

Evaluating Precision Dry Fertilizer Placement to Improve Nutrient Use Efficiency and Corn Yield in the Southeastern US

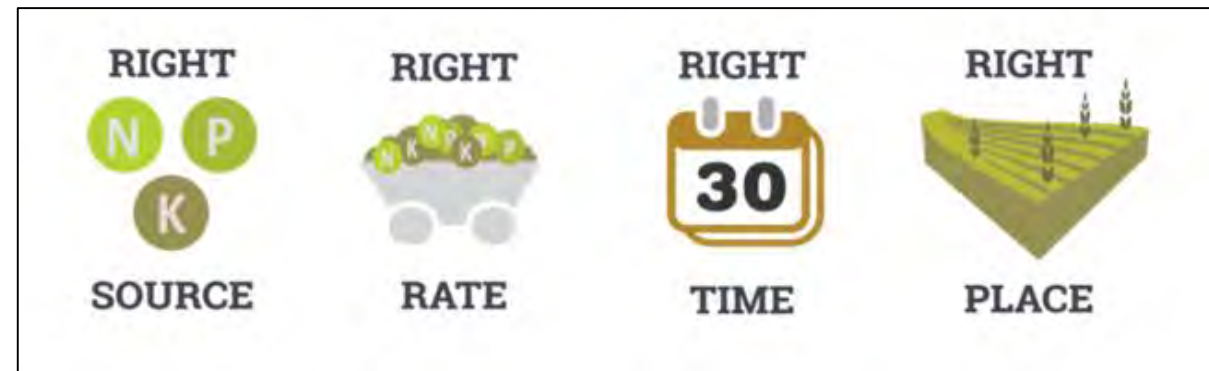
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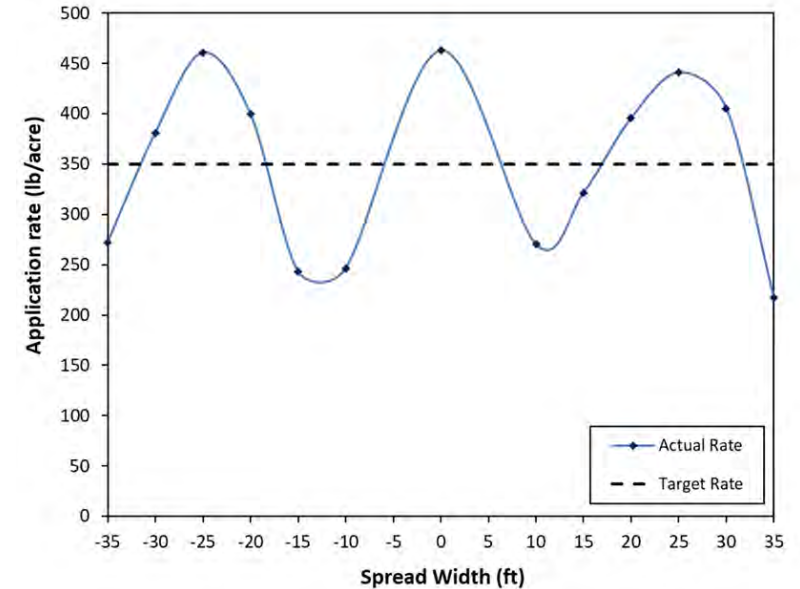
Introduction

- ❑ **Proper nutrient management** – one of the most important aspects in corn production for attaining higher yields.
- ❑ **4R's of nutrient management** – consideration for right source, rate, time and place.
- ❑ **Granular Fertilizer** – single or blended products (N-P-K) are commonly applied to meet (pre-plant) nutrient requirements

