Precision N management through crop model-based approaches

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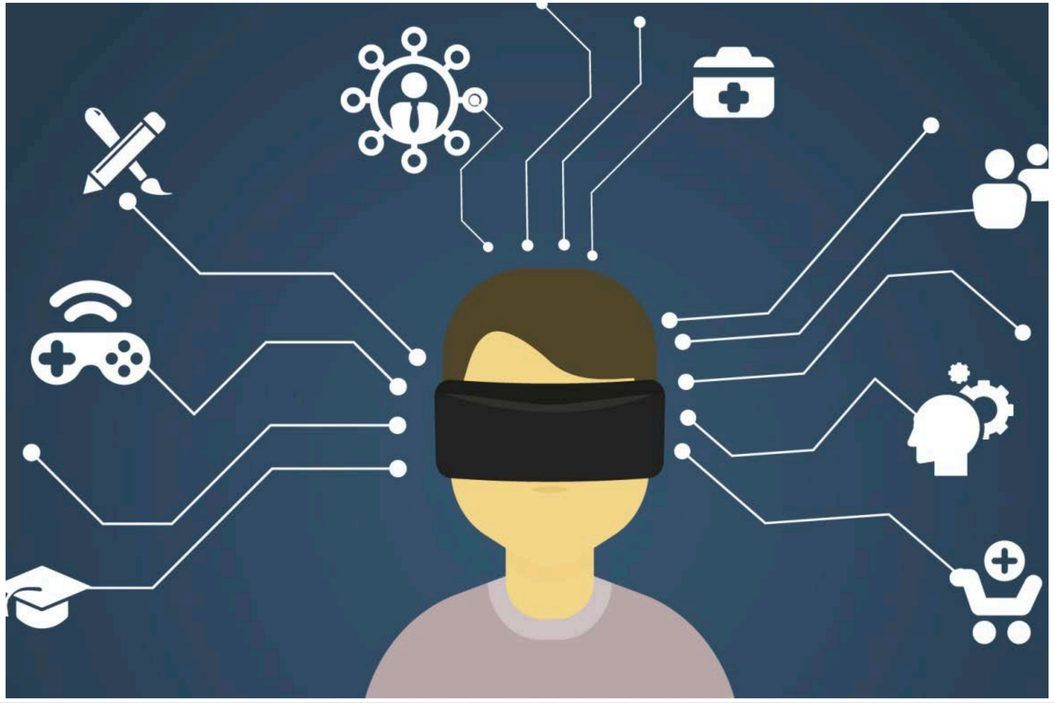
Session Goals

- At the end of this session participants will be able to:
  - Identify the main benefits and required inputs for model-based N tools
  - Identify the available modeling-based tools for N management
  - Evaluate if in-season N management based on models is feasible for your operation and learn how to test it.

Crop model-based tools. What is a crop model?

A virtual reality of your farm.

