

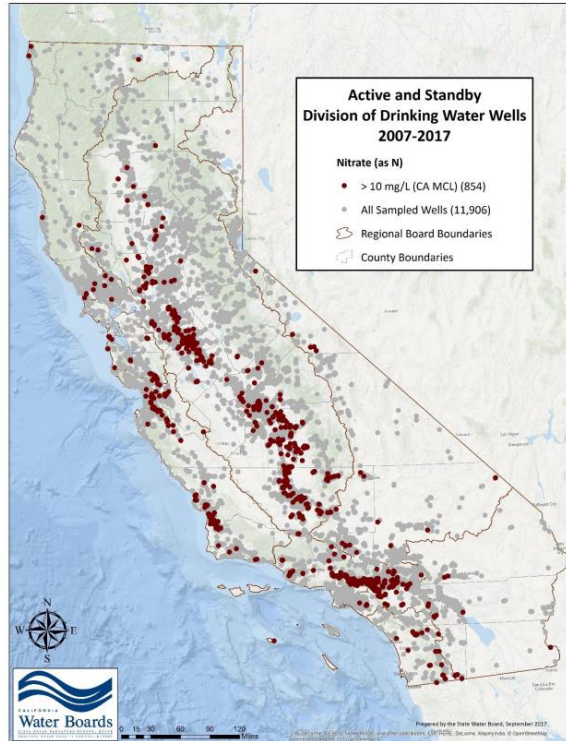


Assessing the Impact of Nitrogen Fertilizer Rates and Sources on Celery Yield and Quality

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**State Water Resources Control Board
Division of Water Quality
GAMA Program**



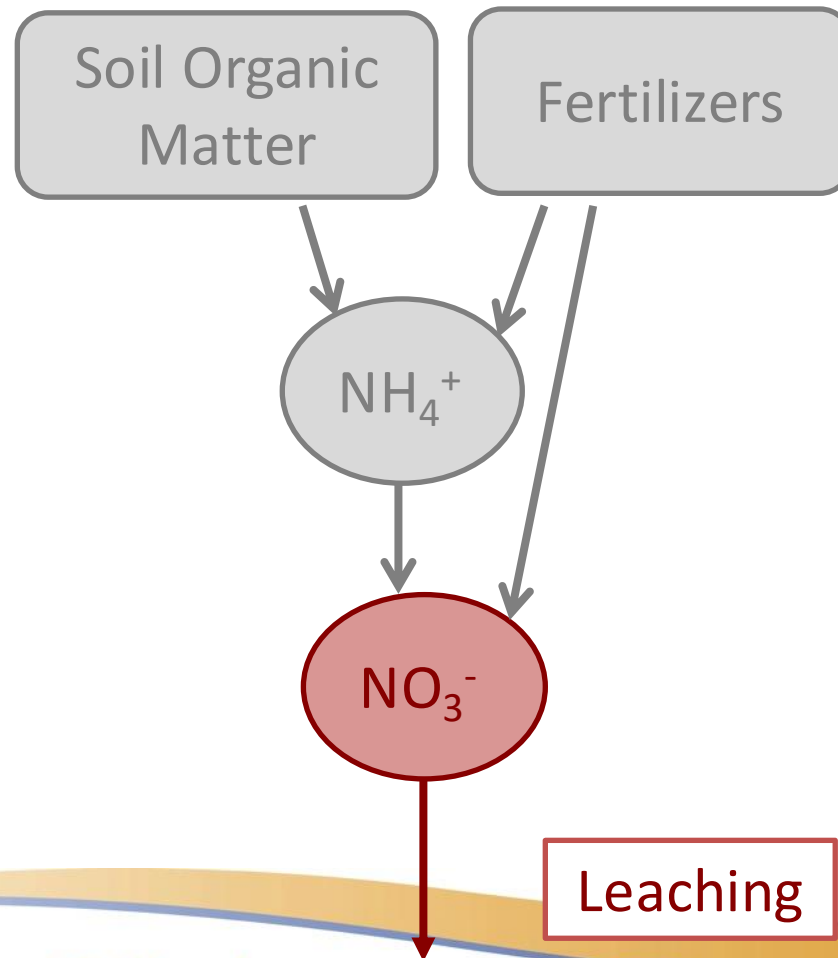
Active and standby public drinking water wells that had at least one detection of nitrate (as N) above the MCL, 2007-2017, 854 wells. (Source: Public Well Data using GeoTracker GAMA).

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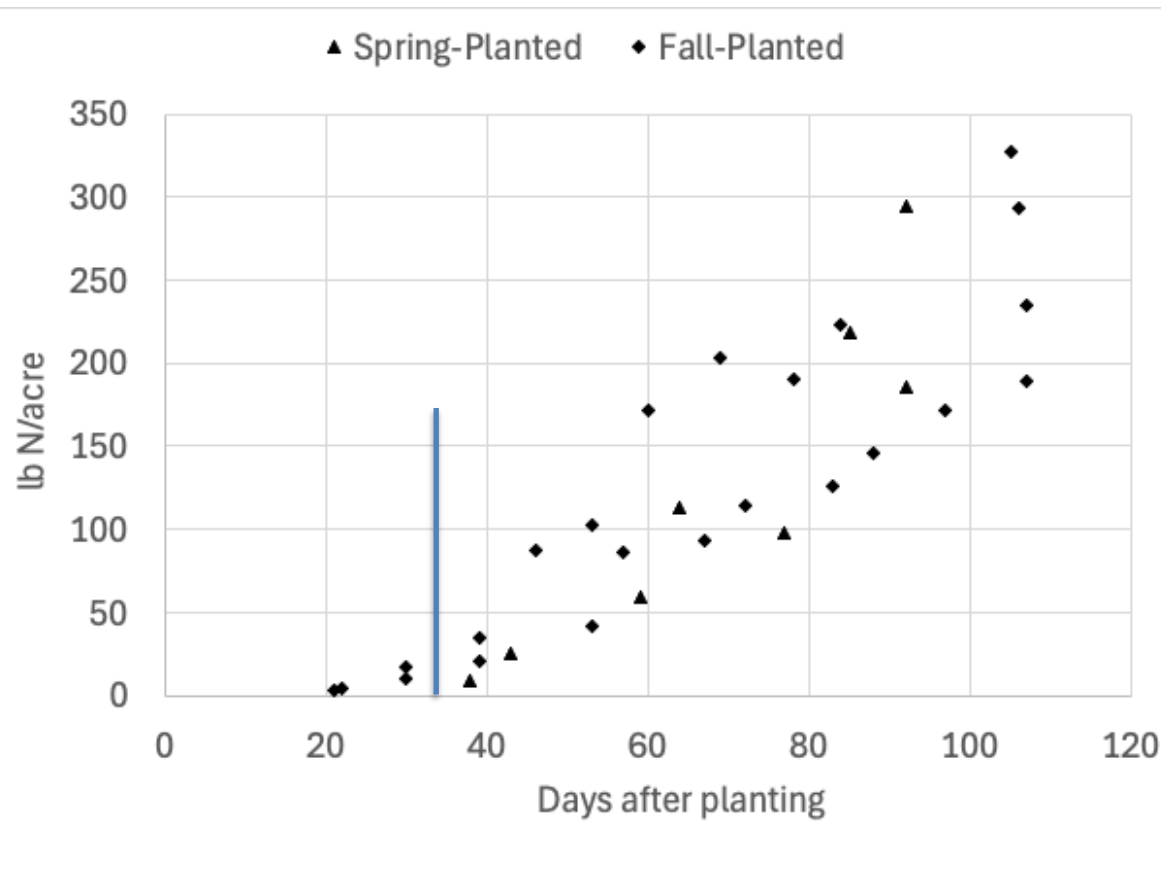
(Applied N – Removed N)

Nitrate Leaching

Loss of nitrate (NO_3^-) from the soil due to irrigation or rain.
Greatest loss potential of nitrogen from the soil.



