Cotton Yield, Quality, and Plant Growth Response to Soil-Applied Potassium

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B. Robertson, and R. Nichols

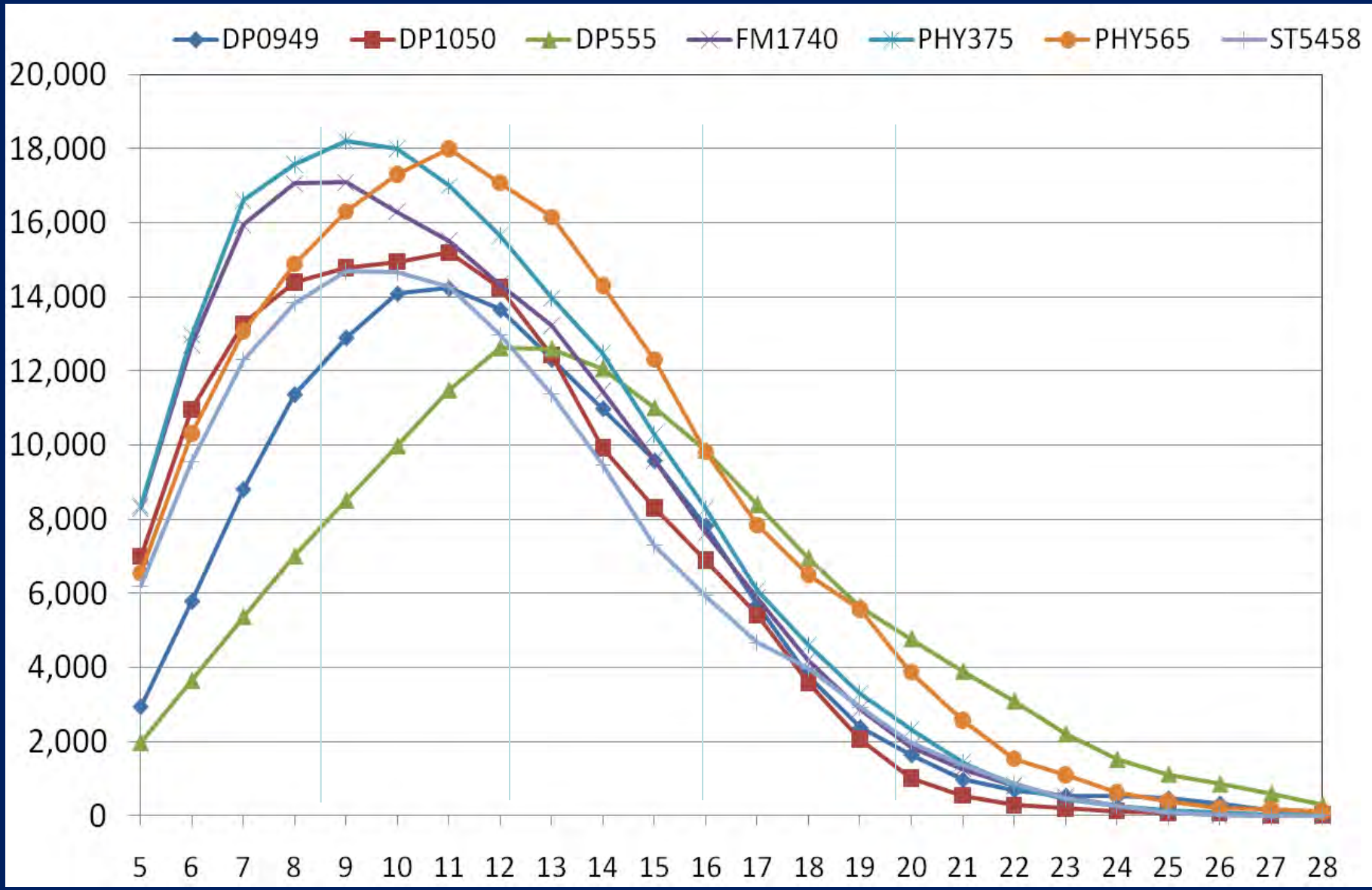
An Extension Cotton Specialist Project

Introduction

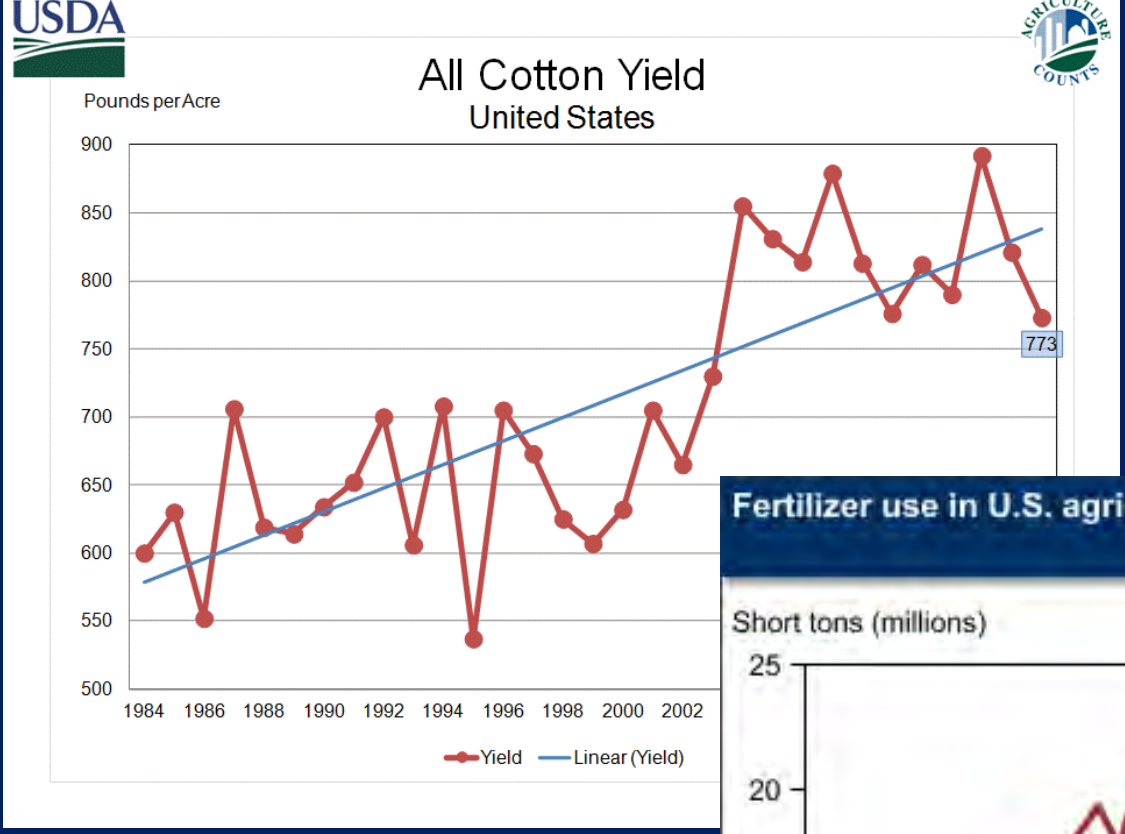
- More common reports of K deficiency symptoms from across the Cotton Belt.
- Todays varieties-increased yields and in many cases faster fruiting-more with more K demand in a shorter amount of time.
- K deficient plants more prone to foliar diseases.