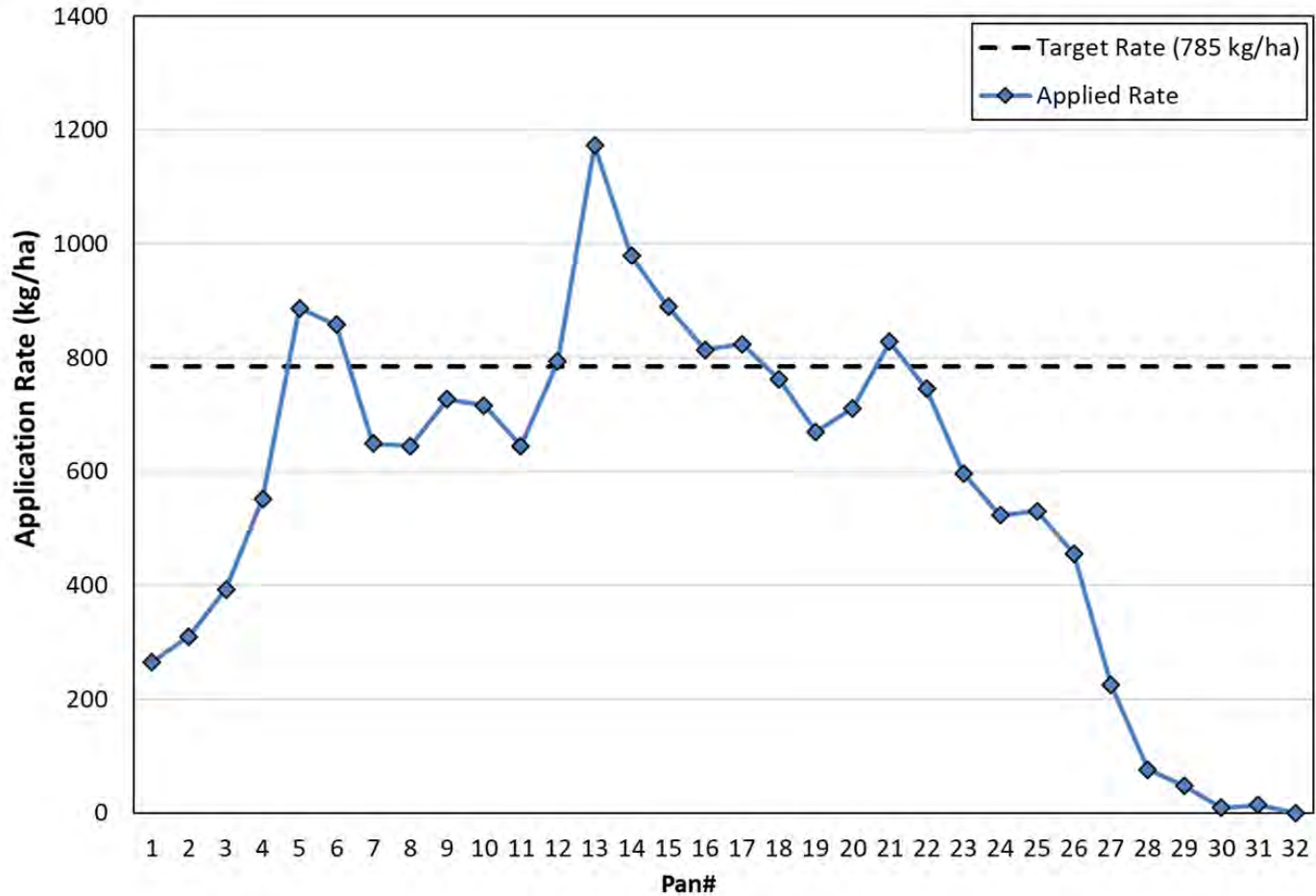


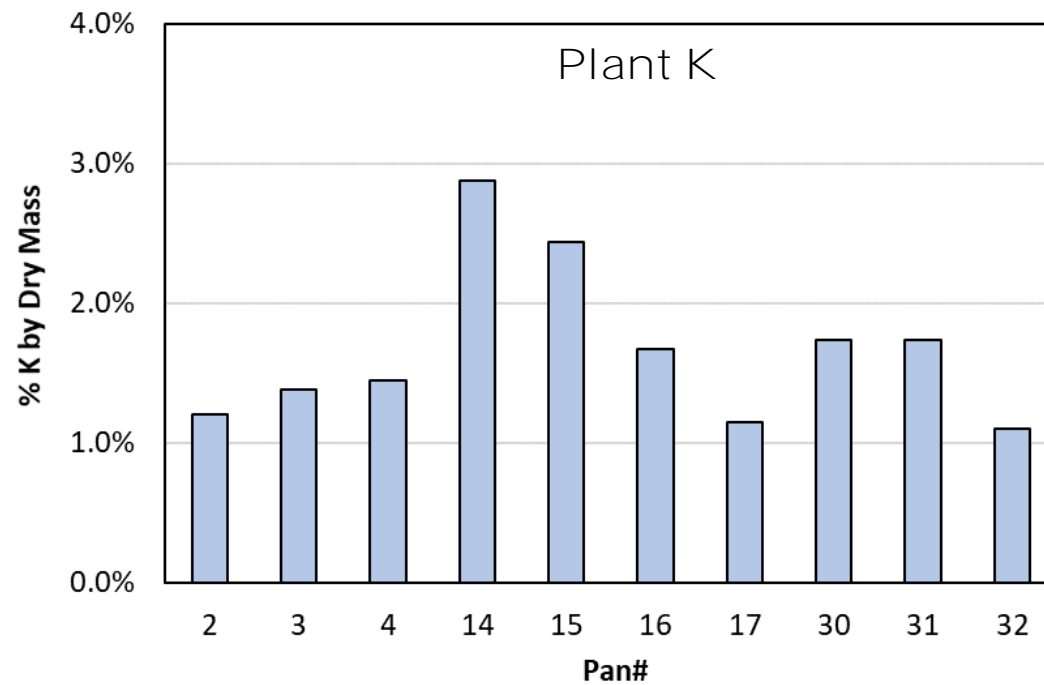
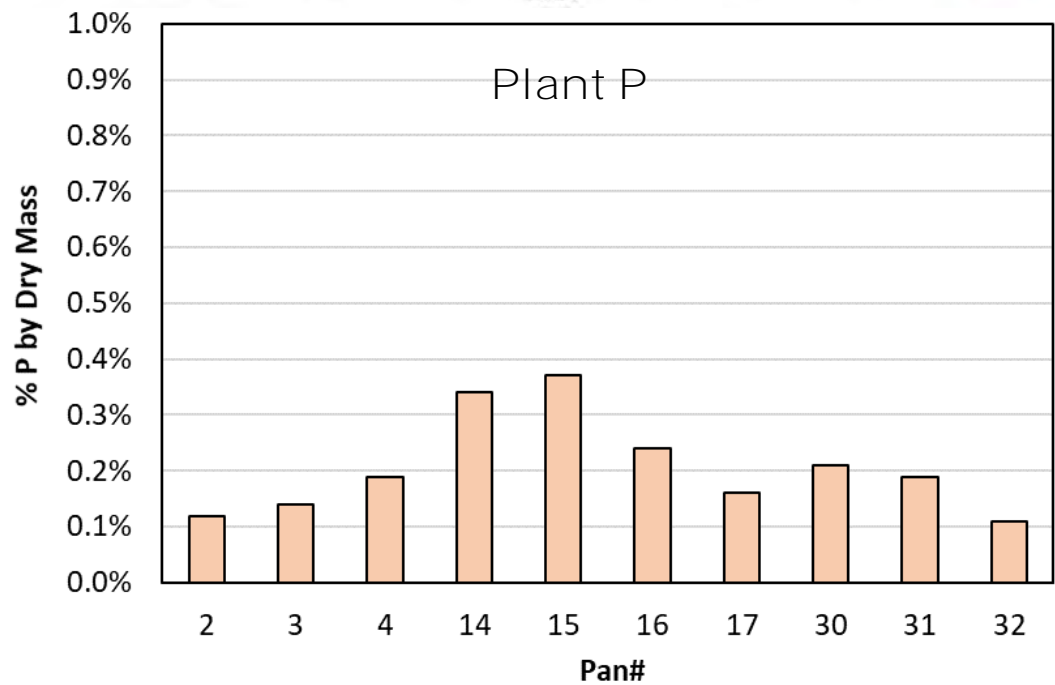
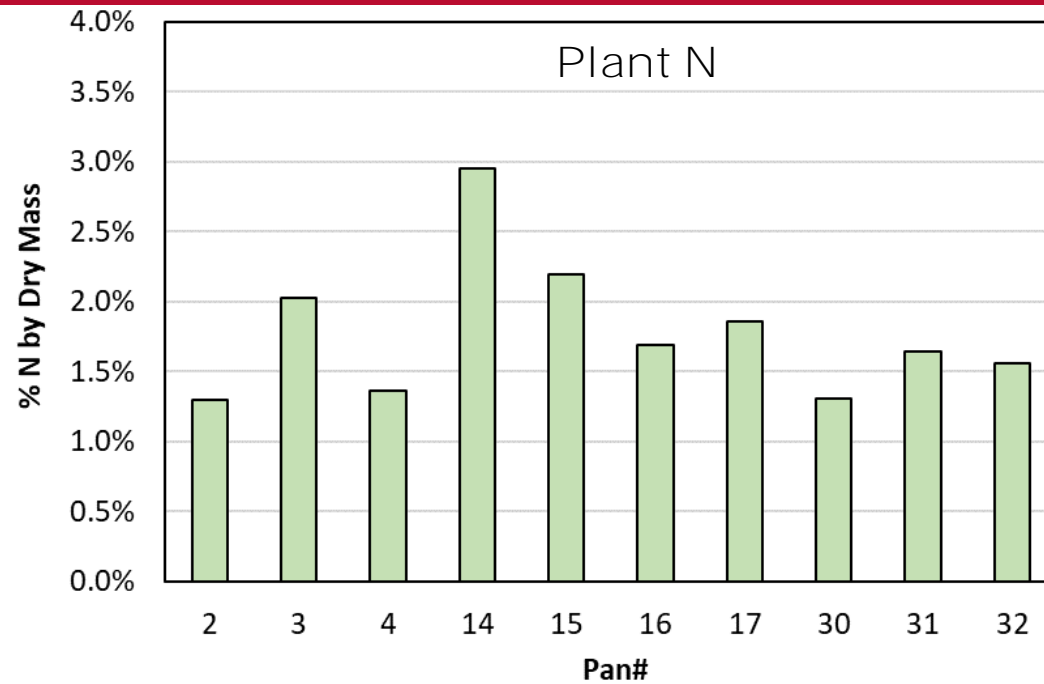
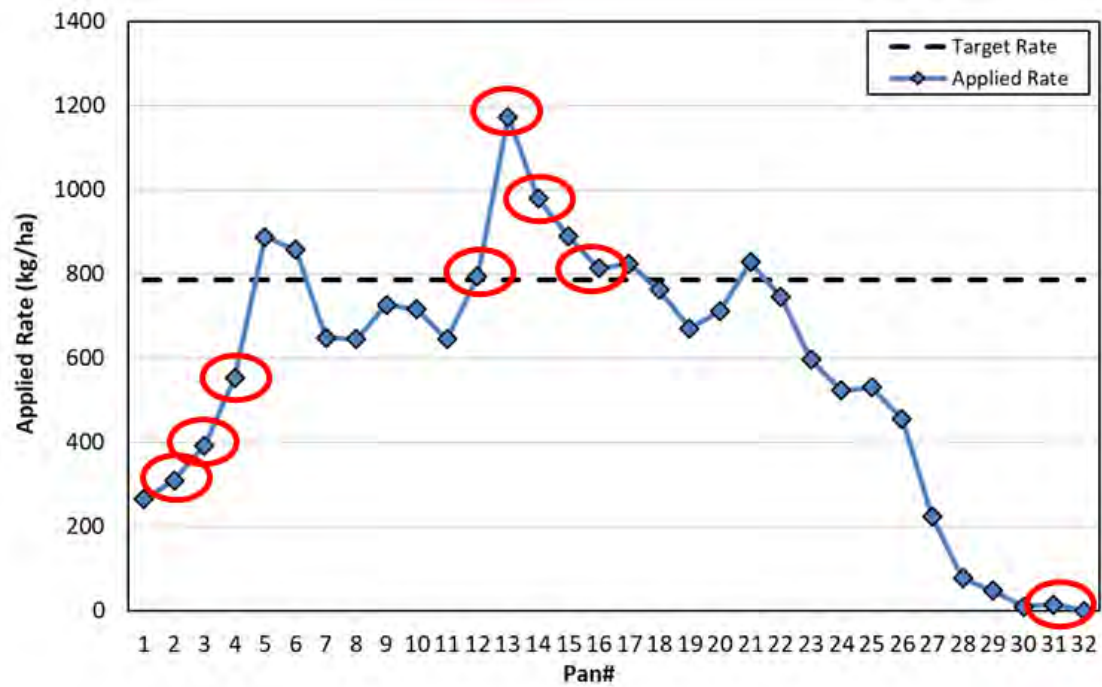
Broadcast Dry Fertilizer Application