Nitrogen Uptake (6 fields)



----- lb N/acre/day -----				
	first 30-40 days	after 30-40 days		
	0.2	3.1	spr	proc
	0.5	3.5	fall	proc
	0.6	5.2	spr	cart
	0.3	2.8	fall	cart
	0.5	2.4	fall	cart
	0.8	4.2	fall	proc
avg	0.5	3.5		

Project objectives:

Better understand the impact of two major aspects of N fertilization in N use-efficiency, yield and address regulatory compliance.

- 1) Assess how different N fertilizer rates affect yield and quality,
- 2) Determine if yield and quality are affected by fertilizers with different proportions of NH_4^+ or NO_3^- as N source.

Fall 2025



Material and Methods

- Planting/harvesting dates: Mar 31/Jun 23 (84 days)
- Variety type: Proprietary processor/fresh cut
- Soil type: sandy clay loam
- Previous crop: bell peppers
- Soil N at planting (0-12in depth): 11.4 ppm N ($\text{NO}_3 + \text{NH}_4$)
- Pre-plant fertilizer: 500 lb/ac of 6-24-24 (30 lb N/ac)
- Irrigation total: 15.8in; Rainfall: 0.57in
- N in water: < 5 lb/ac/season
- Medium flow tape

Irrigation Scheduling:

- Hortau tensiometers: determined when to irrigate
- Irrigation Calculator: determined how long to irrigate

Irrigation Calculator

EN 

Calculator currently in beta testing. [Click here](#) to provide feedback.

This calculator estimates irrigation requirements based on weather station and crop stage data. It is currently designed for strawberry, celery, cabbage, broccoli and cauliflower production in Ventura County, CA. [More about this calculator](#).

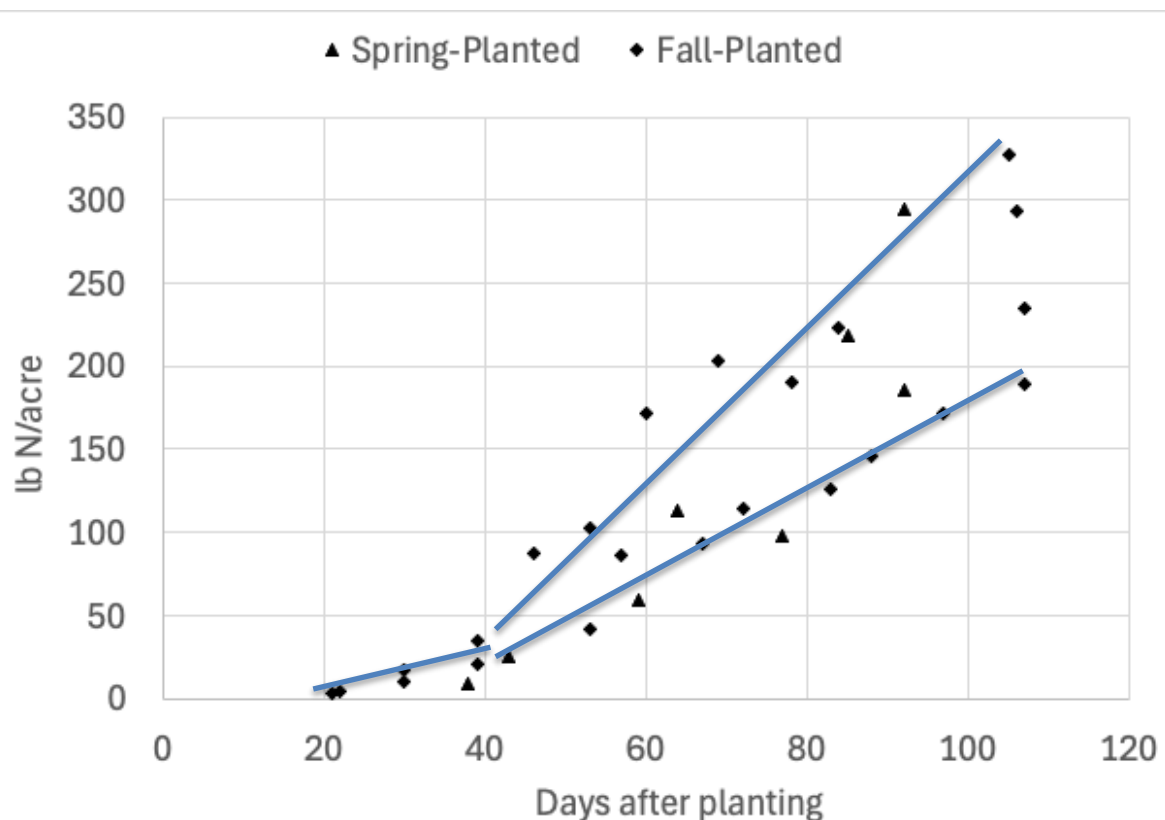
Crop		Canopy Cover	
Celery		20 - 30%	
ETo Zone		Last Irrigation or Significant Precipitation	
Zone 3	Find your zone → 	Aug. 5	
Application Rate (acre-in/h)			
0.1			

Calculate

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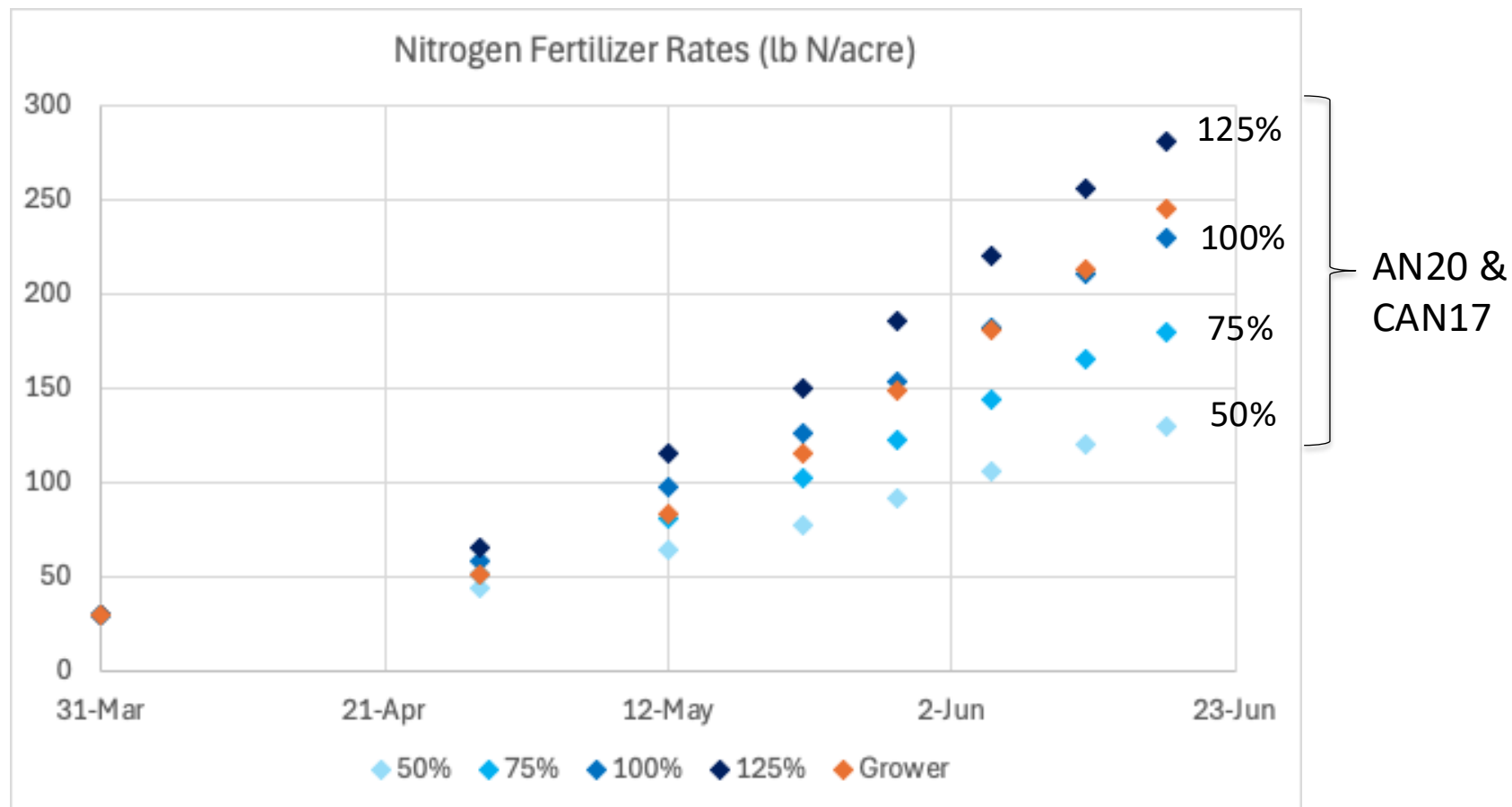
Determining N rates