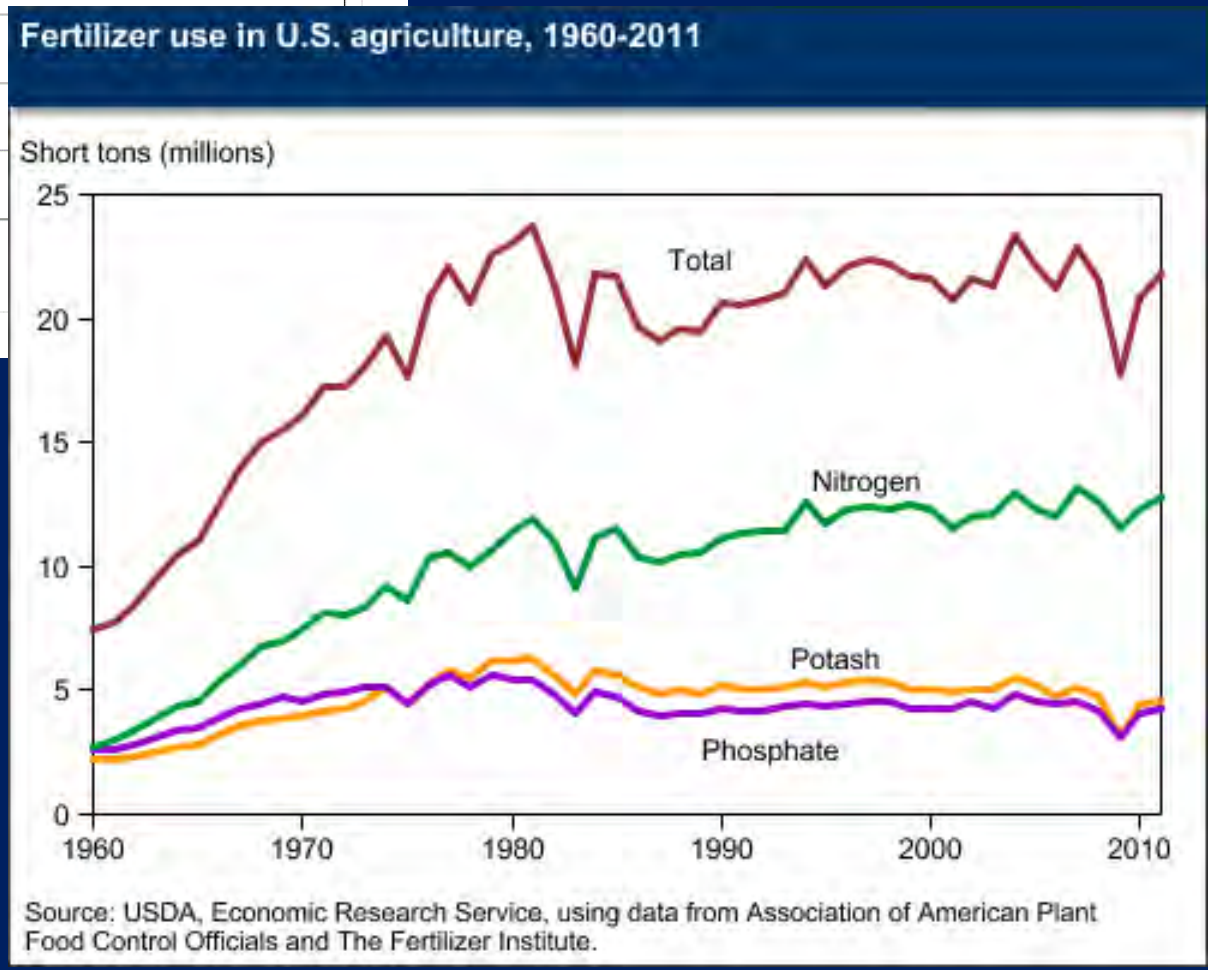

07/12/

Distribution of 1st Position Bolls



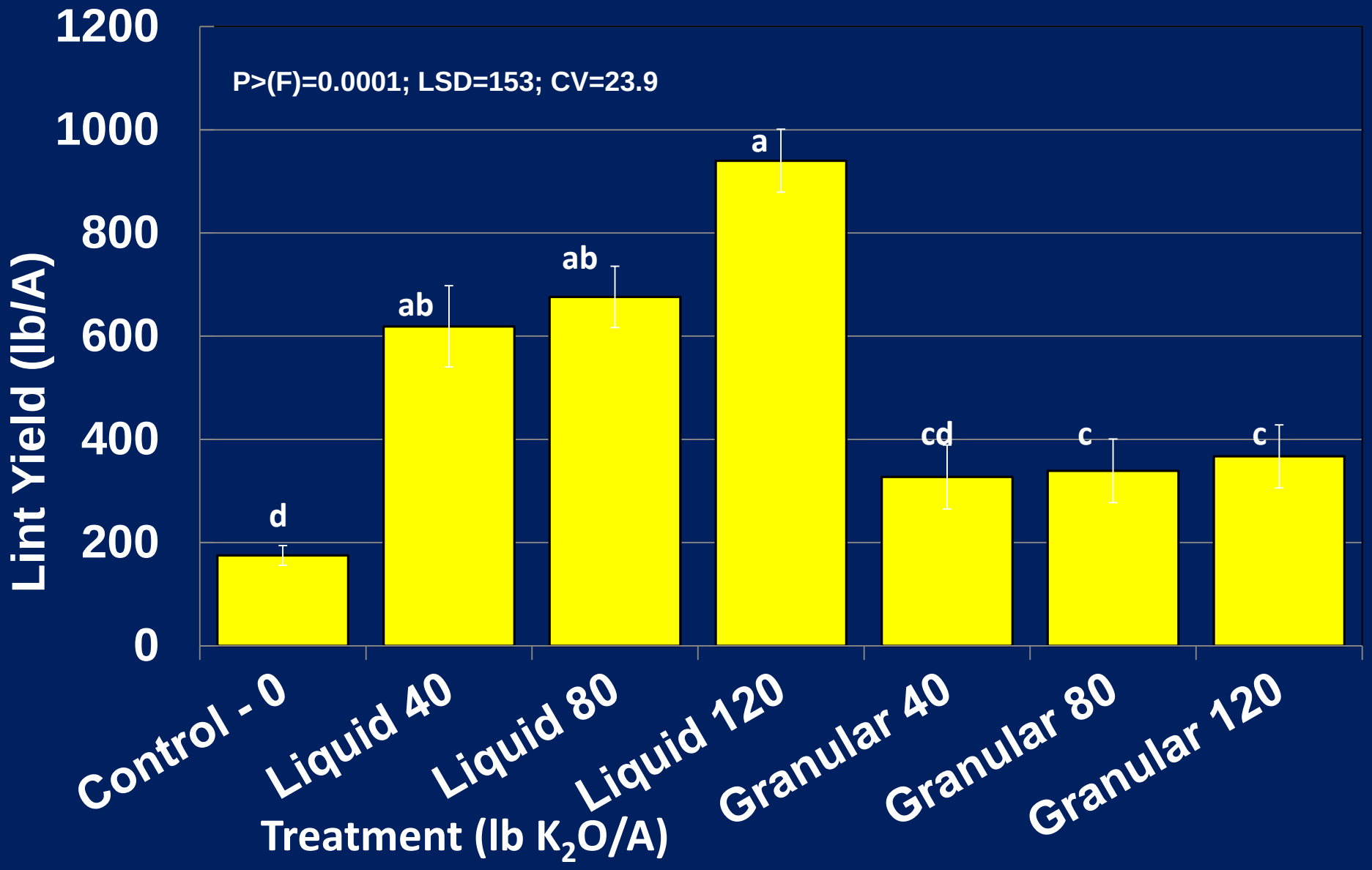
Whitaker, Collins, and Ritchie


All Cotton Yield
United States
Pounds per Acre
900
850
800
750
700
650
600
550
500
773
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
Yield
Linear (Yield)

