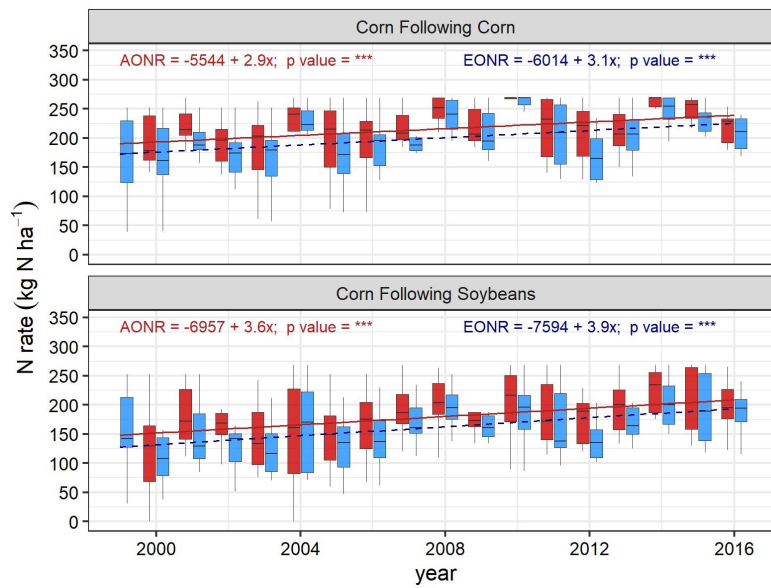


1

Optimum N Rates are Variable and Changing

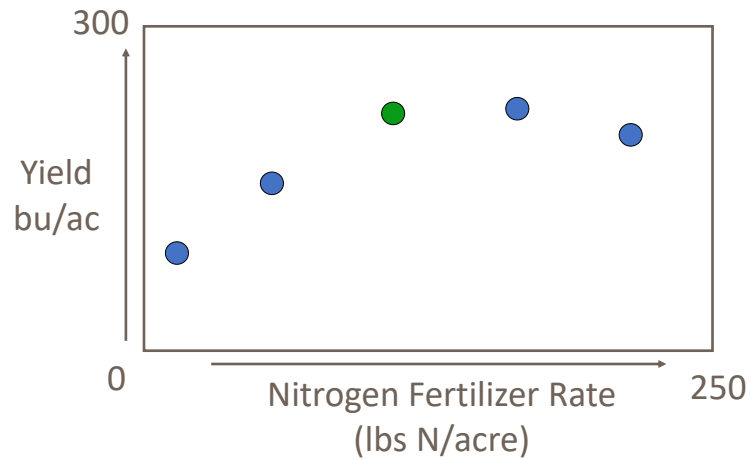


Mitch Baum, ISU

2

Nitrogen Fertilizer Management

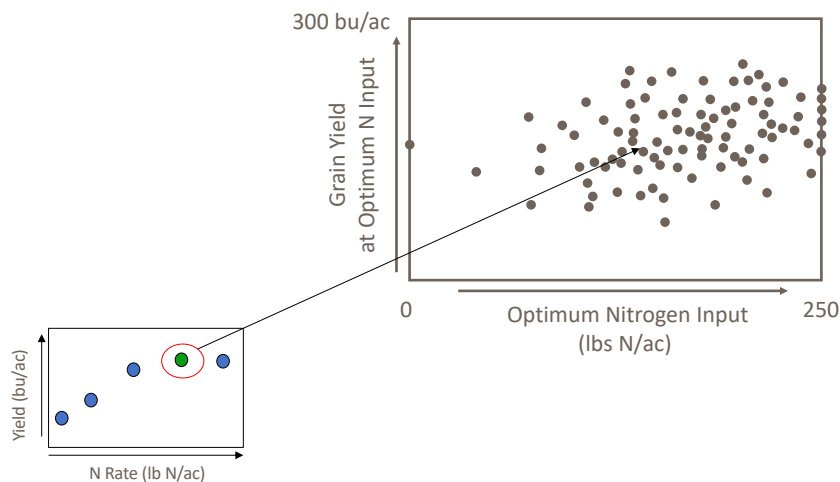
Crop yield generally increases with nitrogen fertilizer input



3

So what's the optimum nitrogen fertilizer rate:

Trials: ~10 years across ~15 sites in central Iowa

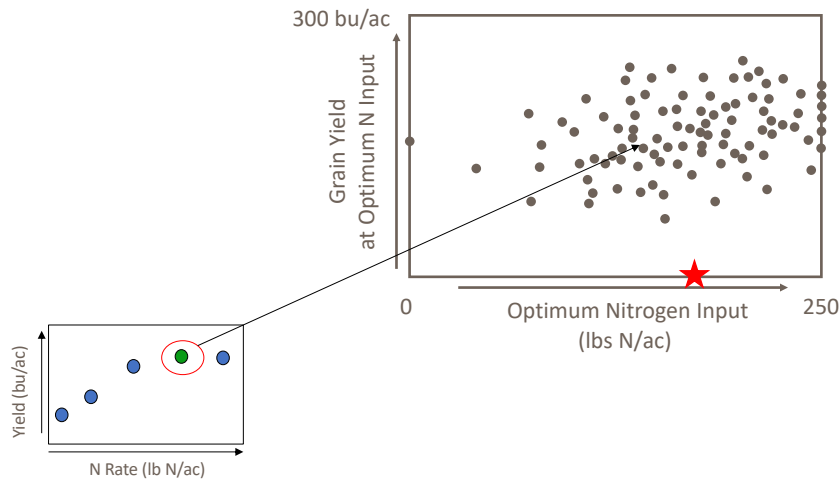


"Corn Nitrogen Rate Calculator"
<http://cnrc.agron.iastate.edu/>

4

Yet this is our best recommendation:

