Connecting Past with Present:

Soil Fertility Insights from Historical Experiments

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The Cullars Rotation

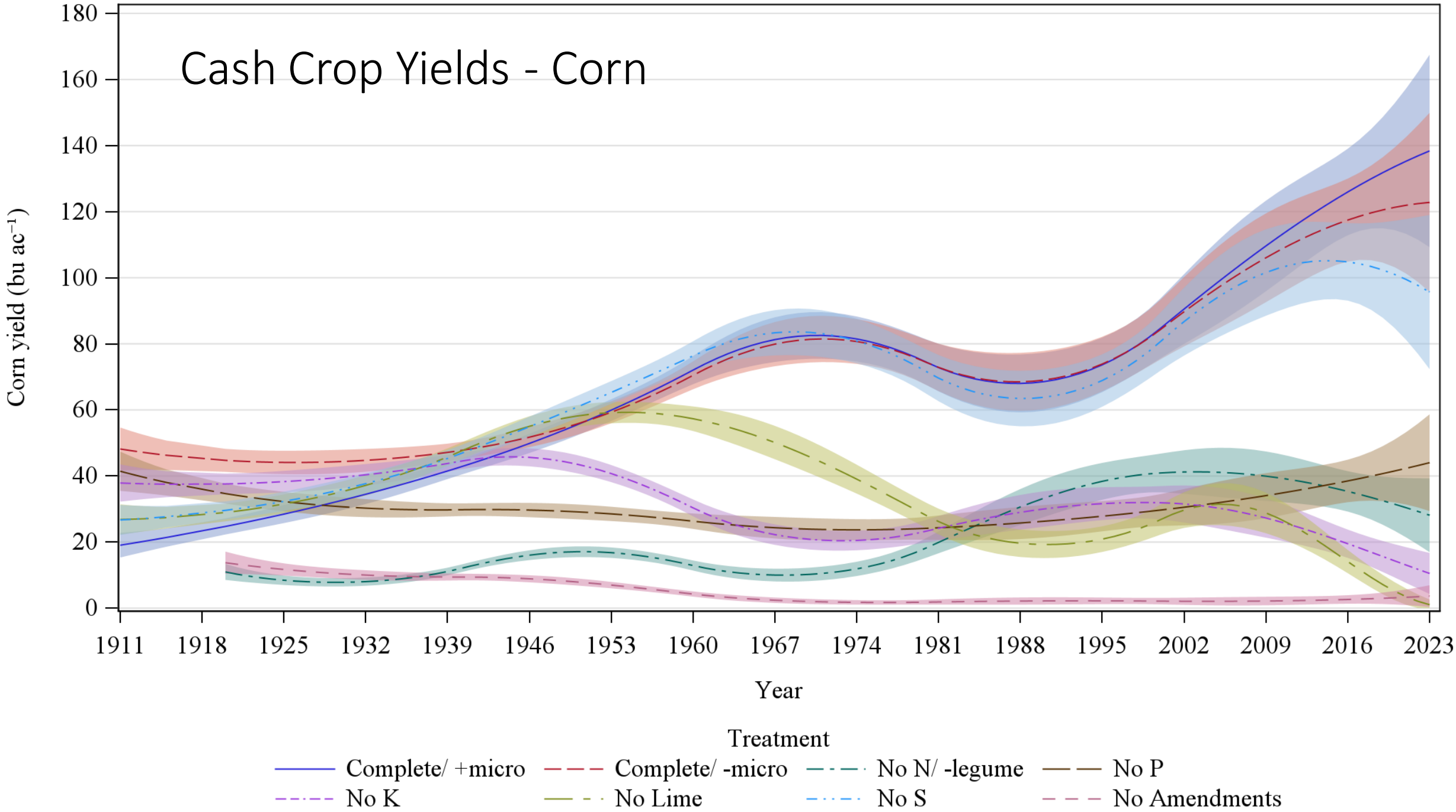
- Established in **1911**
- The oldest soil fertility experiment in the South
- Demonstrates effect of **soil fertility management** on **cotton, corn, soybean, and wheat yields**

Fall 2022 Routine Soil Test Results

Plot	Treatment	pH[1]	Mehlich1-Extractable Nutrients	
			P	K
			lbs per acre	
A	No N/ + winter legume	6.1	156	85
B	No N/ no winter legume	6.43	133	80
C	No soil amendment	4.97	11	20
1	Complete fertilization/ no winter legume	6	88	86
2	No P	6.2	12	60
3	Complete fertilization	6.03	103	86
4	4/3 K	6.03	125	75
5	Rock phosphate	6.27	512	79
6	No K	5.97	270	20
7	2/3 K	5.97	119	62
8	No lime	4.13	214	38
9	No S	6.07	212	85
10	Complete fertilization + micronutrients	5.87	179	77
11	1/3 K	6.13	129	41

