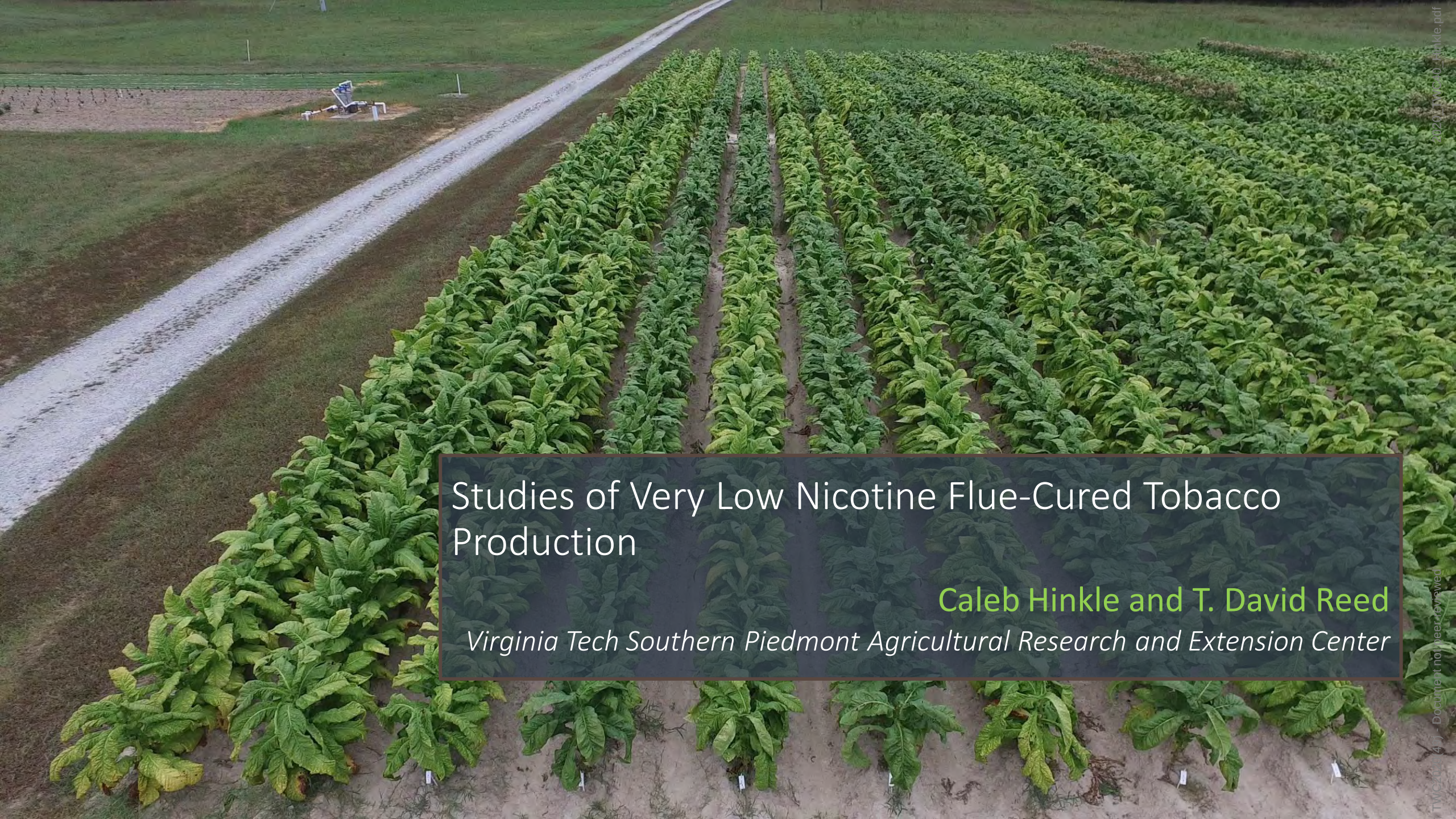

Studies of Very Low Nicotine Flue-Cured Tobacco Production

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U.S. FOOD & DRUG ADMINISTRATION

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FDA STATEMENT

Statement from FDA Commissioner Scott Gottlieb, M.D., on pivotal public health step to dramatically reduce smoking rates by lowering nicotine in combustible cigarettes to minimally or non-addictive levels