Trials: ~10 years across ~15 sites in central Iowa

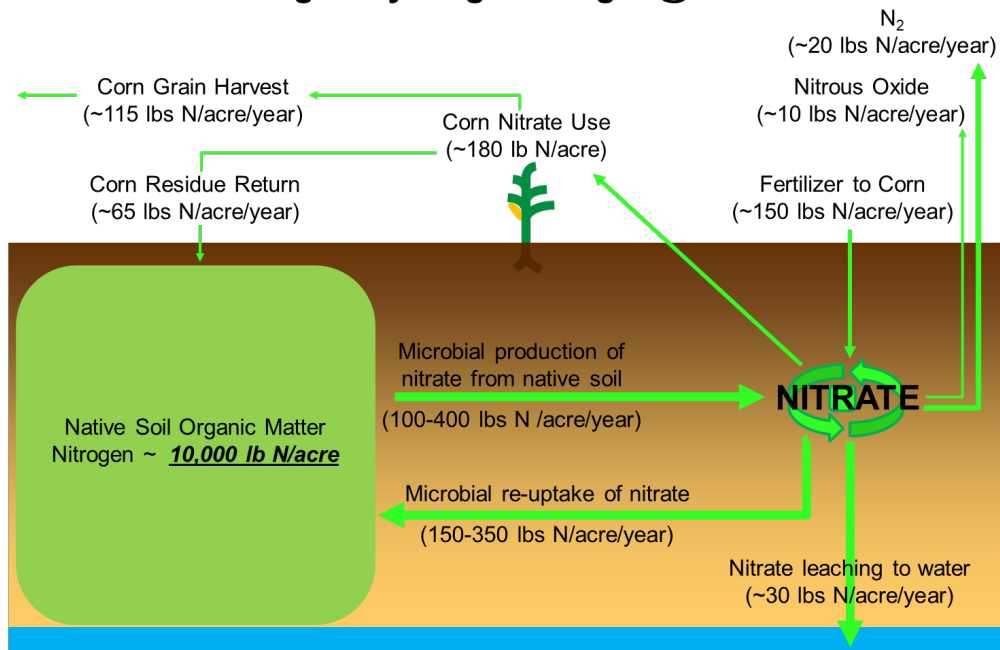


"Corn Nitrogen Rate Calculator"
<http://cnrc.agron.iastate.edu/>

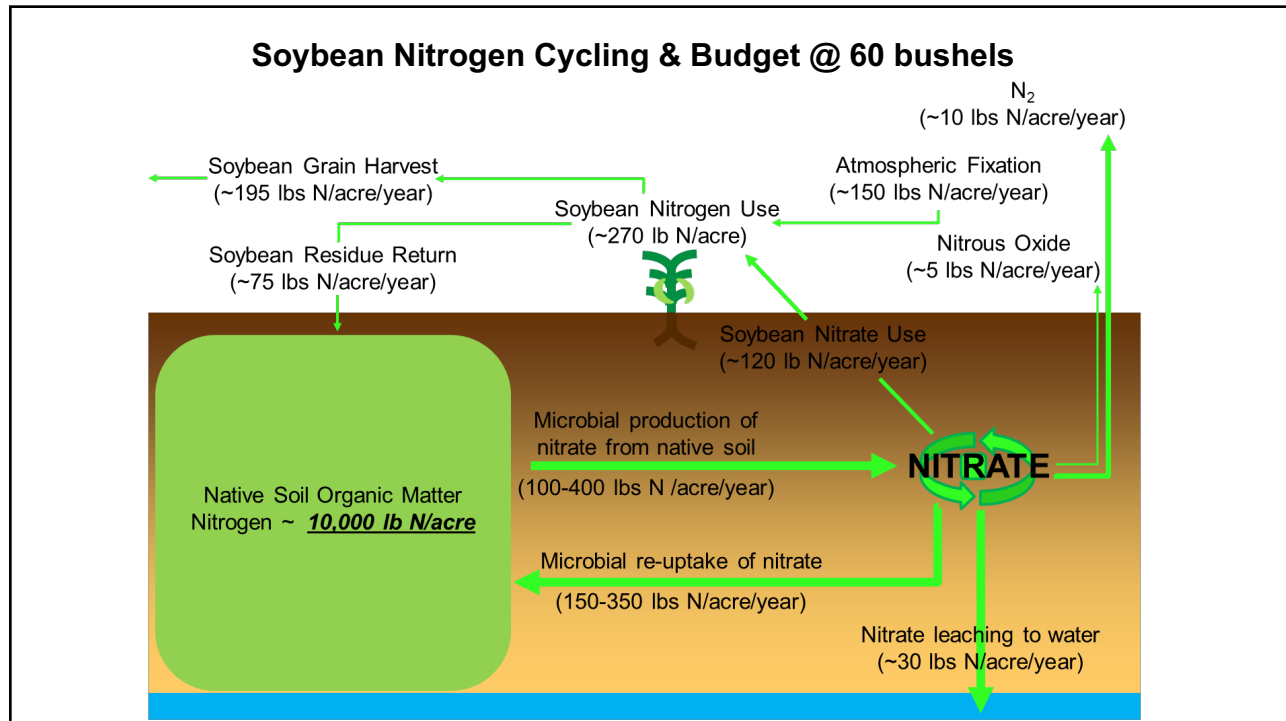


5

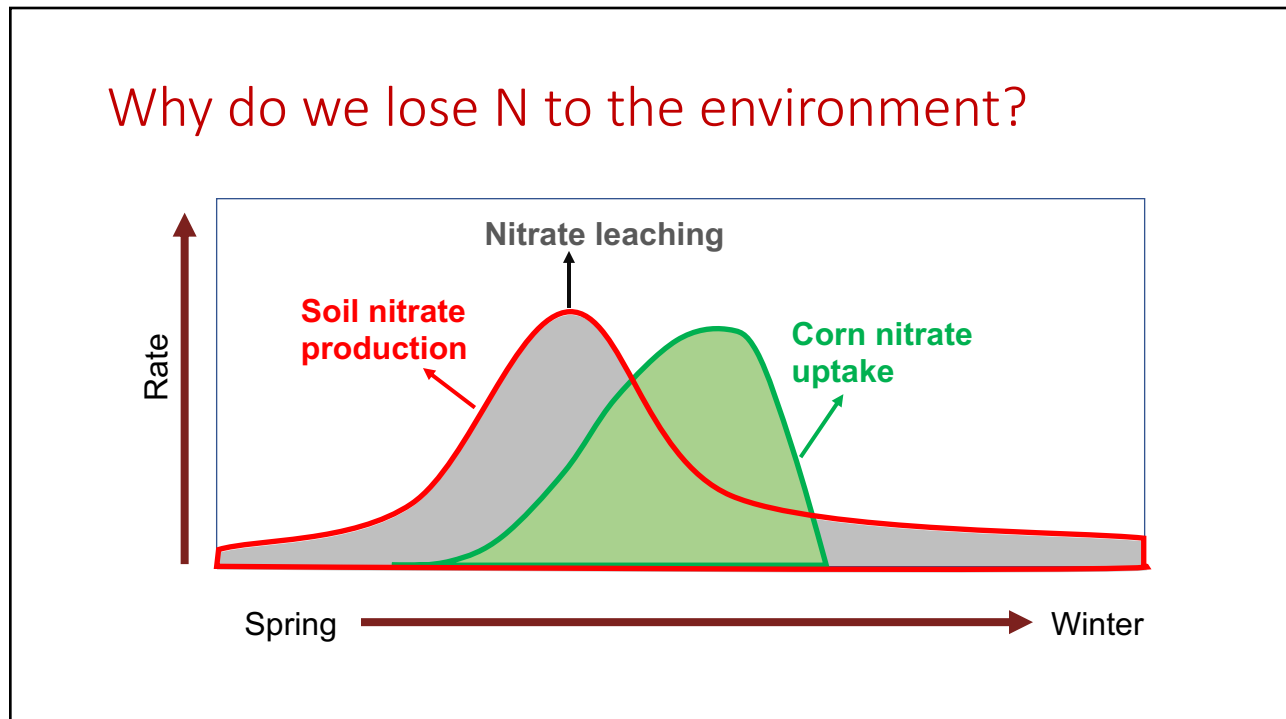
Corn Nitrogen Cycling & Budget @ 200 bushels



6



7

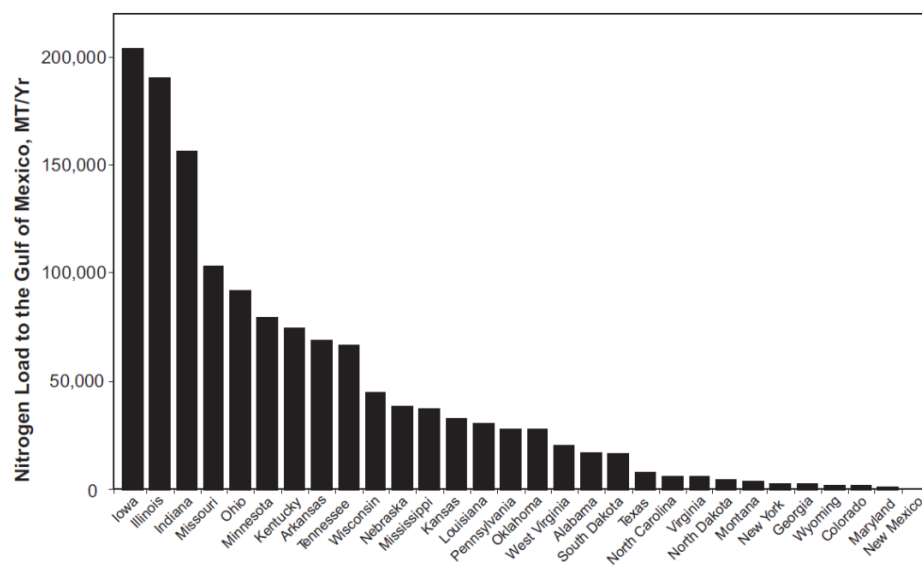


8

What are the consequences?
(why do we need to improve)