- ❑ Common application equipment to broadcast apply dry granular fertilizer and lime.
 - Application issues are very common (requires proper setup and calibration)
 - Material properties influence application rate and uniformity

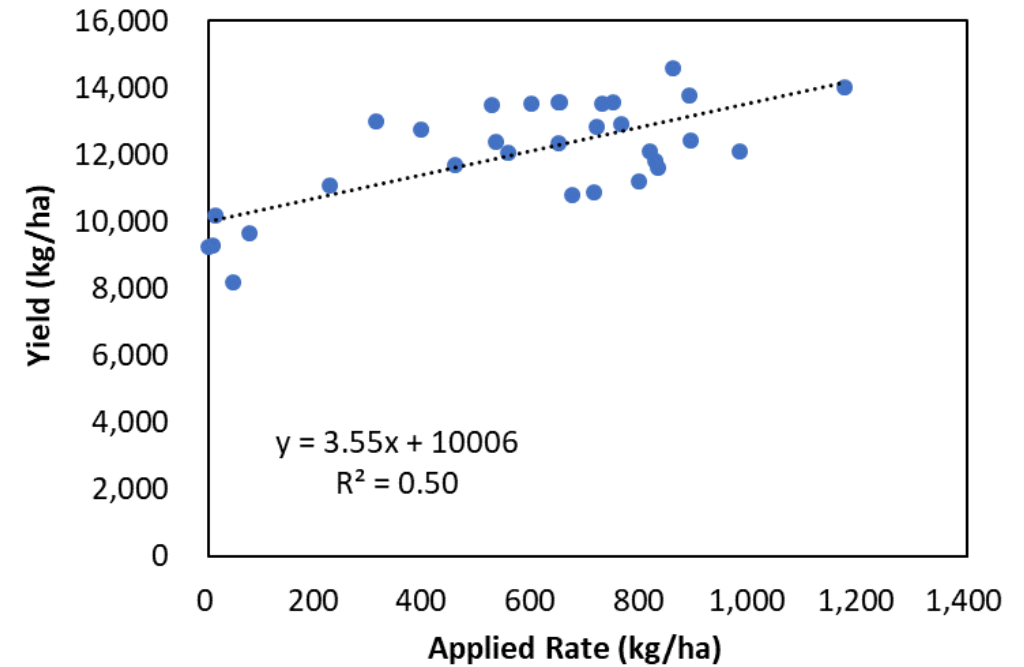
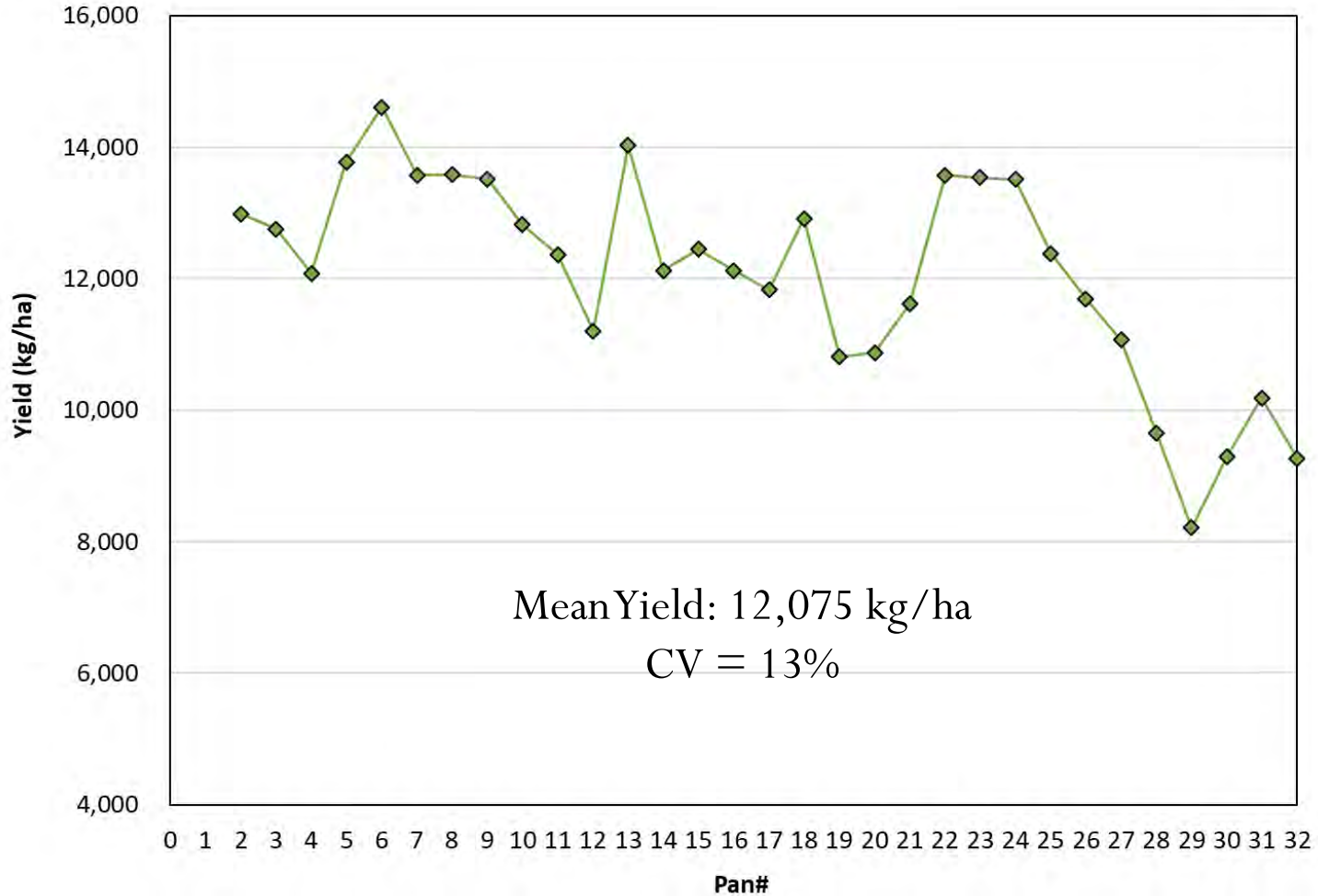


