University of Minnesota Extension
Driven to Discover℠

Improving Manure Management

New Acres and New Applications

Melissa Wilson, Ph.D.
Associate Professor and Extension Specialist
Department of Soil, Water, and Climate

MAKING A DIFFERENCE IN MINNESOTA: ENVIRONMENT + FOOD & AGRICULTURE + COMMUNITIES + FAMILIES + YOUTH

© 2025 Regents of the University of Minnesota. All rights reserved.

Topics to discuss

Sidedressing manure into growing corn

Applying manure to sugarbeet fields

Using the Presidedress Nitrate Test (PSNT) on manured fields

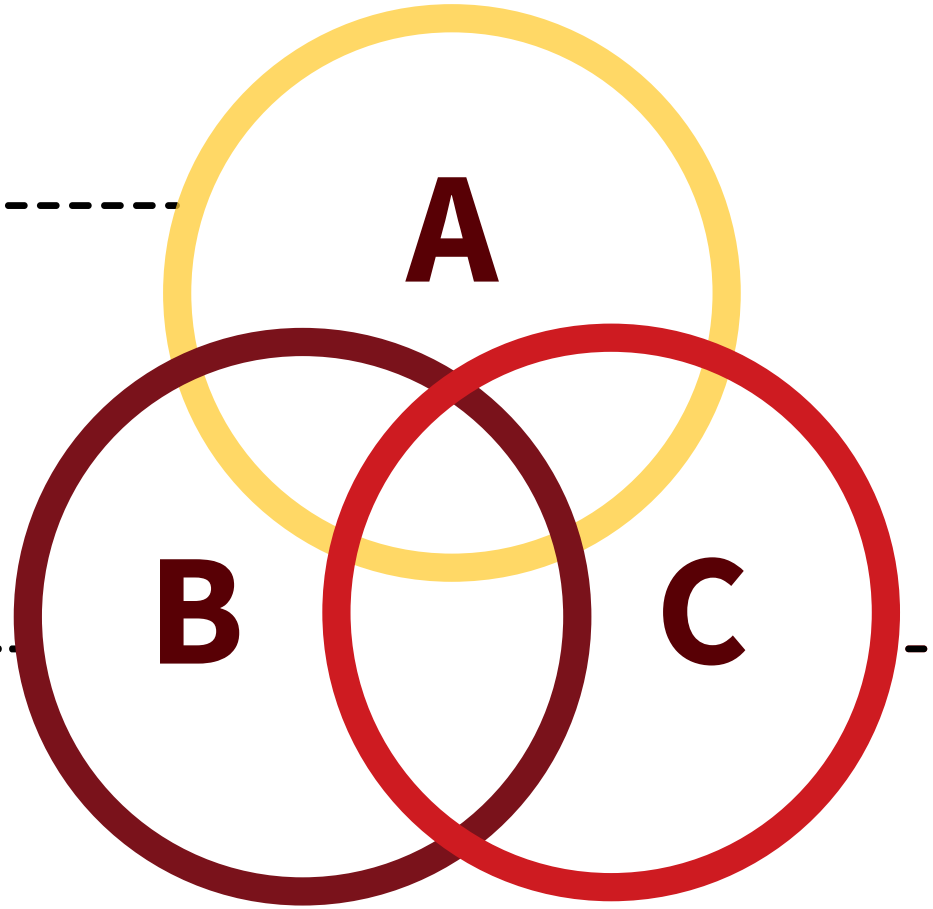
© 2025 Regents of the University of Minnesota. All rights reserved.

Sidedressing corn with liquid manure

© 2025 Regents of the University of Minnesota. All rights reserved.

Why sidedressing?

Need for improved nutrient management



Fewer days for manure application

Older manure storages are filling up more quickly

© 2025 Regents of the University of Minnesota. All rights reserved.

Research in Ohio showed success

- Six years of on-farm swine manure drag hose plots (corn yield in bu/acre)

17 bu/acre difference

Year	Swine Manure	28% UAN
2014	204	204
2015	154	121
2016	222	216
2017	165	145
2018	264	246
2019	195	168
6-Year Average	**200**	**183**

© 2025 Regents of the University of Minnesota. All rights reserved.

Evaluating sidedressing in MN

1. On-farm study using a drag hose system
2. Small-plot study dragging a hose over corn at different growth stages
3. On-farm study using a tanker at different corn growth stages
4. Small-plot study using a tanker with different application equipment

© 2025 Regents of the University of Minnesota. All rights reserved.

Sidedressing with a dragline system

Corn-Corn-Soybean

- 40 lbs N in starter
- Sidedressed 140 lbs N at V4/V5 stage
- Compared:
  - Swine manure with dragline (~3,500 gal per acre)
  - Anhydrous ammonia
  - Liquid UAN (32%)
  - No N sidedressed

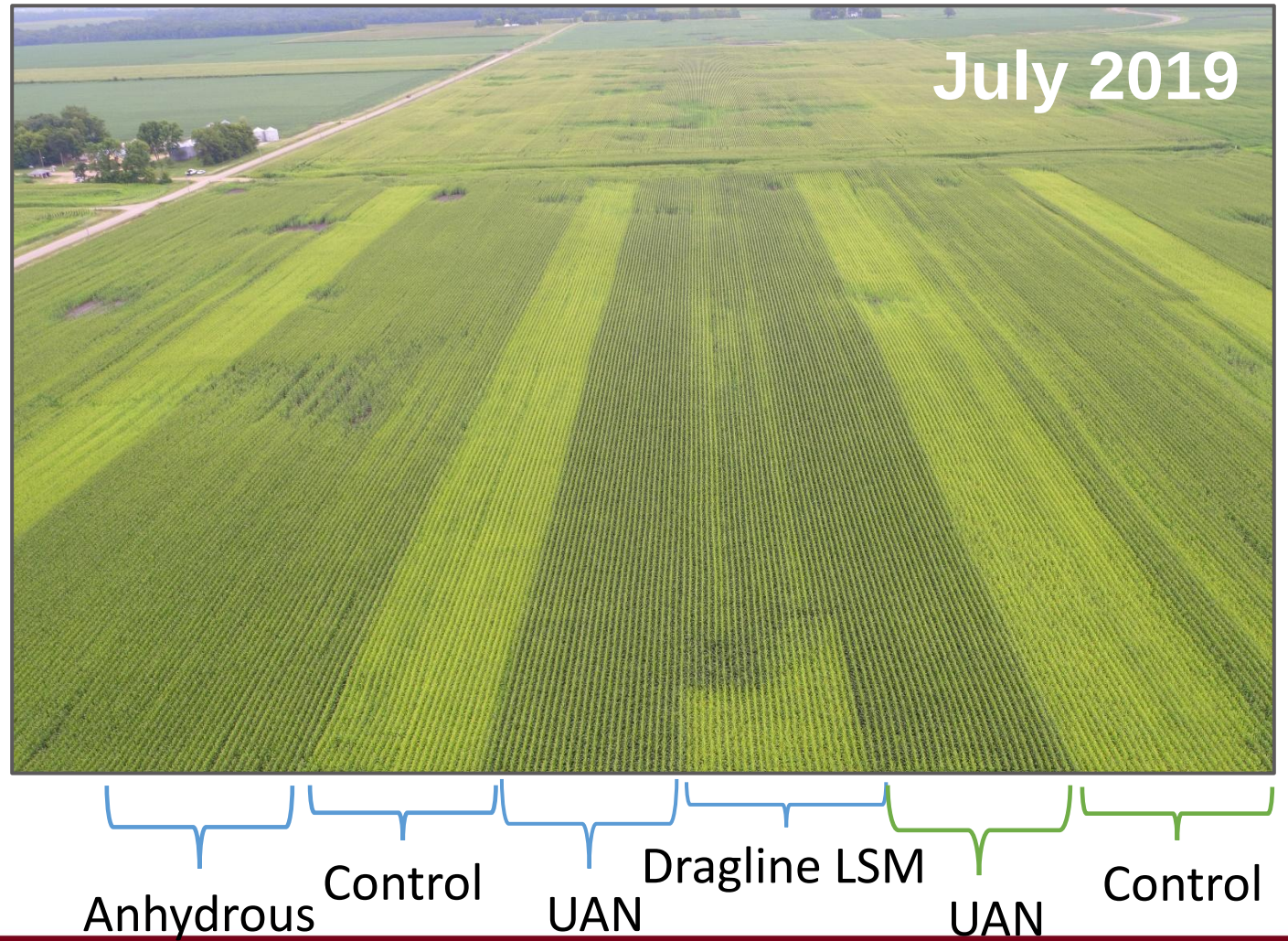
© 2025 Regents of the University of Minnesota. All rights reserved.

© 2025 Regents of the University of Minnesota. All rights reserved.

Sidedressing Manure - 2018

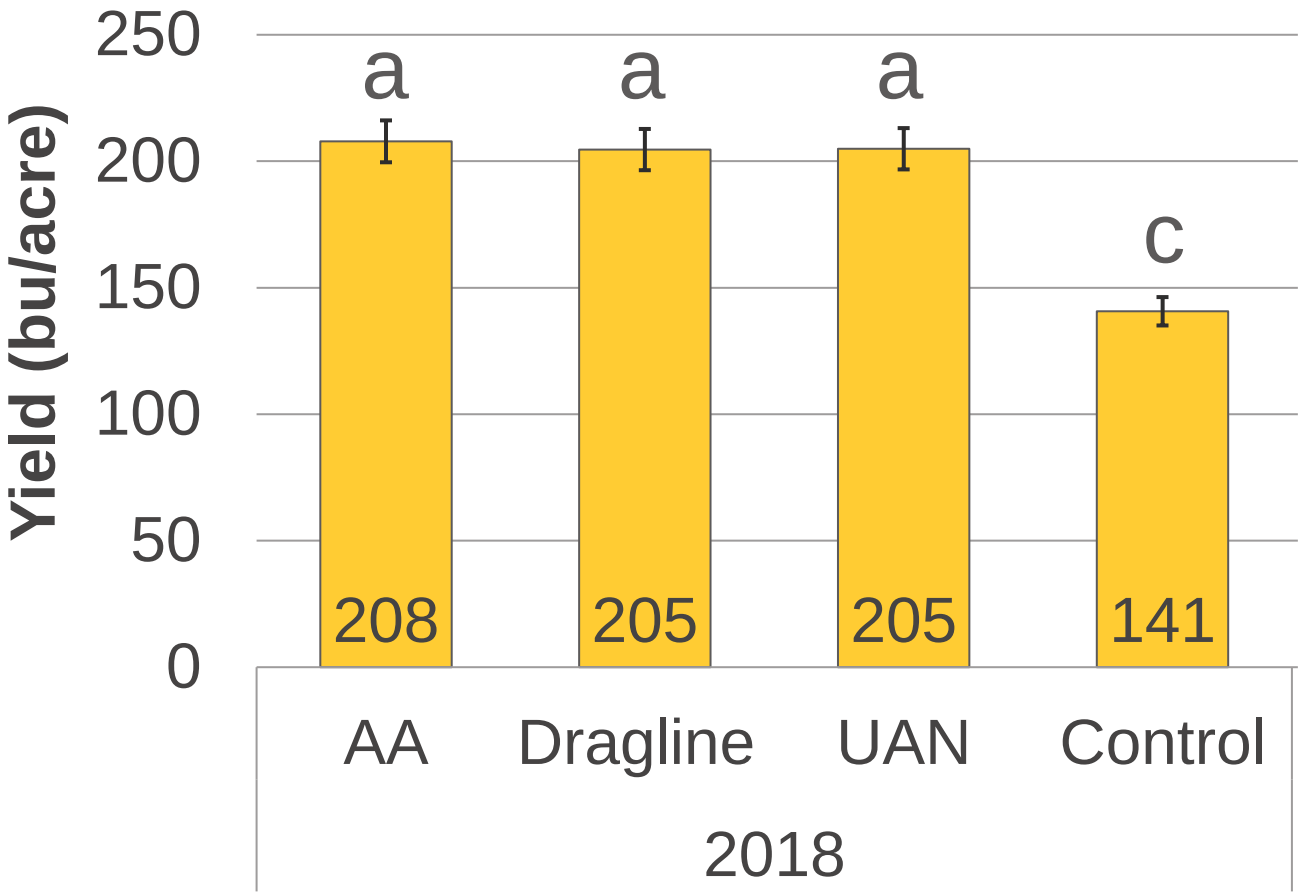
© 2025 Regents of the University of Minnesota. All rights reserved.

Sidedressing Manure - 2019



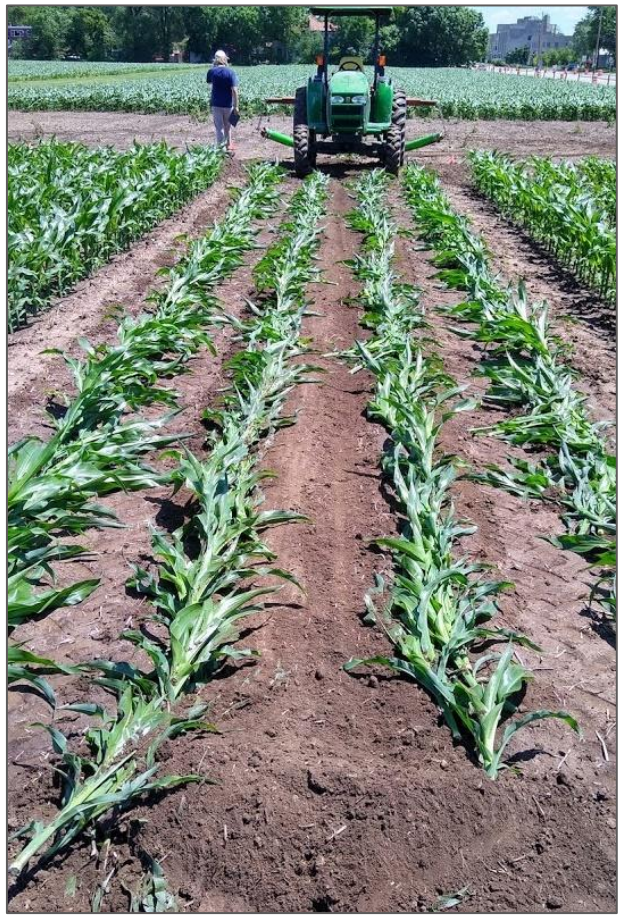
© 2025 Regents of the University of Minnesota. All rights reserved.

