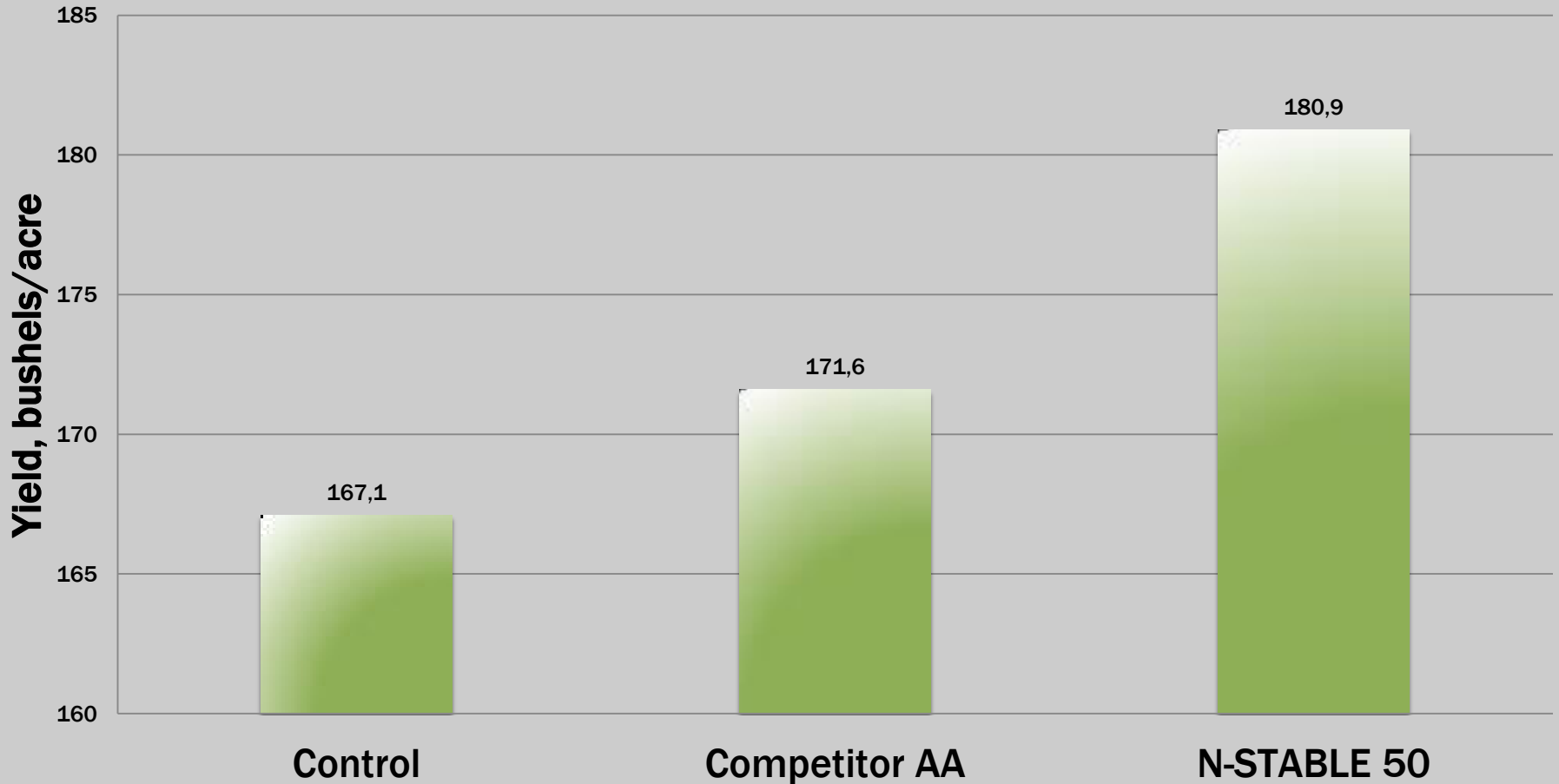
# N-STABLE 50

**Urea Corn Trials**  
Avg of Six Trials: OH, IN, NE, KS, IL, ND



# N-STABLE 50

**Urea Corn Trials**  
Avg of Five Trials: OH, IN, NE, KS, ND



# N-STABLE

For Above Ground Losses

NBPT

# RESERVOIR

For Below Ground Losses

works here

Leaching Losses



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# RESERVOIR

- Based on Nitrification Inhibitor: DCD (Dicyandiamide)