[1]2022 soil test data averaged between the three replicates

[2]K rates calculated according to annual soil test recommendations


Cash Crop Yields - Corn
Corn yield (bu ac⁻¹)
180
160
140
120
100
80
60
40
20
0
1911
1918
1925
1932
1939
1946
1953
1960
1967
1974
1981
1988
1995
2002
2009
2016
2023
Year
Treatment
Complete/ +micro
Complete/ -micro
No N/ -legume
No P
No K
No Lime
No S
No Amendments

Cash Crop Yields - Corn

Corn yield (bu ac^{-1})

180
160
140
120
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1911 1918 1925 1932 1939 1946 1953 1960 1967 1974 1981 1988 1995 2002 2009 2016 2023

Year

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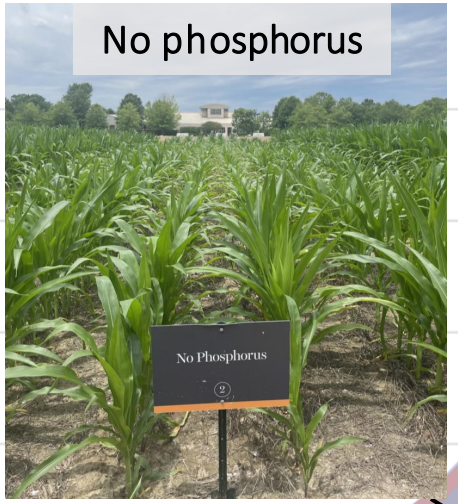

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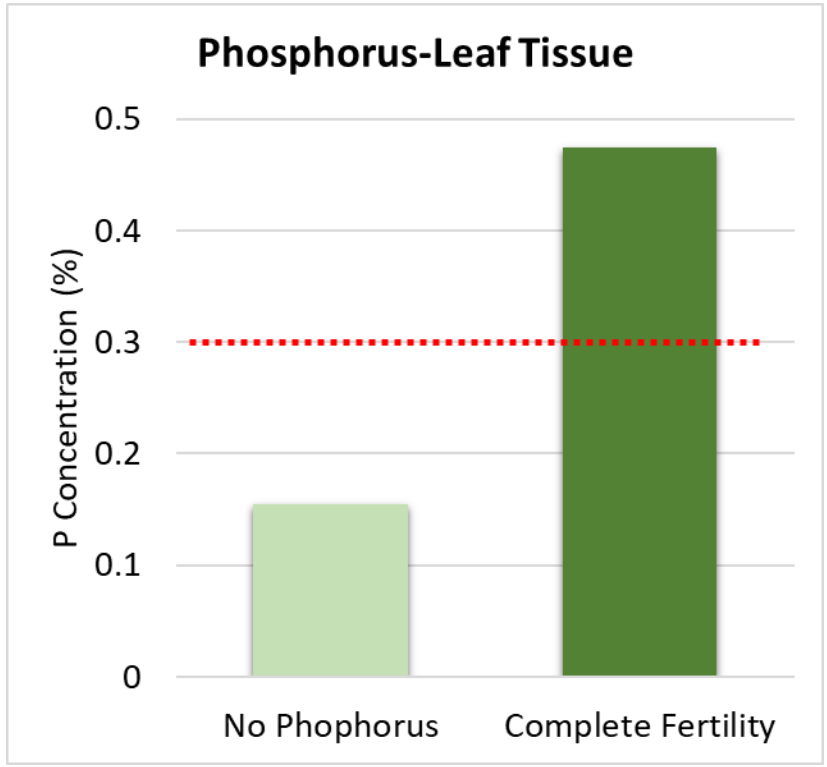

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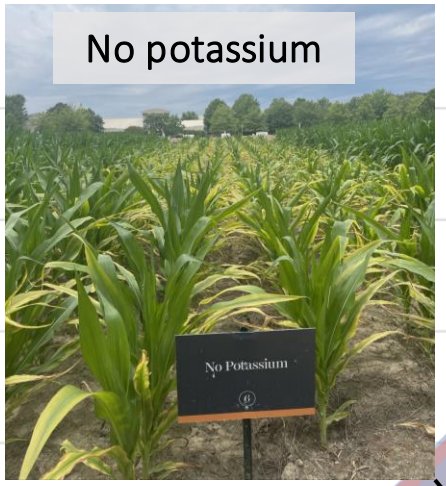
Cash Crop Yields - Corn