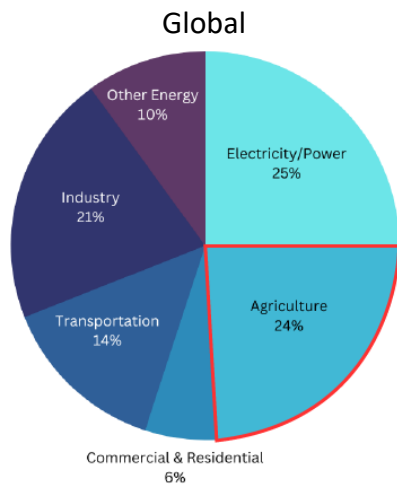
9

Nitrate loading to the Gulf by state:



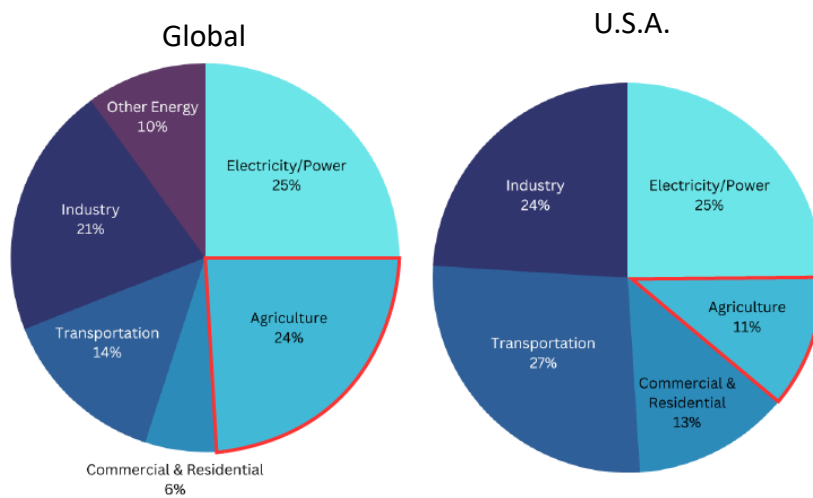
10

Greenhouse Gas Emissions by Sector:



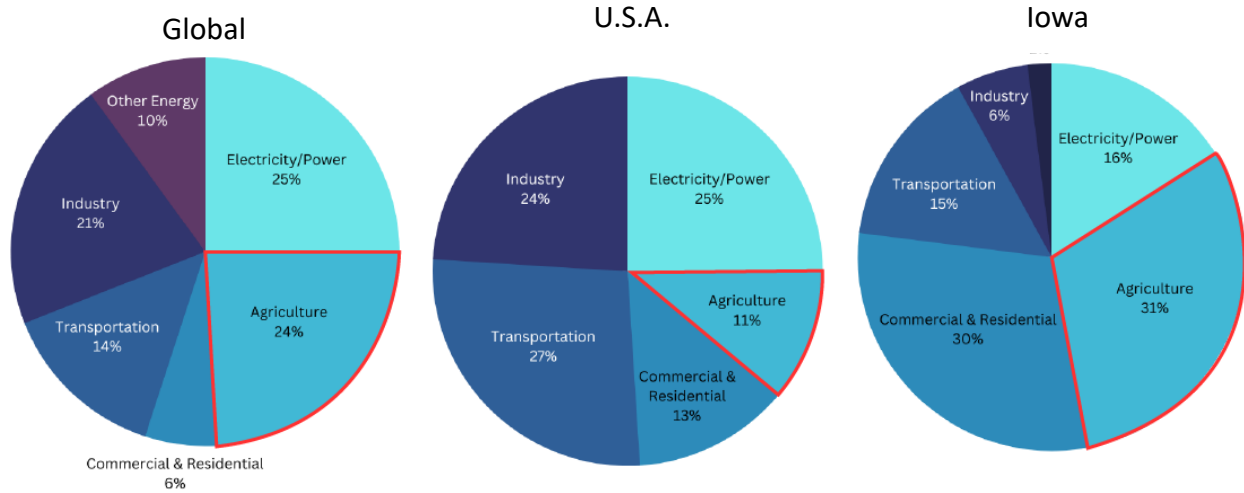
11

Greenhouse Gas Emissions by Sector:



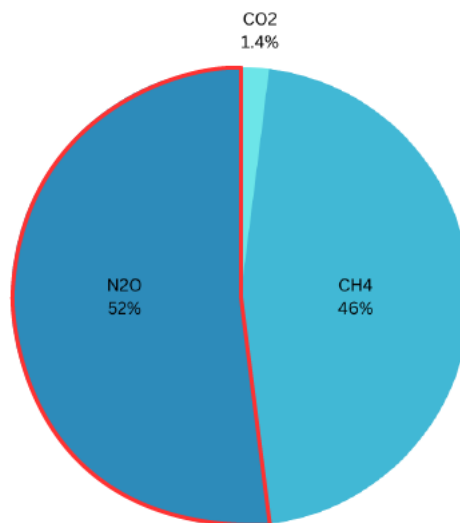
12

Greenhouse Gas Emissions by Sector:

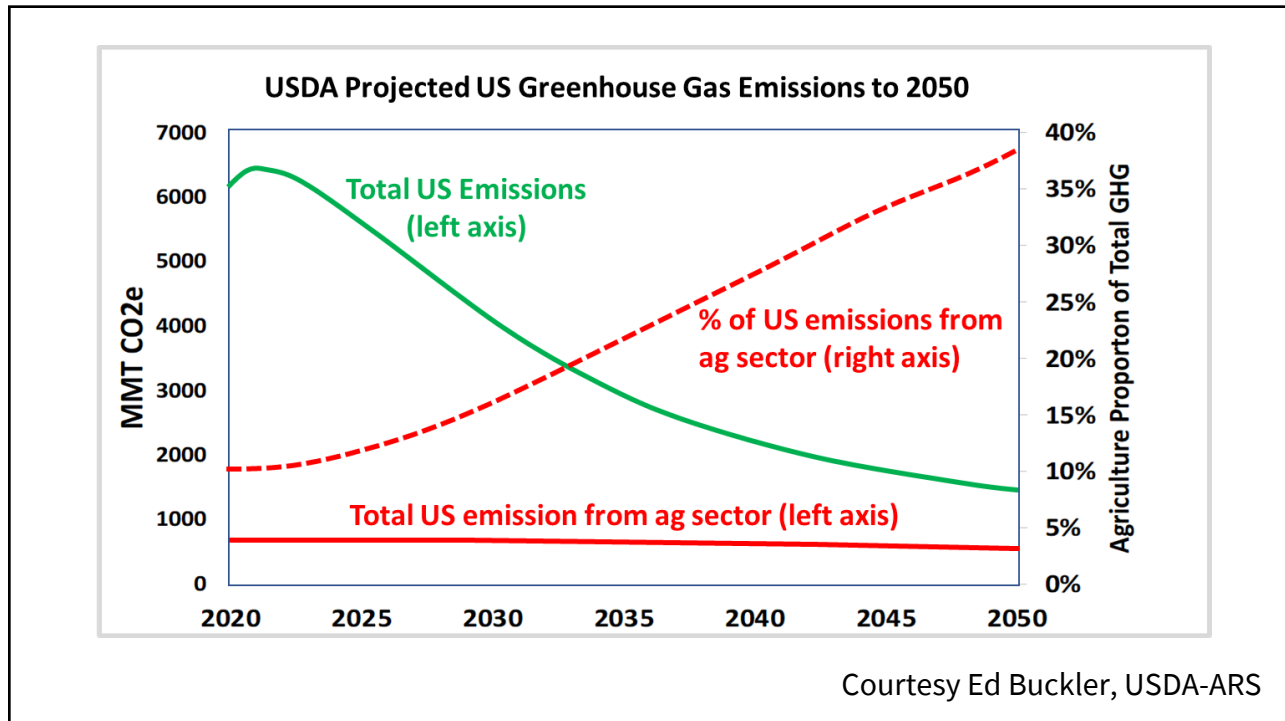


13

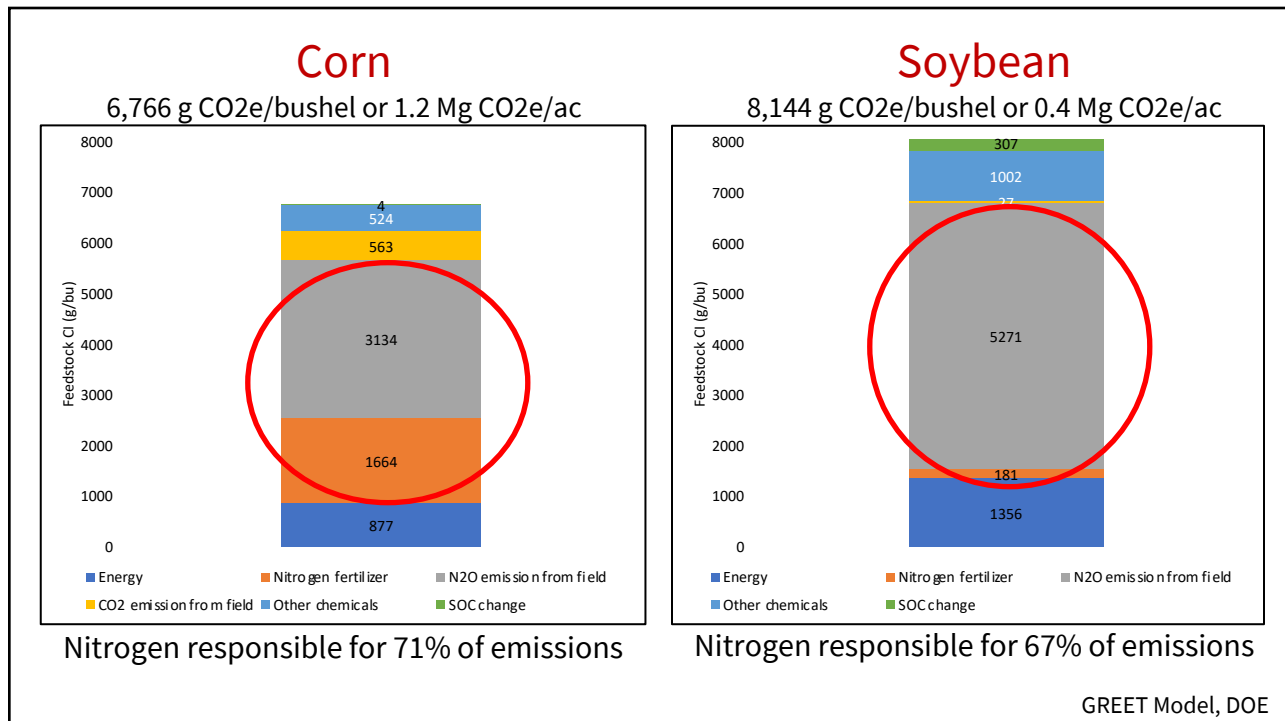
Sources of US agricultural emissions:



14

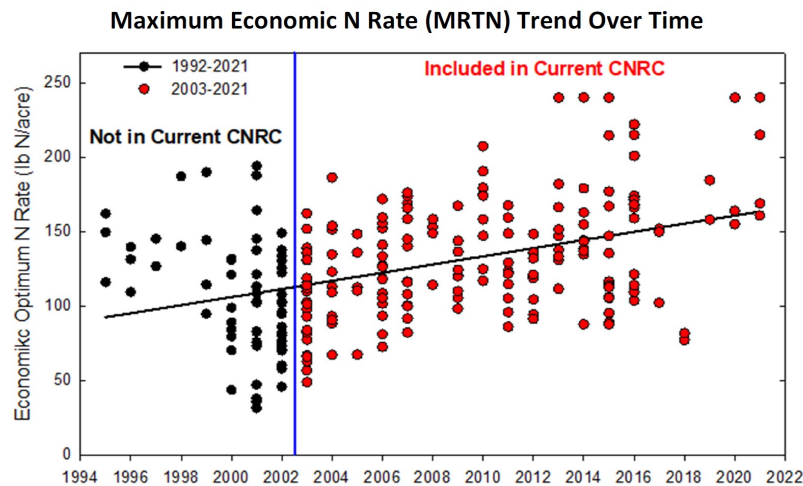


15



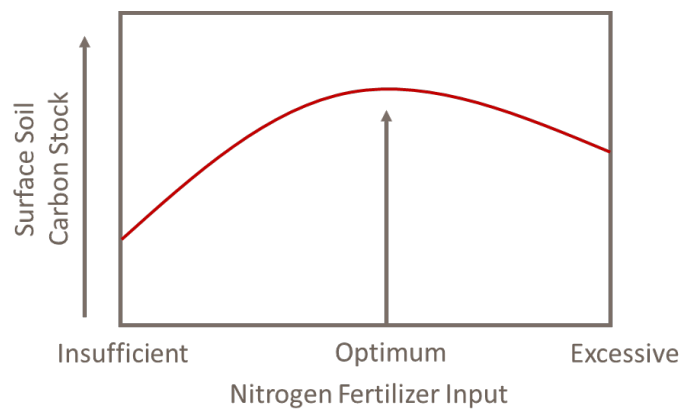
16

The optimum N rate is variable and changing:



17

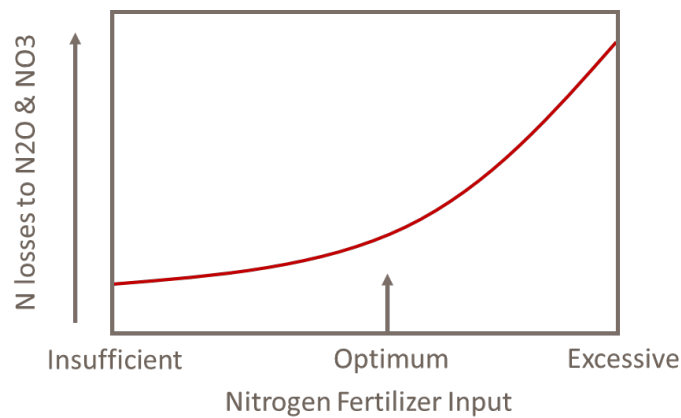
Getting the optimum right is important for productivity, profitability, and environmental performance (including soil health)



Poffenbarger et al. 2017 PLOS ONE
Ordóñez et al. 2020 Field Crops Res.
Mahal et al. 2019 Front Ecol & Evol