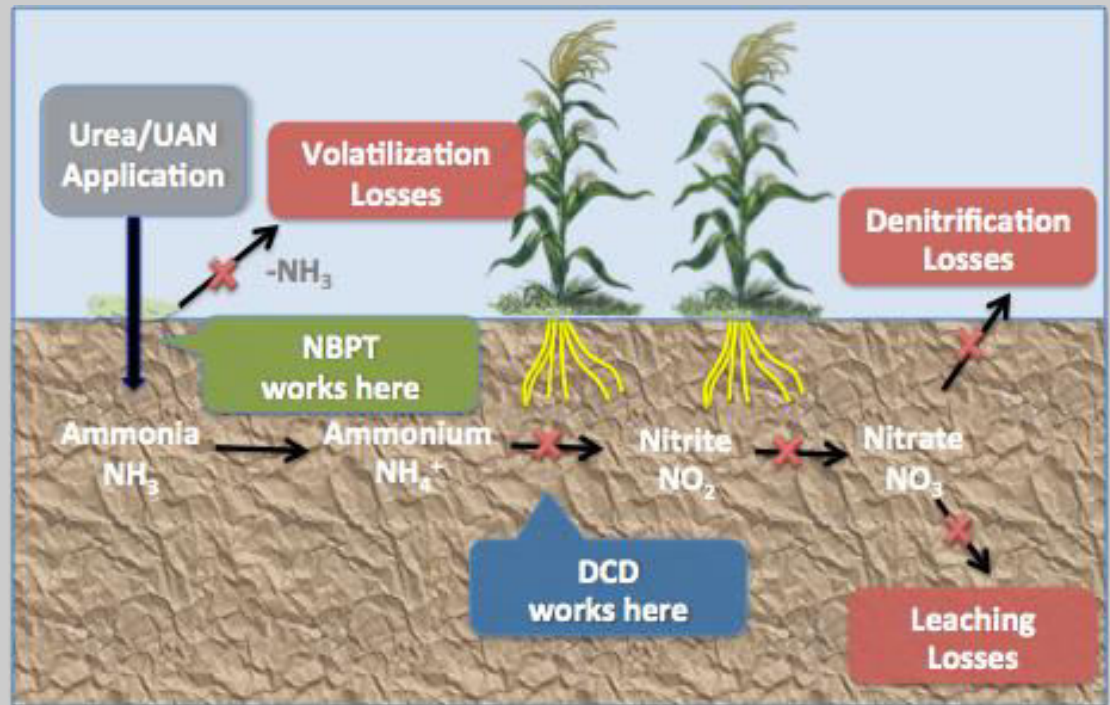
- Nitrification inhibitor: *Nitrosomonas*

- Mechanism:  $2\text{NH}_4^+ + 3\text{O}_2 \rightarrow 2\text{NO}_2^- + 2\text{H}_2\text{O} + 4\text{H}^+$   
Ammonia Nitrite

- Keeps nitrogen in its ammonium form (still available to plant)