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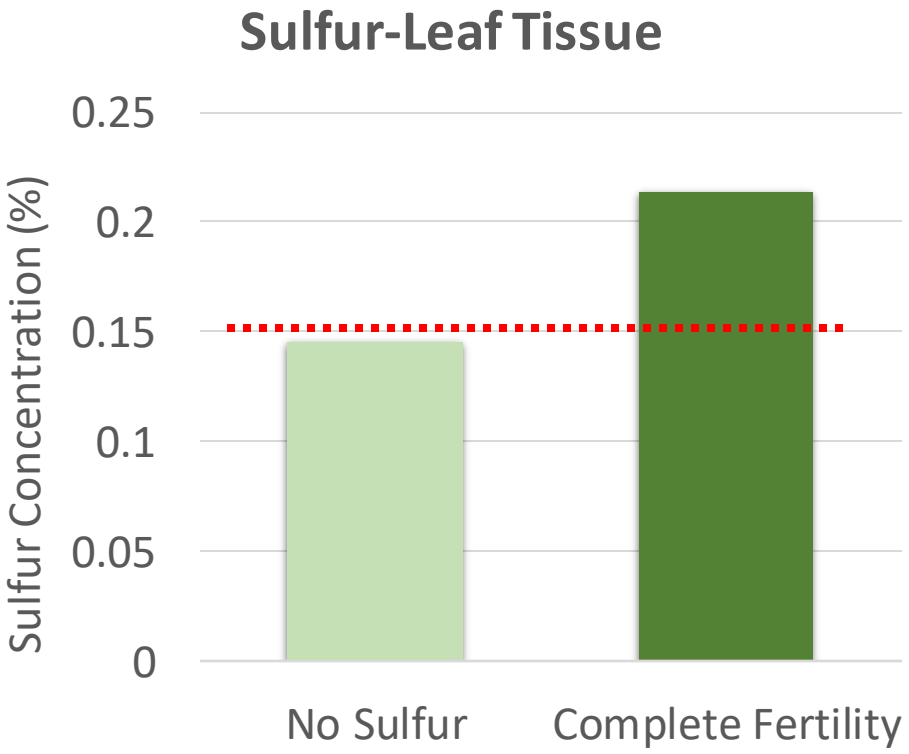

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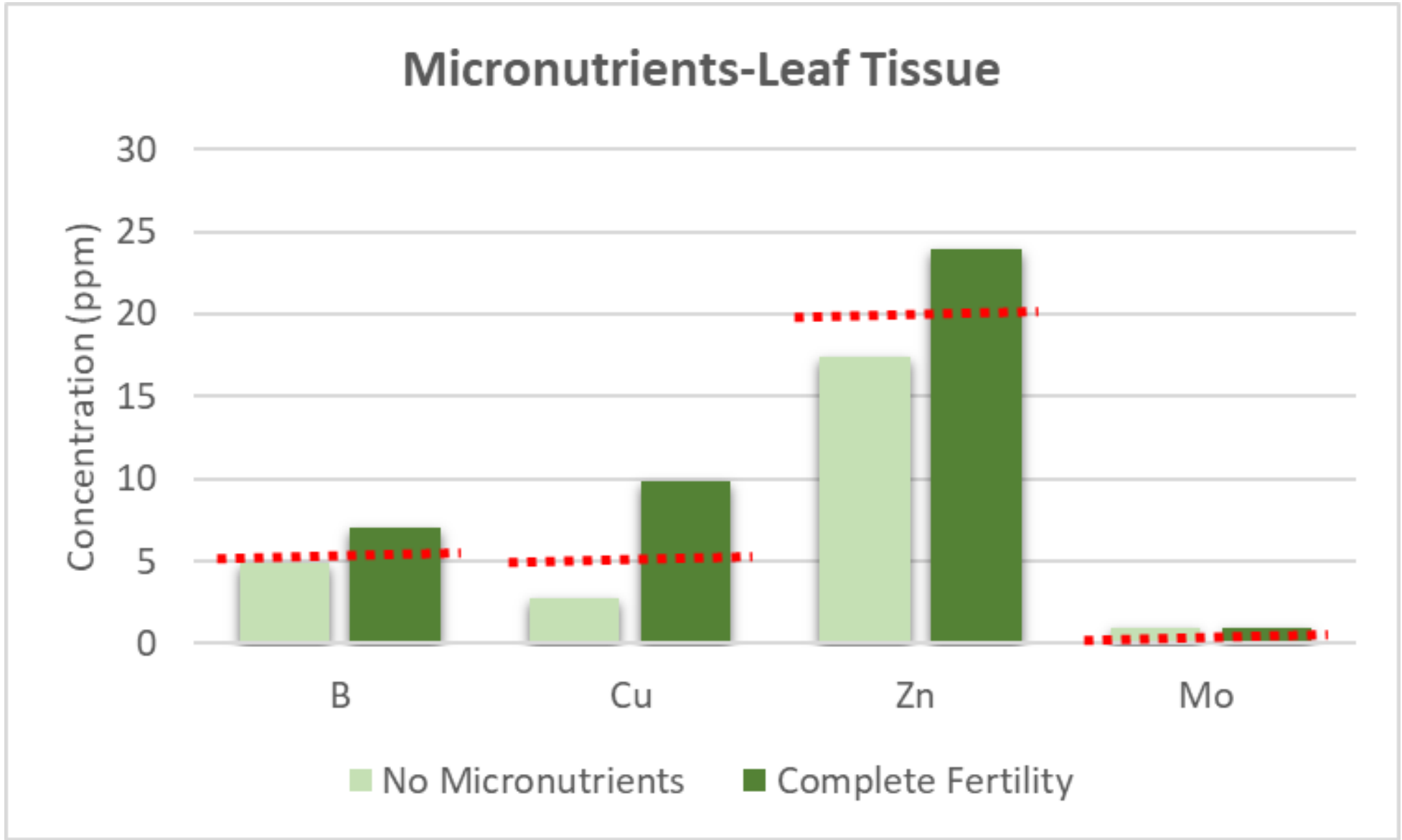