Pre-Plant Dry Fertilizer Broadcast Studies (2021-2022)





Corn Yield Response to Non-Uniform Application



Banding Pre-Plant Dry Fertilizer



RoGator AirMax Precision R1/R2 System (AGCO)

- Limited research in the southeastern US
- Does precision dry fertilizer placement impacts nutrient uptake and corn yield?

- Systems for banding (surface and sub-surface) dry fertilizer are becoming more commercially available



Soil Warrior (Environmental Tillage Systems)

Pre-Plant Dry Fertilizer Broadcast vs Banding Studies (2021-2022)

■ Three Application Methods

- Broadcast
- Banded Surface
- Banded Sub-Surface

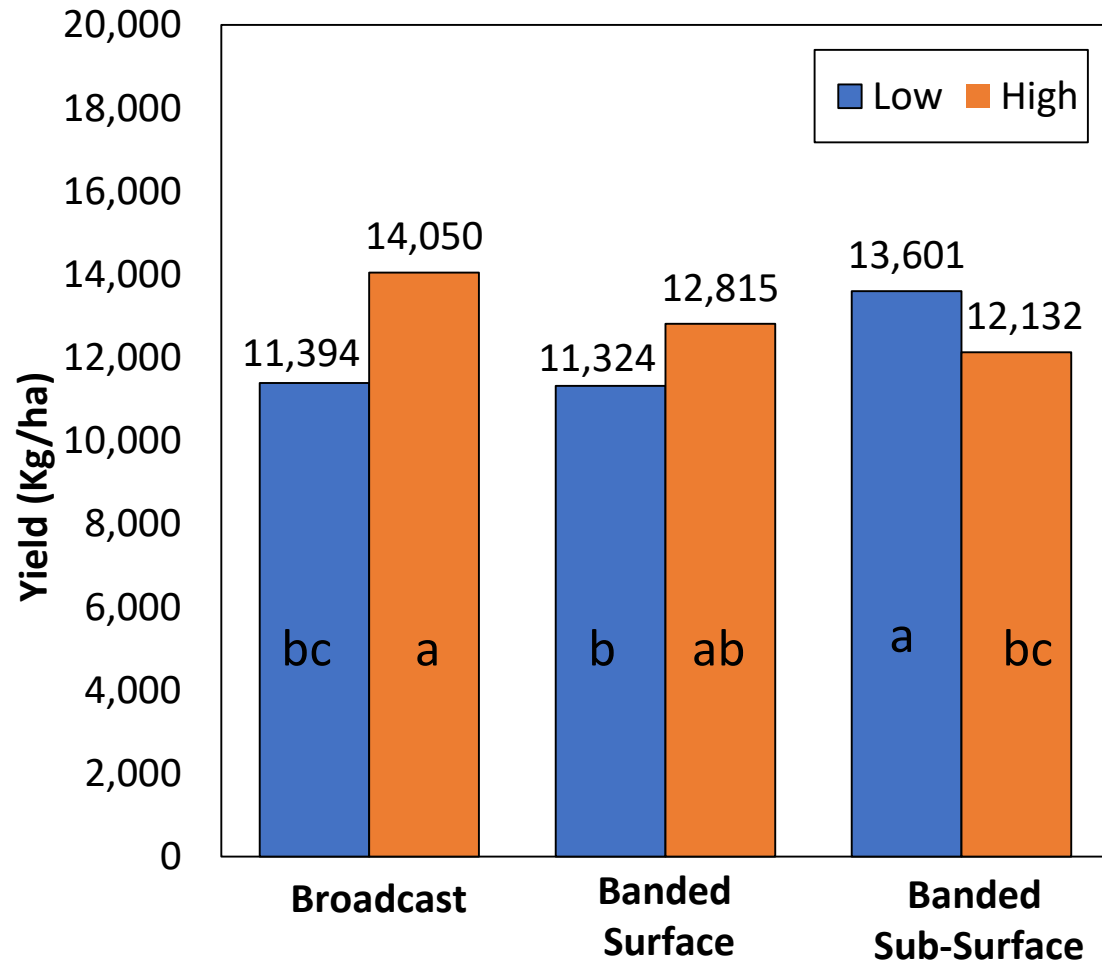
■ Two Rates

- Low (9,415 kg/ha yield goal)
40-67-78 kg/ha (N-P-K)
- High (15,692 kg/ha yield goal)
74-135-170 kg/ha (N-P-K)