Corn Yields



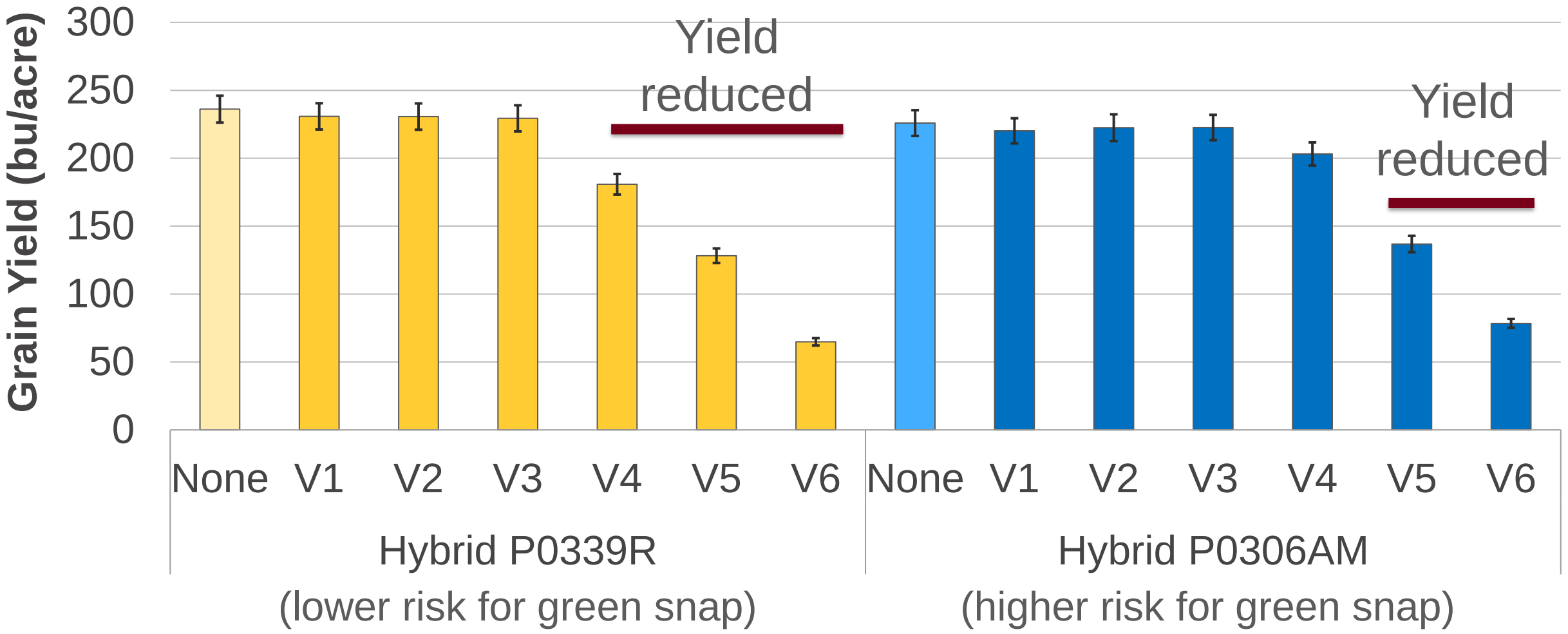
© 2025 Regents of the University of Minnesota. All rights reserved.

When can you safely drag corn?



© 2025 Regents of the University of Minnesota. All rights reserved.

Grain Yield



© 2025 Regents of the University of Minnesota. All rights reserved.

Can you sidedress with a tanker?

Corn-Corn-Soybean

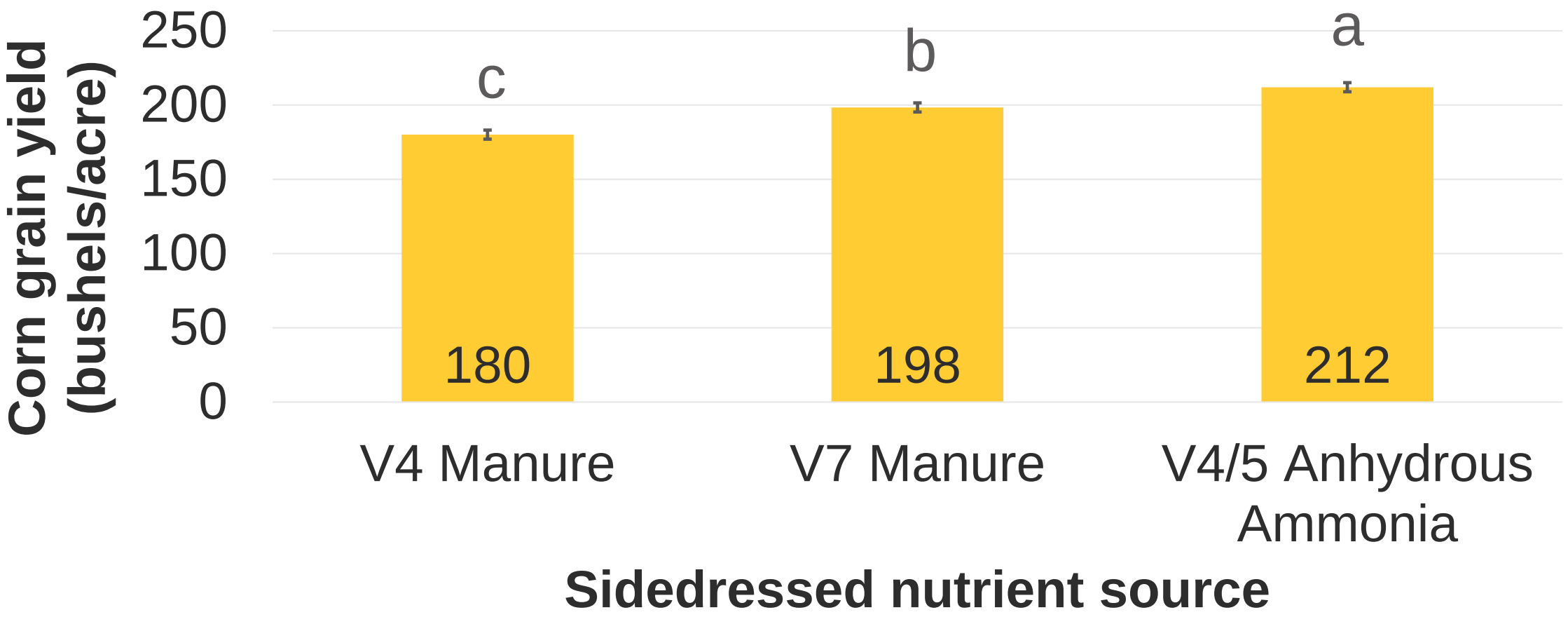
- 40 lbs N in starter
- Sidedressed 155 lbs N (~4,000 gal per acre)
- Compared:
  - Swine manure with tanker at:
    - V1, V4, V7 (missed V1 in 2021)
  - Anhydrous ammonia at V4/V5

© 2025 Regents of the University of Minnesota. All rights reserved.

October 2021

© 2025 Regents of the University of Minnesota. All rights reserved.

Corn yield when sidedressing with a tanker



© 2025 Regents of the University of Minnesota. All rights reserved.

Tire tracks and compaction?

© 2025 Regents of the University of Minnesota. All rights reserved.

Does application equipment matter?

Soybean-corn rotation

- 40 lbs N in starter fertilizer
- Sidedressed dairy manure at Rosemount, MN and swine manure at Waseca, MN
- Compared V1 or V6 application timing:
  - Manure sweep injected
  - Manure disk injected
  - Manure surface broadcast
  - Urea with urease inhibitor
  - No-nitrogen control

© 2025 Regents of the University of Minnesota. All rights reserved.

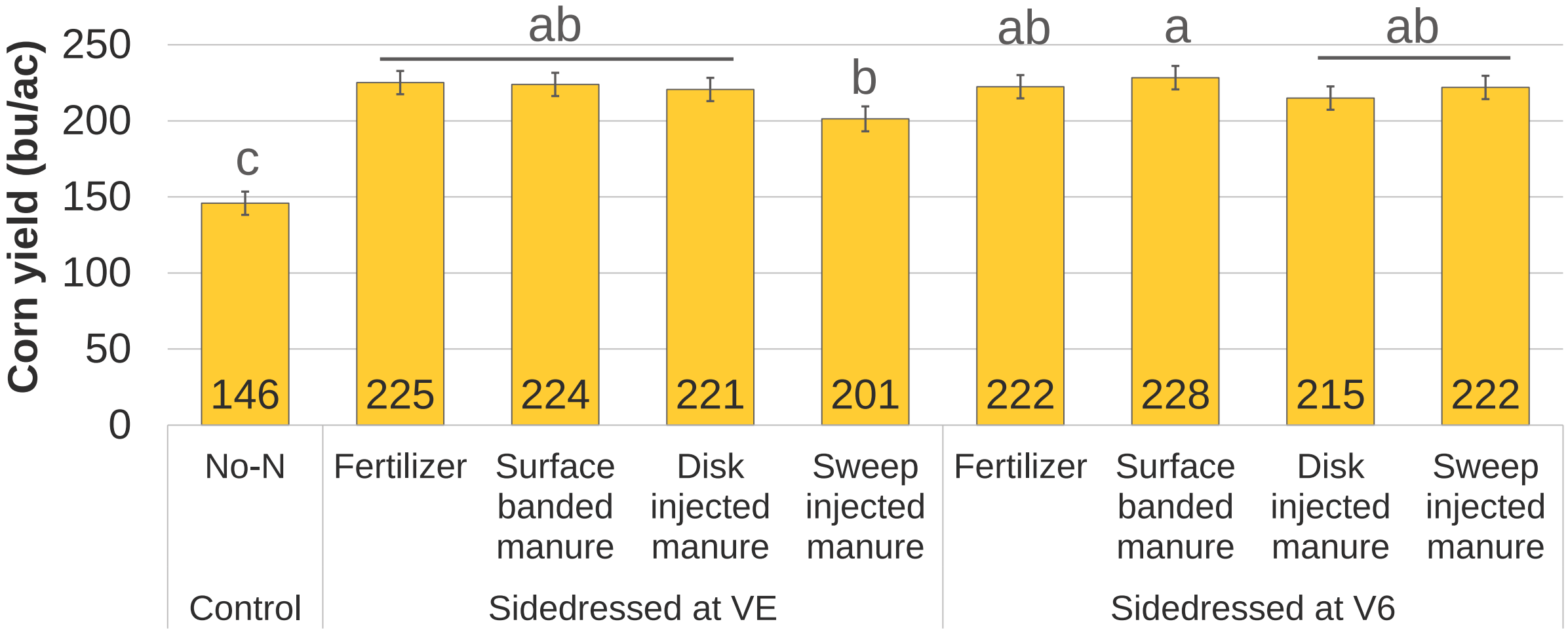
Sweep injection

© 2025 Regents of the University of Minnesota. All rights reserved.

Disk injection and broadcast

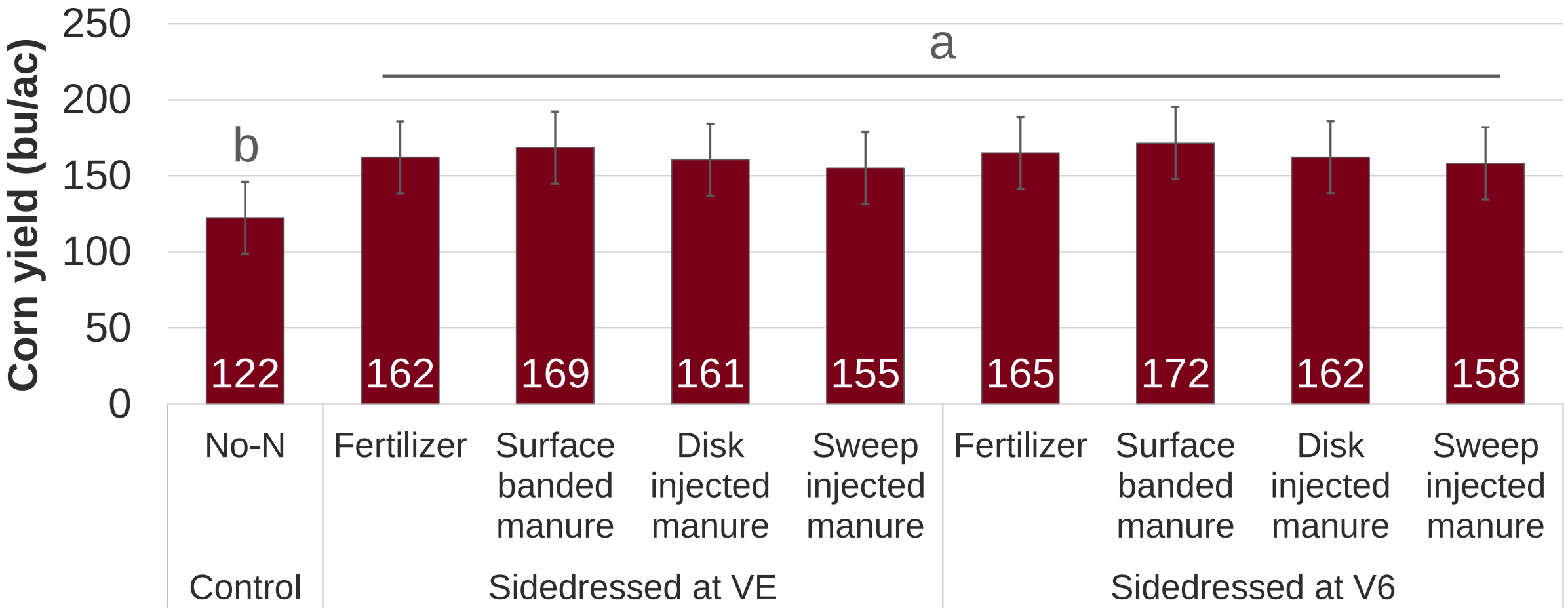
© 2025 Regents of the University of Minnesota. All rights reserved.