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Conventional Nicotine Levels

Conventional Flue-Cured Varieties:

- 17-34 mg/g

Cigarette Levels: ***14-27 mg/g***

- Flue-Cured
  - Leaf: 15-45 mg/g
  - Stem: 3-7 mg/g
- Burley
  - Leaf: 15-50 mg/g
  - Stem: 3-7 mg/g
- Oriental
  - Leaf: 5-20 mg/g

FDA Proposed Nicotine Levels

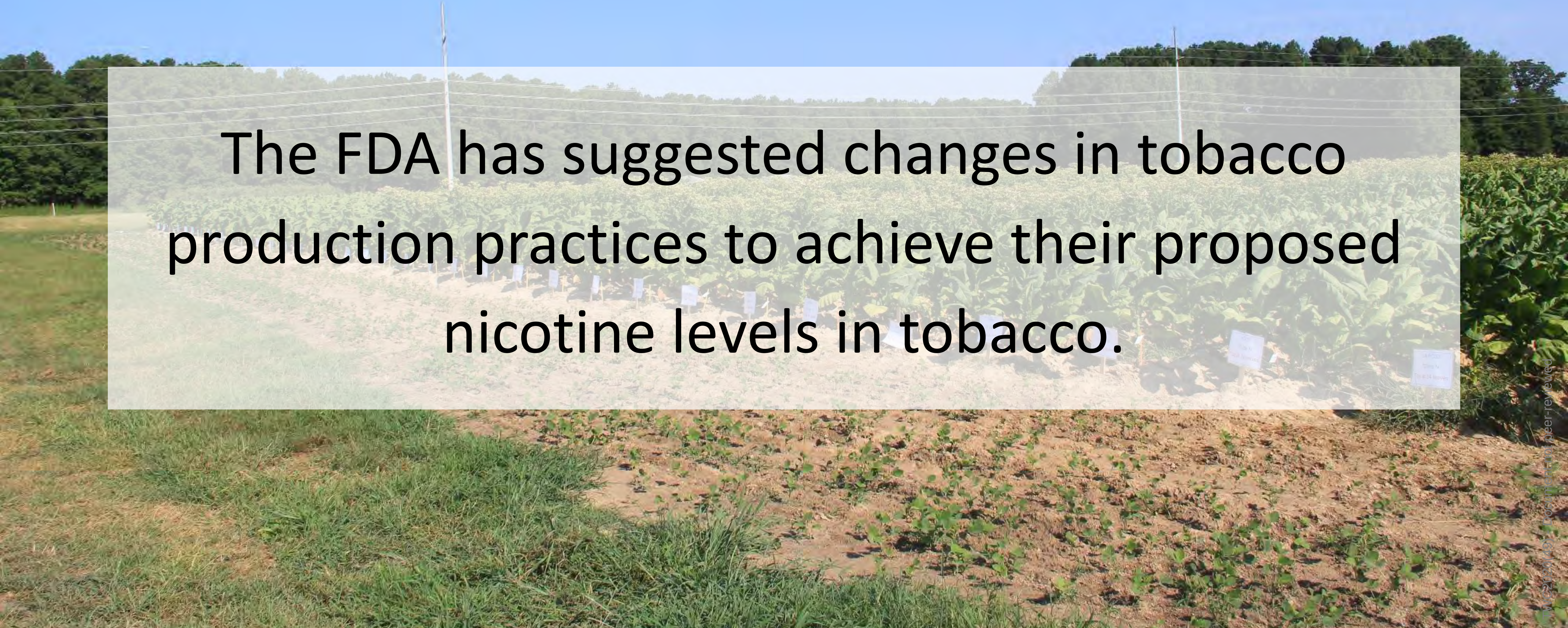
Proposed Low Nicotine Flue-Cured Varieties:

- 2-8 mg/g

Cigarette Levels: ***0.3-0.5 mg/g***

- 98% reduction

Tobacco Product Standard for Nicotine of Combustible Cigarettes

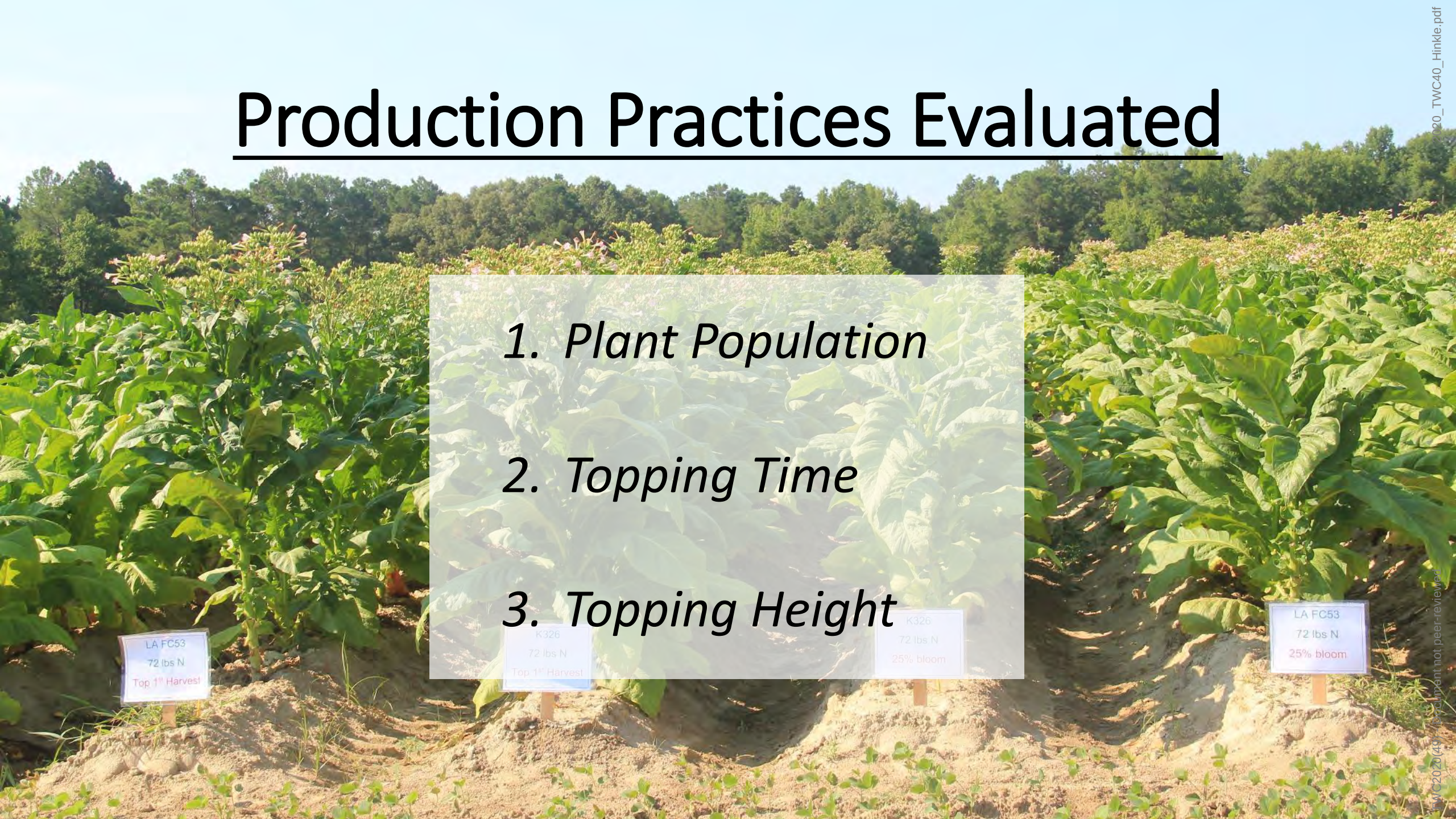


The FDA has suggested changes in tobacco production practices to achieve their proposed nicotine levels in tobacco.

Project Objective

Investigate the effect of alternative agronomic production practices on the yield, quality, and nicotine levels of flue-cured tobacco.