100% N rate:
 $3.5 \text{ lb N/acre/day} + 15\% = 4.0 \text{ lb N/acre/day}$

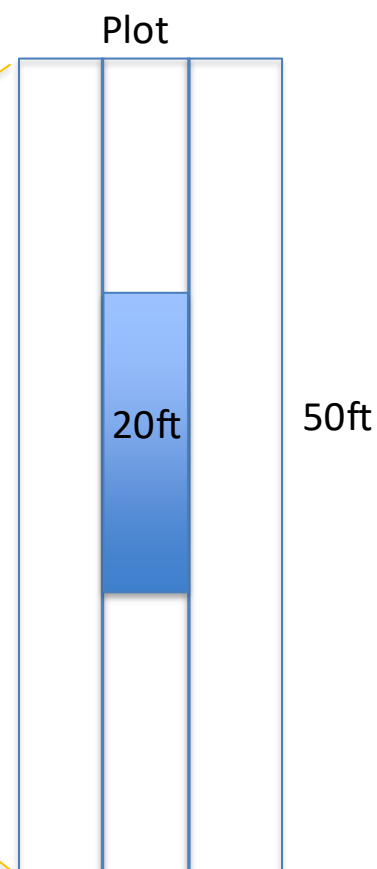
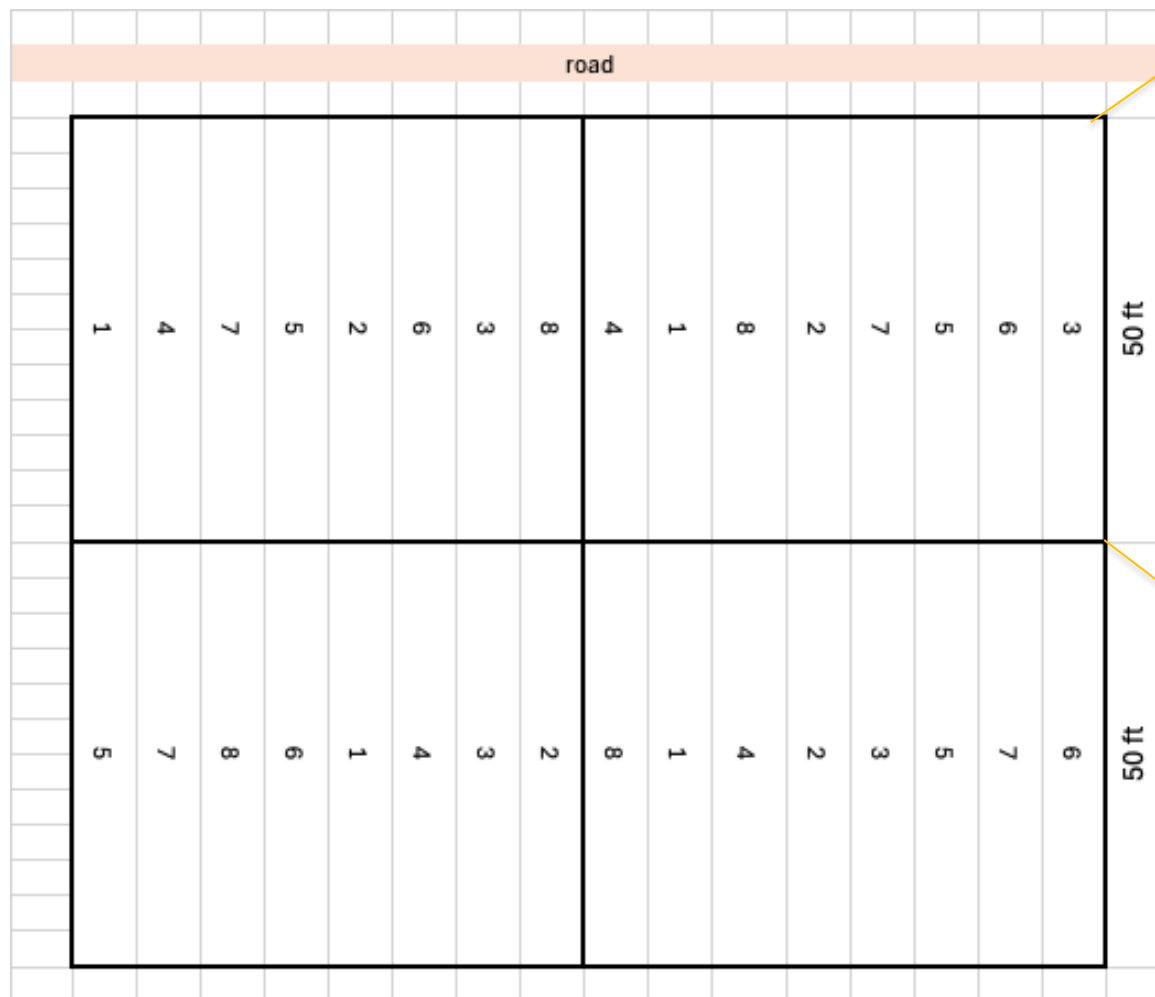
	Rates			
% of Uptake	50	75	100	125
	> 40 days			
lb N/acre/day	2.0	3.0	4.0	5.0
lb N/acre/week	14	21	28	35

Treatments



	Rates			
% of Uptake	50	75	100	125
	> 40 days			
lb N/acre/day	2.0	3.0	4.0	5.0
lb N/acre/week	14	21	28	35

Randomized Complete Block Design



trt #	Rate	Fert
1	50%	AN20
2	75%	AN20
3	100%	AN20
4	125%	AN20
5	50%	CAN17
6	75%	CAN17
7	100%	CAN17
8	125%	CAN17