Corn yield at Waseca with swine manure



© 2025 Regents of the University of Minnesota. All rights reserved.

Corn yield at Rosemount with dairy manure



© 2025 Regents of the University of Minnesota. All rights reserved.

Lessons learned

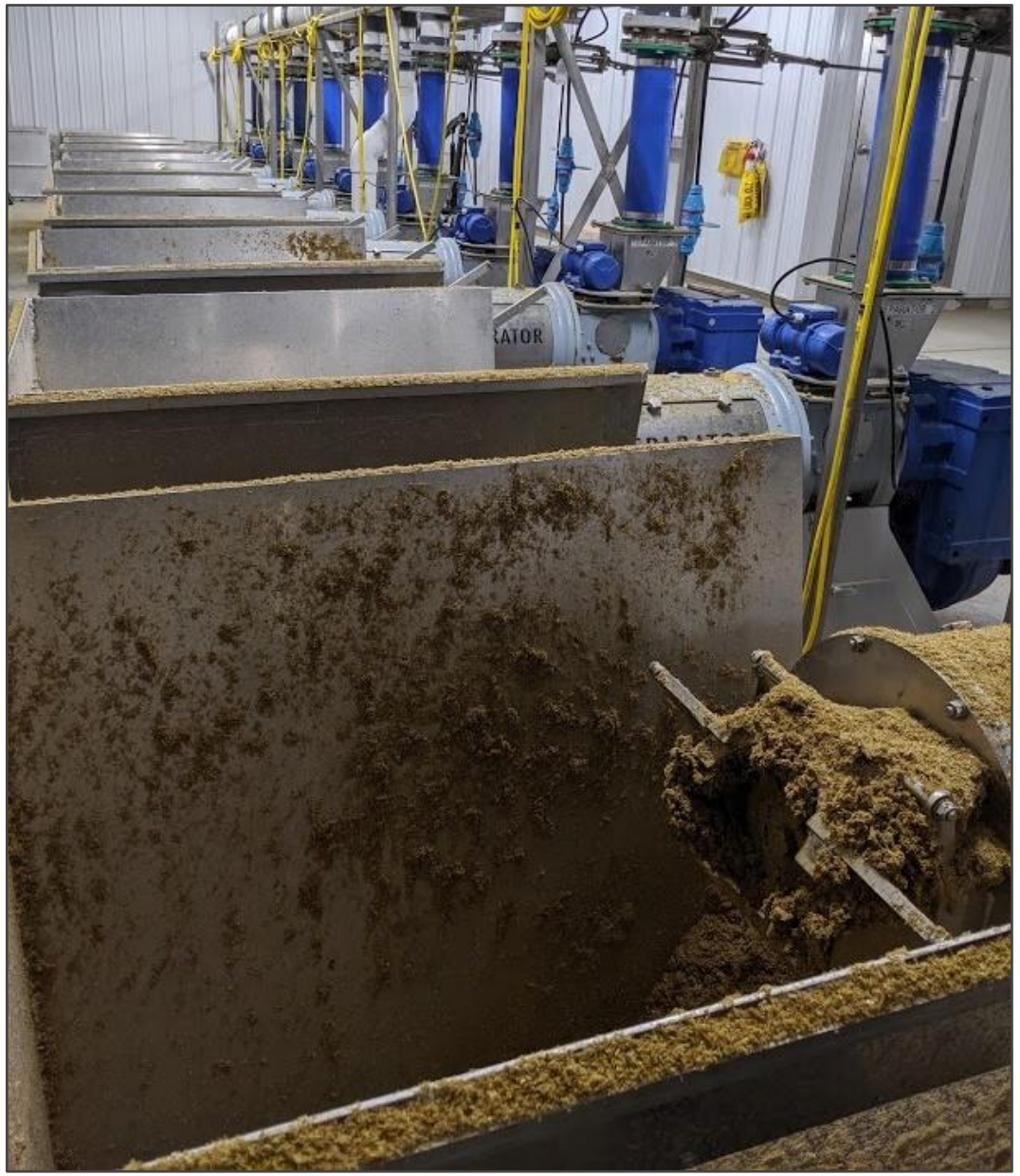
Sidedressing liquid manure into corn:

© 2025 Regents of the University of Minnesota. All rights reserved.

Liquid separated dairy manure in a sugarbeet rotation

© 2025 Regents of the University of Minnesota. All rights reserved.

Study locations



© 2025 Regents of the University of Minnesota. All rights reserved.

Plot setup – Nutrient management

- First year of 3-yr rotation
  - Manure applied fall before study started
    - High rate was ~15,000 gal/ac
    - Low rate was ~10,000 gal/ac
    - Control: Spring fertilizer
- Second and third year
  - Fertilizer only, taking credit for manure N and soil test P and K as appropriate

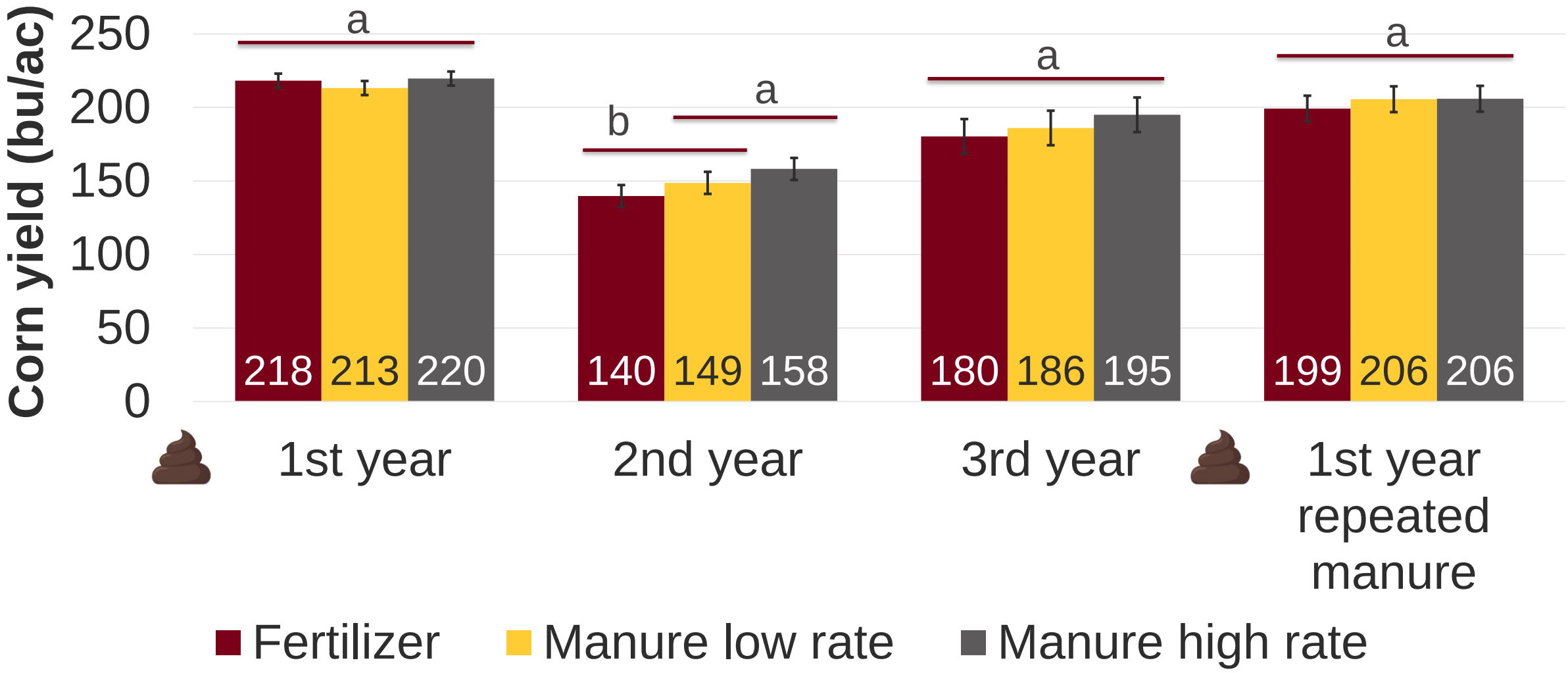
© 2025 Regents of the University of Minnesota. All rights reserved.

Plot setup – Crop rotation

- Three crops – all represented each year of study
  - Sugarbeet, soybean, corn
- 4 replications of each crop

© 2025 Regents of the University of Minnesota. All rights reserved.