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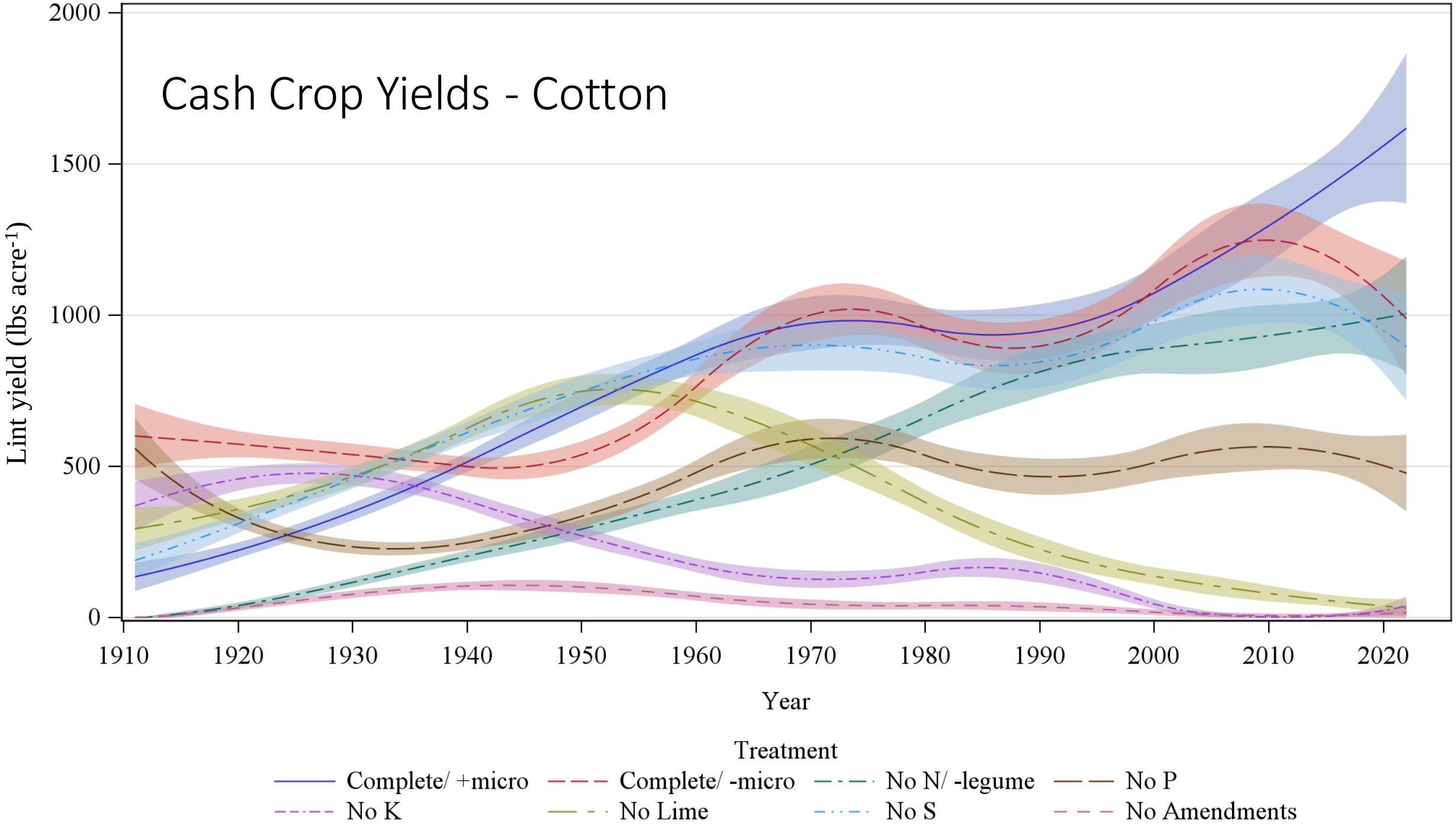
Cash Crop Yields - Cotton
Lint yield (lbs acre-1)
2000
1500
1000
500
0
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Year
Treatment
Complete/ +micro
Complete/ -micro
No N/ -legume
No P
No K
No Lime
No S
No Amendments