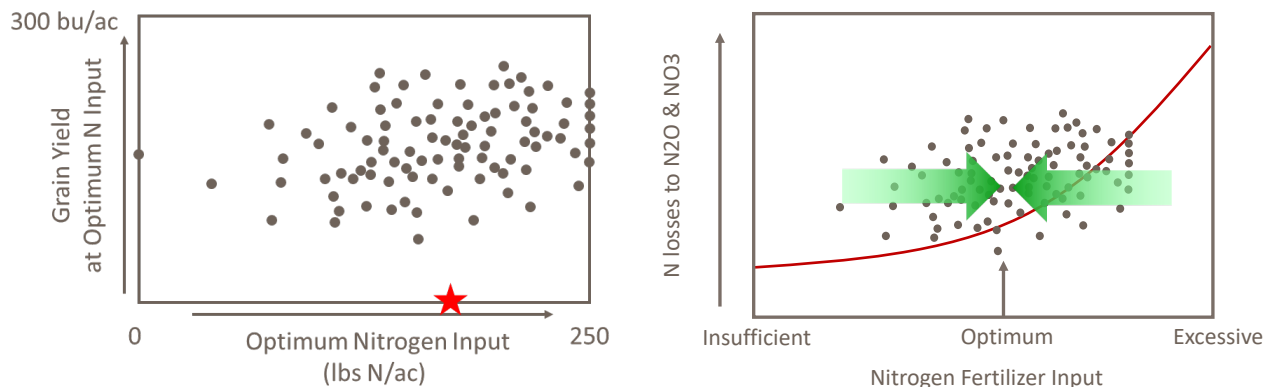
18

Getting the optimum right is important for productivity, profitability, and environmental performance (including soil health)



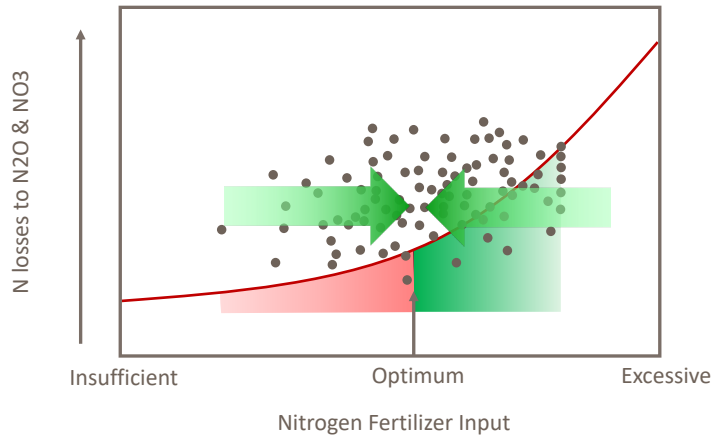
19

Improved Nitrogen Fertilizer Management: Environmental Benefits



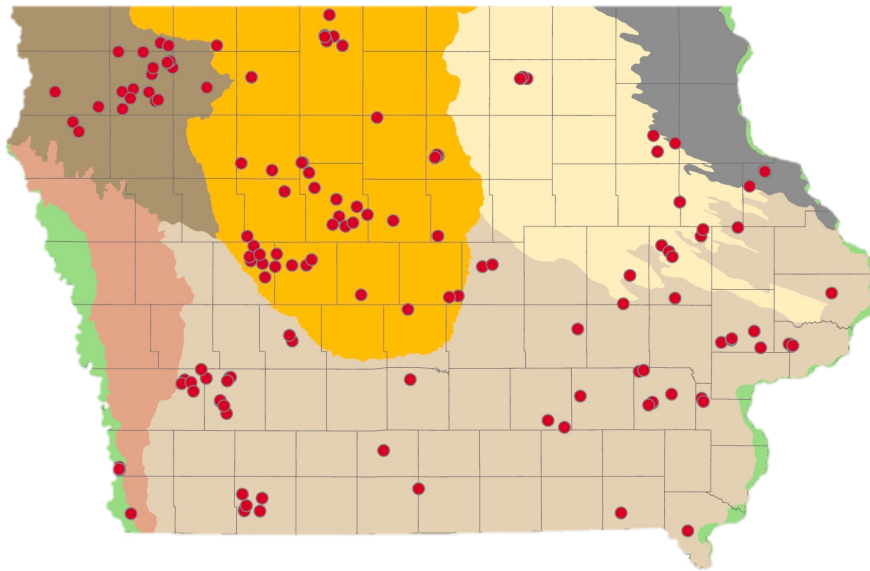
20

Managing for the optimum vs. the average:



21

The Iowa N Initiative

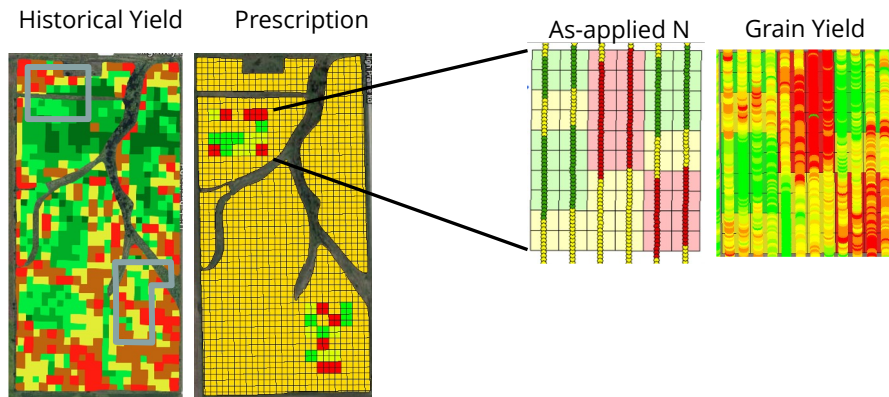


Crop Year 2023:

270 On-farm trials
148 fields
72 growers

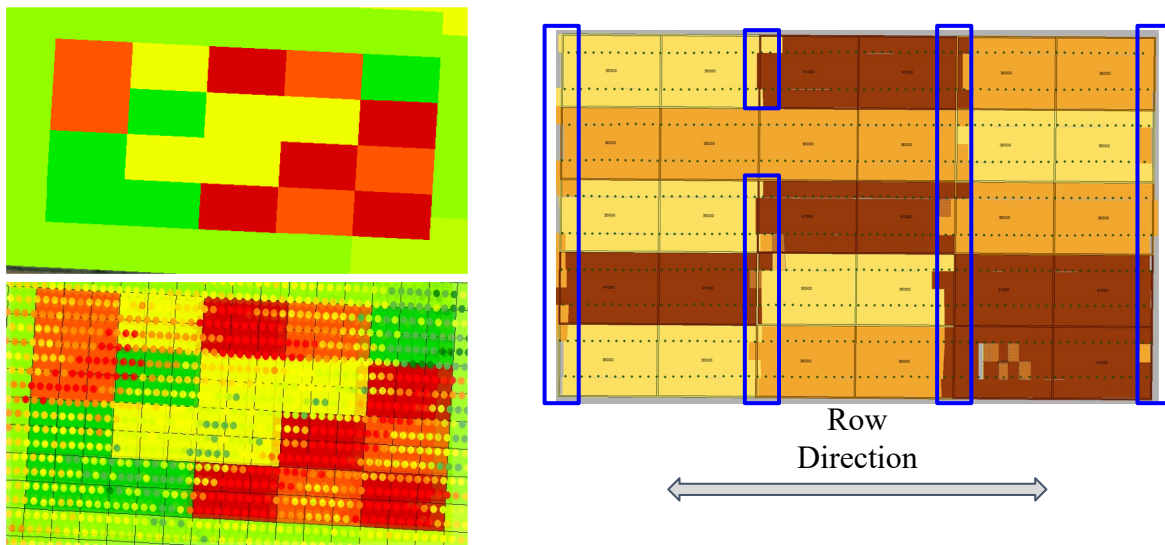
22

On-Farm Technology to Create Knowledge



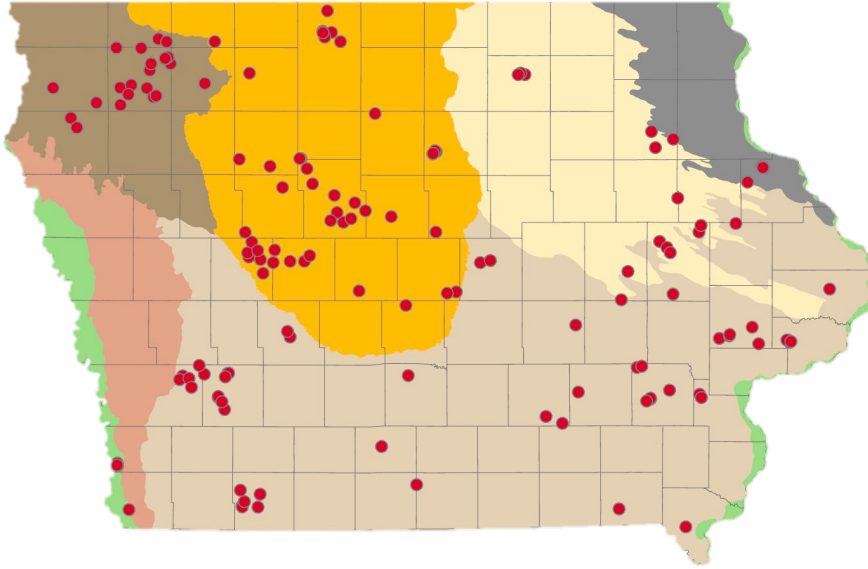
23

Quality Control



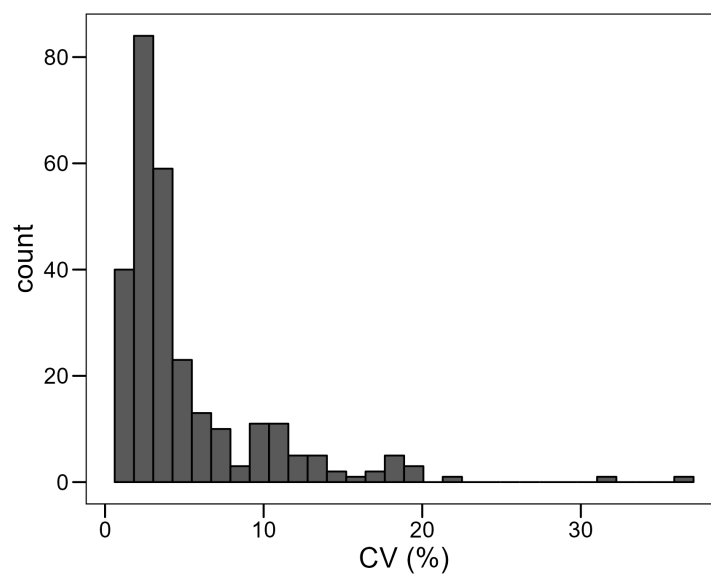
24

2023 Results: 90/270 trials are in

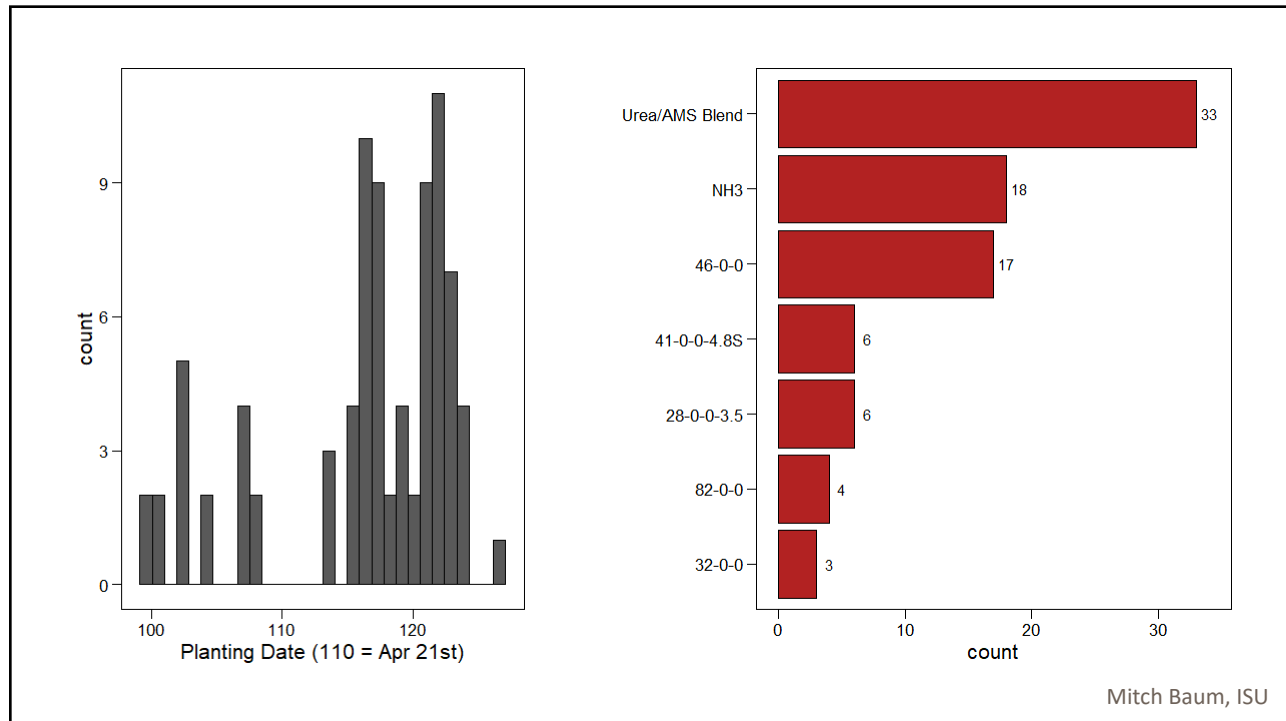


25

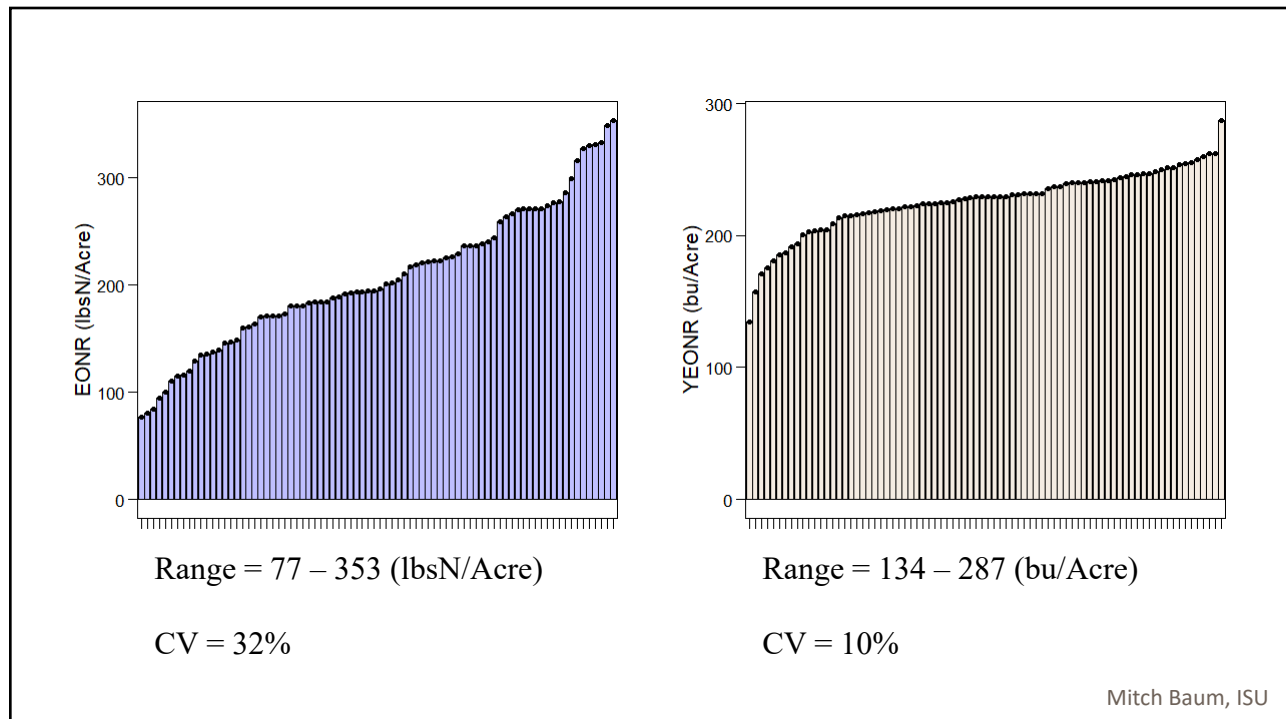
Quality Control



26

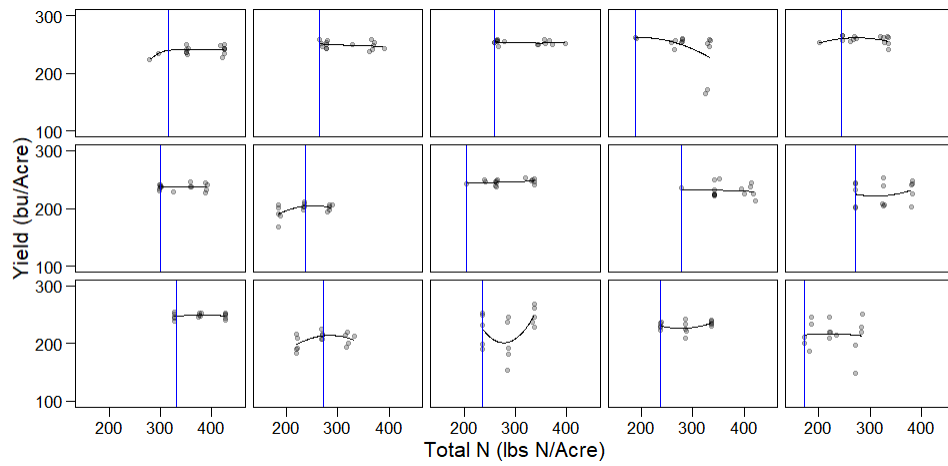


27