Data collection

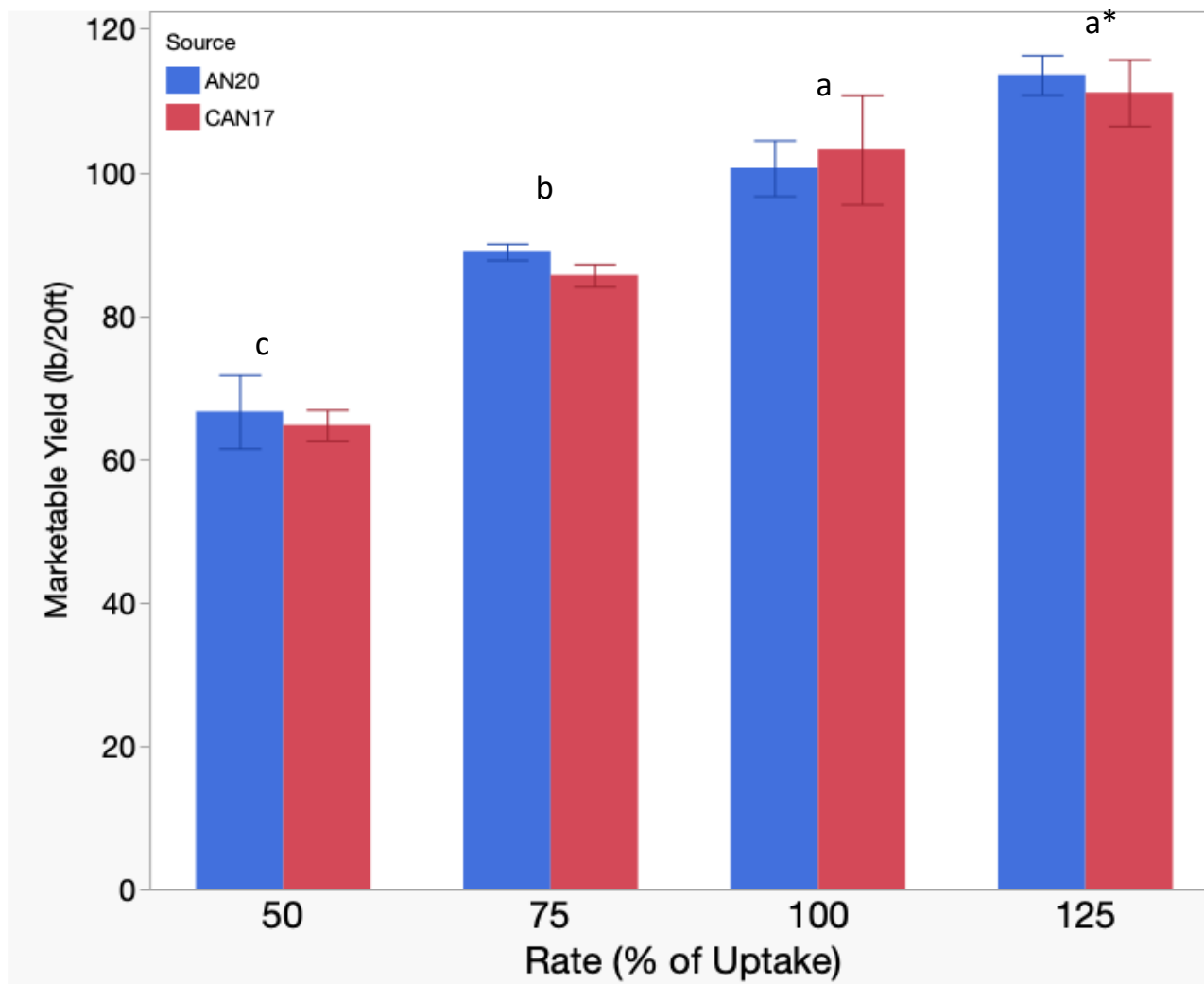
- Soil analysis: at planting, mid-growth and at harvest (0-12, 12-24 and 24-36in depth)
- Total N plant tissue: mid-growth and pre-harvest
- Soil moisture: Hortau tensiometers
- Applied water measured with Seametrics flow meter
- Plant height, canopy coverage, bacterial rot: mid-growth and pre-harvest
- Marketable yield and total biomass
- Number of marketable petioles and petiole length

Treatments' Application



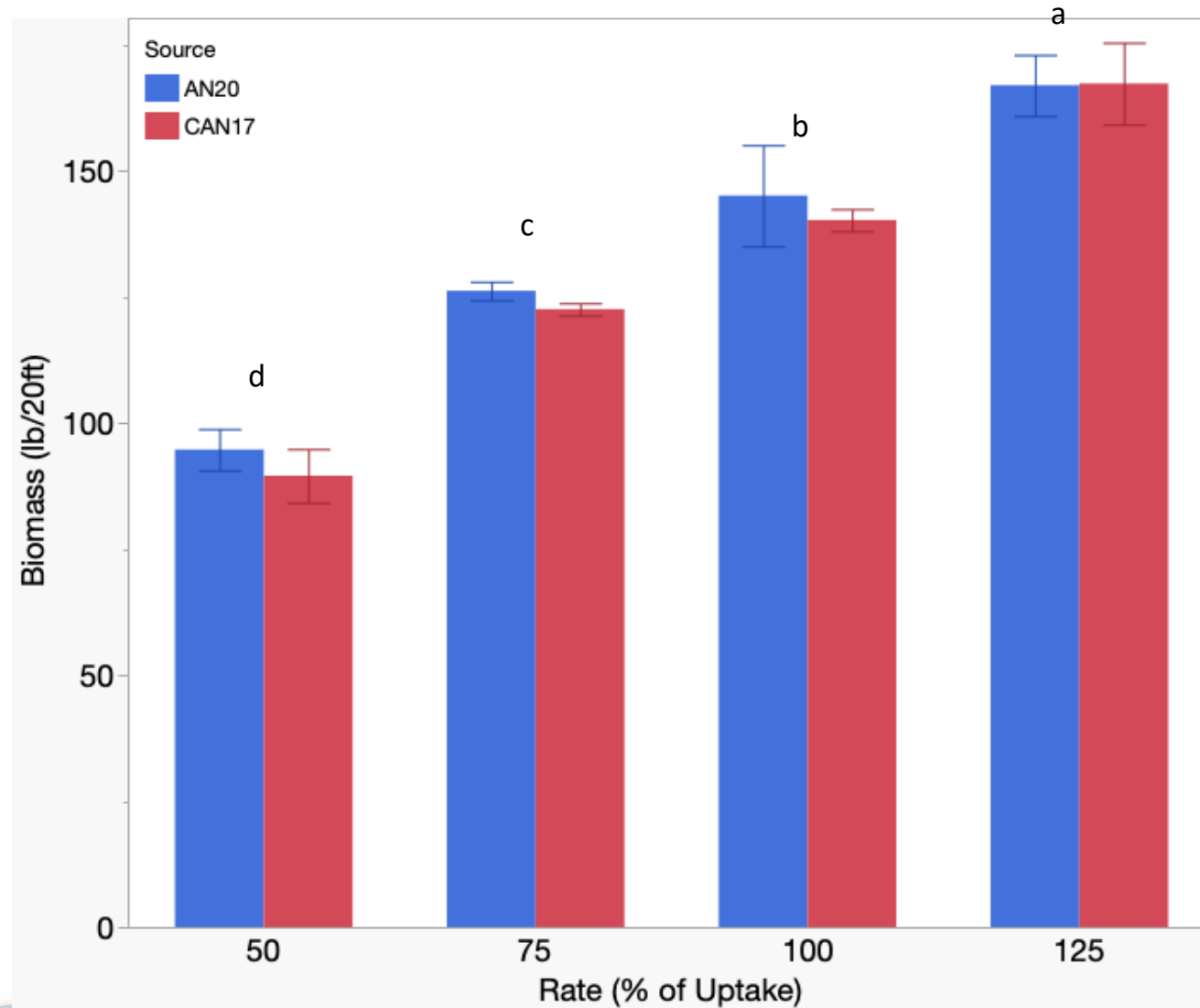
Results

Marketable yield was significantly affected by N rate, but not by fertilizer source