Lint yield (lbs acre^{-1})

2000
1500
1000
500
0

1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010 2020

Year

Treatment

Complete/ +micro
Complete/ -micro
No N/ -legume
No P
No K
No Lime
No S
No Amendments

Lint yield (lbs acre^{-1})

2000
1500
1000
500
0

1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010 2020

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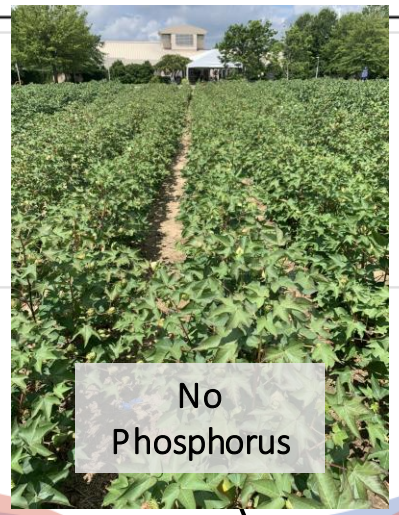
Cash Crop Yields - Cotton



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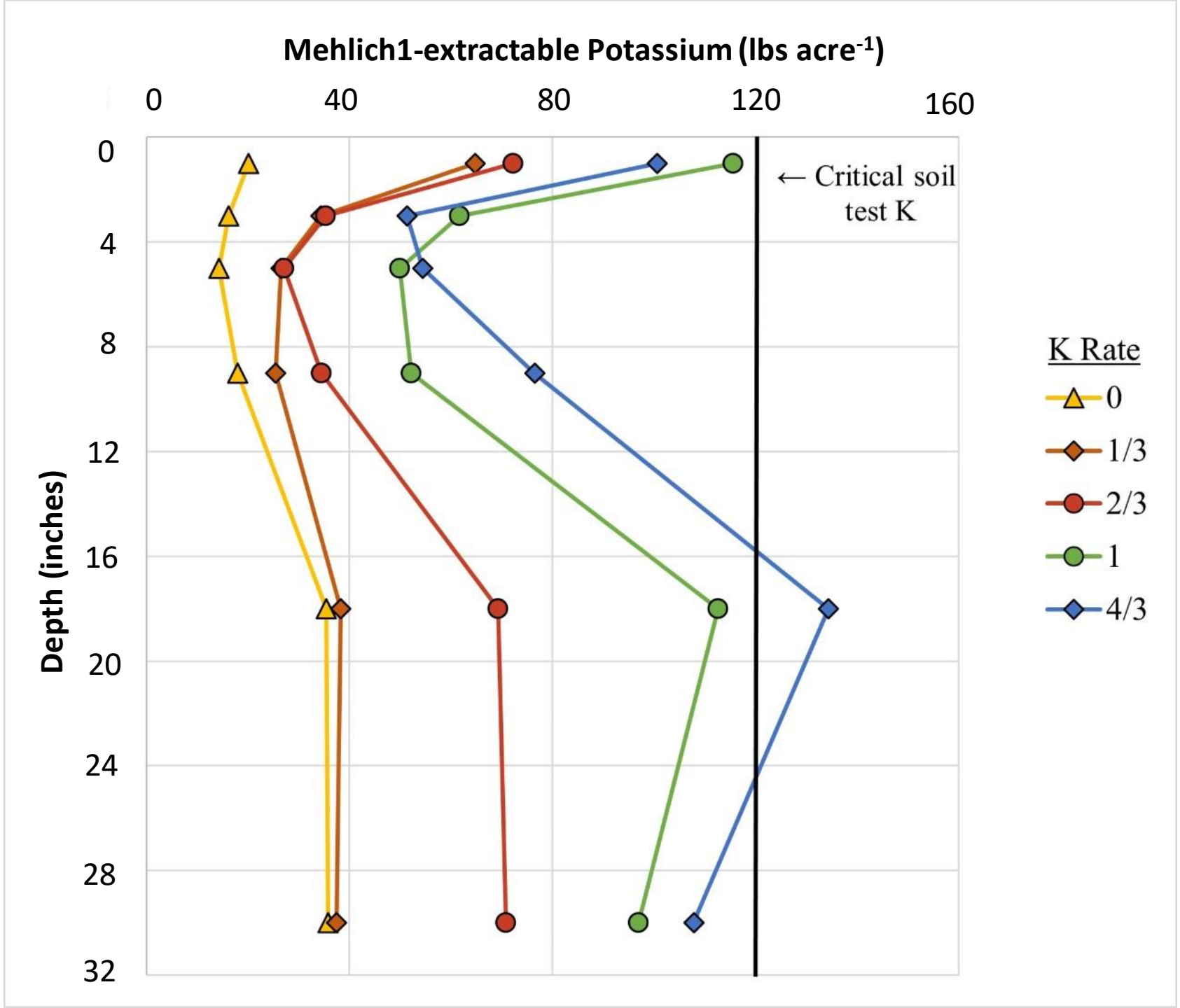