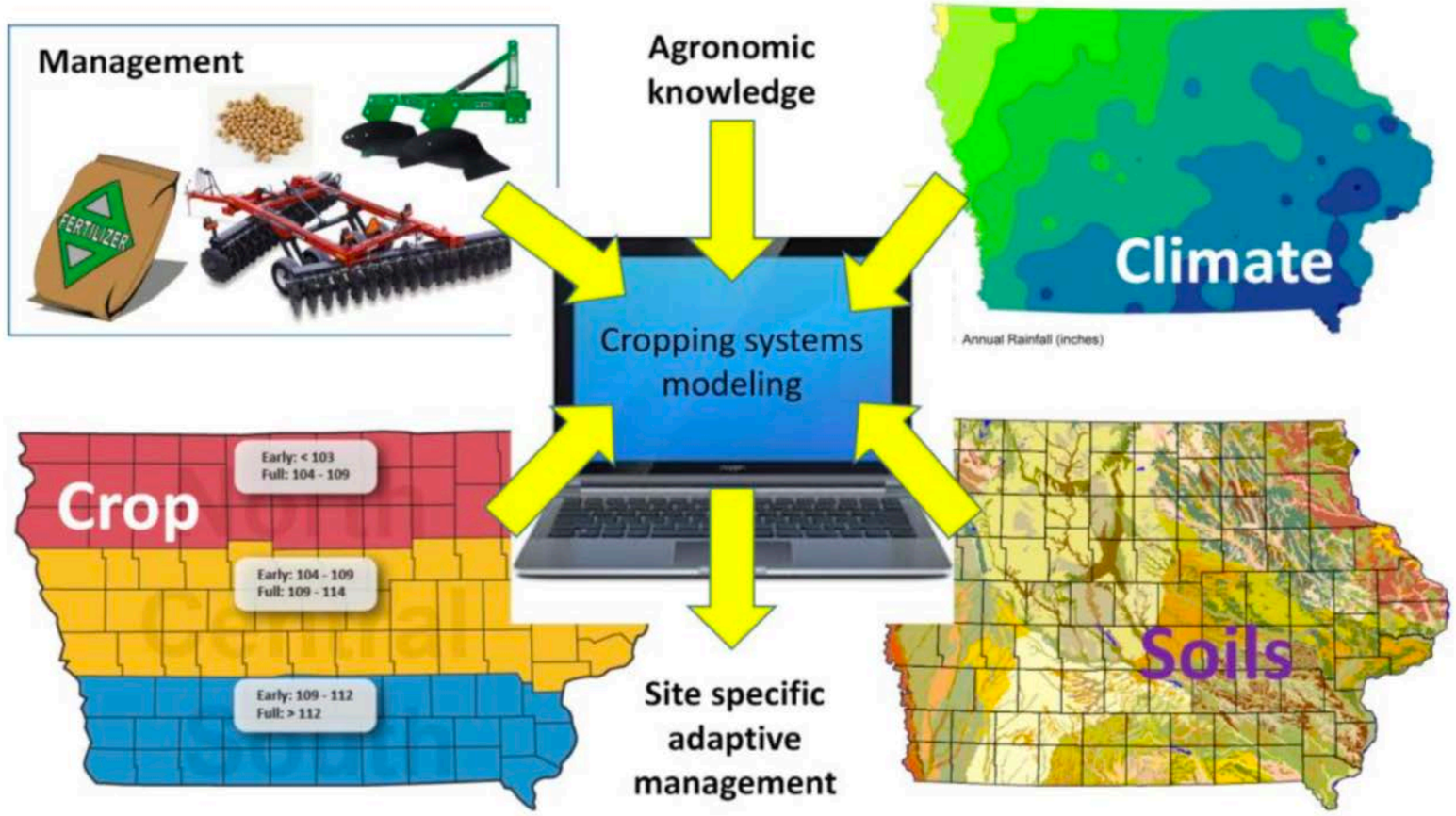


Crop model-based tools: computational tools

Crop model-based tools. What is a crop model?

Components

Planting date
Fertilizer day
Fertilizer source
Hybrid
Irrigation amount
Rotation
Manure



Temperature
Radiation
Precipitations

Organic matter
Texture
Nitrates

***Figure 1**. A cropping systems model uses agronomic principles to analyze information on soils, crop, climate, and management practices for every field and year separately.*

Crop model-based tools: why?

Excess or need of N

N leaching

N mineralization

N uptake

Crop model-based tools: why?

N rate = **Crop demand** - **Soil N**

N Rate (lb/ac) = [35+(1.2 x EY)-(8 x NO_3-N_{ppm})-(0.14 x EY x OM) – other N credits] x $Price_{adj}$ x $Timing_{adj}$

EY = Expected yield (bu/ac)
NO_3-N_{ppm} = Root zone average NO_3-N (ppm)
OM = Soil organic matter (%)

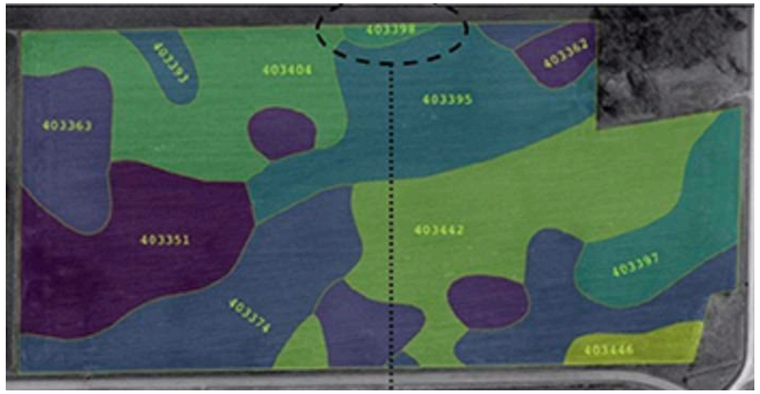
Site- and time-specific N recommendations can be made through the ***dynamic simulation of the weather–soil–crop system*** to adjust in-season N applications to more precisely match crop N demand.