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Same producer (Multiple fields)

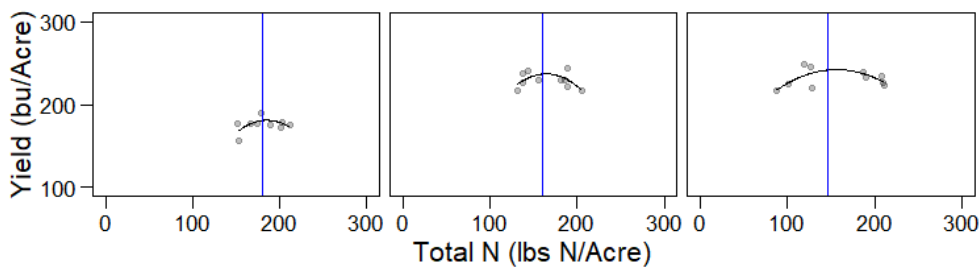


EONR
171 – 331 (lbsN/Acre)
CV = 18%

YEONR
204 – 262 (bu/Acre)
CV = 7%

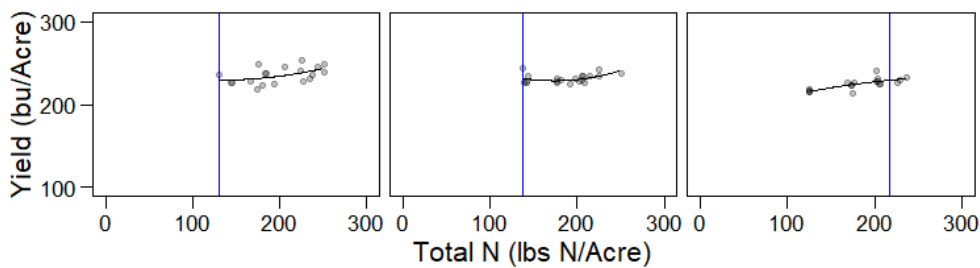
29

Field 1 Northeast Iowa



EONR
147 - 180
YEONR
181 – 242

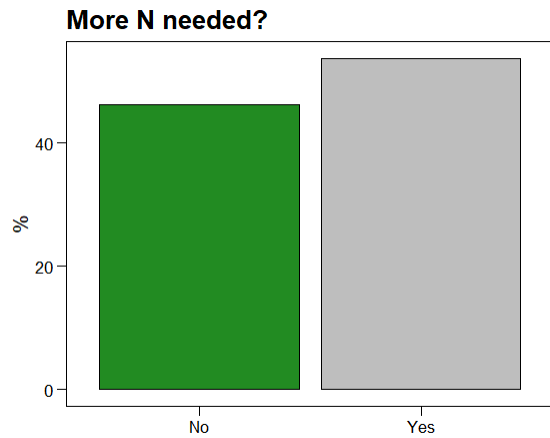
Field 2 Eastern Iowa



EONR
129 - 217
YEONR
229 – 232

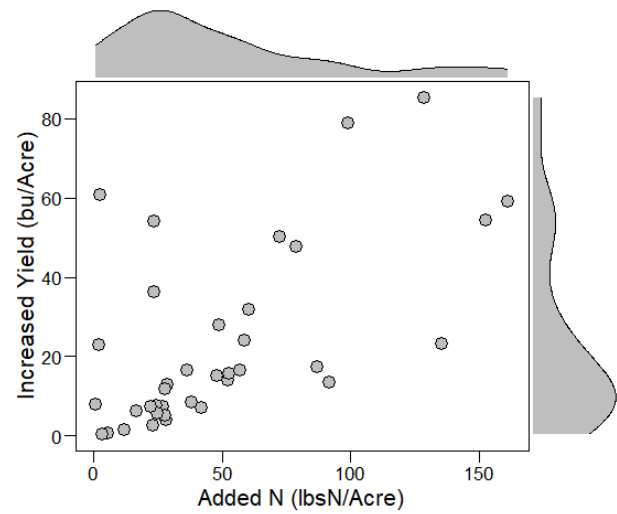
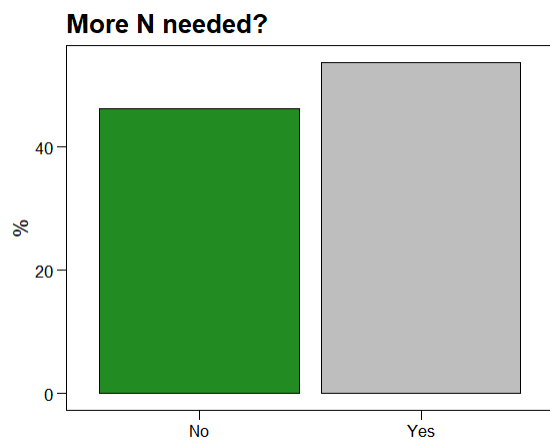
30

Does Sidedress Pay?