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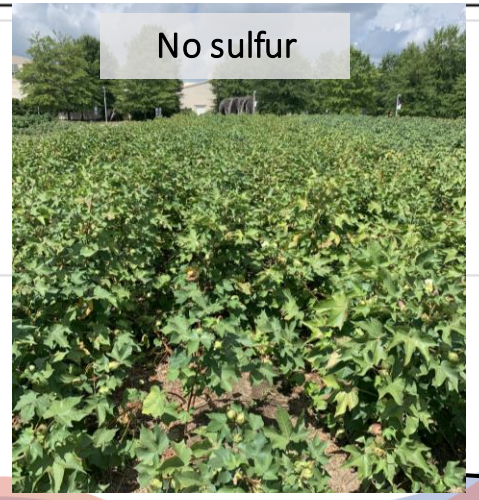
Cash Crop Yields - Cotton



Lint yield (lbs acre^{-1})

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Cash Crop Yields - Cotton

Lint yield (lbs acre^{-1})

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1500
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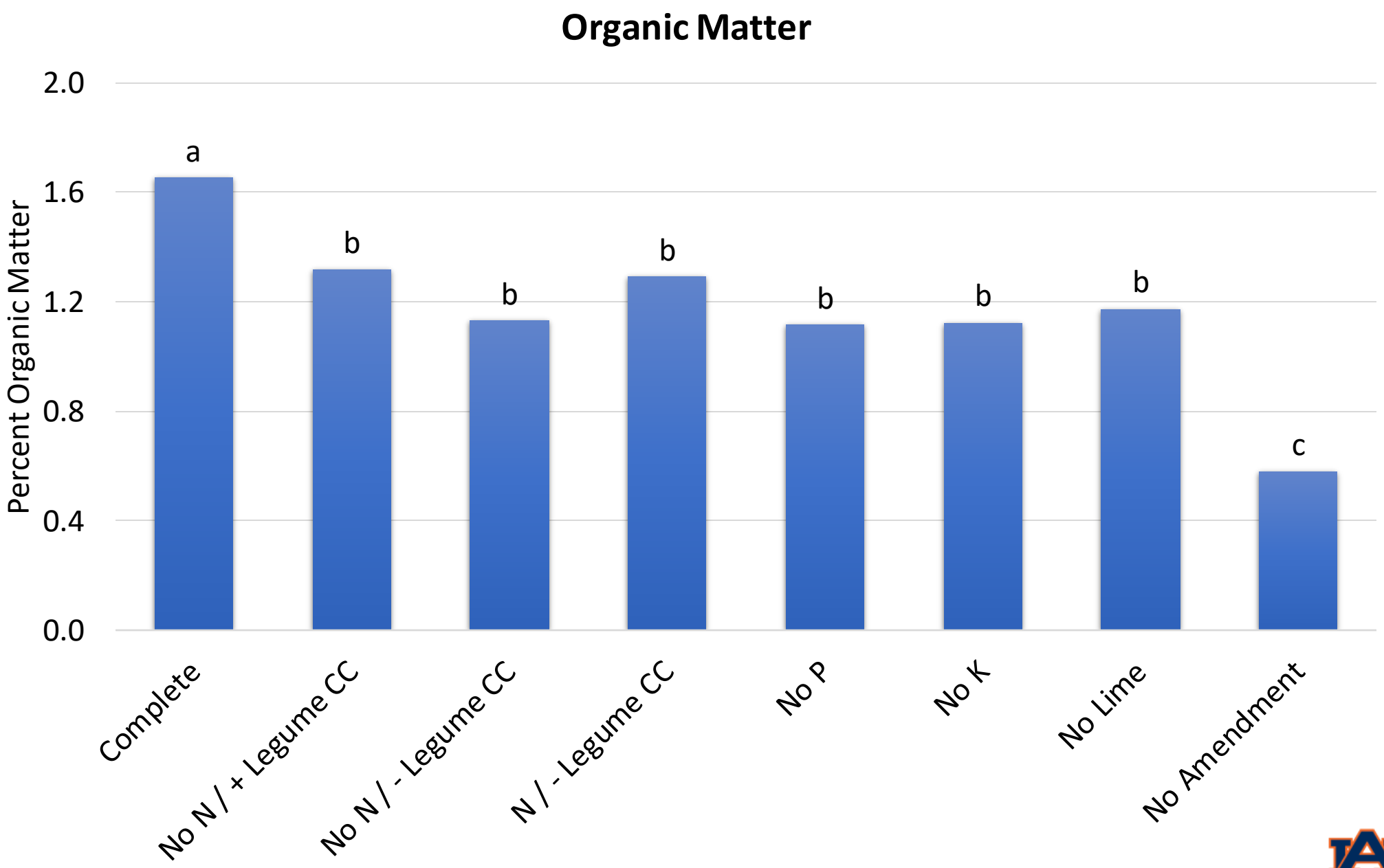
Treatment	Soybean Yield (bushels per acre)
No Nitrogen, Winter Legume	40
No Nitrogen, No Winter Legume	40
No Soil Amendment Since 1911	1
Complete Fertilization, No Winter Legume	37
No Phosphorus	15
Complete N-P-K, No Micronutrients	37
4/3 Potassium Rate	37
Rock Phosphate	39
No Potassium	15
2/3 Potassium Rate	37
No Lime (pH 4.5)	3
No Sulfur	38
Complete N-P-K, with Micronutrients	40
1/3 Potassium Rate	34