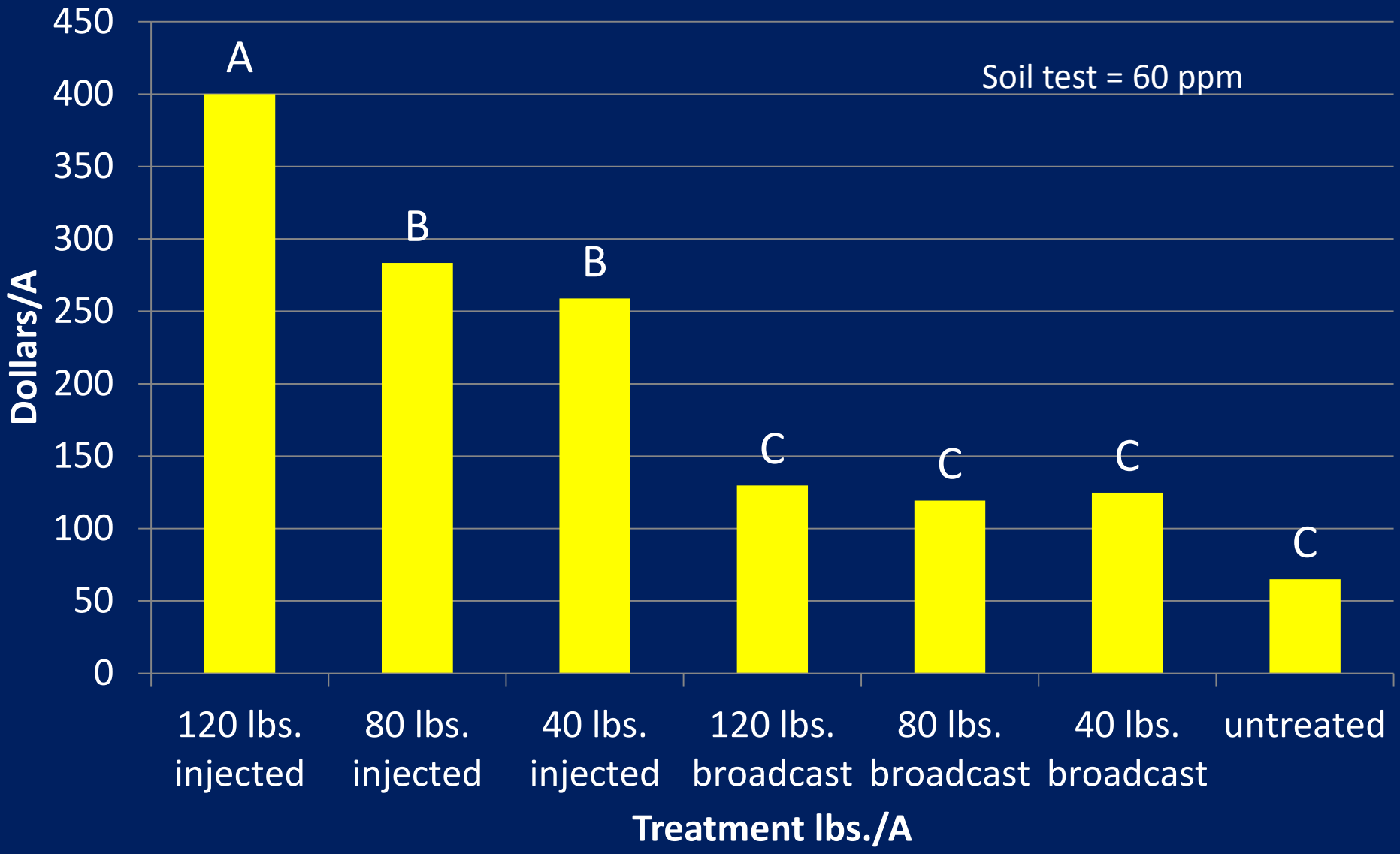

Fertilizer use in U.S. agriculture, 1960-2011
Short tons (millions)
25
20
15
10
5
0
Total
Nitrogen
Potash
Phosphate
1960
1970
1980
1990
2000
2010
Source: USDA, Economic Research Service, using data from Association of American Plant Food Control Officials and The Fertilizer Institute.