Crop model-based tools

- Point based

- Grid based

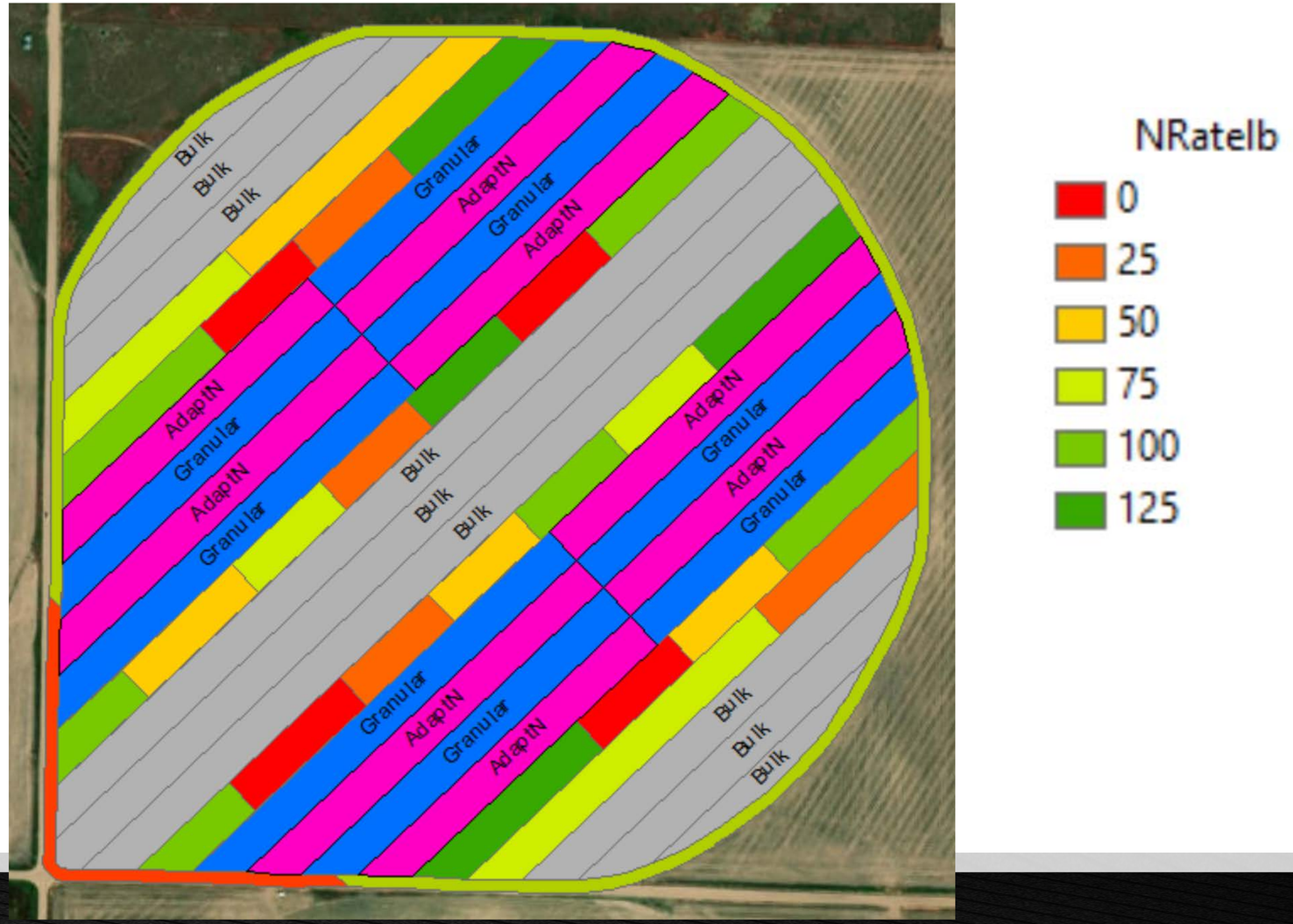
- Zone based



Resolution of your input data…

Crop model-based tools. Testing