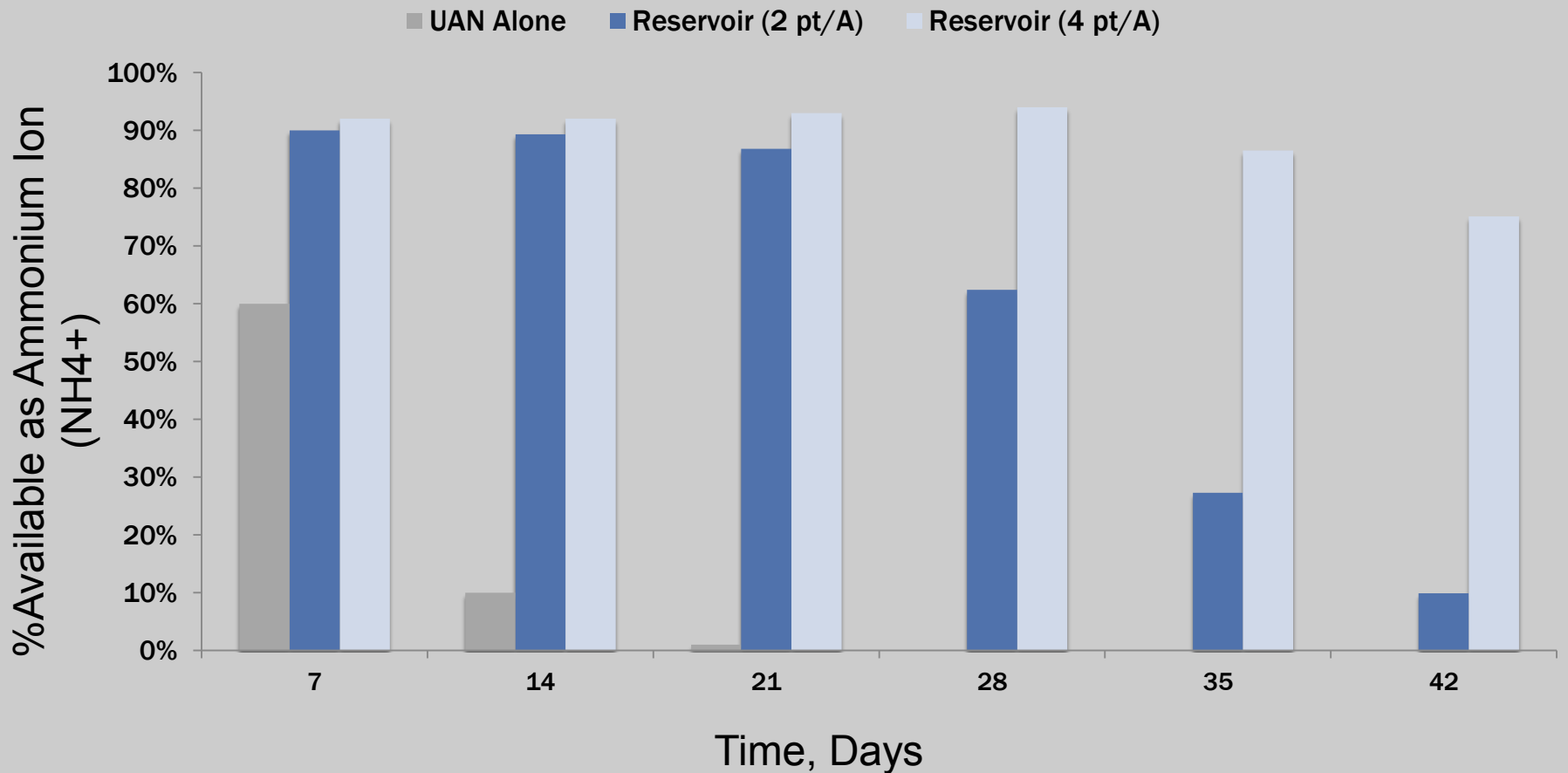
- Once in Nitrate form:

- Conversion to  $\text{N}_2\text{O}/\text{N}_2$ 
  - Greenhouse gases
- Leaching
  - Groundwater contamination