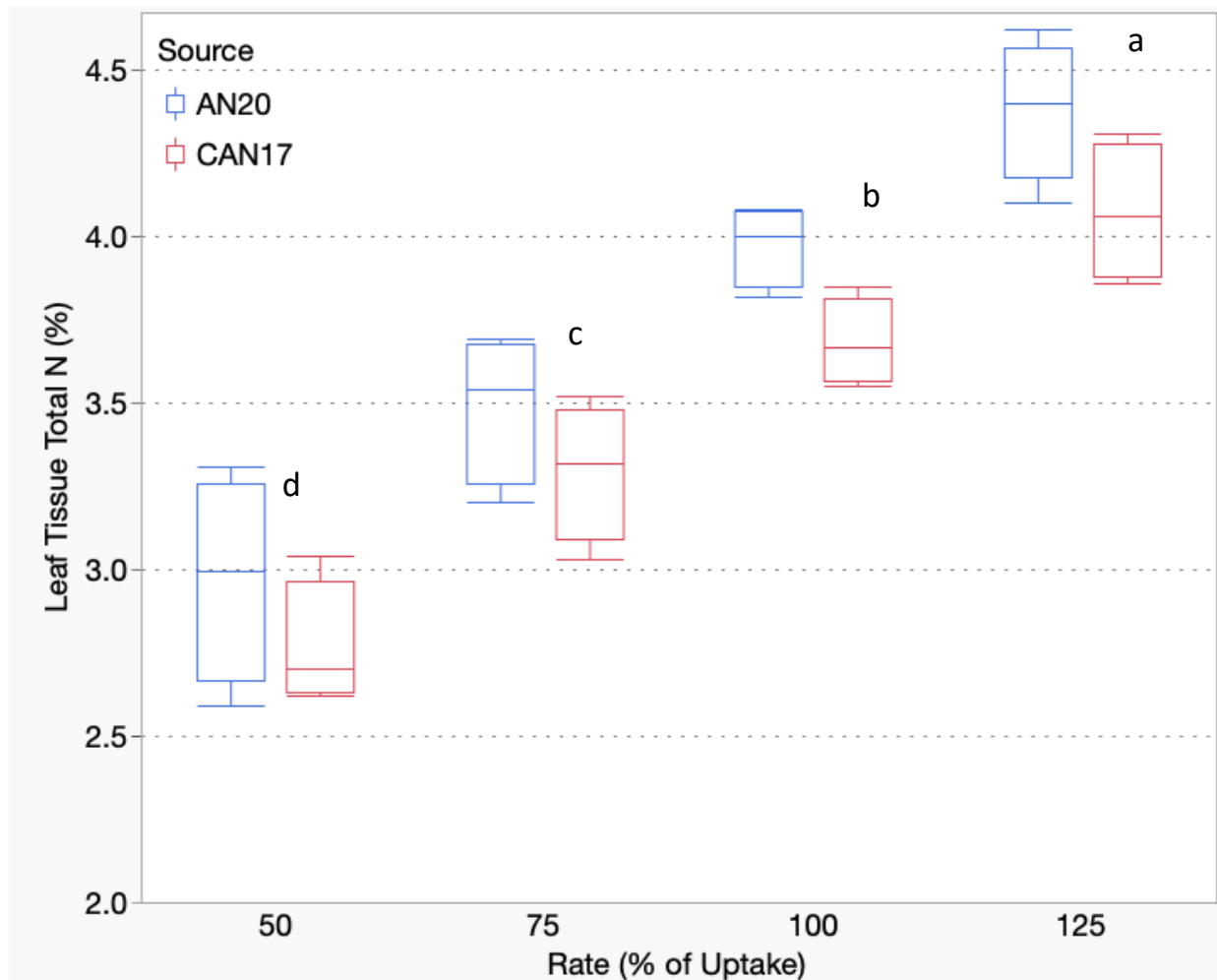


*Treatments with different letters indicate that differences were statistically significant

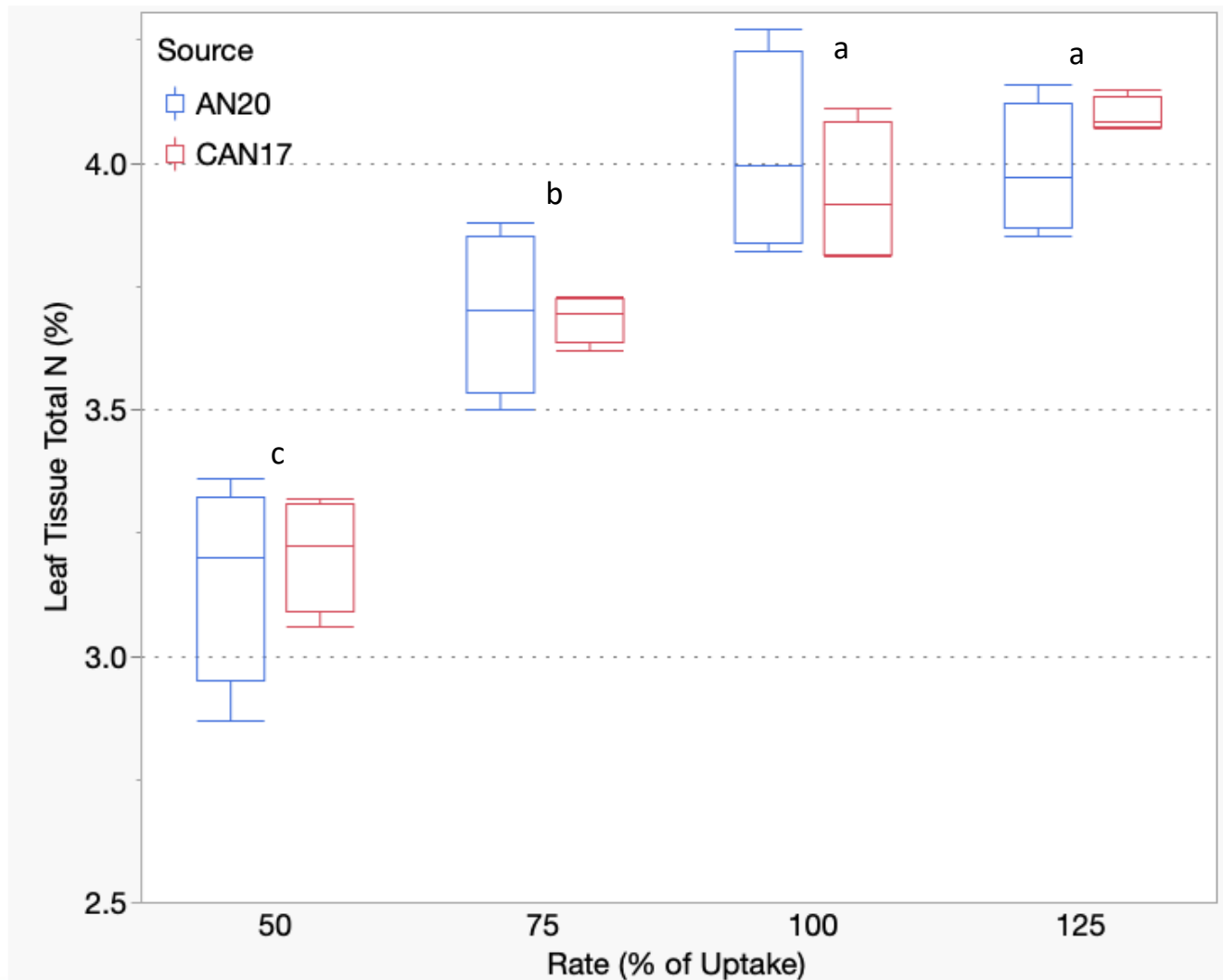
Biomass was significantly affected by N rate, but not by fertilizer source



Mid-growth leaf tissue N was significantly affected by both N rate and fertilizer source



Leaf tissue N at harvest was significantly affected by N rates, but not by fertilizer source