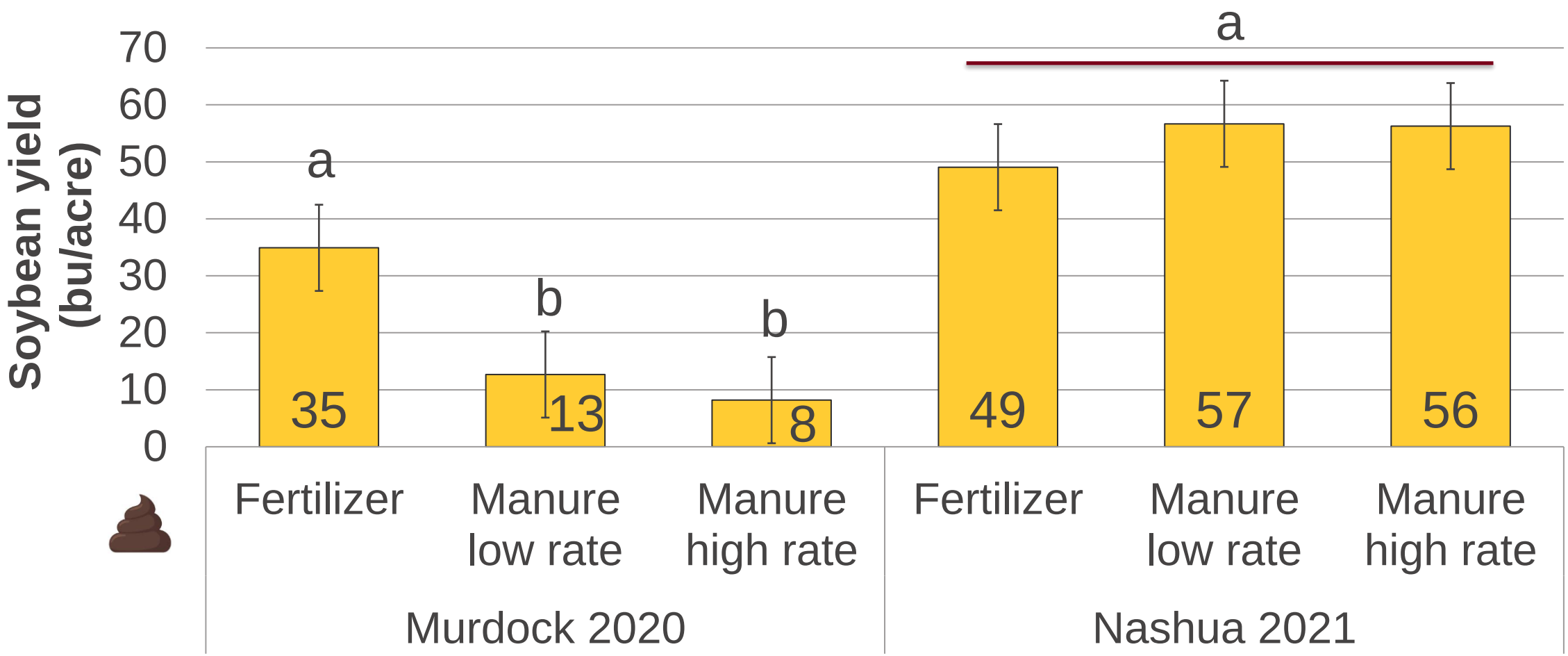
Corn yield



Averaged over both sites

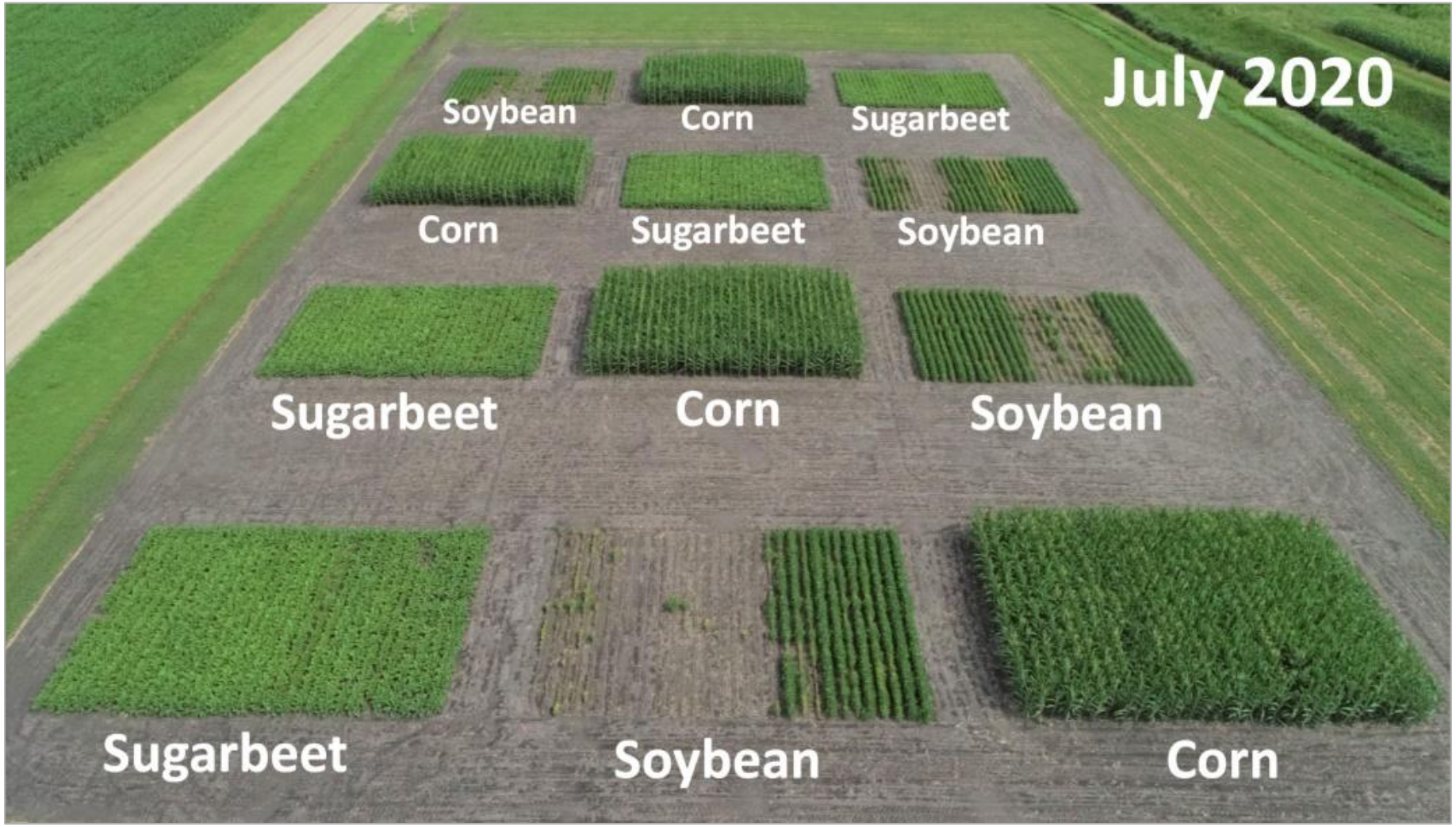
© 2025 Regents of the University of Minnesota. All rights reserved.

Soybean yield – First year after manure



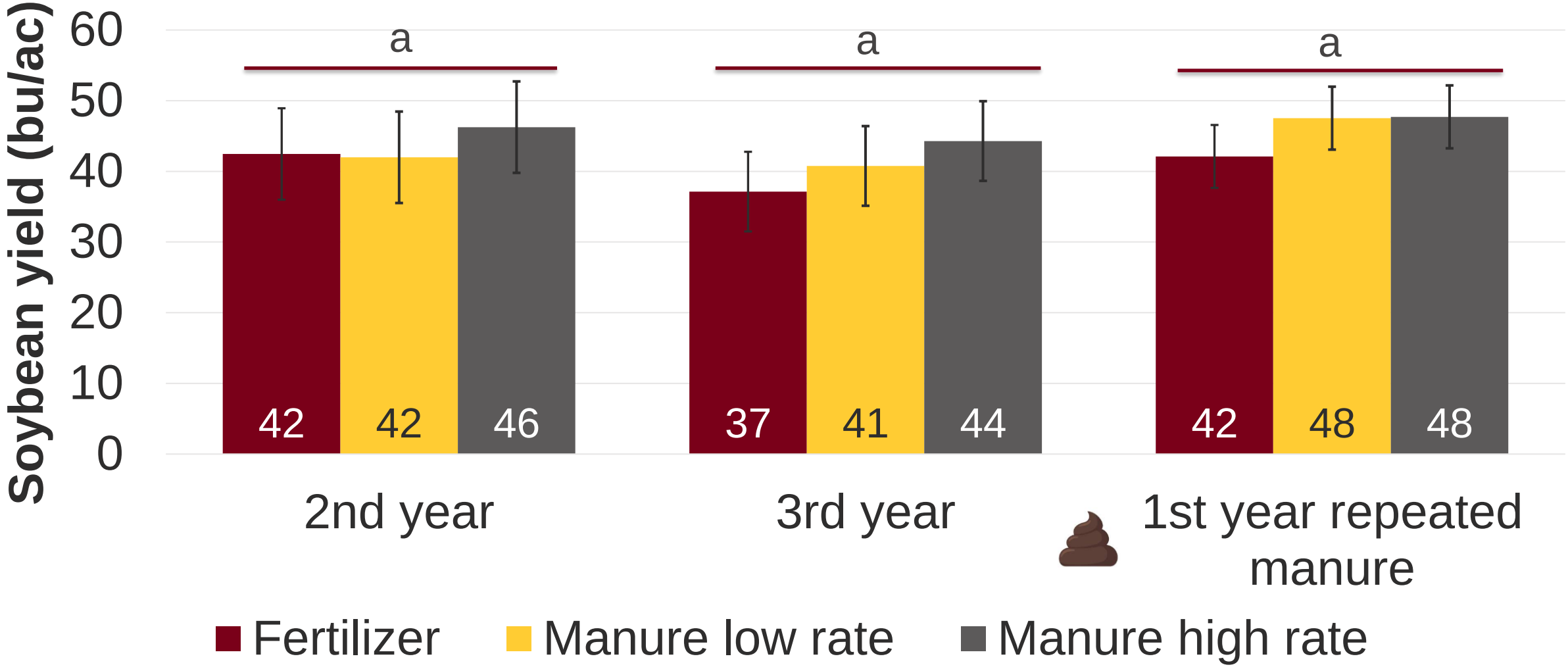
© 2025 Regents of the University of Minnesota. All rights reserved.

Murdock 1st year after manure application



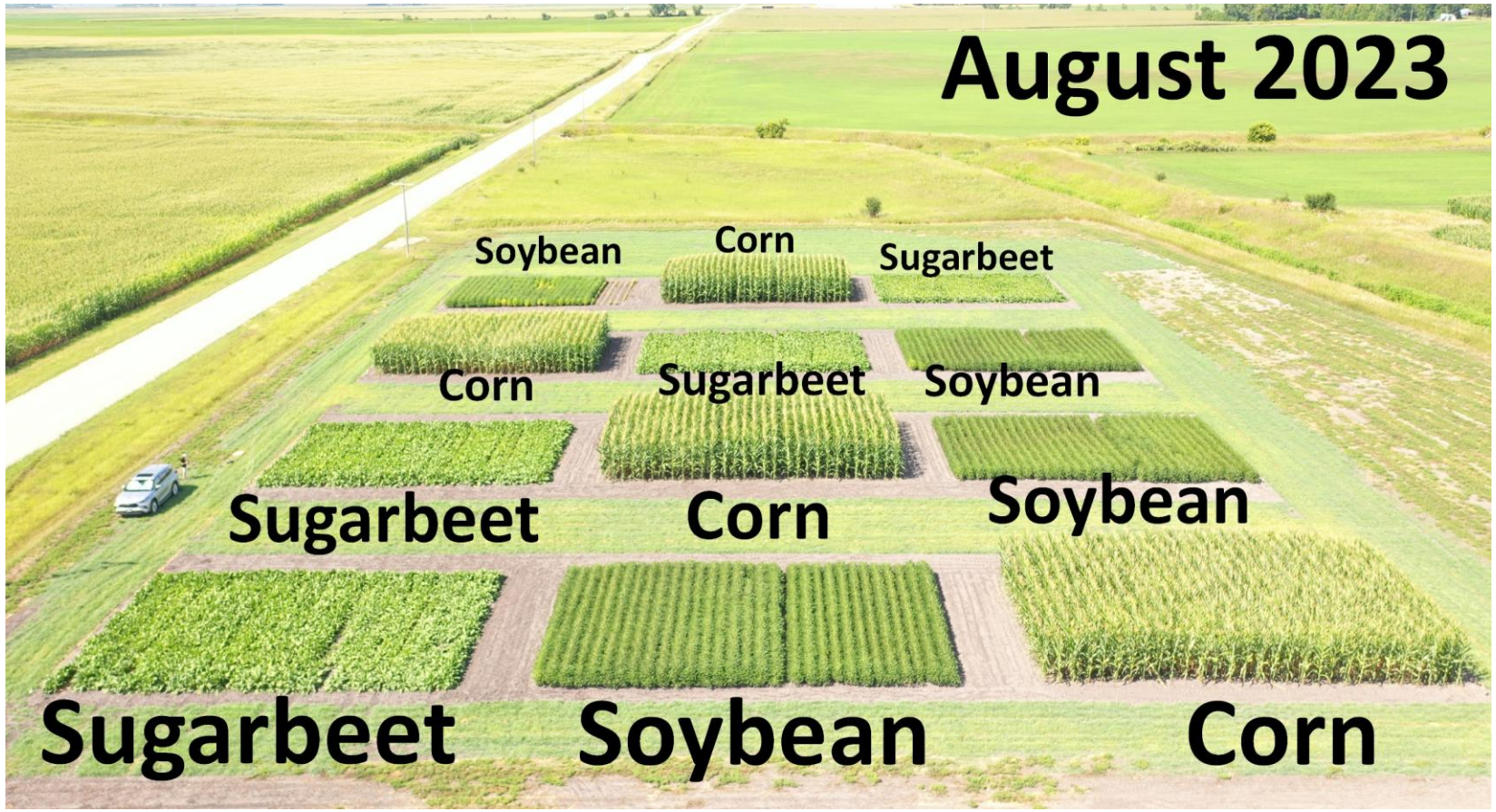
© 2025 Regents of the University of Minnesota. All rights reserved.

Soybean yield



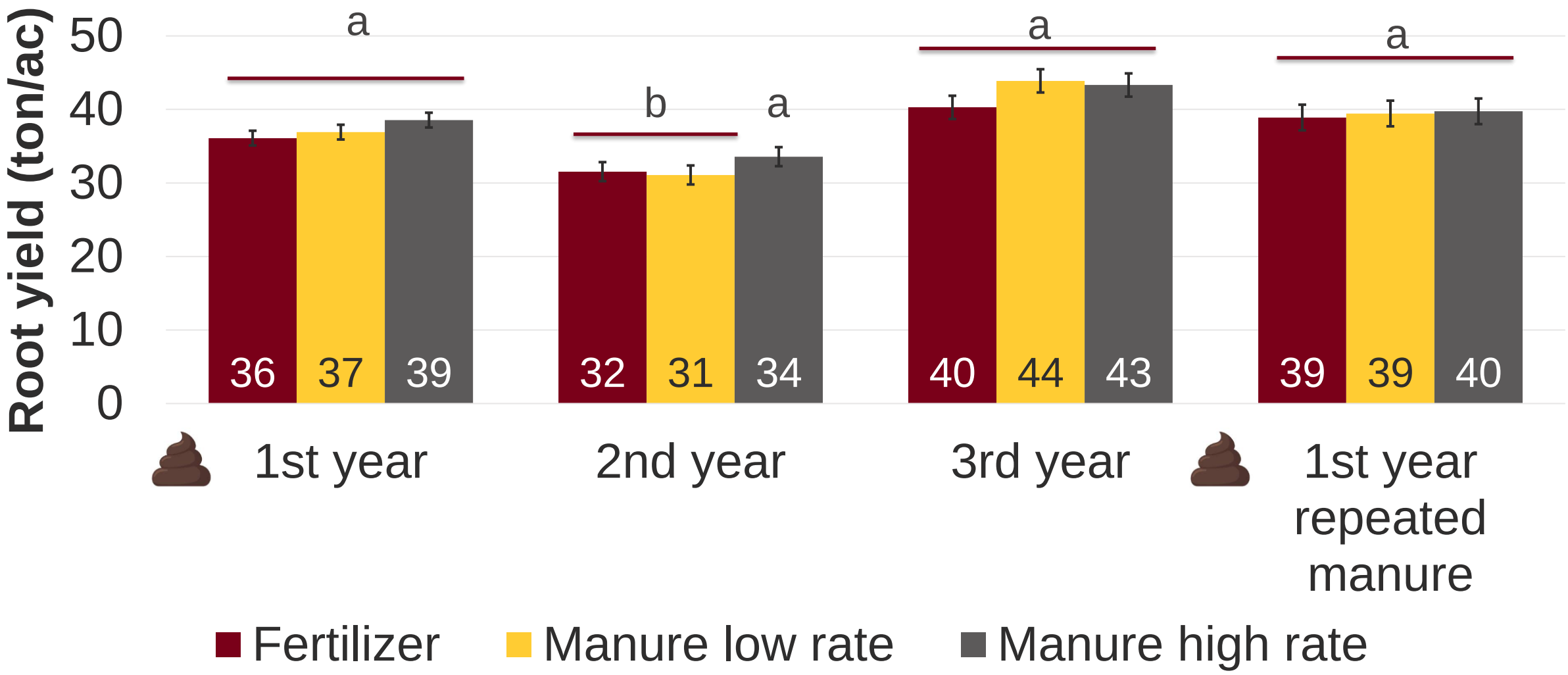
© 2025 Regents of the University of Minnesota. All rights reserved.

1st year after repeated manure application at Murdock



© 2025 Regents of the University of Minnesota. All rights reserved.