Lint Yield Response

Stiles Farm Foundation, Williamson County, 2012

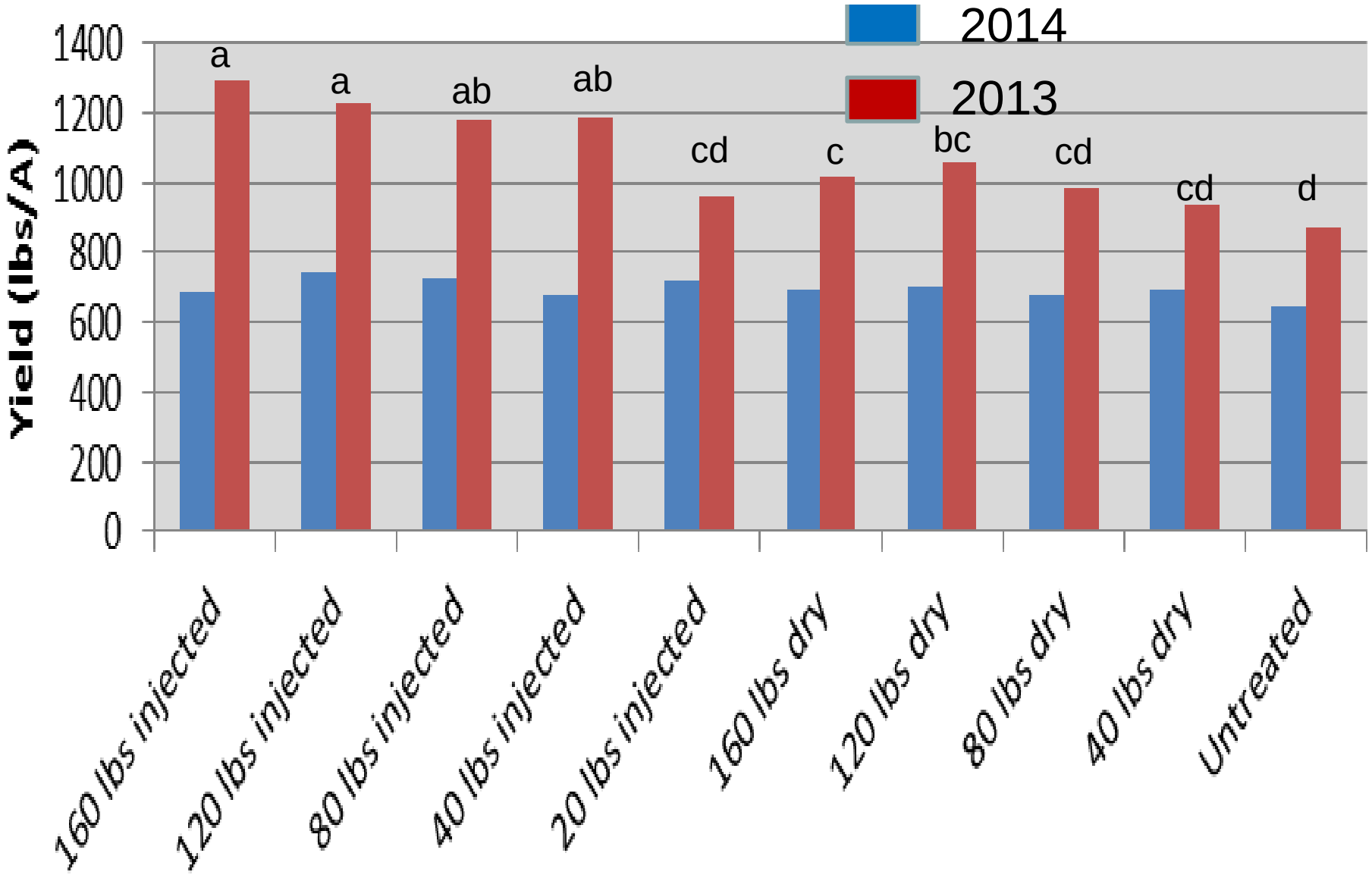


ROI - Williamson 2012

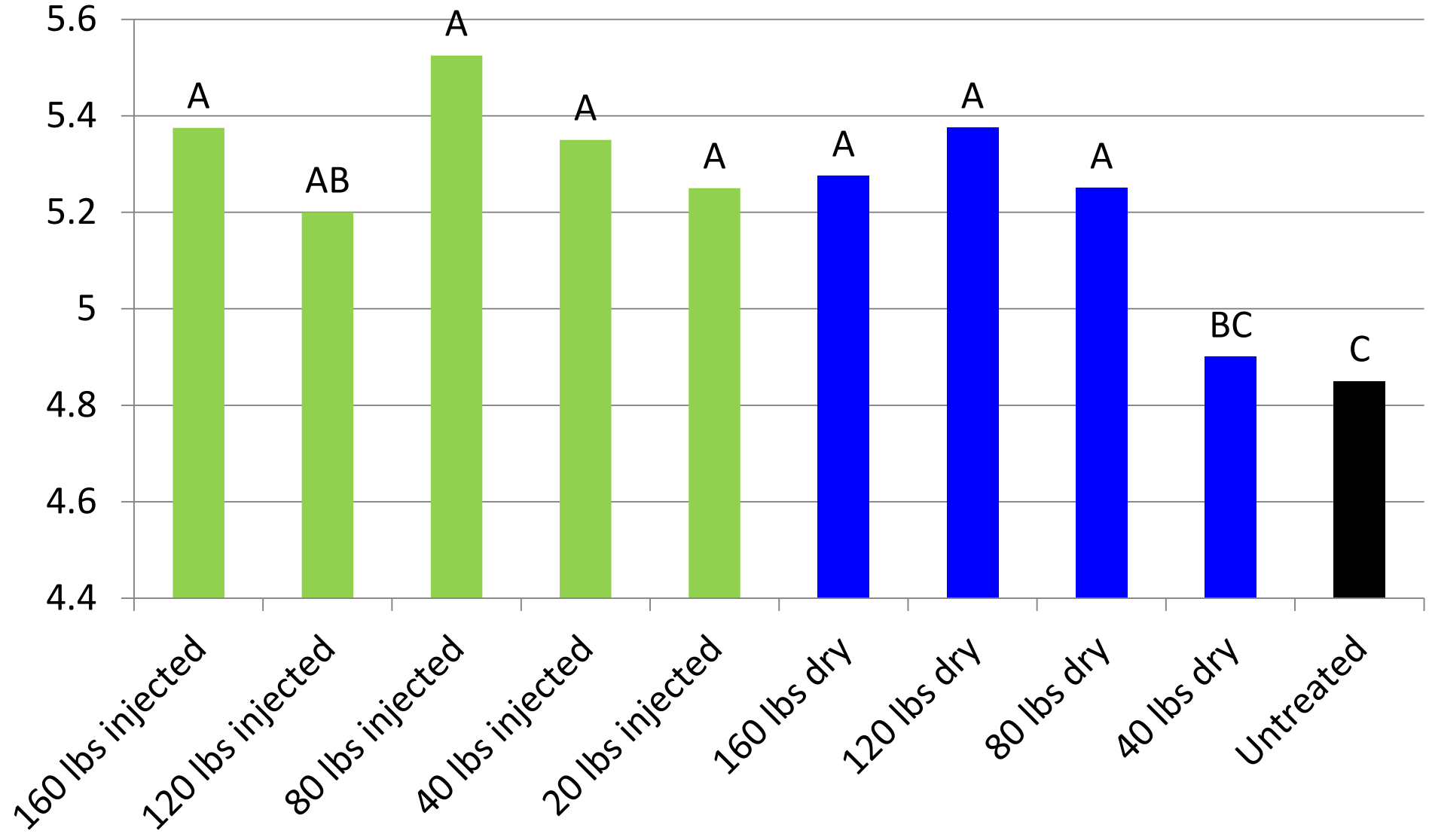


2013

Williamson Co. Yield 2014 and 2013

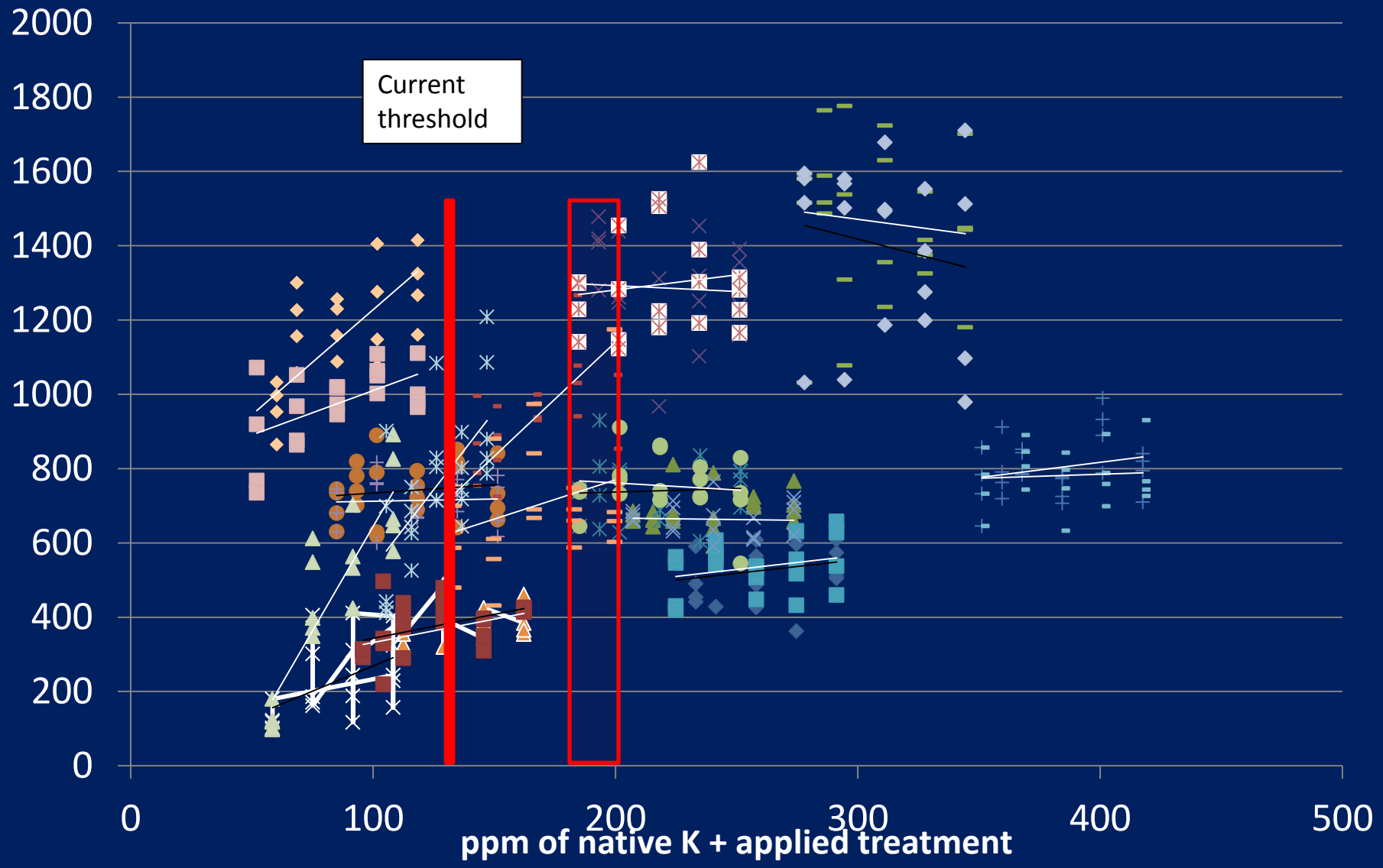


2013 Williamson County K Study - Micronaire



Lint yield

2012-2015: Williamson, Wharton, and Hill Counties



Fiber Quality – Texas Locations

- >200 ppm K
  - Micronaire, strength, and length were non- responsive to treatments
- <200 ppm K
  - Length was non- responsive in all years
  - Micronaire response in liquid treatments in 2012&2013
  - Bundle strength responded in both application methods in 2012, but only liquid application in 2013&2014