- Flurosat
- Adapt-N (Yara)
- Granular
- Maize-N (UNL)
- Others

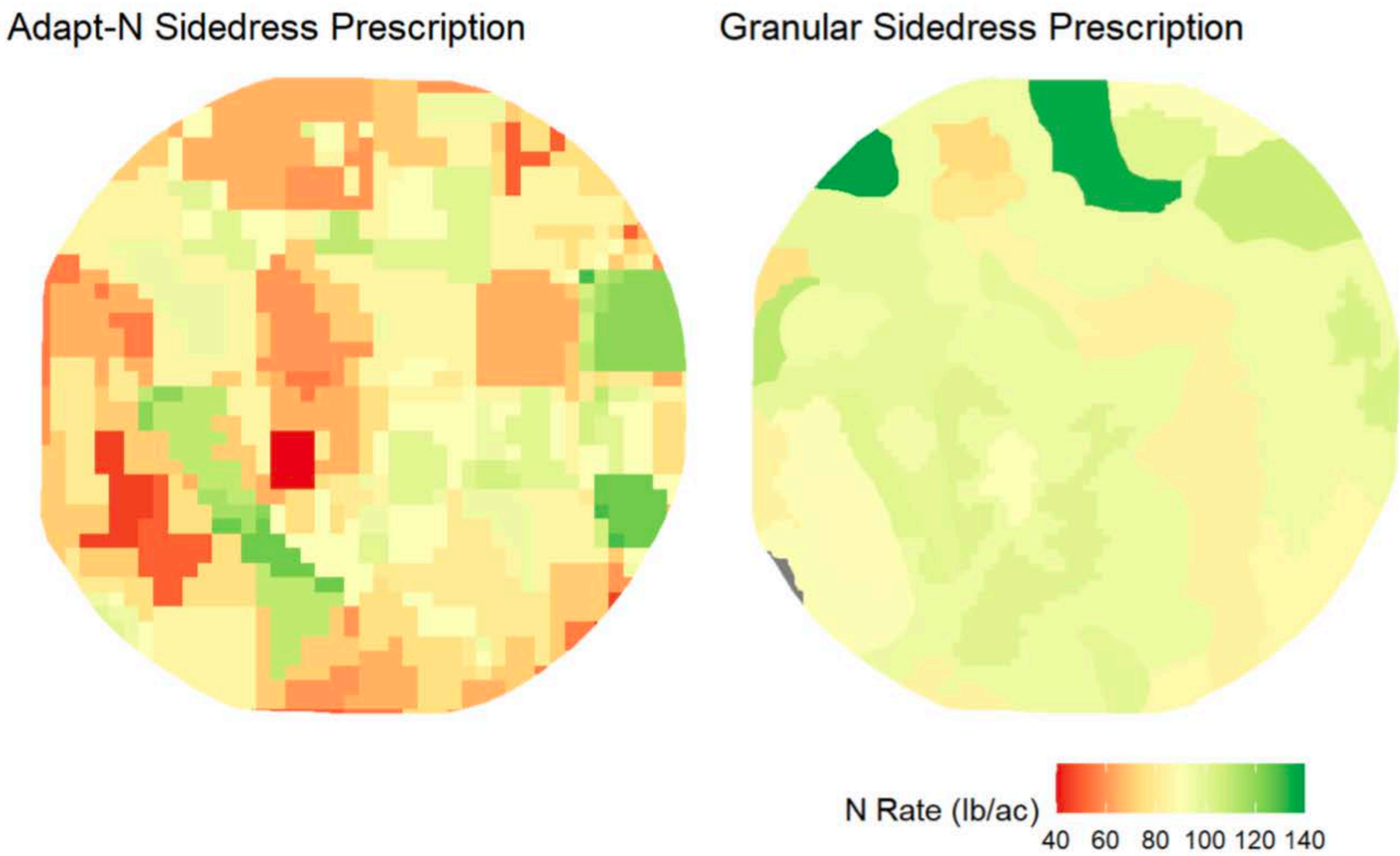


Granular

average of 26 gal/ac (92 lb N/ac)