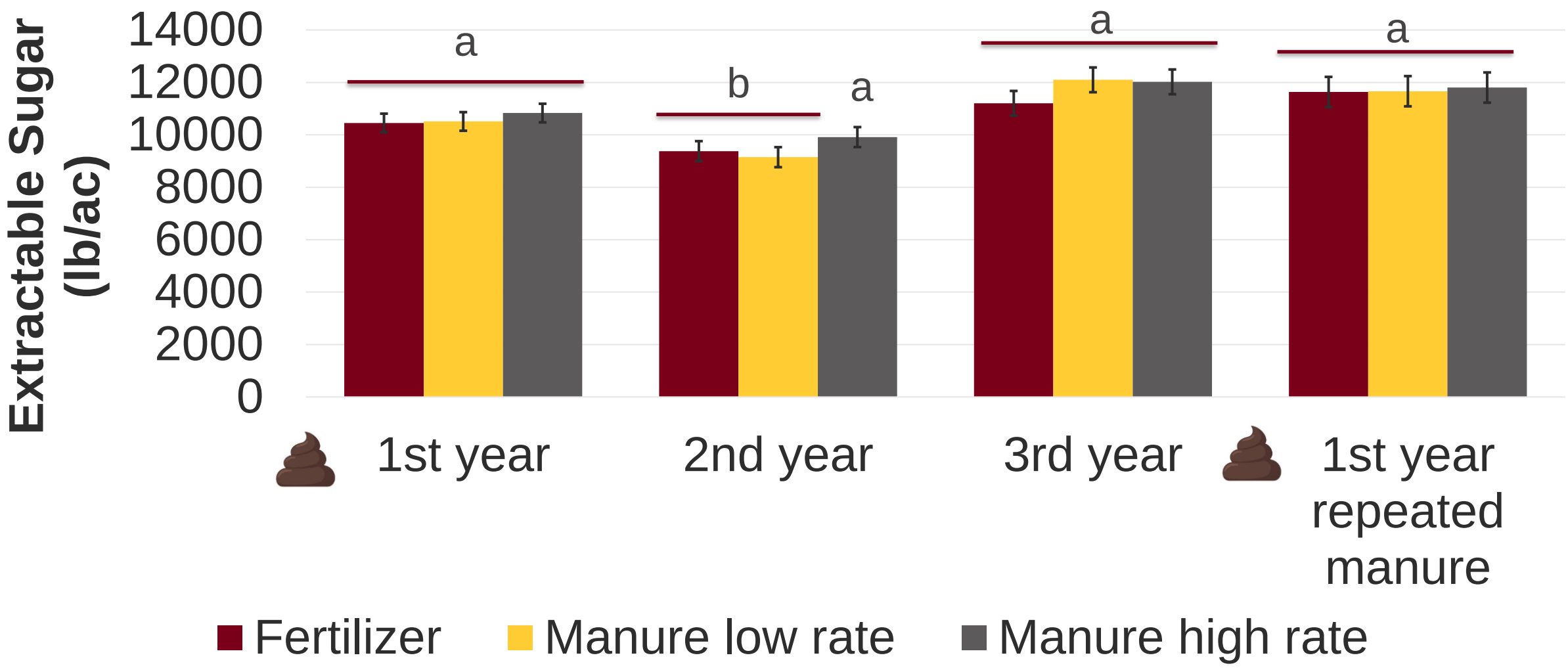
Sugarbeet – Root yield



Averaged over both sites

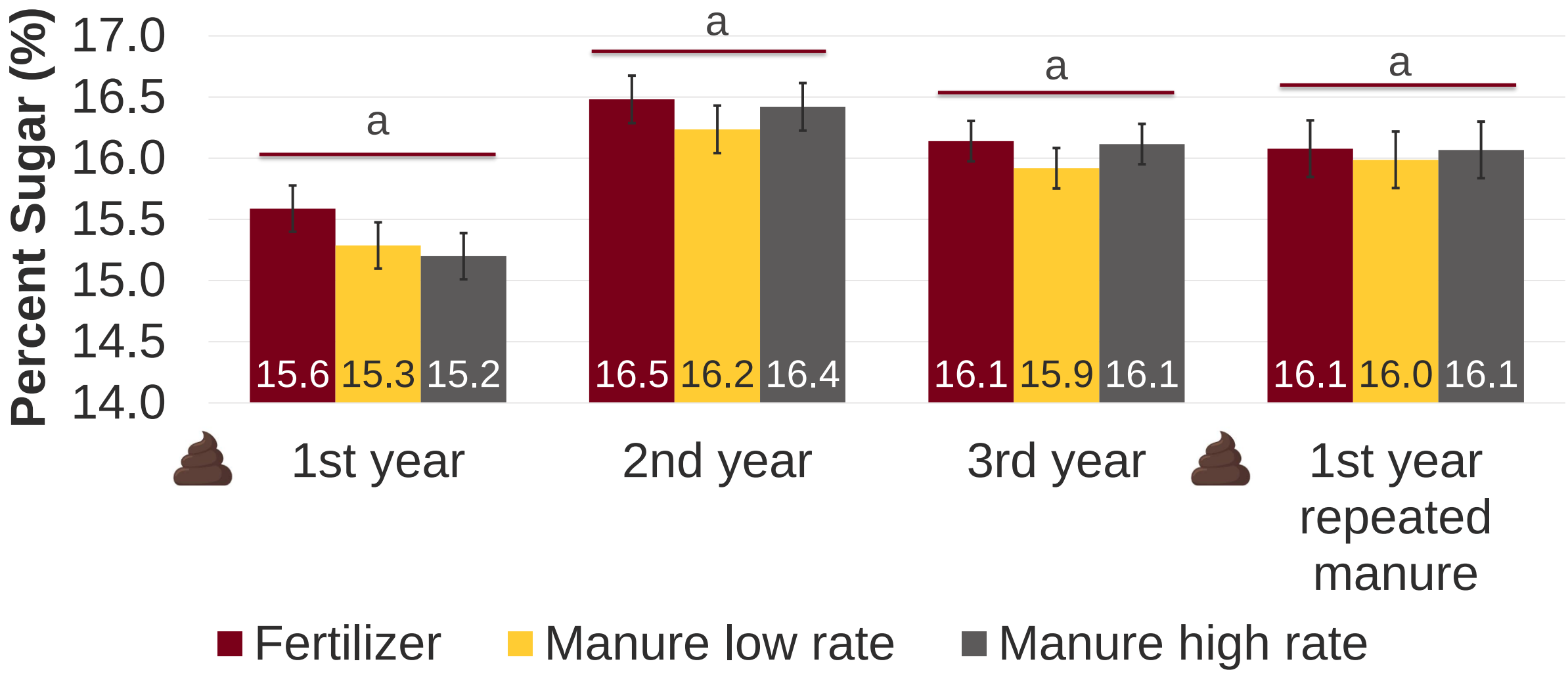
© 2025 Regents of the University of Minnesota. All rights reserved.

Sugarbeet – Extractable Sugar



© 2025 Regents of the University of Minnesota. All rights reserved.

Sugarbeet – Percent Sugar



© 2025 Regents of the University of Minnesota. All rights reserved.

Lessons learned

Using liquid separated dairy manure in sugarbeet:

© 2025 Regents of the University of Minnesota. All rights reserved.

PSNT in manured fields for predicting sidedress N needs

© 2025 Regents of the University of Minnesota. All rights reserved.

Photo Credit: CT Ryan Photography

Objectives

1. Evaluate the PSNT for fall-applied liquid dairy and swine manures to predict sidedressed N needs for corn

2. Compare PSNT results between fertilizer-only and the manure/fertilizer combination

© 2025 Regents of the University of Minnesota. All rights reserved.

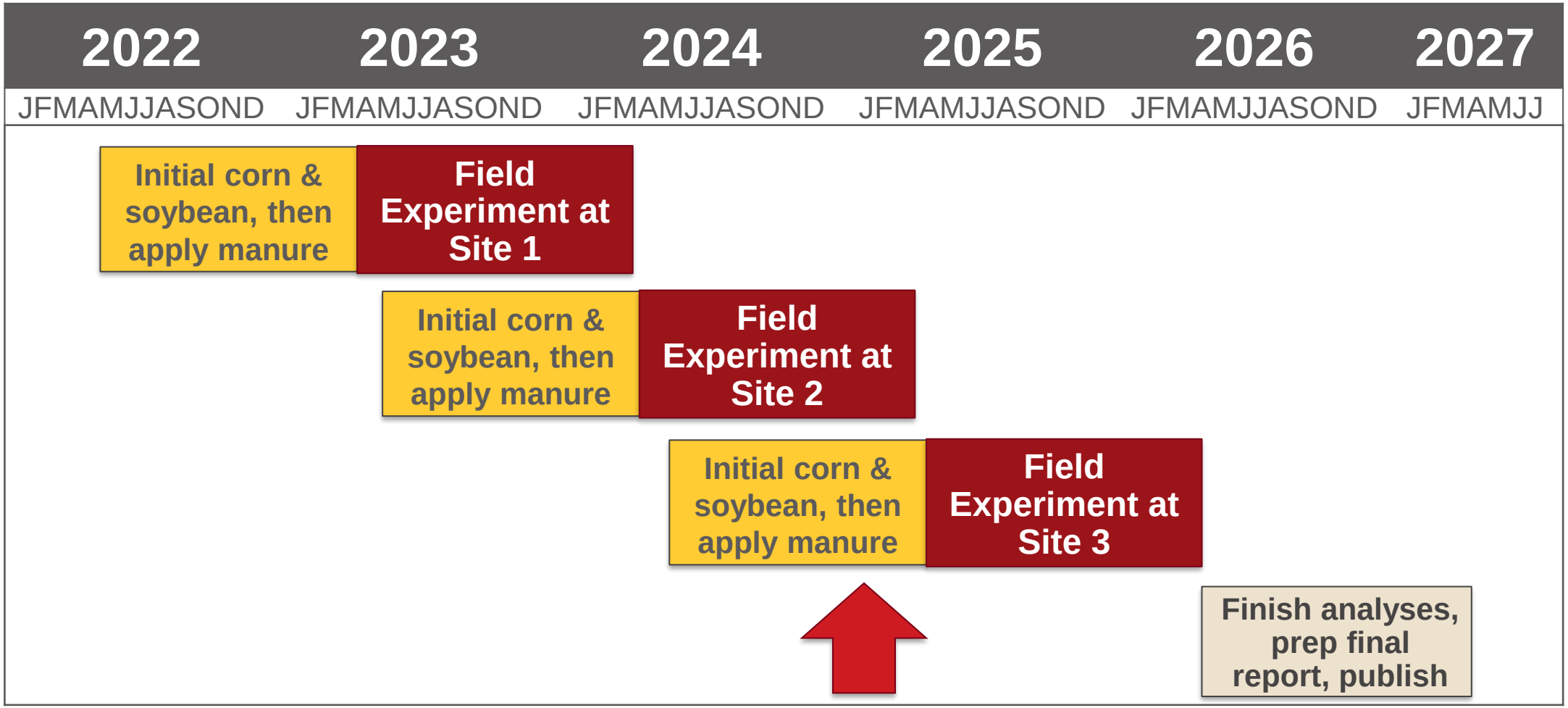
Field experiments

- Three sites starting in different years at the SROC
- Two cropping rotations
- Two fall-applied manures versus spring applied urea fertilizer
  - All applied at 120 lbs PAN per acre
  - Liquid dairy and swine manure
- Sidedressed urea with NBPT at different rates

Soybean-corn				Corn-Corn			
10 60N 118	**18** 60N 128	**23** 0N 138	**2** 0N 148	**6** 120N 218	**14** 120N 228	**1** 0N 238	**21** 80N 248
8 20N 117	**17** 40N 127	**25** 40N 137	**2** 0N 147	**3** 0N 217	**13** 80N 227	**1** 0N 237	**19** 0N 247
7 0N 116	**15** 0N 126	**26** 60N 136	**2** 0N 146	**5** 80N 216	**12** 40N 226	**1** 0N 236	**22** 120N 246
9 40N 115	**16** 20N 125	**24** 20N 135	**2** 0N 145	**4** 40N 215	**11** 0N 225	**1** 0N 235	**20** 40N 245

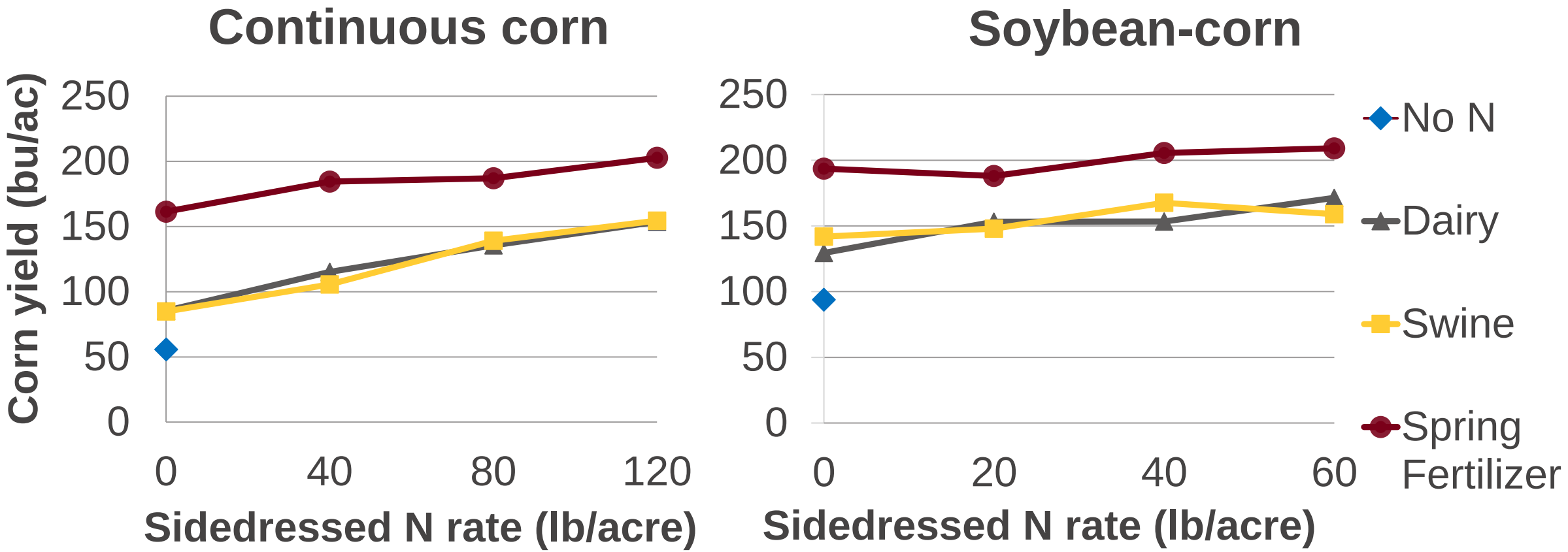
© 2025 Regents of the University of Minnesota. All rights reserved.