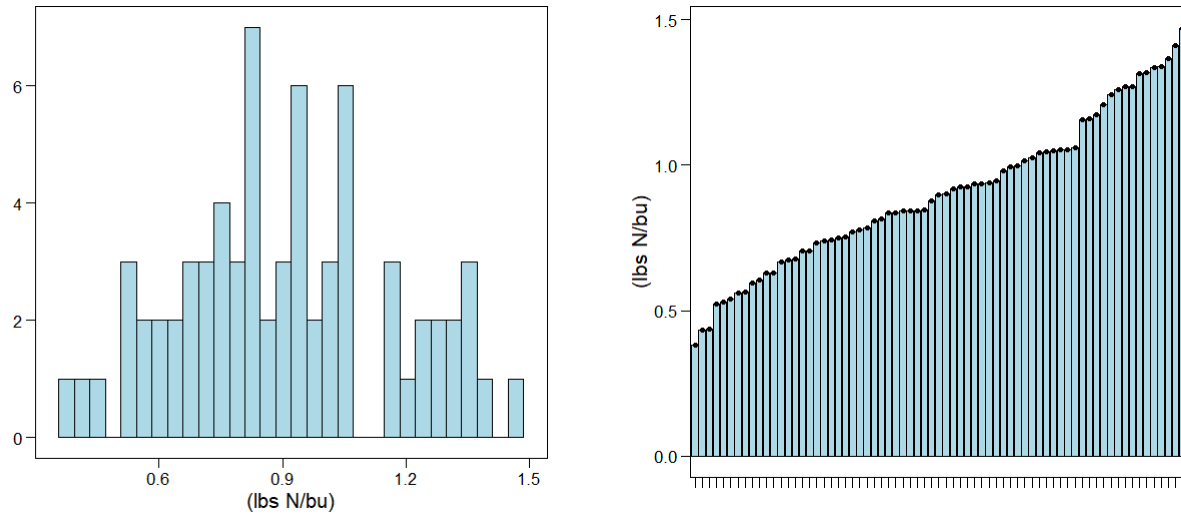
31

Does Sidedress Pay?



32

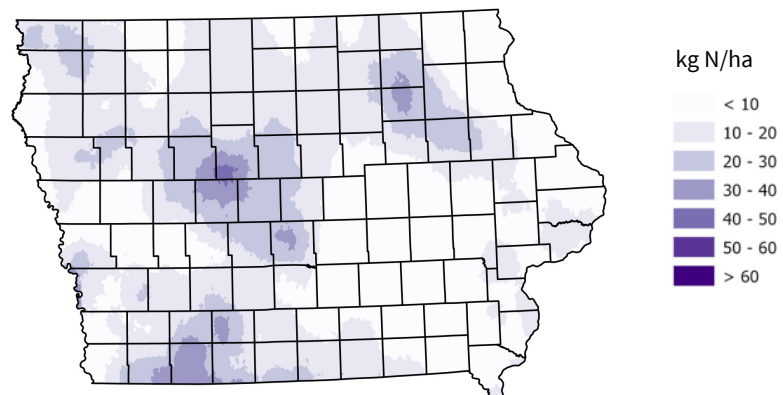
Nitrogen use efficiency (lbs N/bushel) at the economic optimum nitrogen rate:



33

Residual Nitrate Map

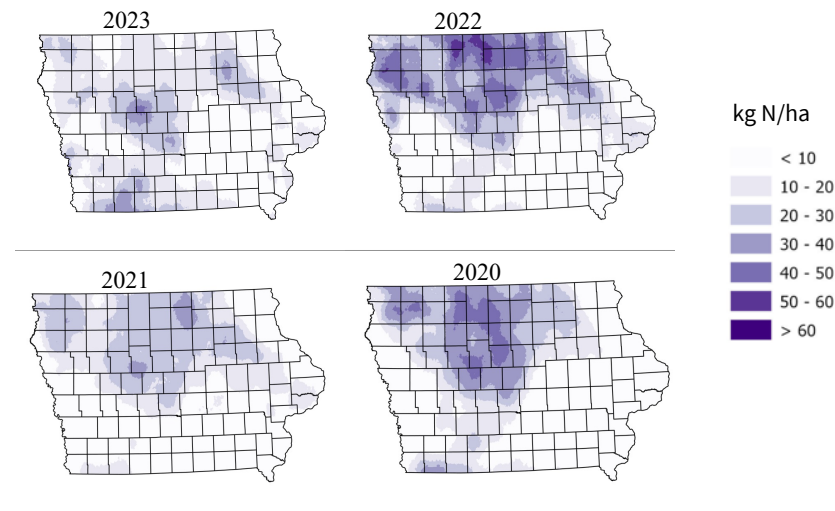
Simulated average soil nitrate in 0-30 cm from **Nov 7** to 21, 2023



Sotirios Archontoulis, ISU

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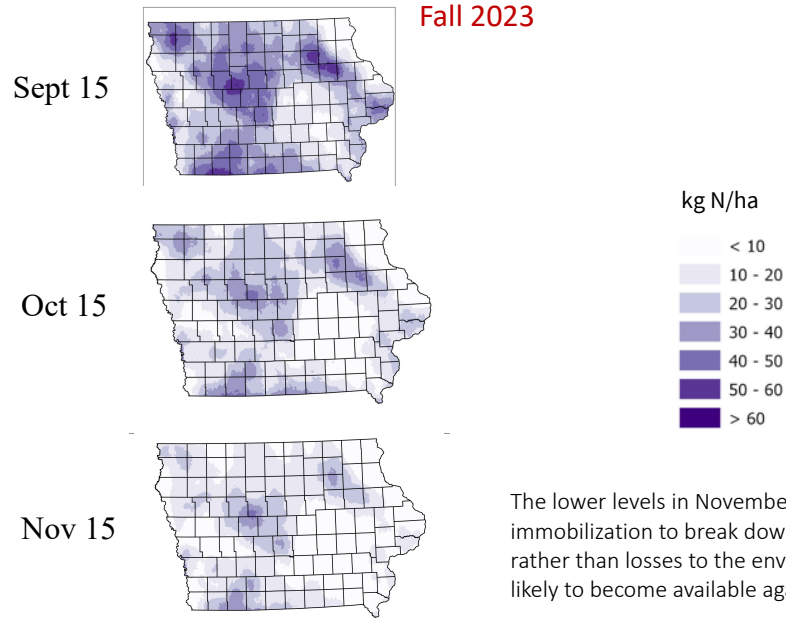
Simulated average soil nitrate in 0-30 cm from **Nov 7 to 21**



Sotirios Archontoulis, ISU

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Fall 2023



The lower levels in November are most likely due to N immobilization to break down residue (decomposition) rather than losses to the environment. Hence, this N is likely to become available again in the future.

Sotirios Archontoulis, ISU

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Additional Research Foci for 2024

Hoping for a different weather year!

- Planting date and tillage comparisons (ISU research farms)
- Corn-soy rotation with winter rye
- Autonomous N application
- Residue removal



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Decision Support Tool Development



Task	Y1Q1	Y1Q2	Y1Q3	Y1Q4	Y2Q1	Y2Q2
Design sprint						
PRD Development						
Customer discovery						
Build research database						
Development environment ready						
App dev, design, engineering						
User Sessions						
Prep Launch						
Launch						

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