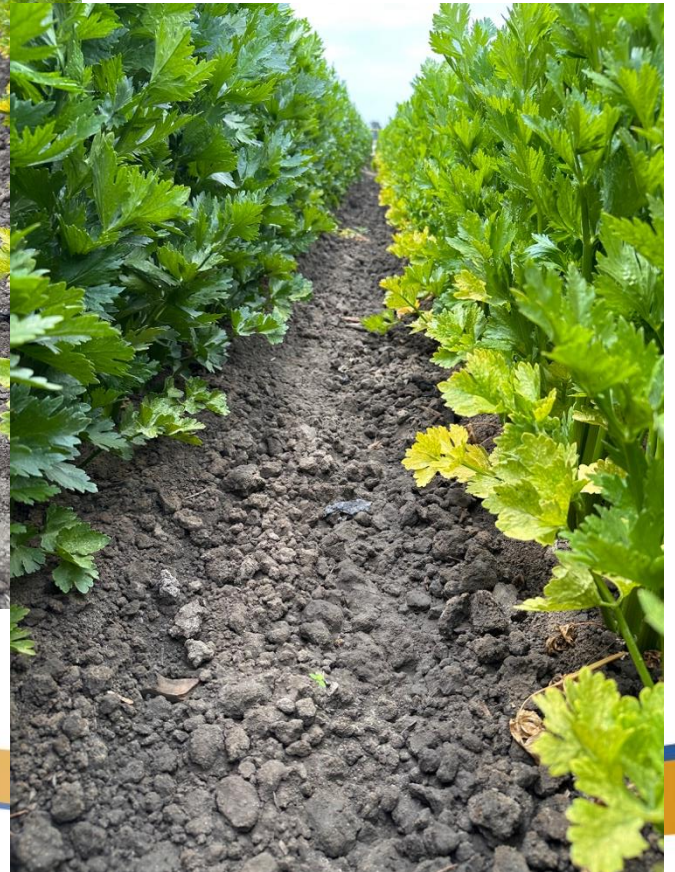


Leaf tissue samples

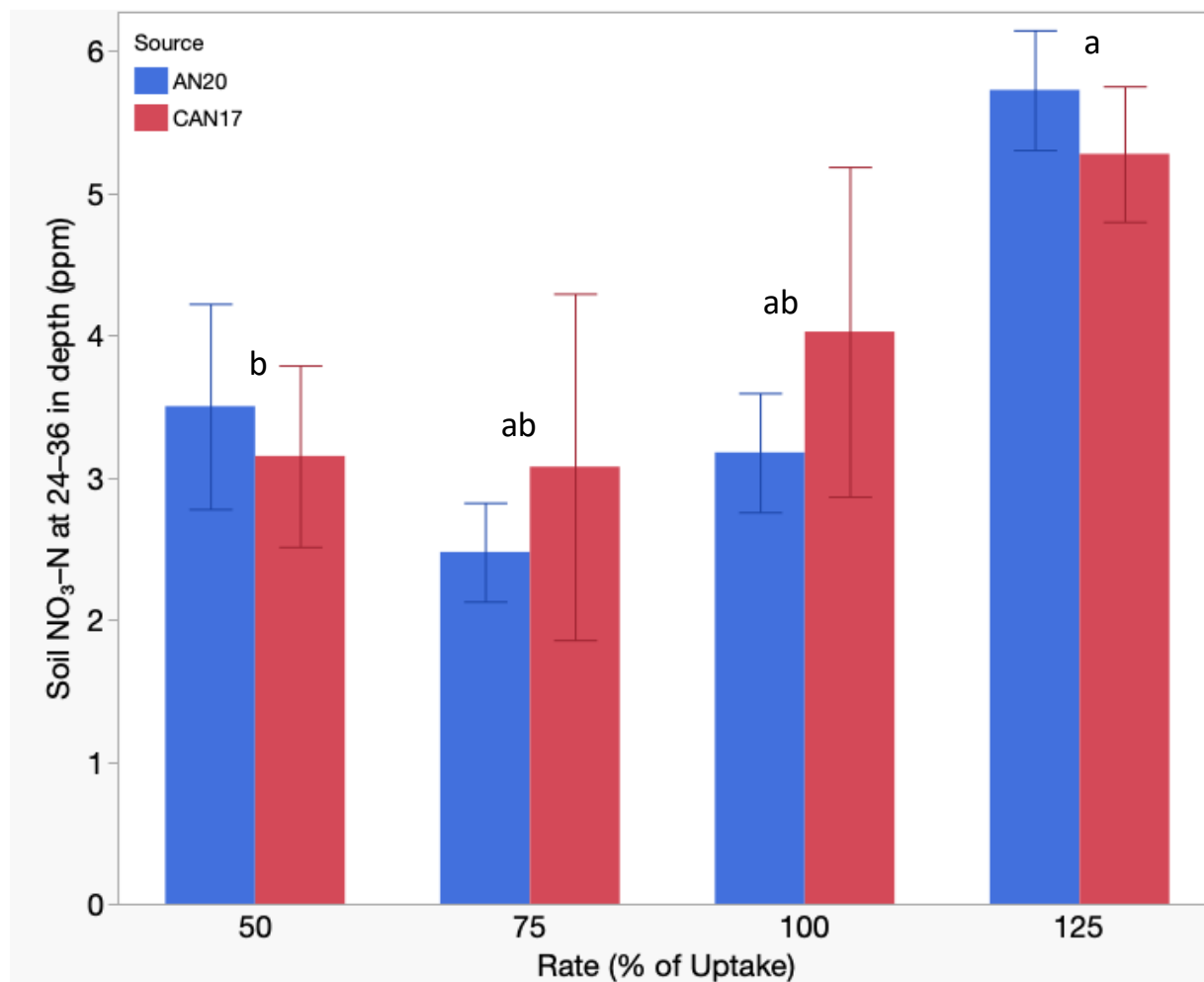




N Deficiency Symptoms

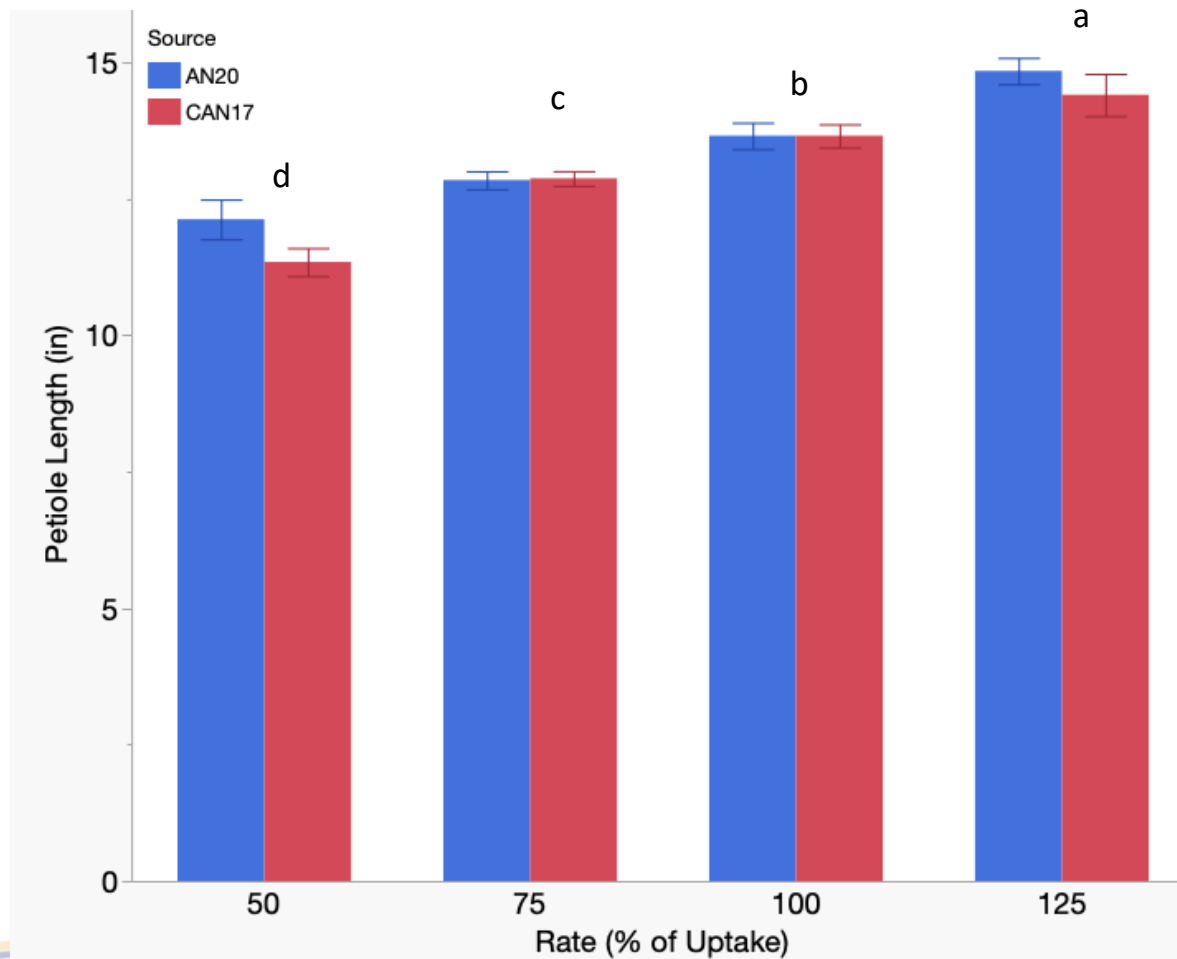


Soil nitrate at 24-36in depth at harvest was significantly affected by N rates, but not by fertilizer source