Timeline



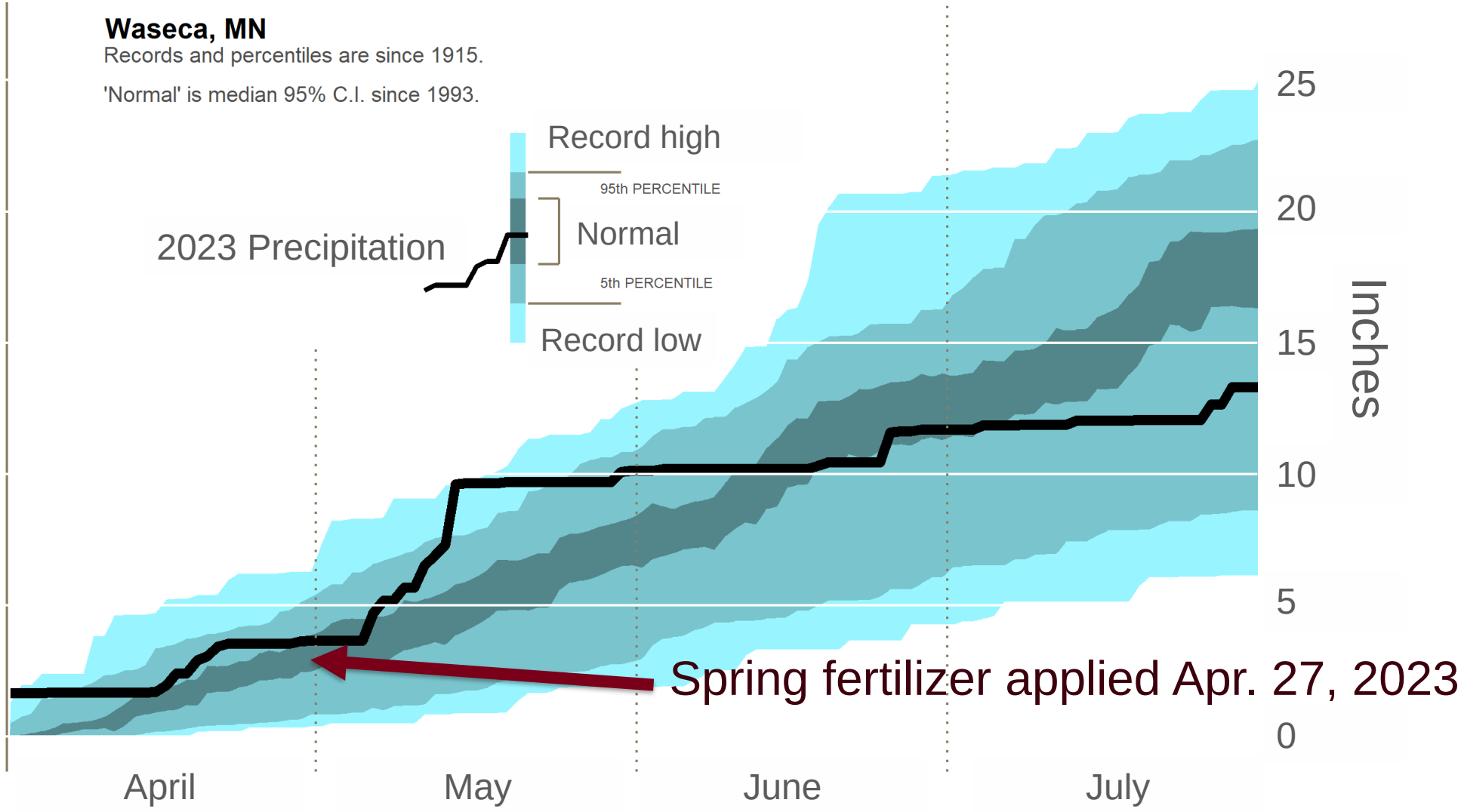
© 2025 Regents of the University of Minnesota. All rights reserved.

2023 Corn Yield at Site 1



© 2025 Regents of the University of Minnesota. All rights reserved.

2023 Cumulative Precipitation in Waseca

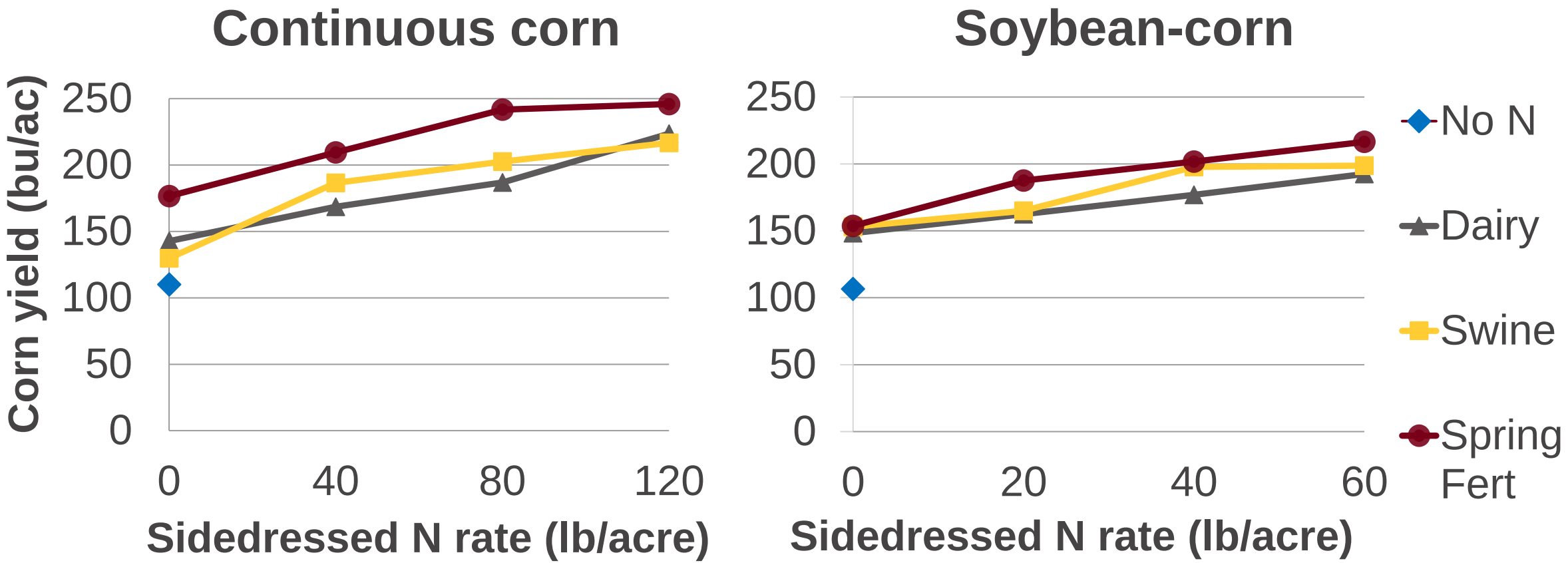


Manure applied Oct. 25, 2022

Spring fertilizer applied Apr. 27, 2023

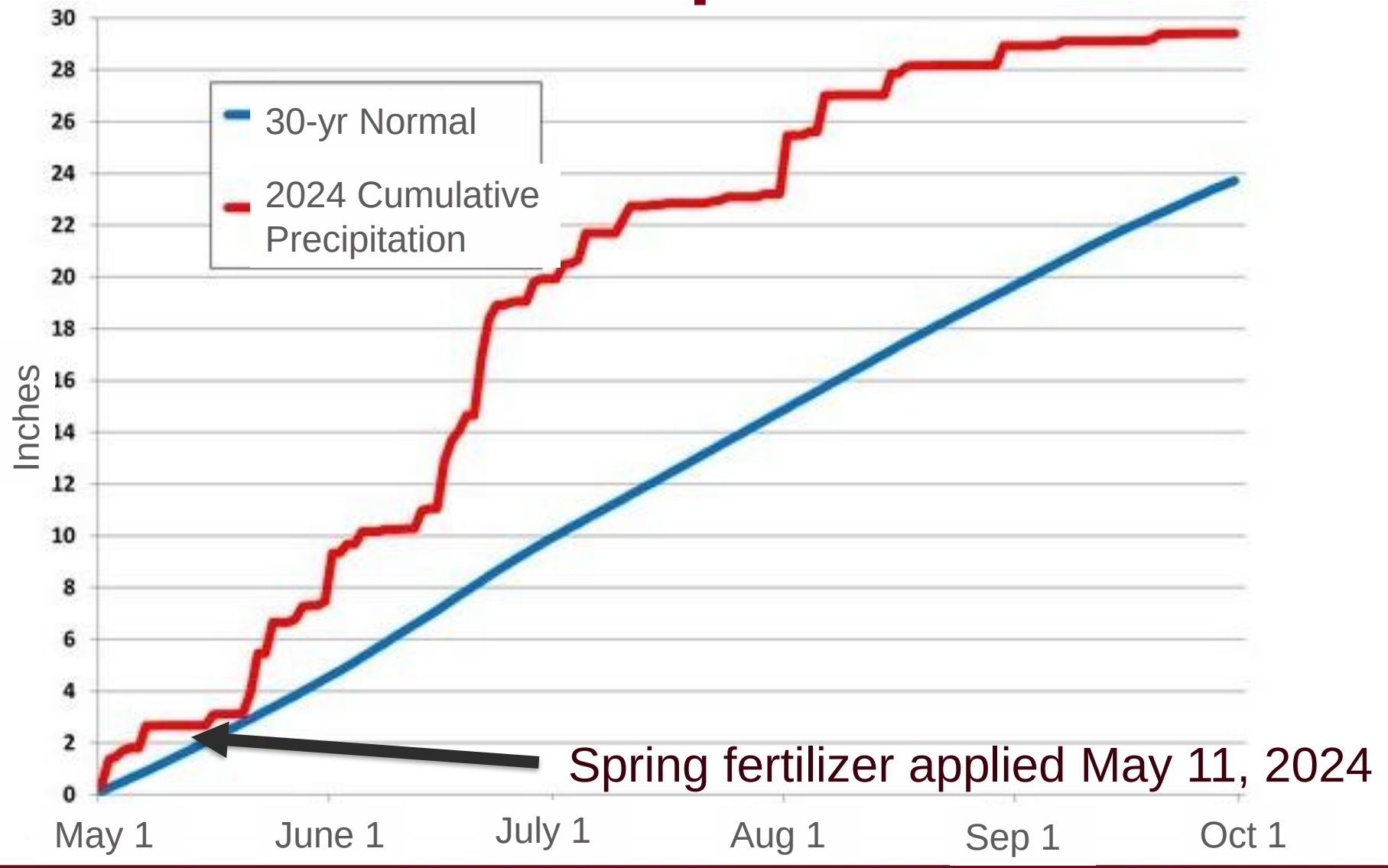
© 2025 Regents of the University of Minnesota. All rights reserved.

2024 Corn Yield at Site 2



© 2025 Regents of the University of Minnesota. All rights reserved.