# RESERVOIR : SLOWS CONVERSION OF AMMONIUM TO NITRATE

## Available Ammonium Over Time in Reservoir-Treated UAN



\* Lab Incubation Study

# RESERVOIR: WHEN DO YOU NEED IT?

- Recommended for all urea or UAN applications where denitrification and leaching is likely
- Highly recommended for:
  - Warmer soil temperatures
  - Porous soils
  - Soils with high organic matter
  - High moisture, waterlogged soils
- **Required** with nitrogen application in certain geographies

# RESERVOIR: HOW DO I APPLY IT?

- Reservoir:

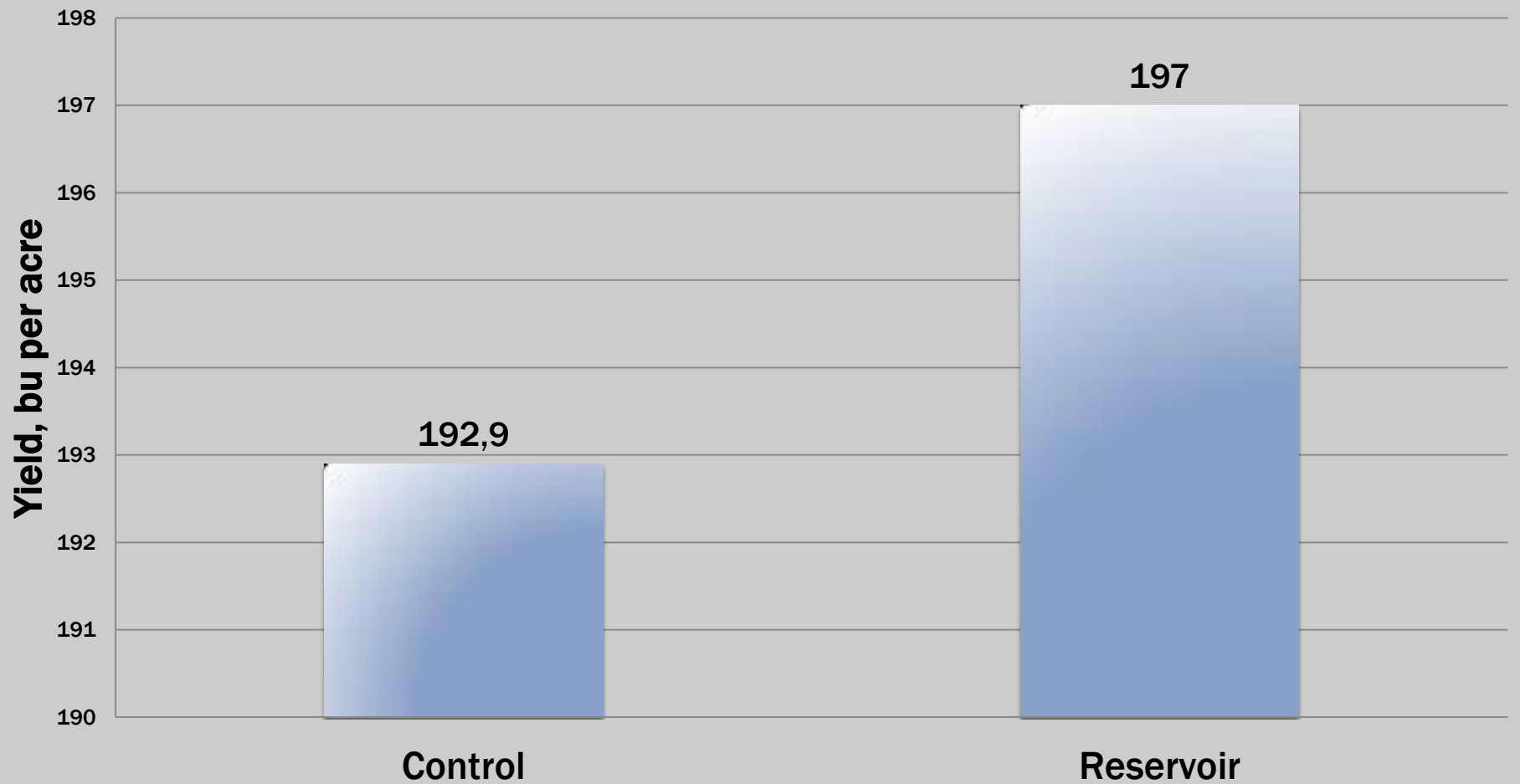
- Liquid
- Solubilized DCD
- Improved handling over powdered DCD
  - DCD crystals: low solubility in water, slow dissolution rates in UAN