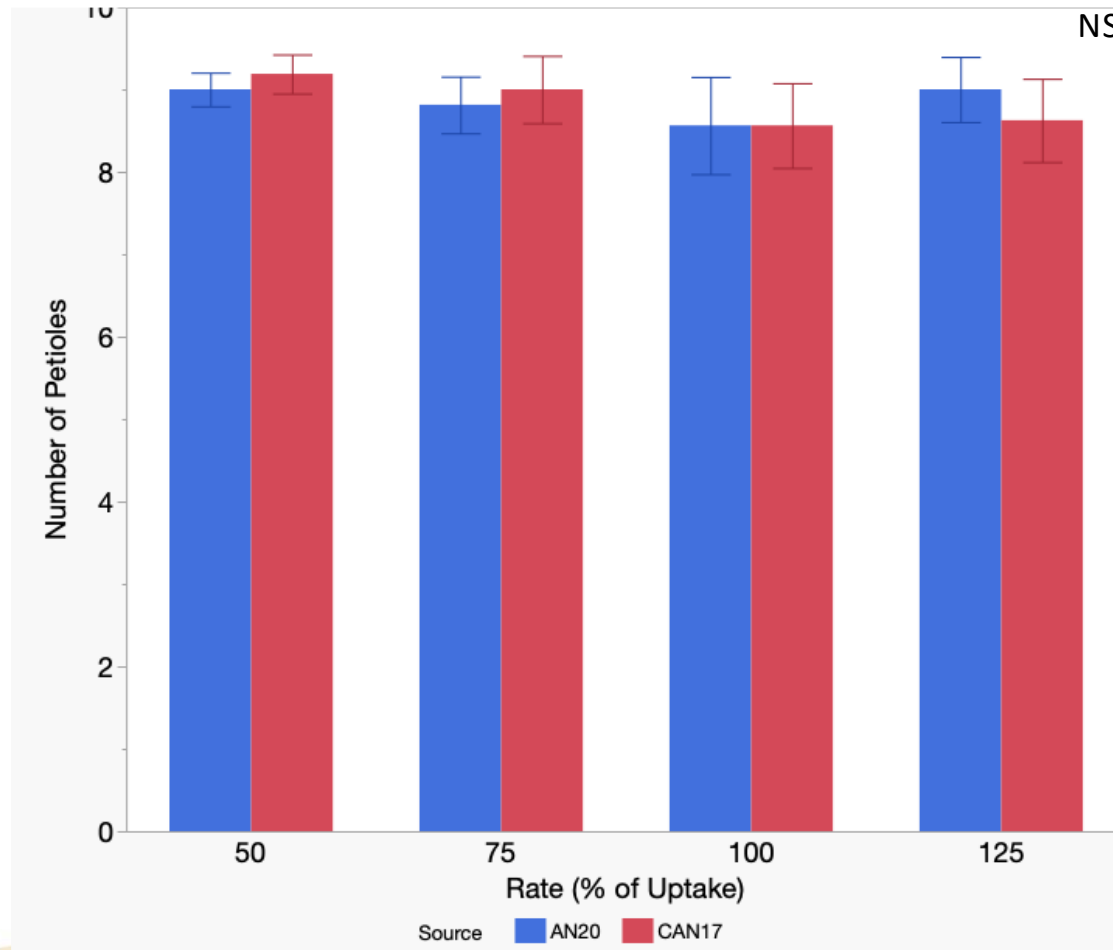


(11.6 ppm NO₃-N at planting)

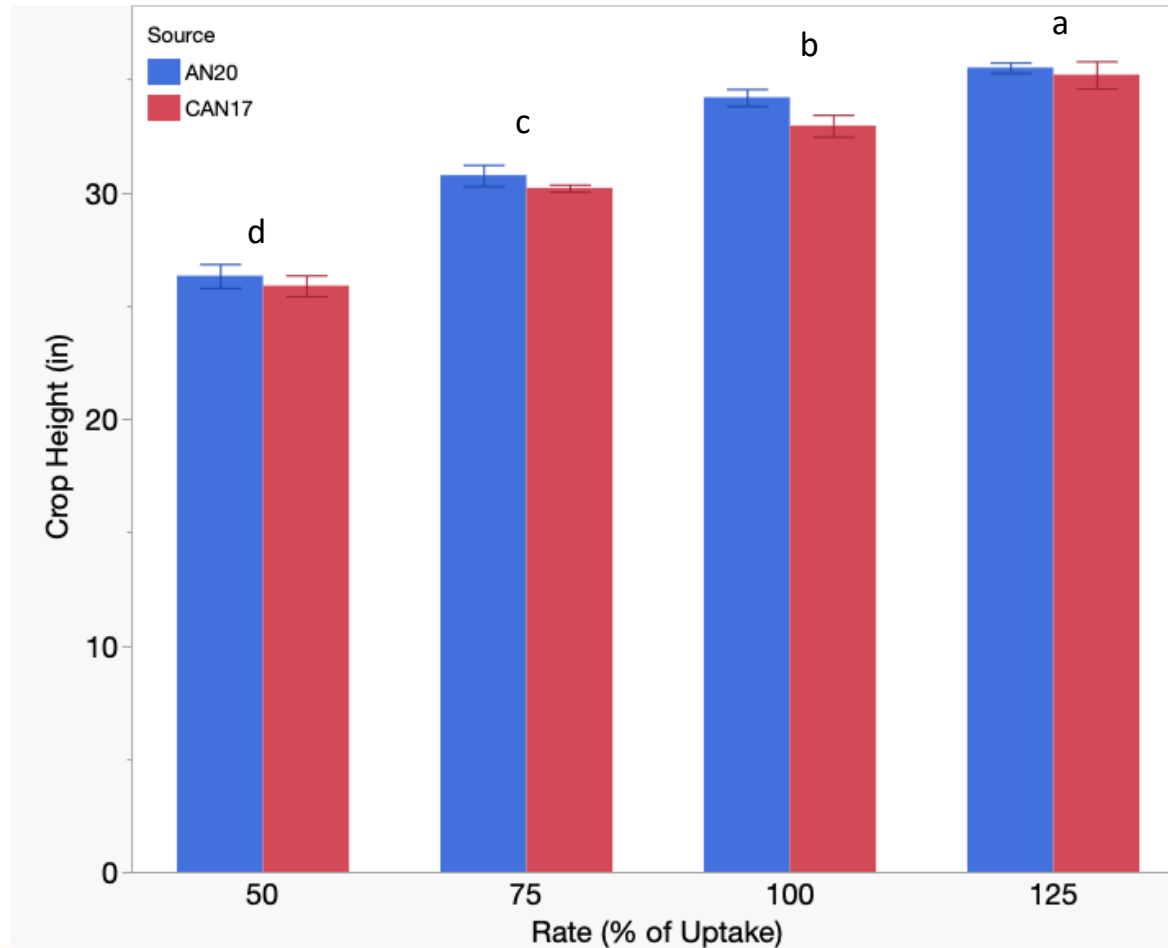
Petiole length was significantly affected by N rates, but not by fertilizer source