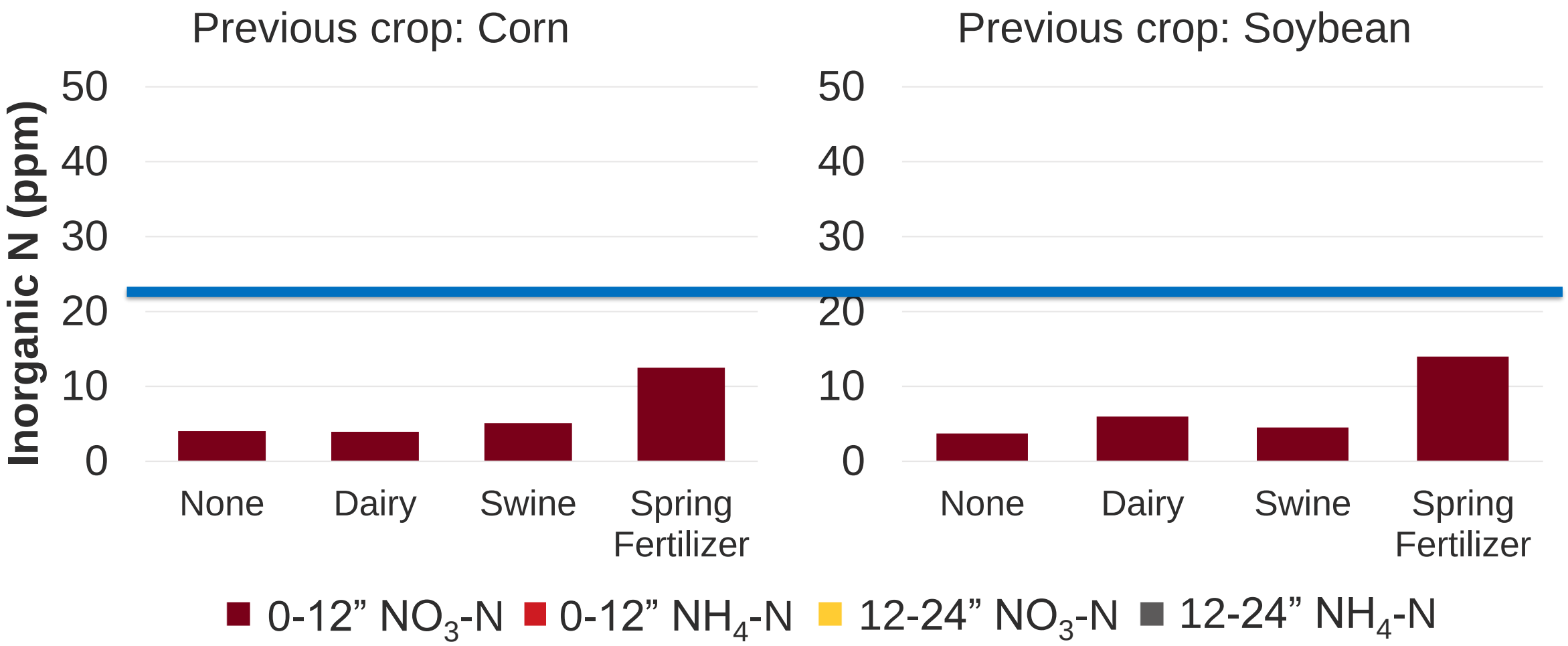
2024 Cumulative Precipitation in Waseca



Manure applied Nov. 6, 2023

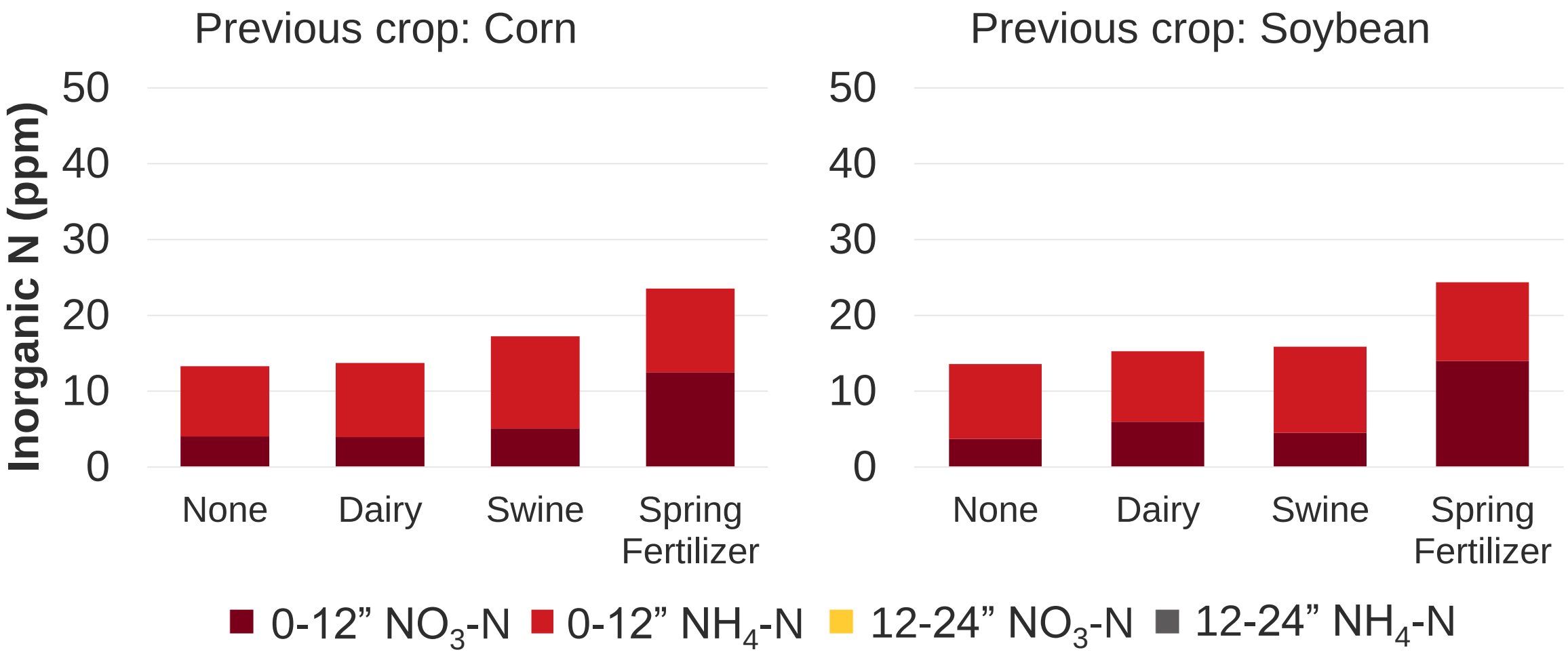
© 2025 Regents of the University of Minnesota. All rights reserved.

2024 Presidedress N Test Results



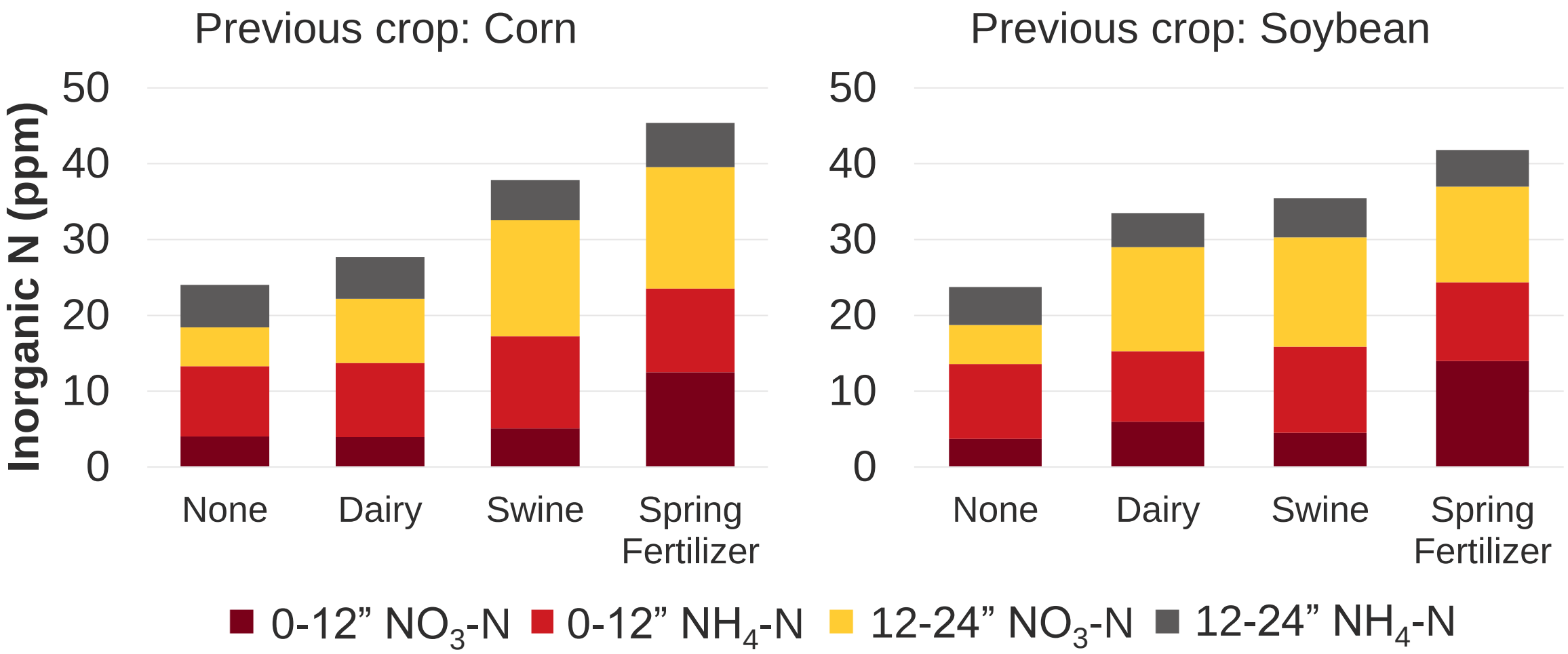
© 2025 Regents of the University of Minnesota. All rights reserved.

2024 Presidedress N Test Results



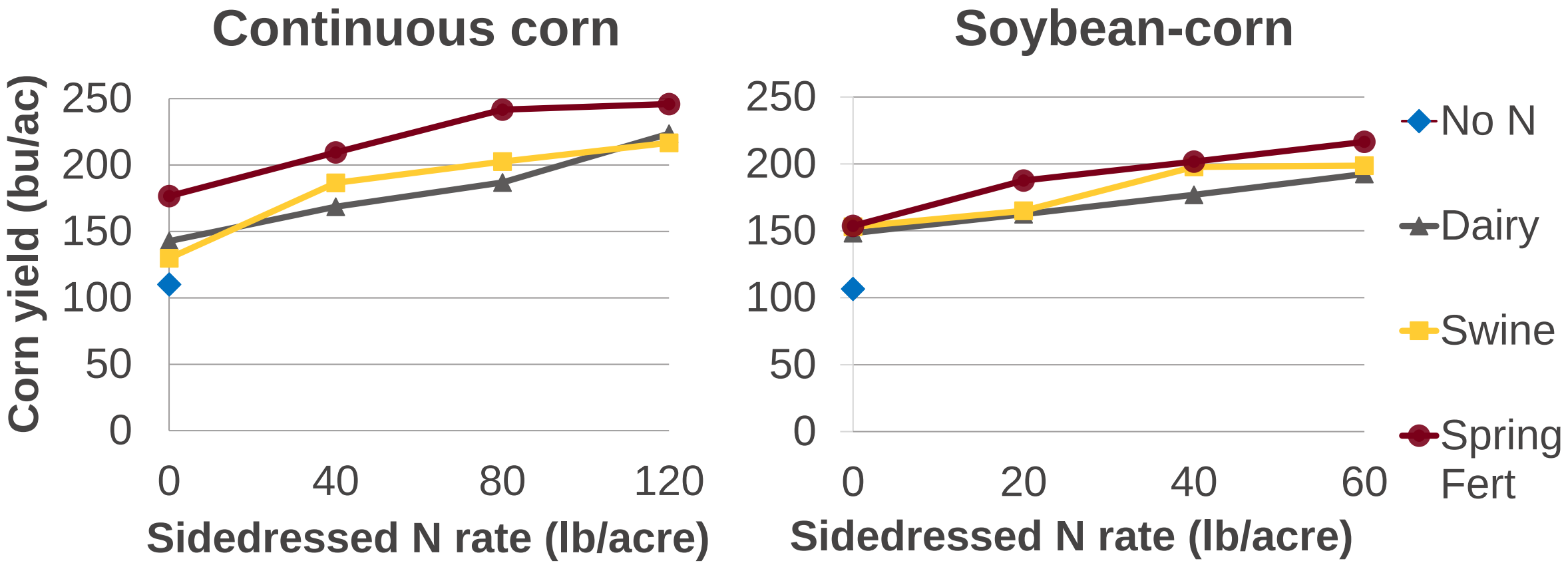
© 2025 Regents of the University of Minnesota. All rights reserved.

2024 Presidedress N Test Results



© 2025 Regents of the University of Minnesota. All rights reserved.

2024 Corn Yield at Site 2



© 2025 Regents of the University of Minnesota. All rights reserved.

PSNT research in manured fields continues

- Lessons learned so far:

Manure can be variable, especially when applied in the fall

PSNT definitely showed differences between nutrient sources

Research needs to be expanded across the region

© 2025 Regents of the University of Minnesota. All rights reserved.

Thank you!

Funding: Thanks to the MN Pork Board, MN Soybean Research and Promotion Council, USDA-NIFA Grant 2020-68008-31410, Sugarbeet Research and Education Board of MN and ND, and Minnesota Ag Fertilizer Research and Education Council (AFREC)

Contact Info: mlw@umn.edu

- Follow me on / : @ManureProf
- https://z.umn.edu/ManureResearch

© 2025 Regents of the University of Minnesota. All rights reserved.
The University of Minnesota is an equal opportunity educator and employer. This PowerPoint is available in alternative formats upon request at 612-624-1222.