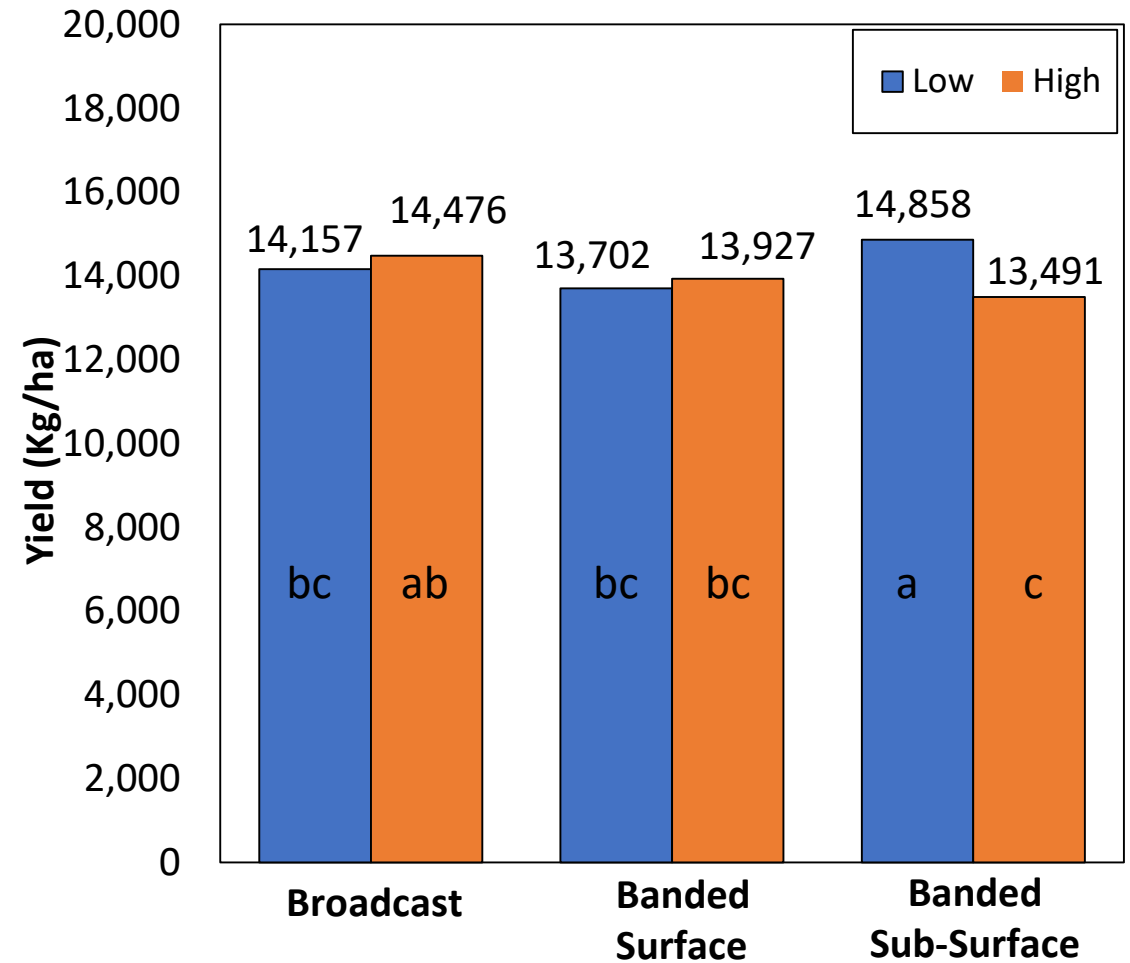


Corn Yield

Tifton



Midville



On-Farm Broadcast vs Banding Studies (2023)

Application Methods:

- **Broadcast** – *Spinner-Disc Spreader (16 m swath)*
- **Banded** – *Montag Dry Fertilizer Banding System (6 row)*

Fertilizer Rates: (*N-P-K: 28-75-150 kg/ha*)

- 336 kg/ha (40% low)
- 560 kg/ha (grower nominal)
- 788 kg/ha (40% high)



DATA COLLECTION



After Emergence:

- Stand counts in all six rows
- Biomass samples (60 plants per replication; randomly selected in the strips)

In-season:

- Tissues samples bi-weekly through the season

End of the season:

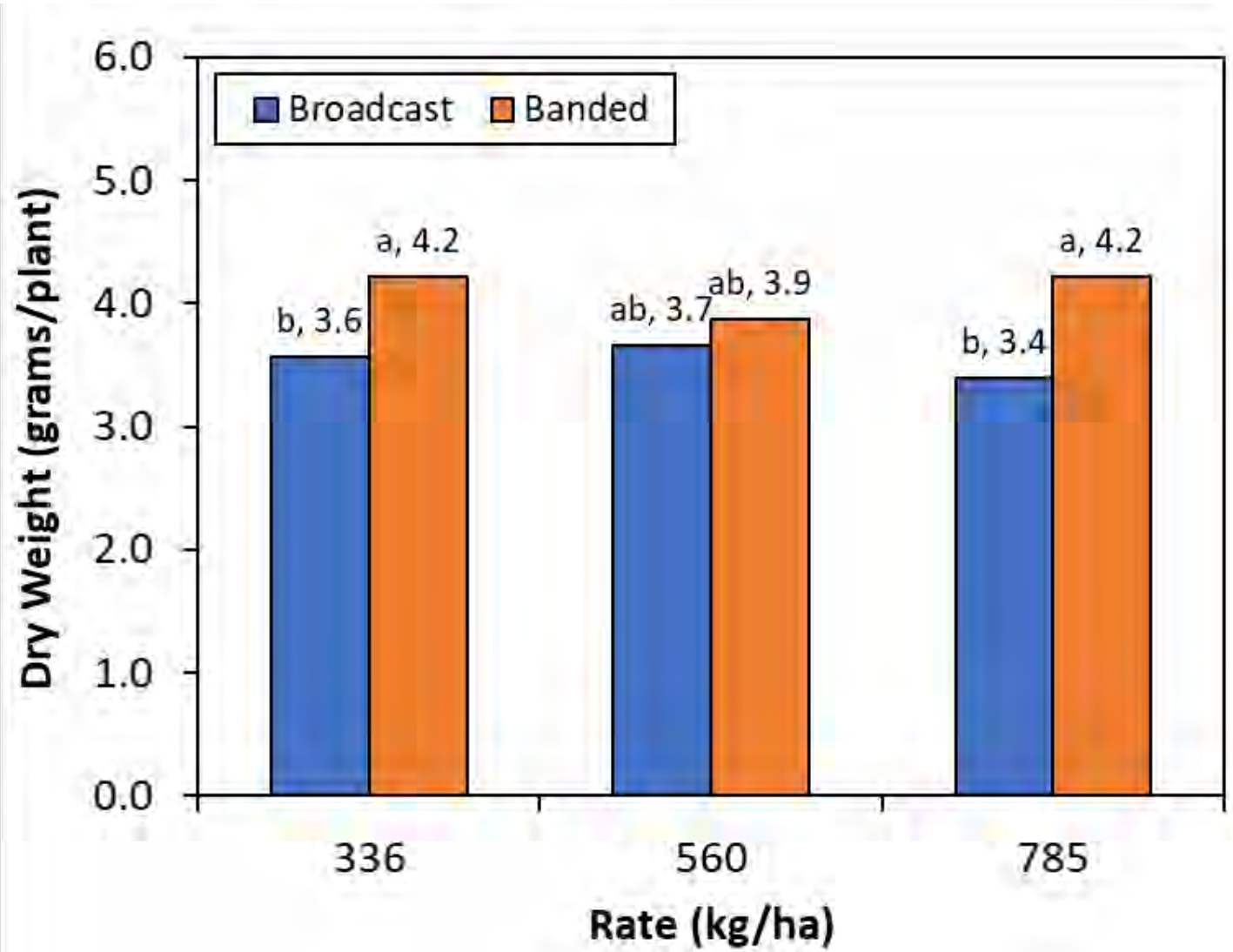
- Yield by harvesting all six rows

RESULTS

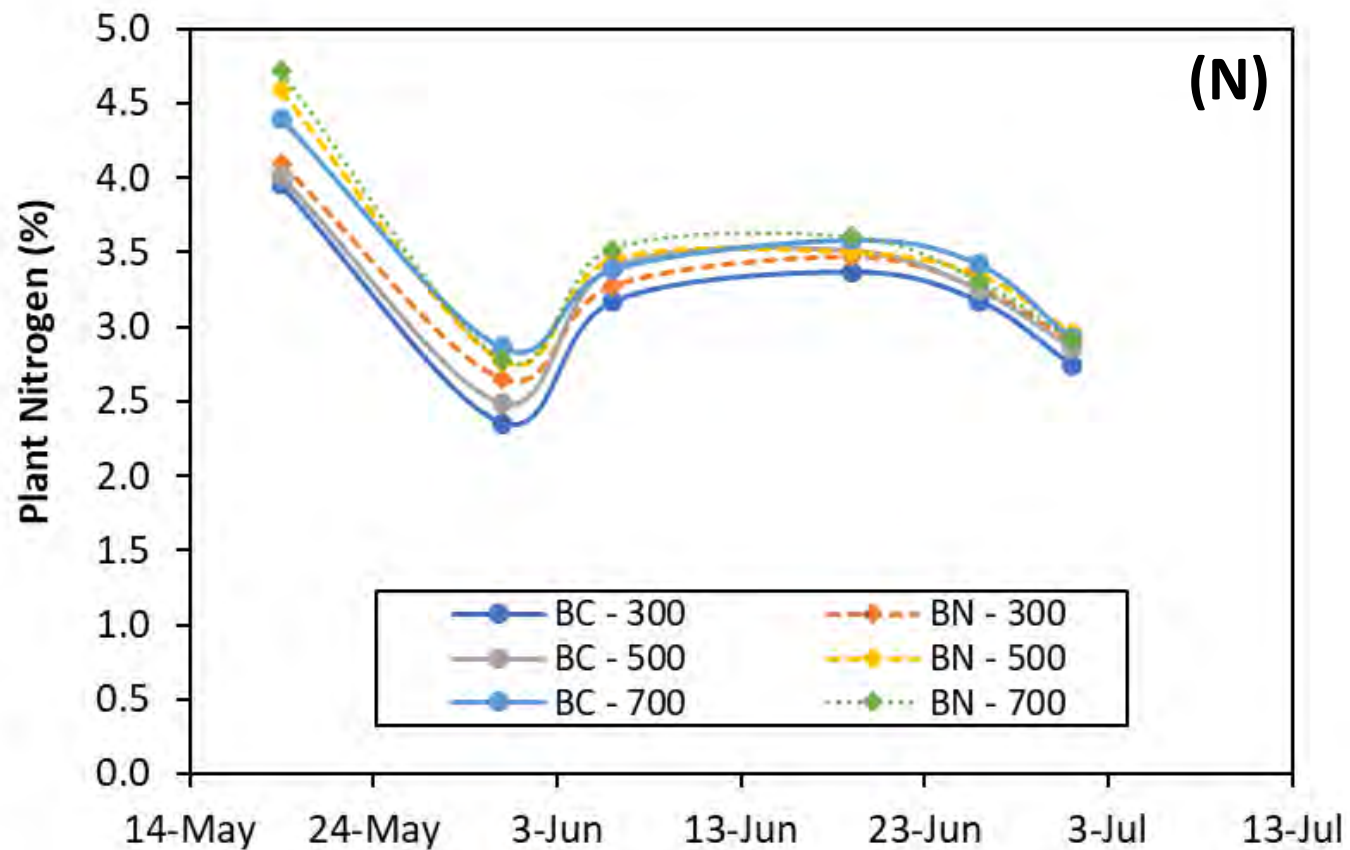
Crop Emergence

Application Method	Rate (kg/ha)	20-Apr (plants/ha)	24-Apr (plants/ha)	26-Apr (plants/ha)	28-Apr (plants/ha)	Emergence (%)
Broadcast	336	68,575	71,363	71,961	72,228	93 a
	560	63,793	70,002	71,529	70,864	93 a
	785	69,370	71,828	72,327	72,425	92 a
Banded	336	71,529	72,991	73,621	73,821	91 a
	560	71,430	71,595	72,724	73,322	90 a
	785	72,094	71,894	72,890	72,858	92 a