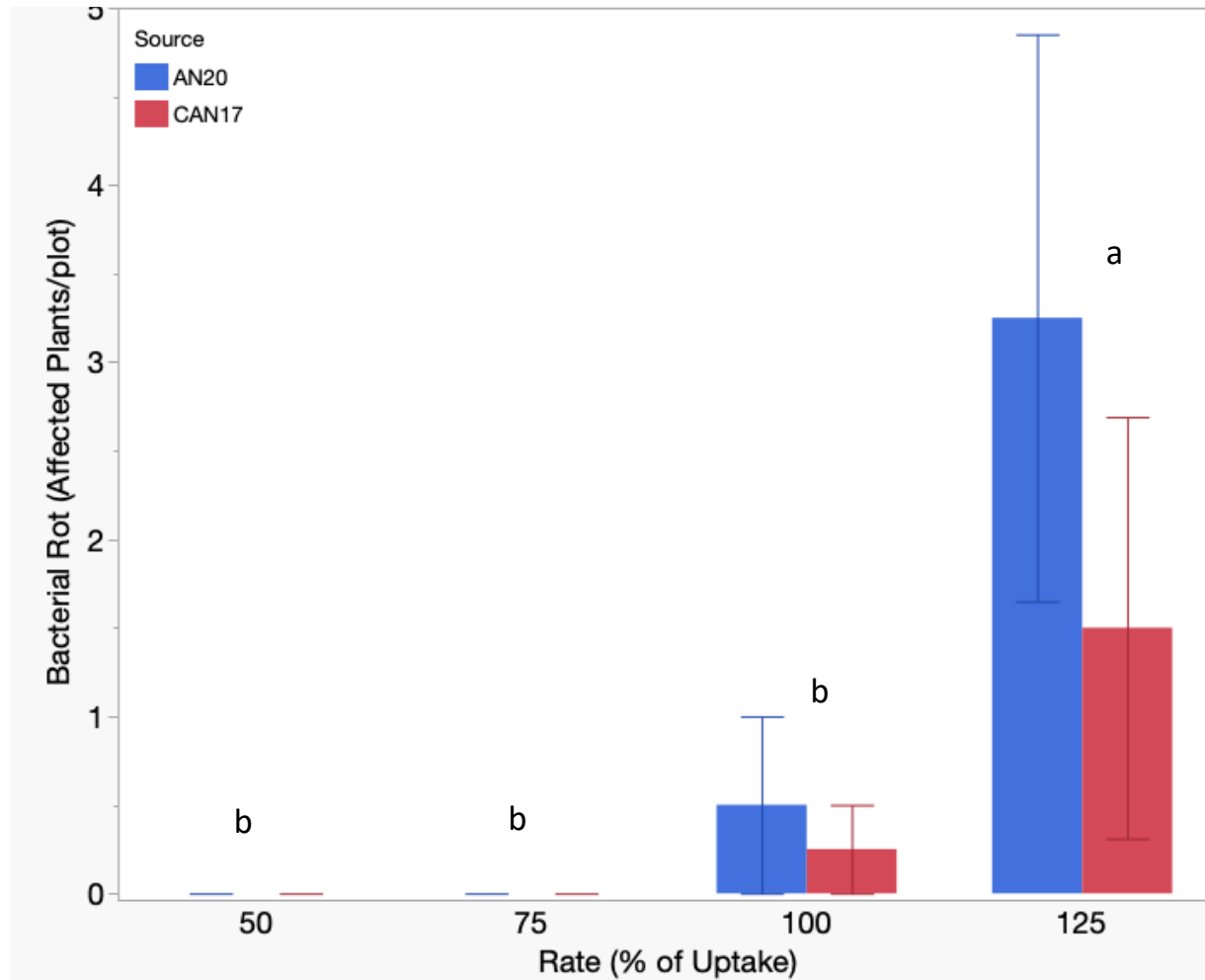
Number of petioles was not significantly affected by N rate or fertilizer source



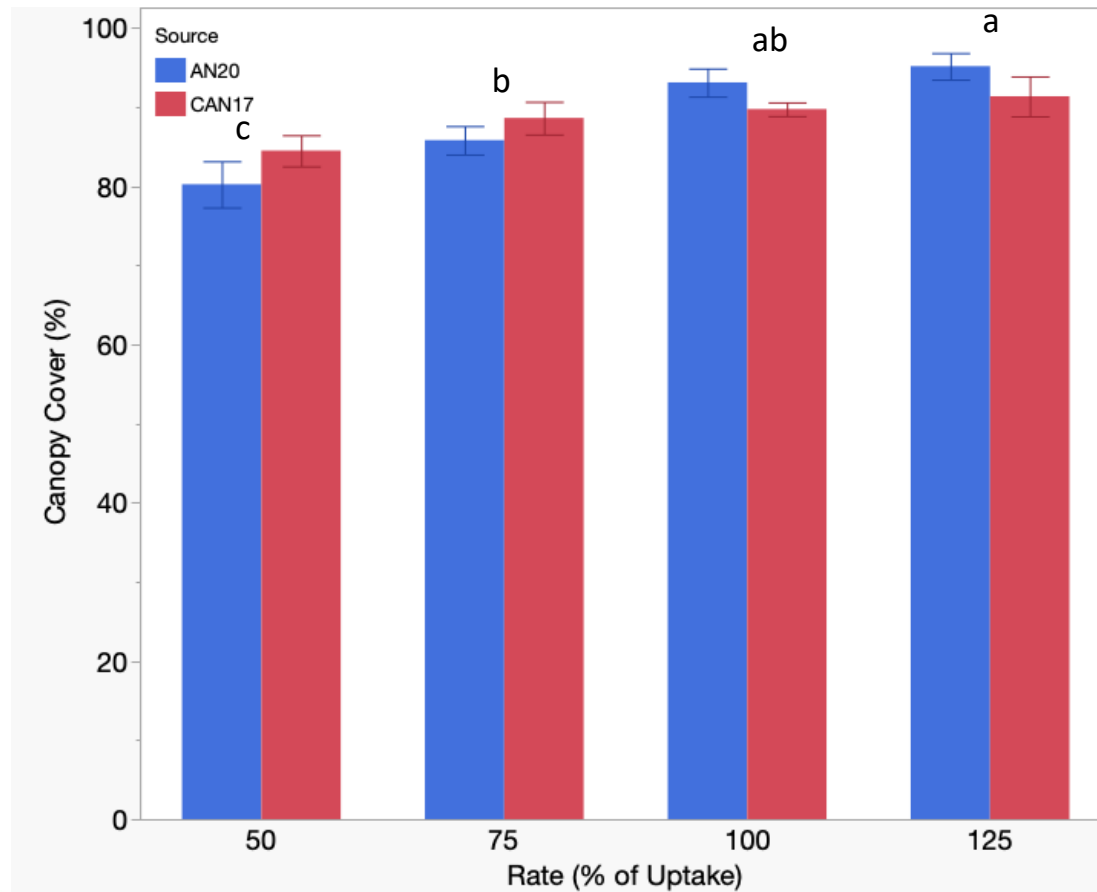
Crop height was significantly affected by N rate and fertilizer source



Bacterial rot was significantly affected by N rate, but not by fertilizer source



Crop canopy was significantly affected by N rate, but not by fertilizer source



Applied - Removed N Scenarios

	Applied N	Yield	Removed N	A-R	A/R
N rate	----- lb/ac -----				
50%	130	52,612	53	77	2.5
75%	180	69,920	70	110	2.6
100%	230	81,608	82	148	2.8
125%	280	90,000	90	190	3.1

Conclusions

- N rates significantly affected all parameters assessed in this study, except for number of petioles at harvest.
- It's unclear whether marketable yield and biomass plateaued at the highest N rate (5 lb N/ac/day, or 35 lb N/ac/week); optimum N rate could not be clearly established.
- Mid-growth leaf tissue N and crop height were the only parameters significantly affected by fertilizer type.
- Leaf tissue N can now be used as a reference for guiding N fertilization.
- Further investigation is needed to refine optimum N fertilizer strategies for celery production.



Acknowledgements:

- Duda Farm Fresh
- Thelma Hansen Funds
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- FGL

Questions/comments?

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