ManureDB:

Regional trends and differences in manure nutrient content from 2012-2022

UNIVERSITY OF MINNESOTA
Driven to Discover®

Historical record of what's in manure

Manure
"book values"

- Average nutrient values of various manure types published by different organizations

American Society of Agricultural and Biological Engineers (ASABE)

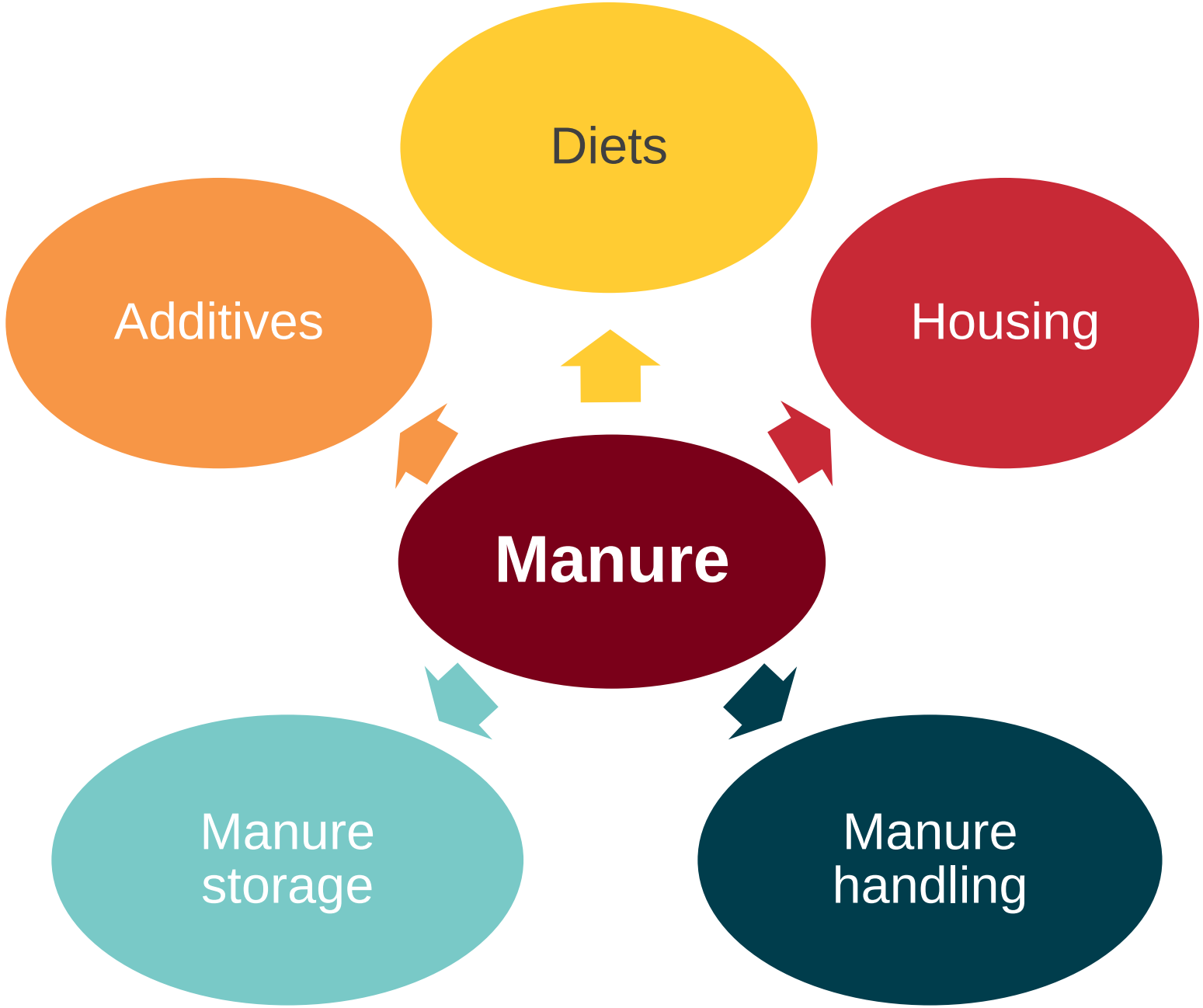
MidWest Plan Service (MWPS)

What are manure book values used for?

1. Developing manure management plans
2. Designing manure storages
3. Establishing best management practices for manure land application
4. Modeling nutrient cycling and gas emissions

Manure is changing!

- Need a way to create “dynamic” book values!



Overview

Design and implement database

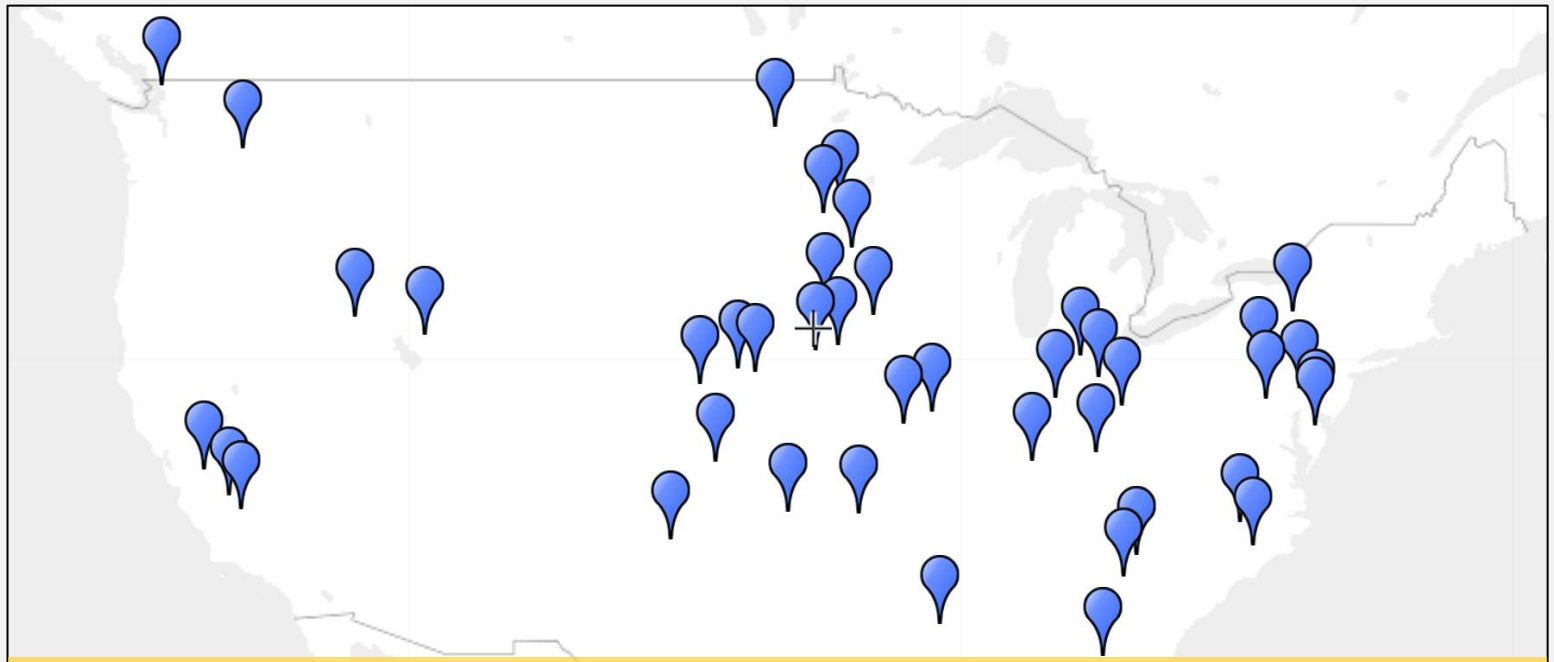
Provide data publicly

Overview

Design and implement database

Provide data publicly

- Goals:
  - combine manure analysis results from around the US
  - ensure it's scalable and dynamic



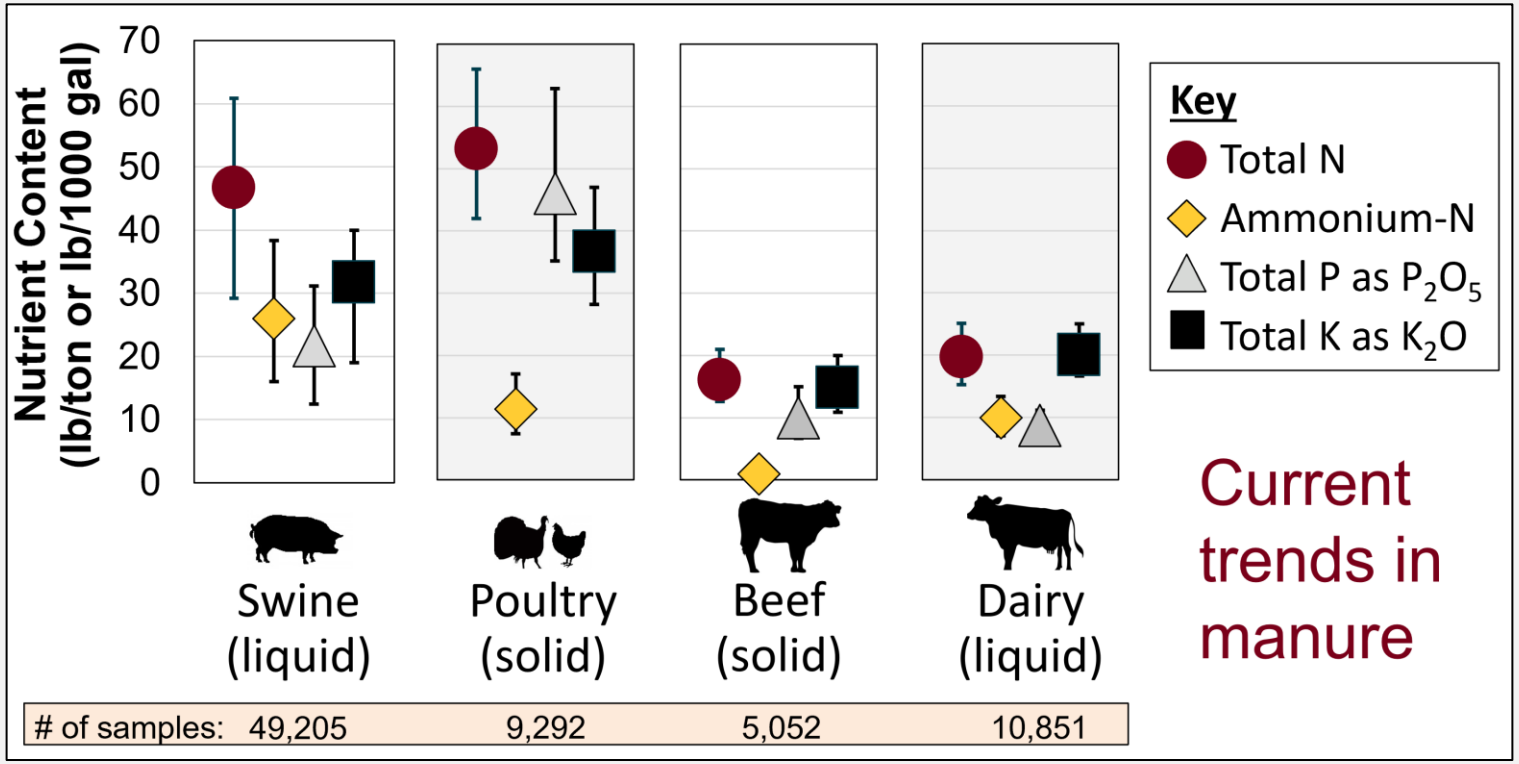
U.S. labs participating in the Manure Analysis Proficiency Program in 2022

Overview

Design and implement database

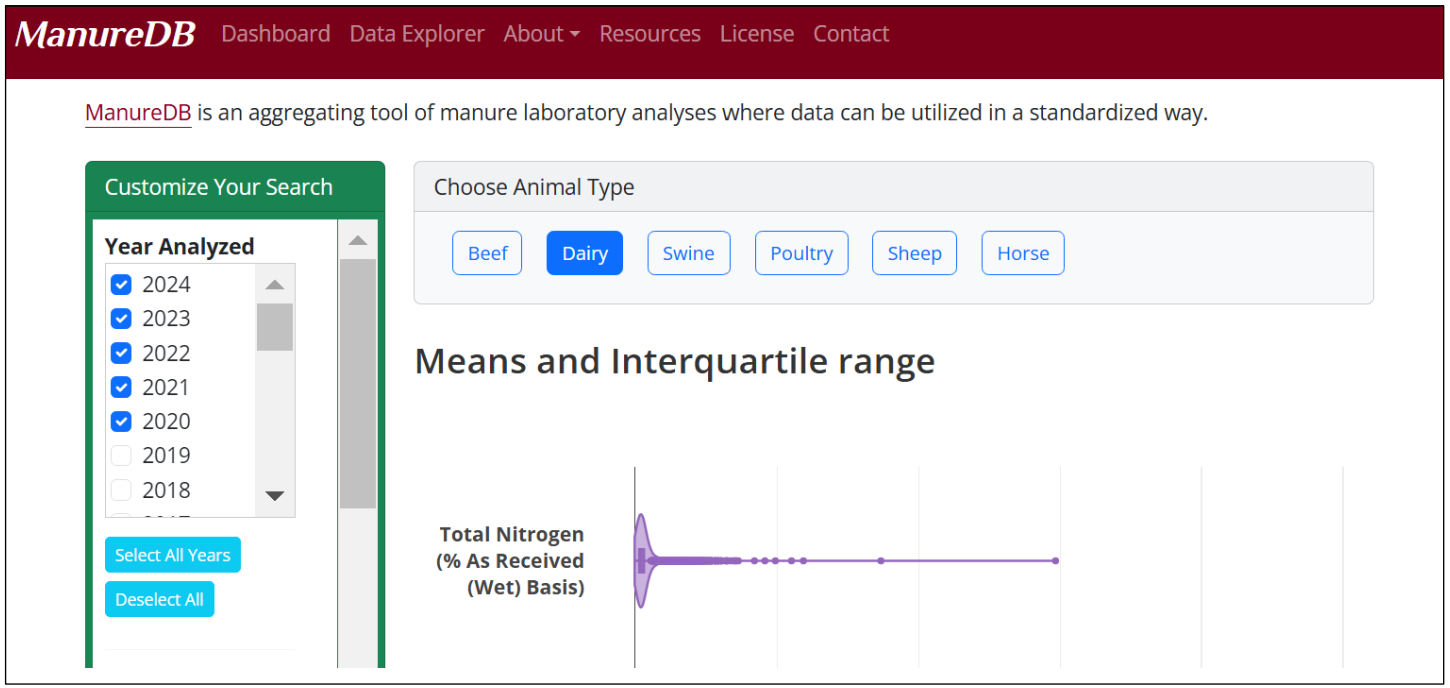
Provide data publicly

Provide up-to-date, aggregated information on animal manure composition in user selected terms: spatially, temporally, and by animal system source



ManureDB is live!

https://z.umn.edu/manureDB



Thank you!

Co-authors: Nancy Bohl Bormann, Melissa Wilson*, Erin Cortus, Larry Gunderson, Kevin Silverstine, Kevin Janni

ManureDB is supported through USDA NIFA Award 2020-67021-32465 and Cooperative Ecosystem Studies Unit program [grant no. NR253A750008C001] from the U.S. Department of Agriculture — Natural Resources Conservation Service.