Plant Biomass



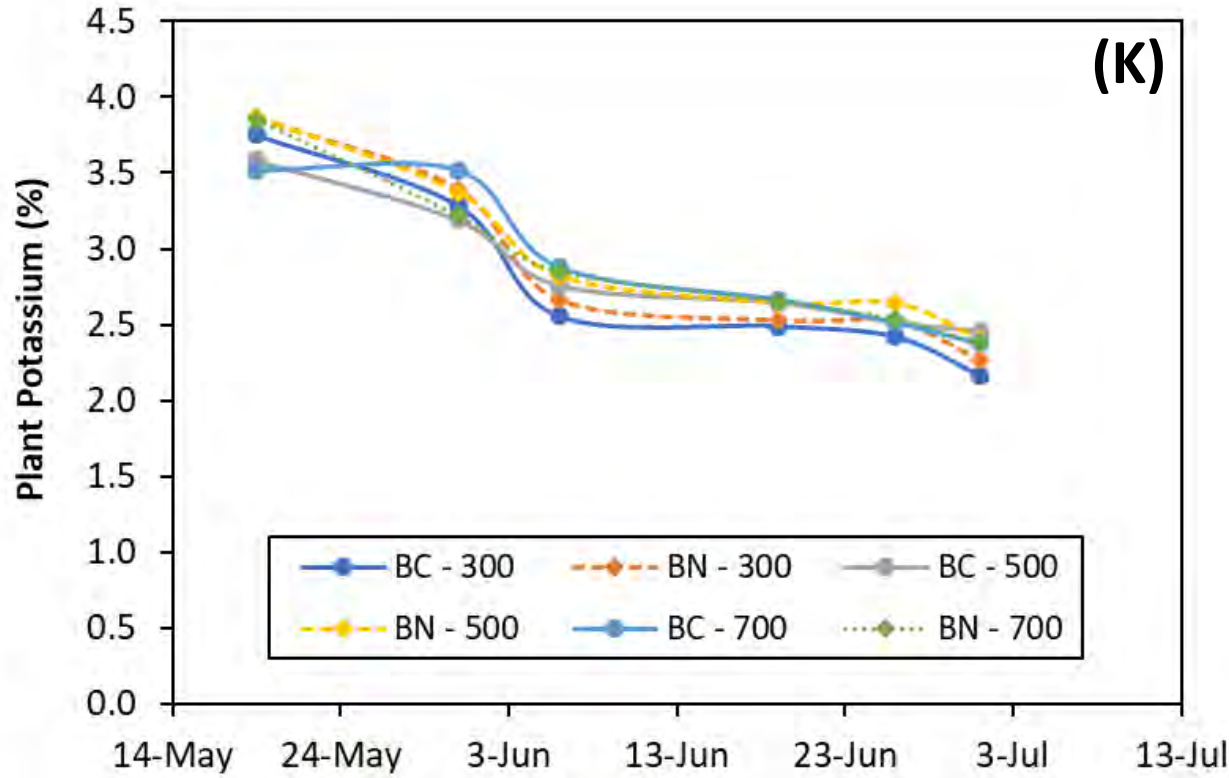
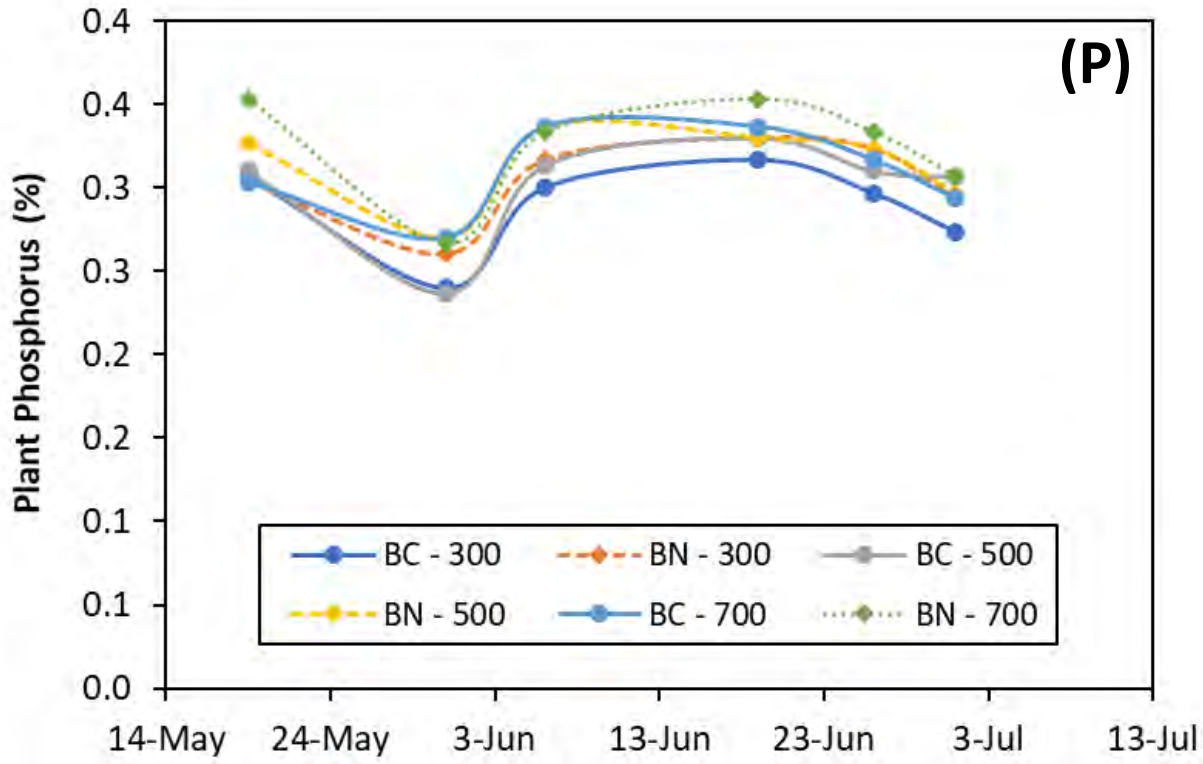
Plant Nutrient Content (%)



Plant stage : V6-V7

App. Method	Rate (kg/ha)	N (%)	P (%)	K (%)
Broadcast	336	3.95	0.31	3.75
Banded	336	4.10	0.30	3.86
Broadcast	560	4.01	0.31	3.59
Banded	560	4.59	0.33	3.87
Broadcast	785	4.40	0.30	3.52
Banded	785	4.71	0.35	3.85

Plant Nutrient Content (%)