- Urea and UAN

- Can be applied to both
- 2.1 – 8.3 liters/tonne

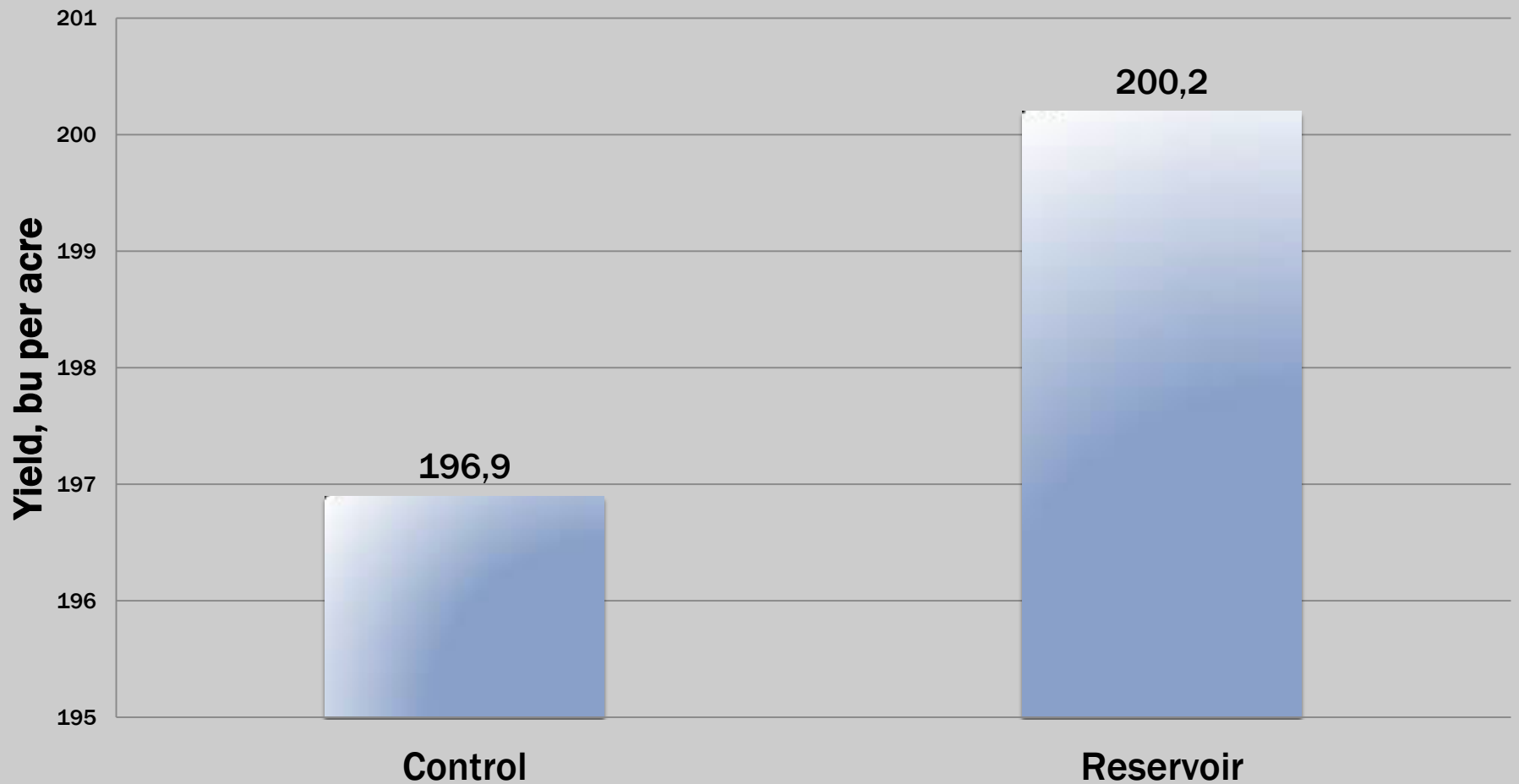
# RESERVOIR

**Average of 49 UAN and Urea Corn Trials**



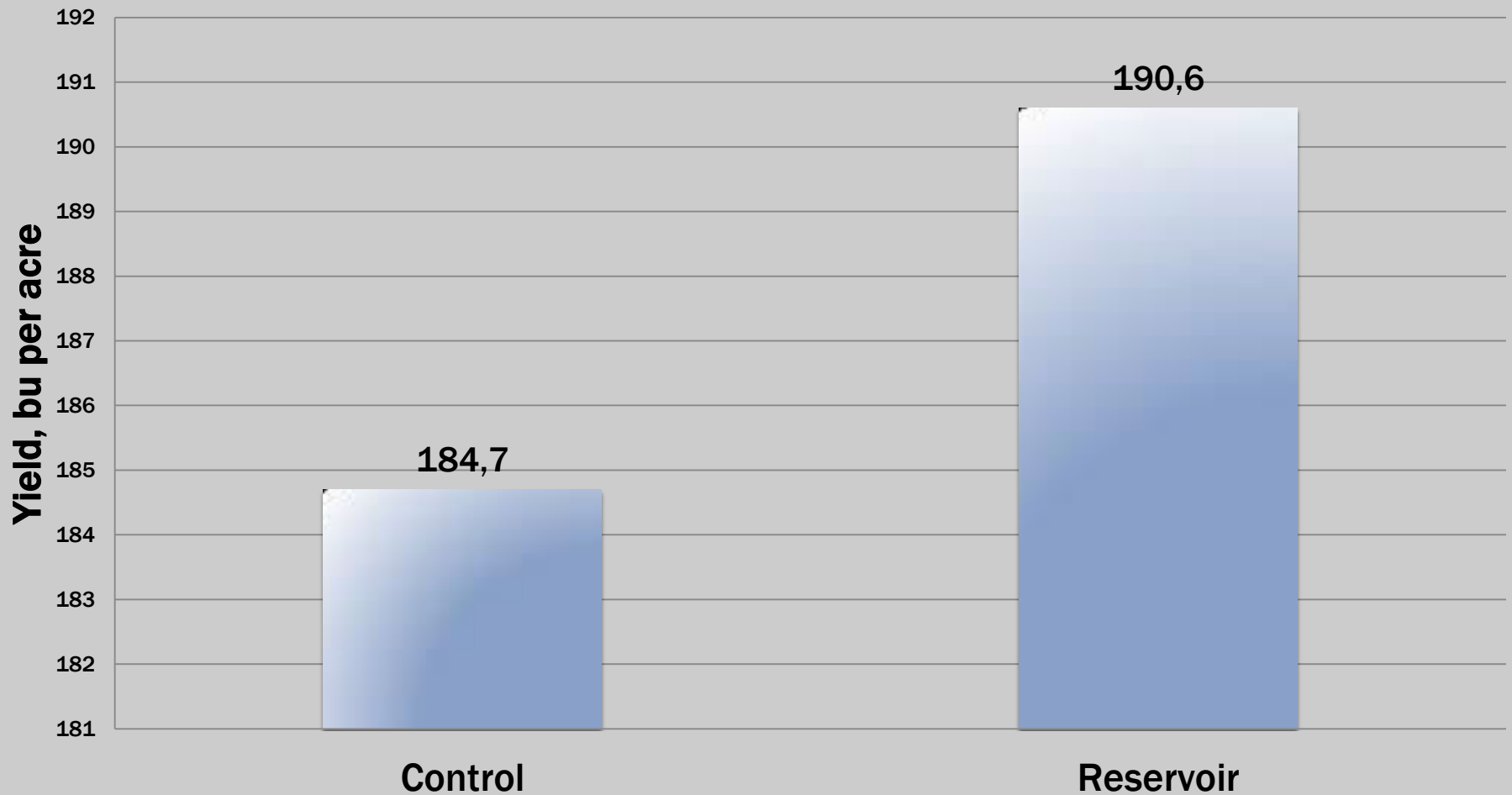
# RESERVOIR

**Average of 33 UAN Corn Trials**



# RESERVOIR

Average of 16 Urea Corn Trials



# COST BENEFIT

## ■ N-STABLE-50 (MAXIMUM USE RATE)

- UREA: \$500/TONNE
- ASSUMING MODERATE 30% LOSS: → \$150
  - Cost of treating: \$96/TONNE . Potential Savings ~ \$50/Tonne

## ■ RESERVOIR

- UAN: \$300/Tonne
- Assuming 30% loss → \$90 loss
- At use rate of 3 L/Tonne: \$63/Tonne. Potential Savings ~\$40/Tonne