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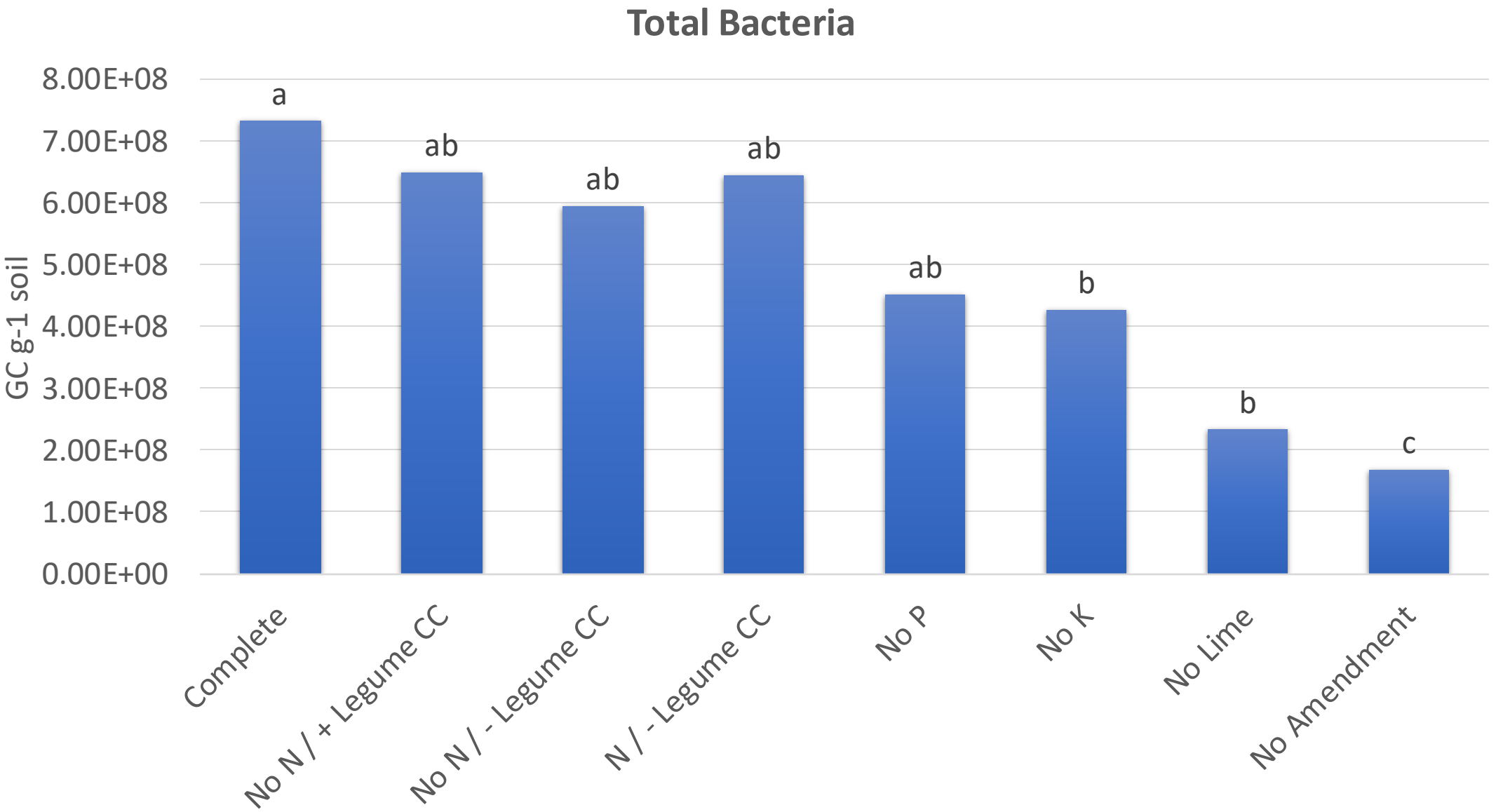