CottonBelt Potassium Project
2015

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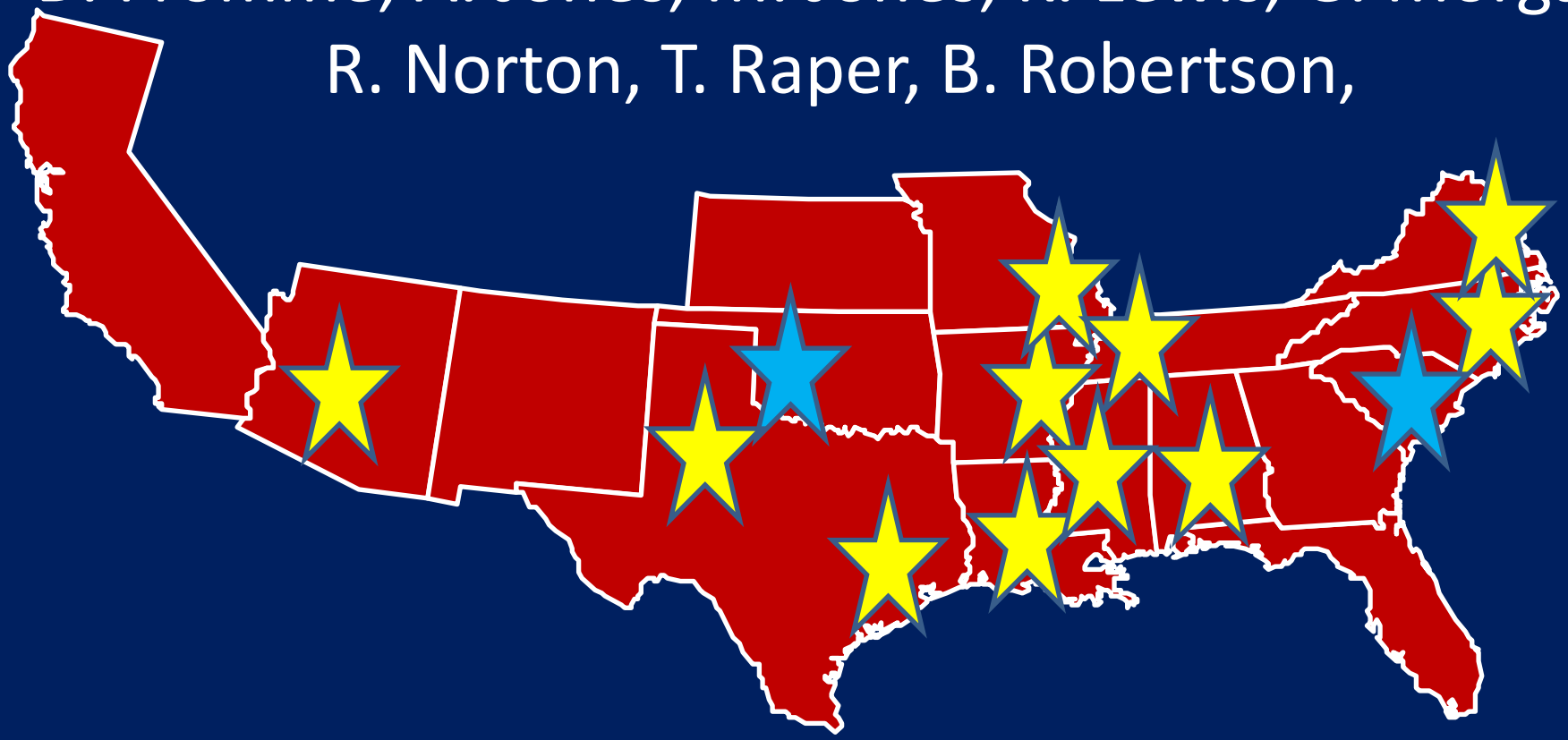


Materials and Methods

Variety - DP 1321 B2RF

Soil analysis for each plot

- **0-6”**
- **7-12”**
- **13-24”**

Melich III Extraction – all locations

Leaf K analysis at first bloom
Lint yield
Fiber quality

Texas 2015 Treatments

1. No additional K – injected
2. Injected 0-0-15 at 40 lb K_2O/A
3. Injected 0-0-15 at 80 lb K_2O/A
4. Injected 0-0-15 at 120 lb K_2O/A
5. Injected 0-0-15 at 160 lb K_2O/A
6. No additional K - disked
7. Broadcast incorp. 0-0-60 at 40 lb K_2O/A
8. Broadcast incorp. 0-0-60 at 80 lb K_2O/A
9. Broadcast incorp. 0-0-60 at 120 lb K_2O/A
10. Broadcast incorp. 0-0-60 at 160 lb K_2O/A