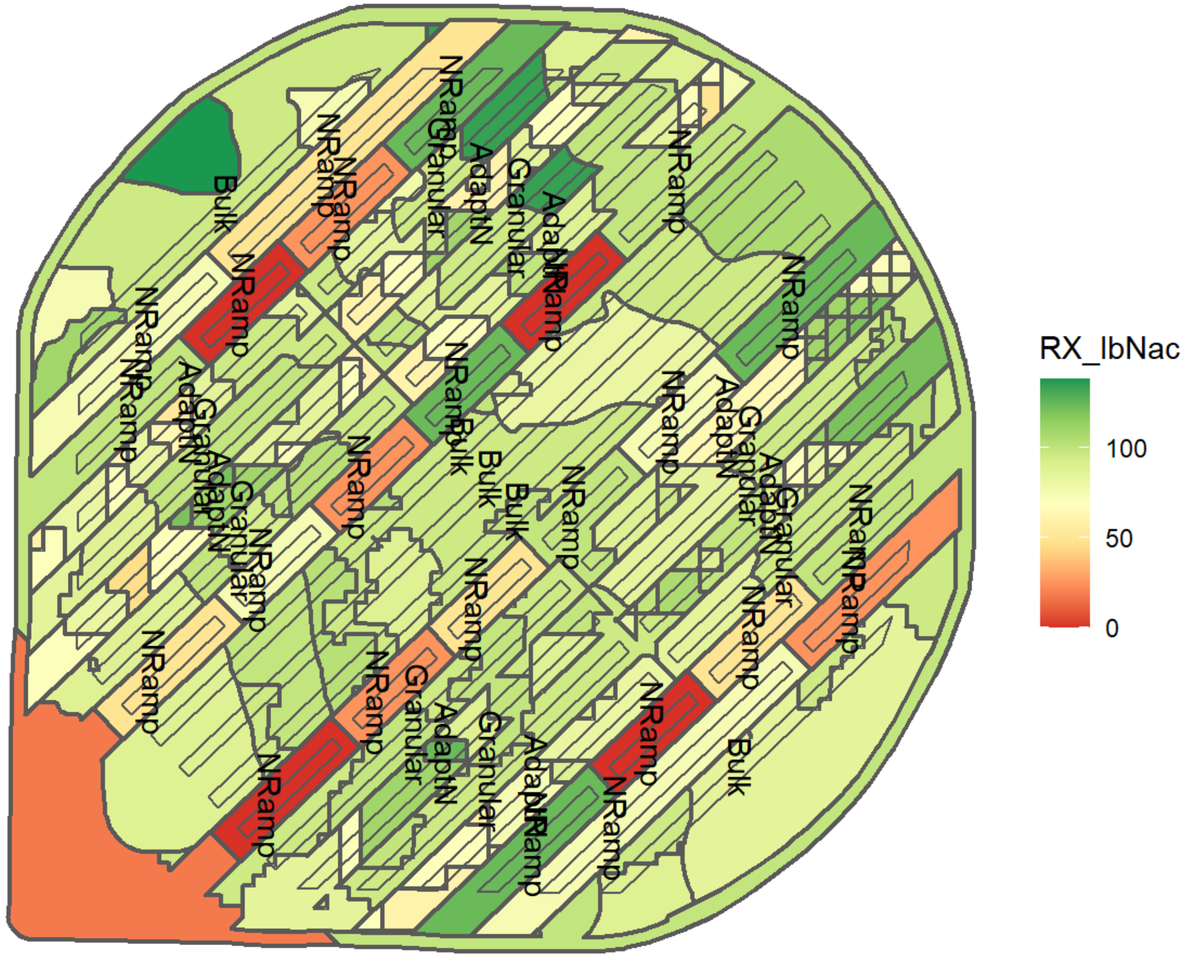
Adapt-N

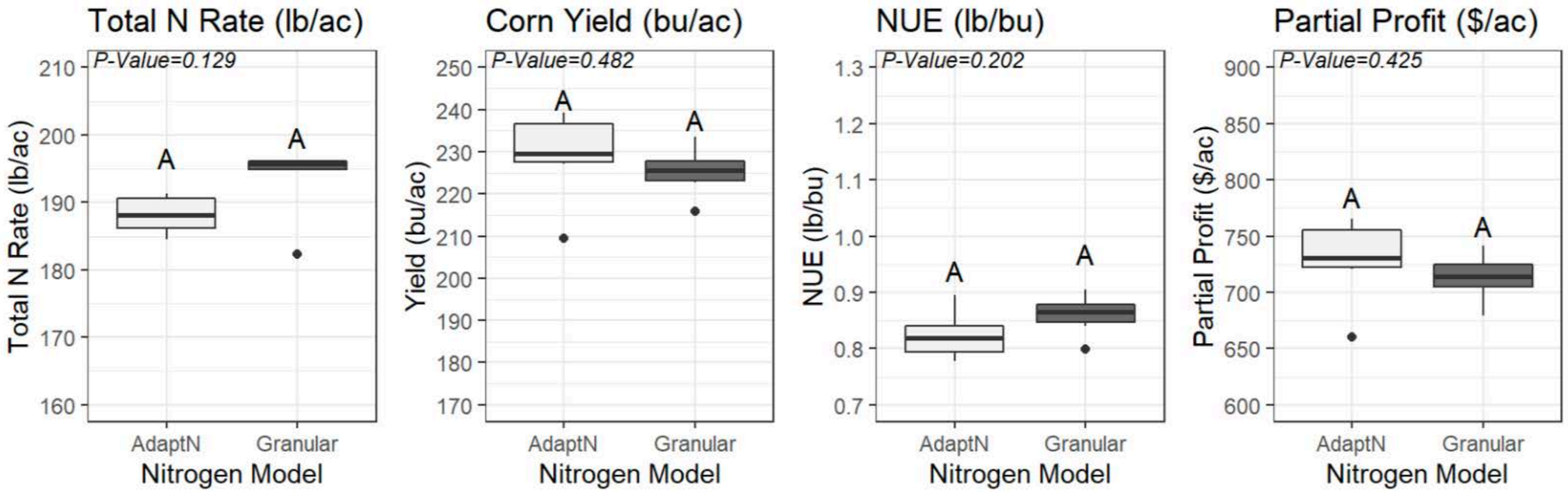
average of 23 gal/ac (82 lb N/ac)



Crop model-based tools. Testing

- Management
- Soil characteristics
- Yield goal
- Economics
- Zones?



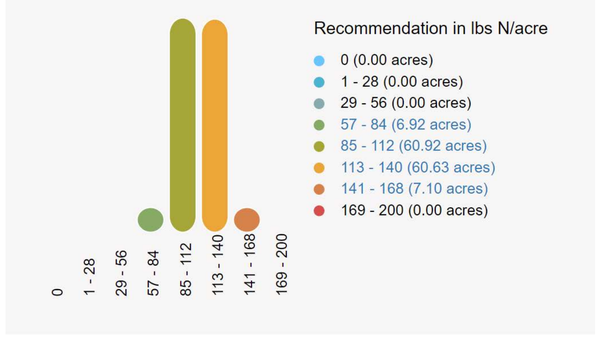


- Total N rate, yield, profit and NUE for the Granular and Adapt-N recommendations were not statistically different.
- NUE was around 0.82 to 0.86 lbs of N per bushel of corn.

Take Home Points

- Crop model-based tools for N management consider the variability of soils and the growing season to better adjust the N needs.
- Reasonable YG estimates are critical…still require input.
- Consider NUE metrics that you are currently operating at…how much more efficient can you operate economically?
- Quality of inputs = Quality of outputs
- On-farm research and precision ag technology offers a great opportunity to model-based N tools.

Interested in how agriculture technologies can improve nitrogen management on your farm?



https://cropwatch.unl.edu/precision-nitrogen-management-farm-research-project

Thanks!

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