- ***Does not include \$\$\$ gained due to Yield Increase; could be anywhere \$15 – 50 per acre!!***



# USE BOTH N-STABLE AND RESERVOIR?

- Customize your blend to maximize protection to local conditions!!
- Target both Above Ground and Below Ground losses at the same time.
- Example:
  - Urea
    - 1.0 L of N-Stable + 3 L of Reservoir
  - UAN
    - 0.5 L of N-Stable 50 + 3 L of Reservoir

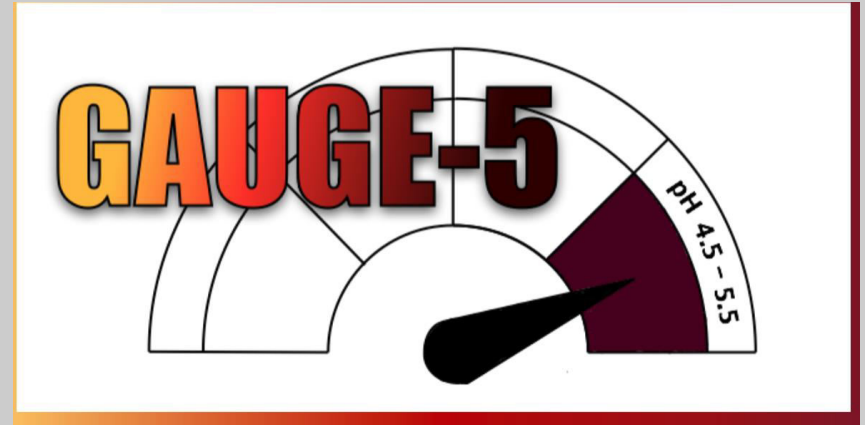
# WATER CONDITIONERS

- WHY NEED WATER CONDITIONING?
- Many herbicides work best at:
  - hardness of less than 50 ppm;
    - Calcium and Magnesium ions can deactivate some herbicide
    - lower pH.
- Most waters have hardness between 100-600 ppm and pH ~7
- Result: Poor efficacy of Herbicide!!
- Solution: Water Conditioners

# GAUGE 5

## ■ Benefits:

- Reduces pH to 4.5
- When pH is reached Changes Color
- Contains Phos esters that act as water conditioner as well as good Compatabilizer
- Broad Application:
  - Various Herbicides, fertilizers compatible
  - Use Rate: 400-600 mL/250 Liters for very Hard Water



# pHitness

- Can lower pH more than 4.5
- Contains Urea-Sulfuric Acid
- Sulfur helps precipitate Gypsum as well
- For Use with Glyphosate Only!!
- Use Rate: ~ 0.5L/400L