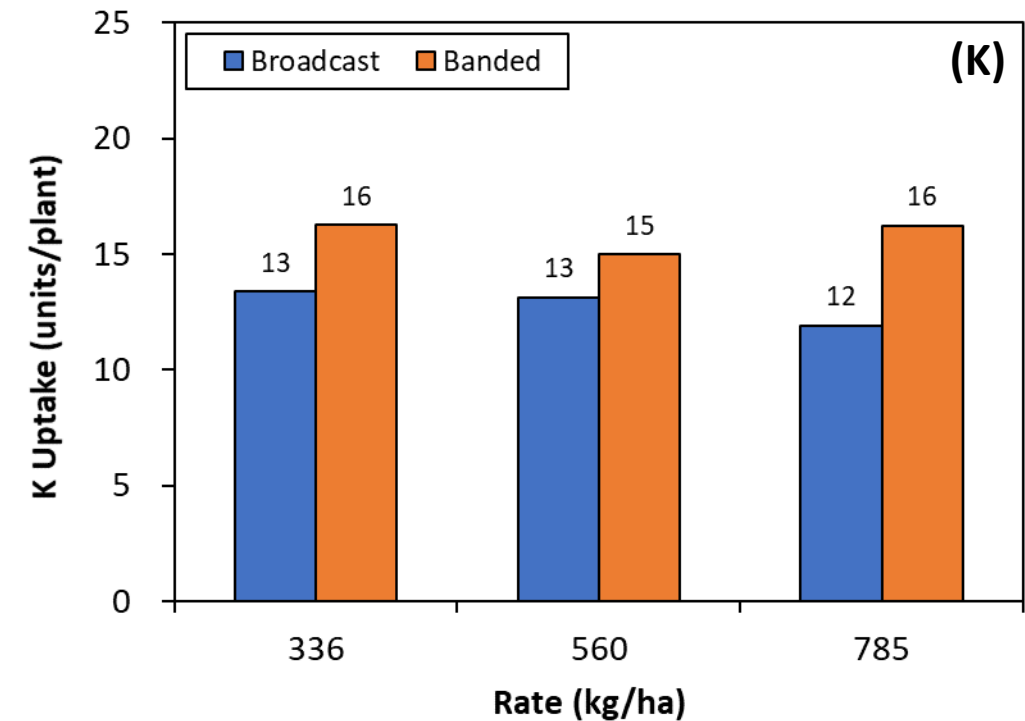
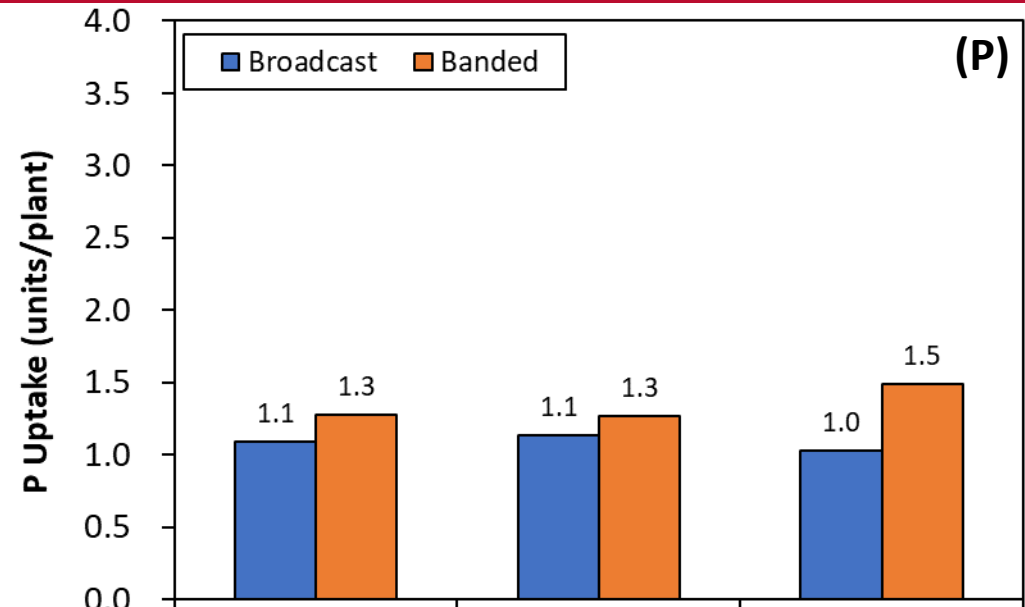
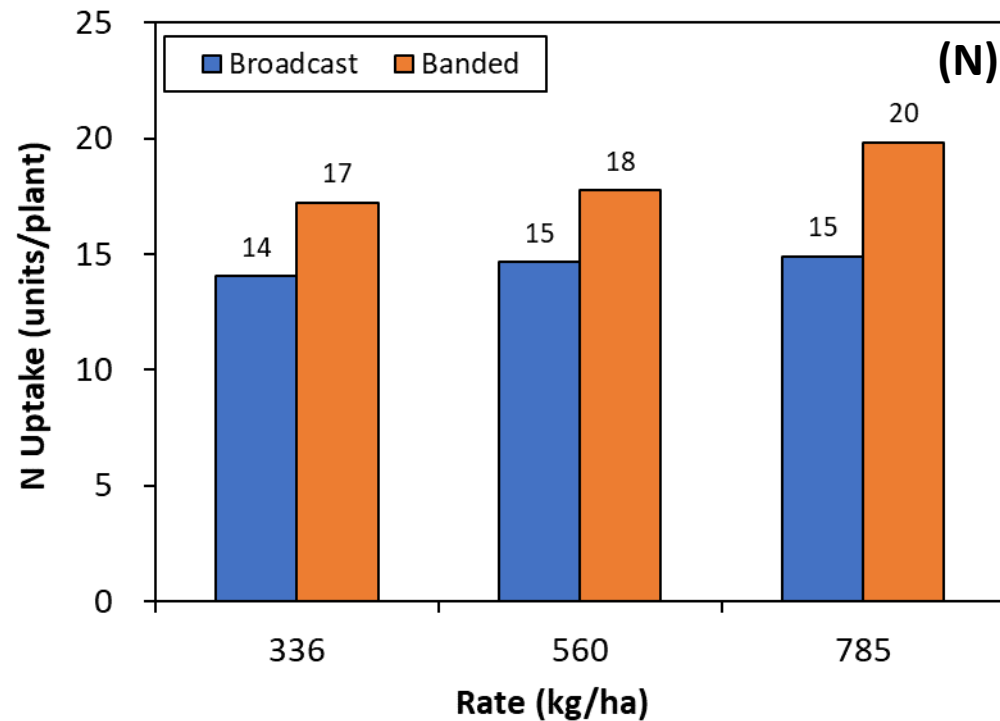
Nutrient Uptake

From biomass and tissue samples @V6-V7:

Nitrogen: 21.0 – 33.0%

Phosphorus: 11.4 – 17.0%

Potassium: 14.2 – 36.1%



Summary and Implications

- Non-uniform application of dry pre-plant fertilizer can impact both plant nutrient content and yield.
- Results from small-plot studies indicated that banded low rate of pre-plant dry fertilizer yielded comparable to high broadcast rate.
- On-farm studies showed that banding pre-plant dry fertilizer improved nutrient uptake (use efficiency) over broadcast application.
- Rising fertilizer rates and motivation to improve nutrient use efficiency and corn yield will encourage more growers to adopt precision dry fertilizer application systems in the southeastern US.

Thanks!

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