Arizona used Potassium sulfate

All plots received equivalent amounts of Nitrogen and Phosphorous

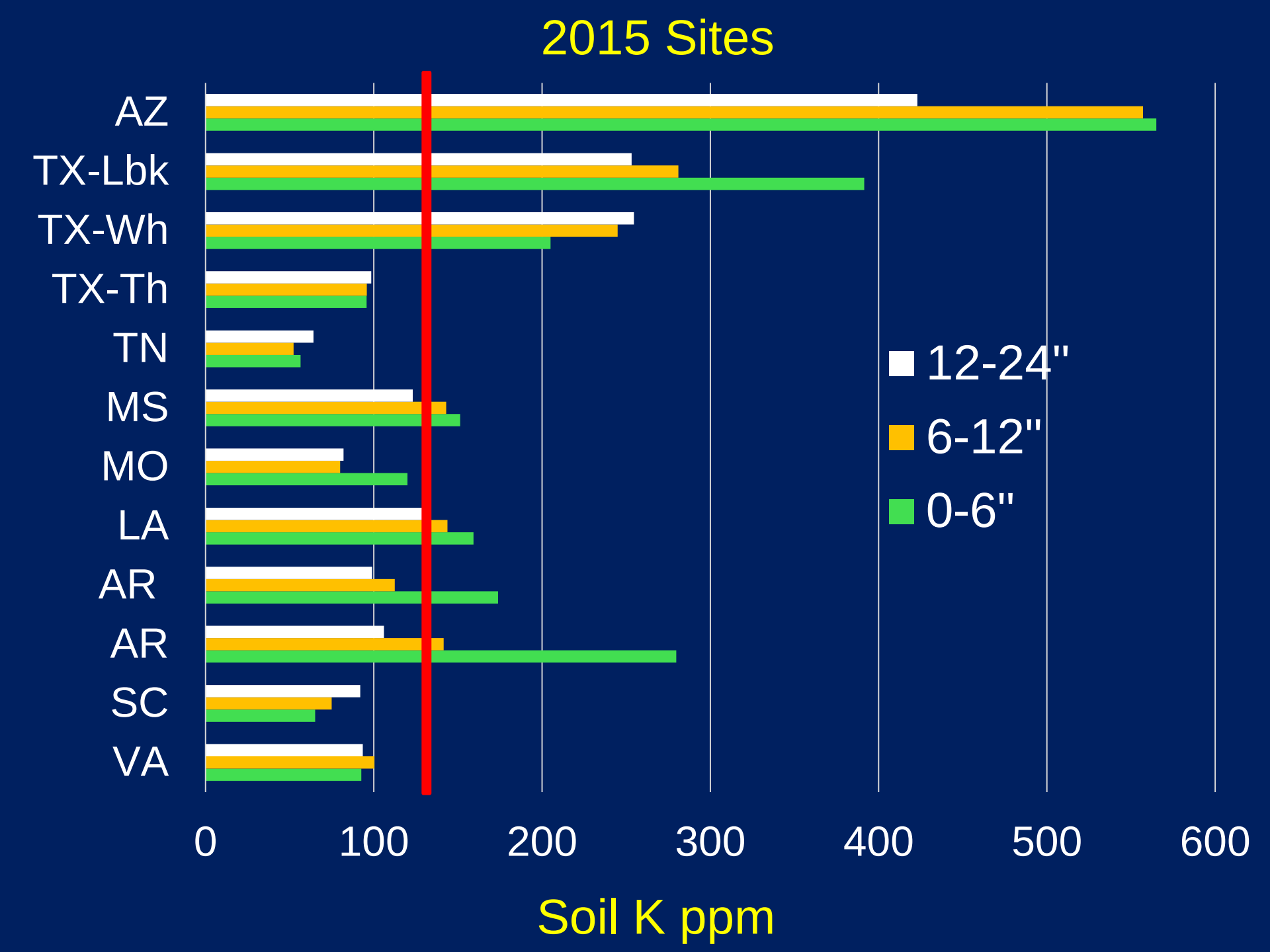
Applications

Liquid

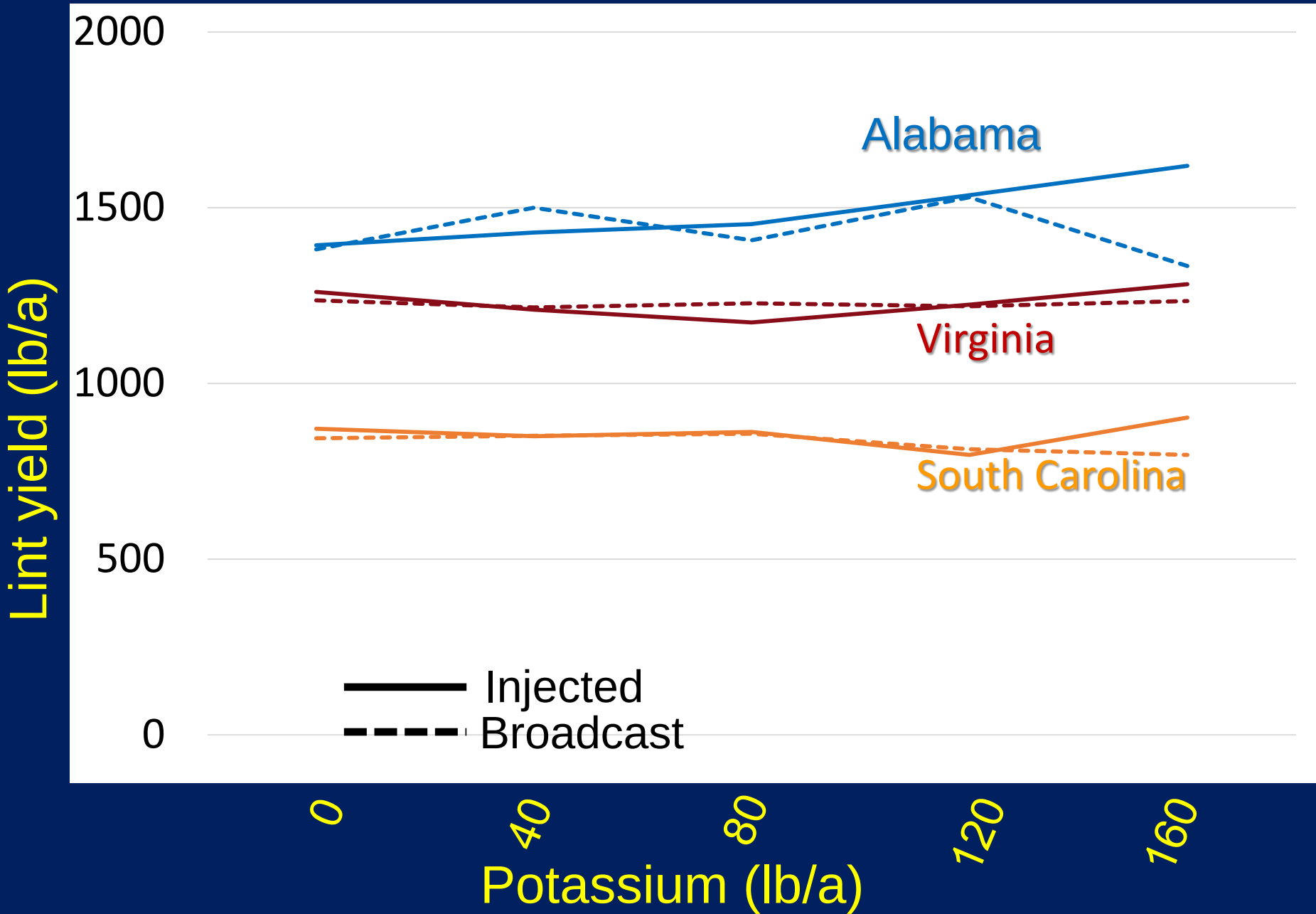
- 4” x 6” from seed furrow
- 2-4 weeks before planting