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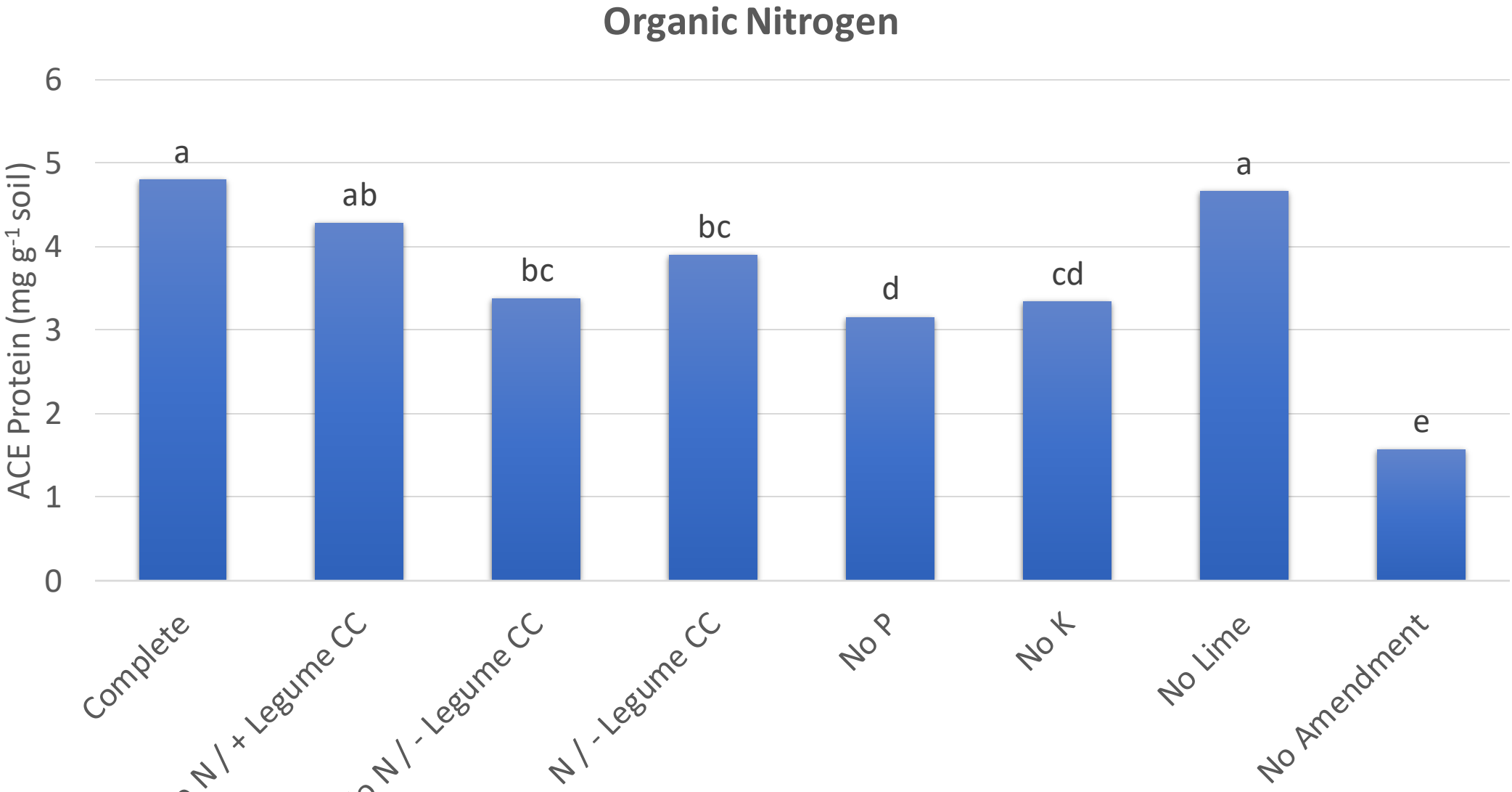

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Important Lessons

- Historic experiments offer a unique opportunity to quantify long-term effects of **soil fertility issues**

- **Soil fertility** and **soil conservation practices** work together to improve soil health and sustainability

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Acknowledgements

- **Joseph Burch (Manager)**
- Alabama Cotton Commission
- Alabama Soybean Producers
- Alabama Wheat and Feed Grain Producers
- USDA-ARS