Broadcast incorporated

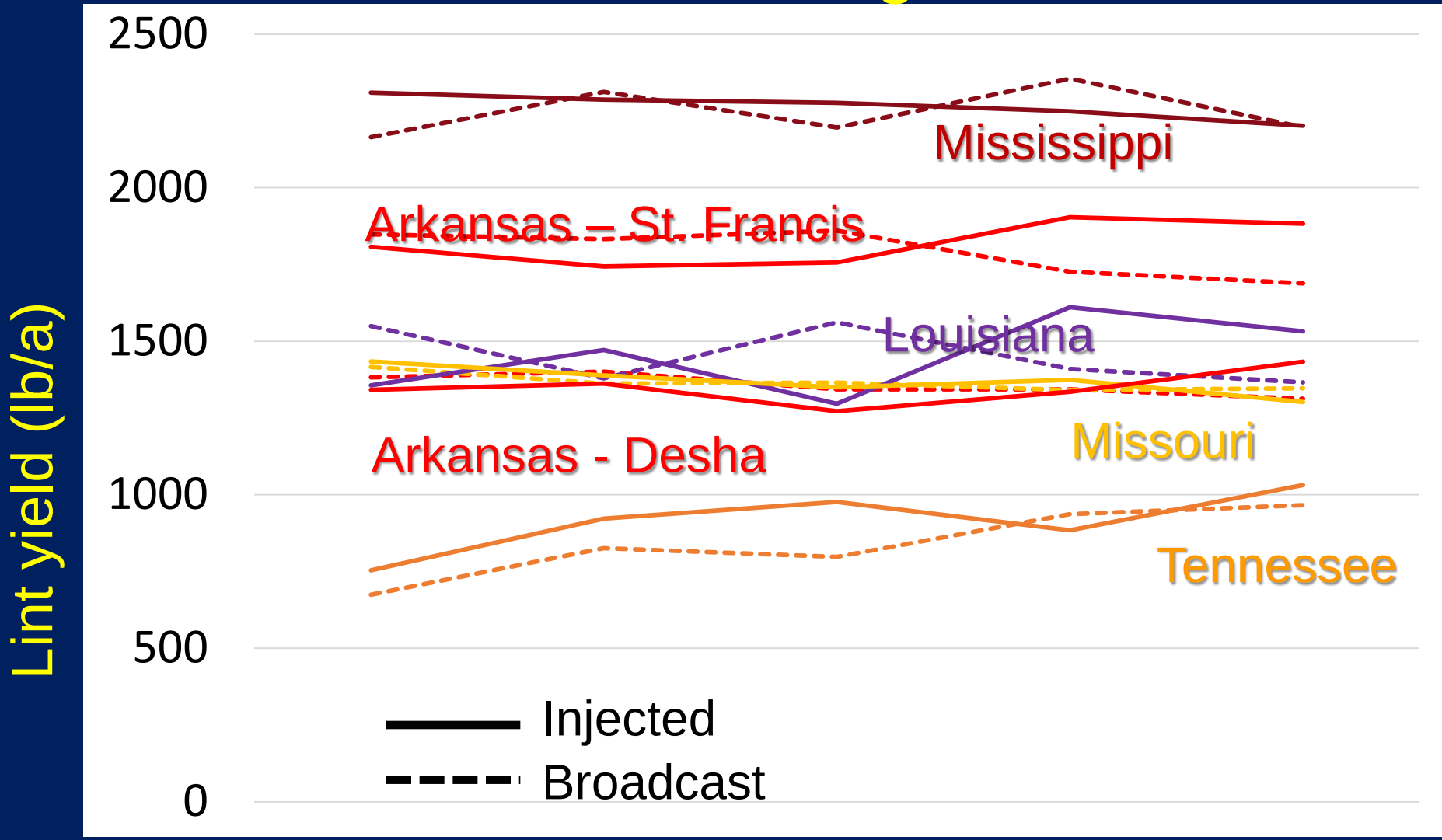
- various mechanisms (> 3”)
- 2-4 weeks before planting


2015 Sites
AZ
TX-Lbk
TX-Wh
TX-Th
TN
MS
MO
LA
AR
AR
SC
VA
12-24"
6-12"
0-6"
0
100
200
300
400
500
600
Soil K ppm

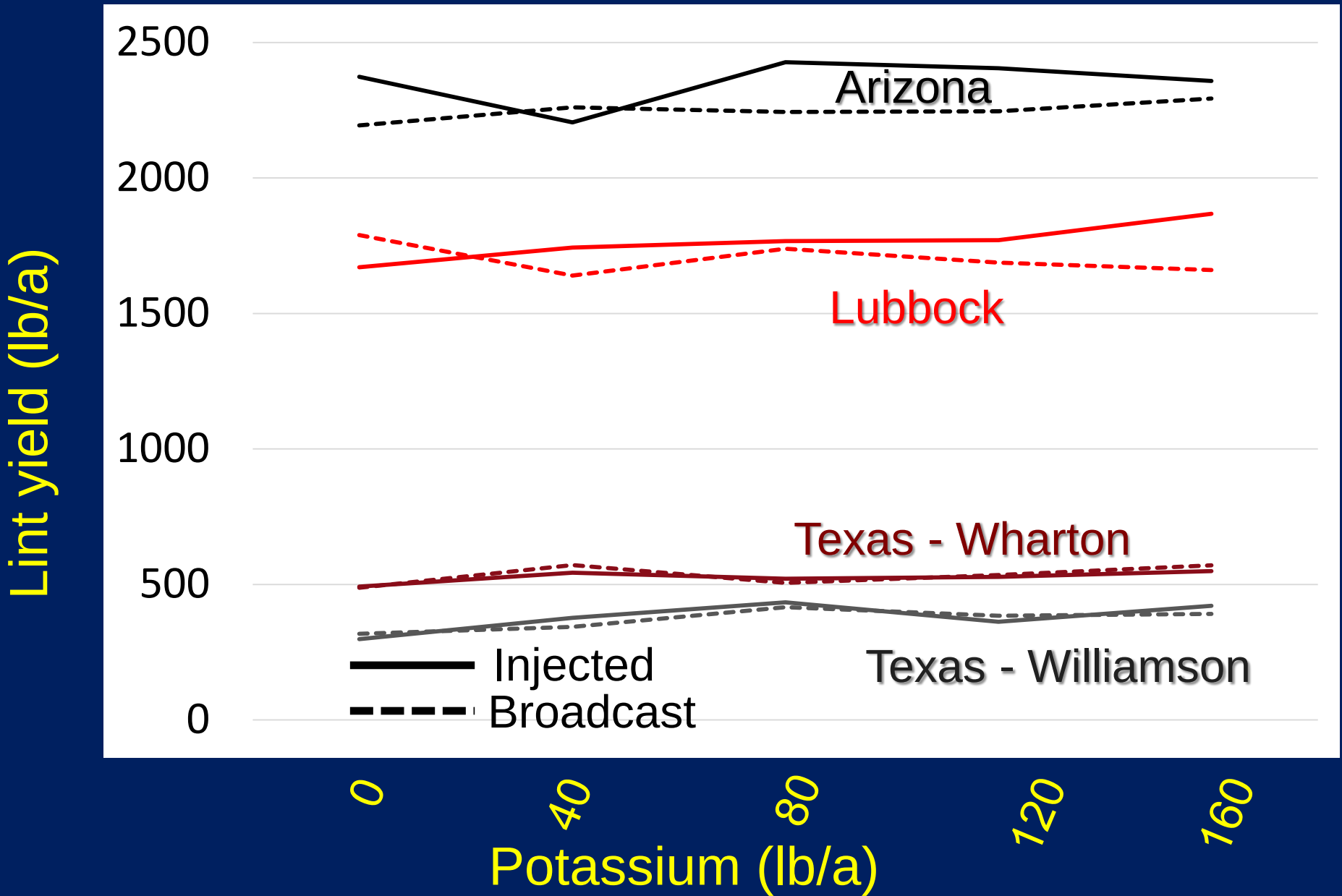
Lint Yield – Eastern Region



Lint Yield – Delta Region



Lint Yield – Southwest



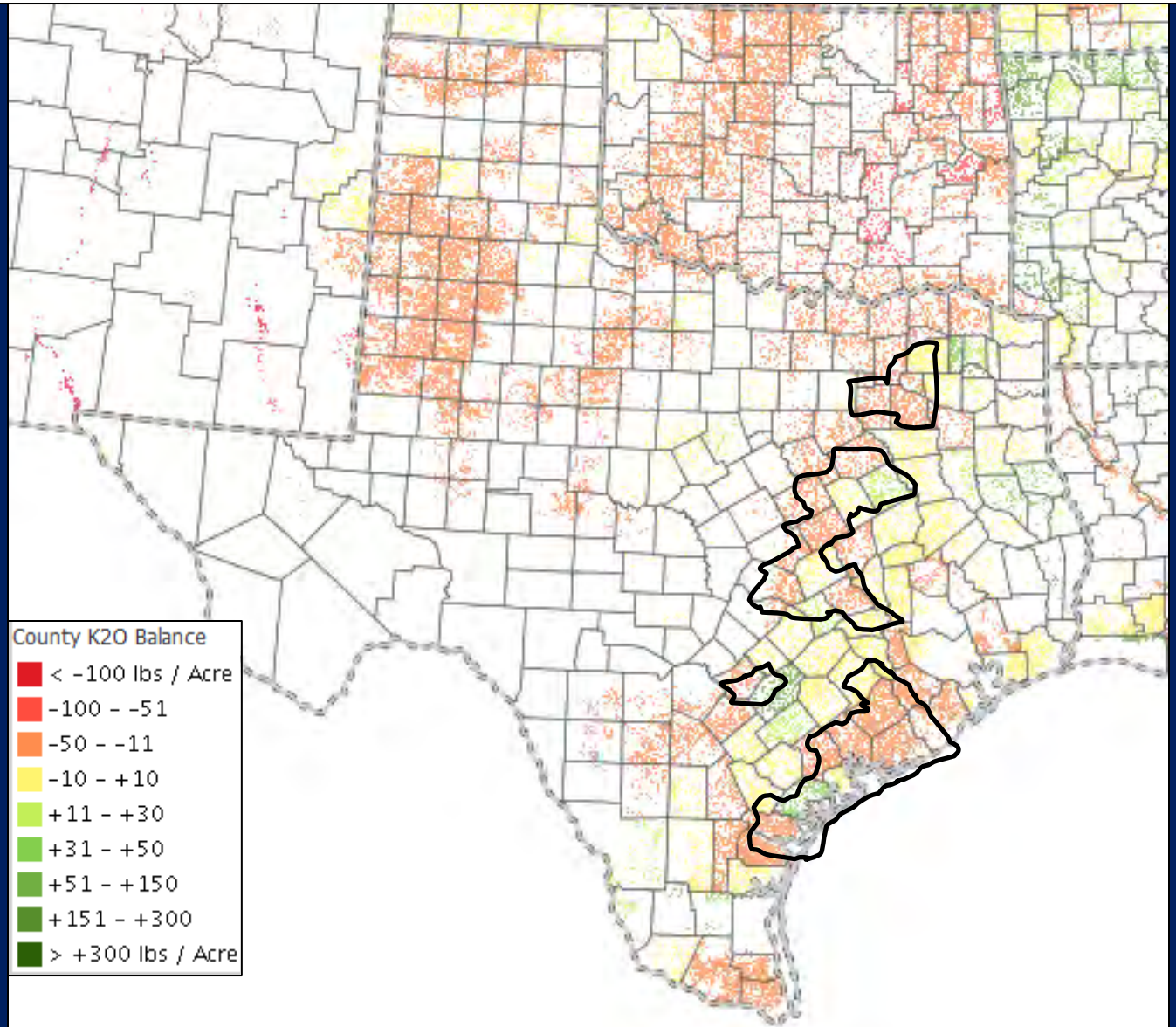
Conclusions

- Despite the sites in Southeast and Delta regions being at or below 125 ppm threshold and high yields, no consistent yield response was observed from either application method.

- The Southwest location with less than 125 ppm was responsive and high rates of injected K at the Lubbock site

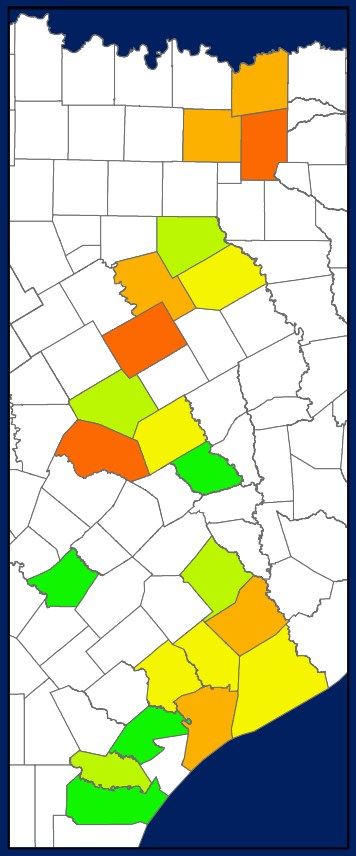
- In previous research, yield lint response has been more consistent in limited moisture years. Excessive moisture in most locations in 2015 likely contributed to the inability to obtain a response.

NuGIS
K_2O Balance Estimate - 2015

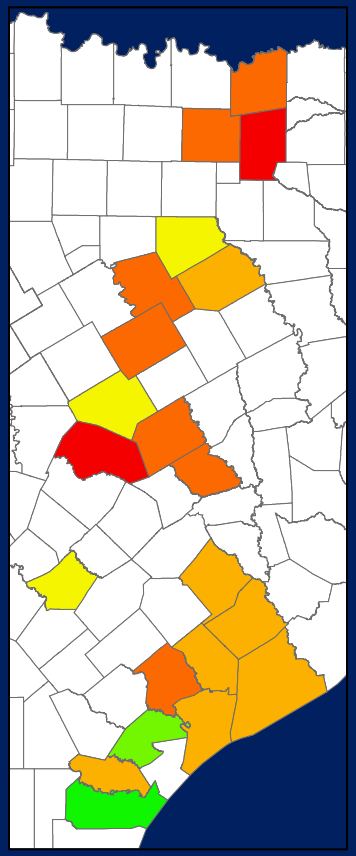


Soil K level with depth

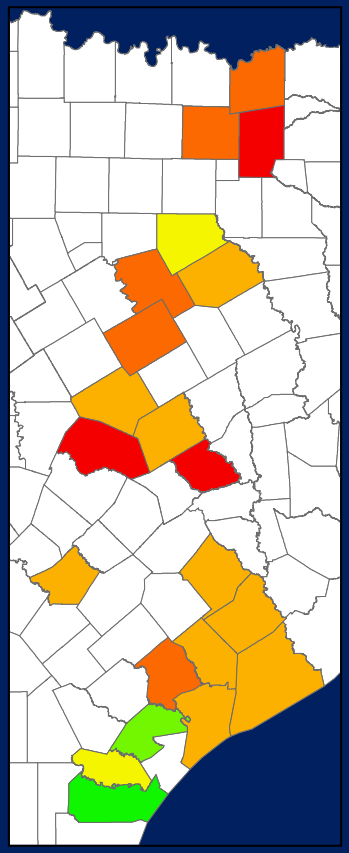
Threshold: 125 ppm K



0-15 cm



15-61 cm



61-122 cm

- Soil K ppm
- <150
- 150- 200
- 200- 250
- 250- 300
- 300- 350
- 350- 400
- >400

Future Research

- Four locations will be evaluated to K depletion and replenishment over 3 years.
- Mineralogy survey of the sites to better understand the exchangeable and non-exchangeable K.
- Meet with Texas A&M Soil Testing Lab to determine the need for modification of current K threshold.

Acknowledgments

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  - Cotton Inc.
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CottonBelt Potassium Project 2015-2017

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