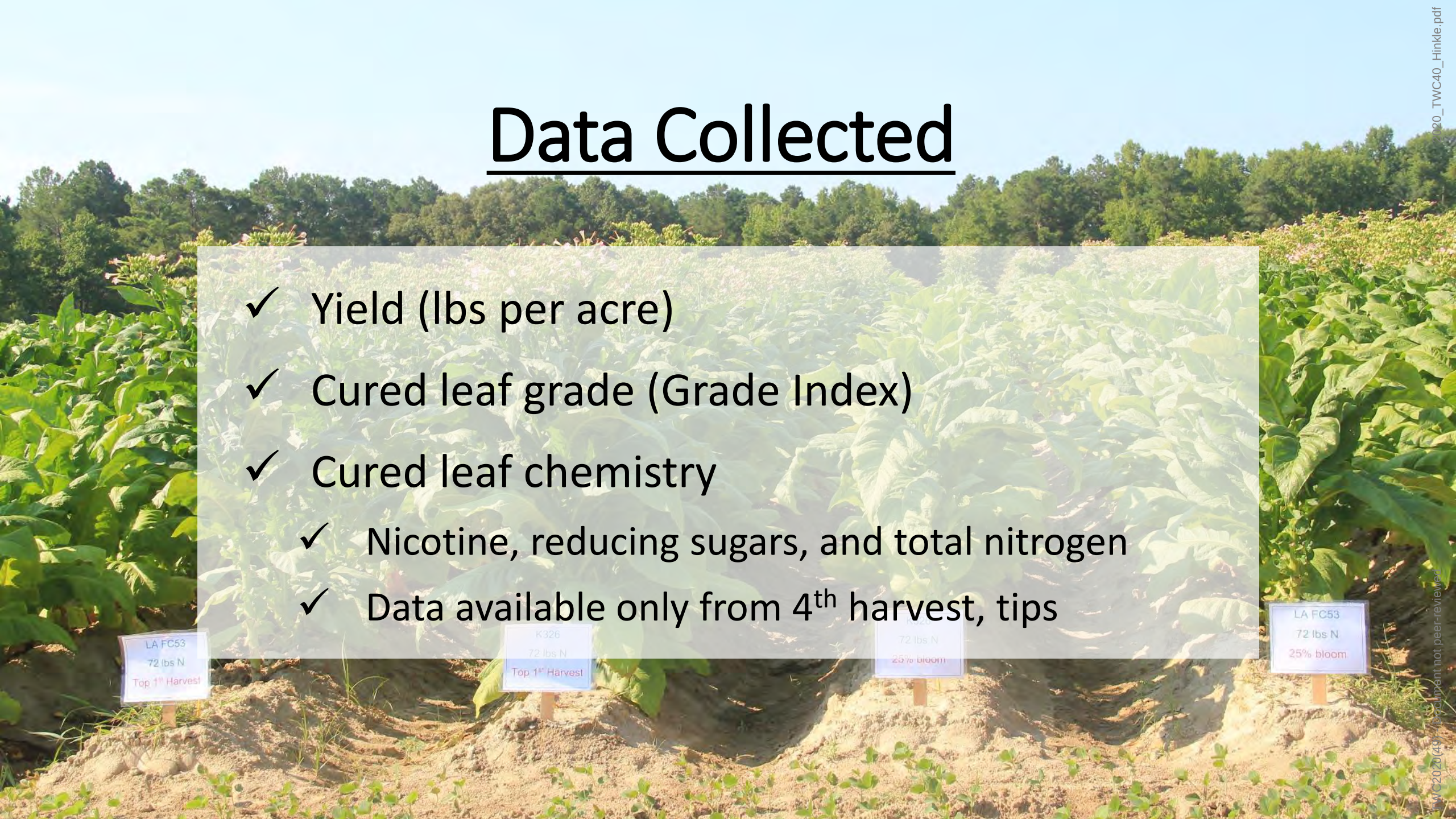
Production Practices Evaluated



1. *Plant Population*
2. *Topping Time*
3. *Topping Height*

Data Collected

- ✓ Yield (lbs per acre)
- ✓ Cured leaf grade (Grade Index)
- ✓ Cured leaf chemistry
  - ✓ Nicotine, reducing sugars, and total nitrogen
  - ✓ Data available only from 4th harvest, tips



Materials & Methods

- Field studies were conducted at the Virginia Tech Southern Piedmont Agricultural Research and Extension Center in Blackstone, VA
- 2019 was the first of two years planned for this project

Materials & Methods

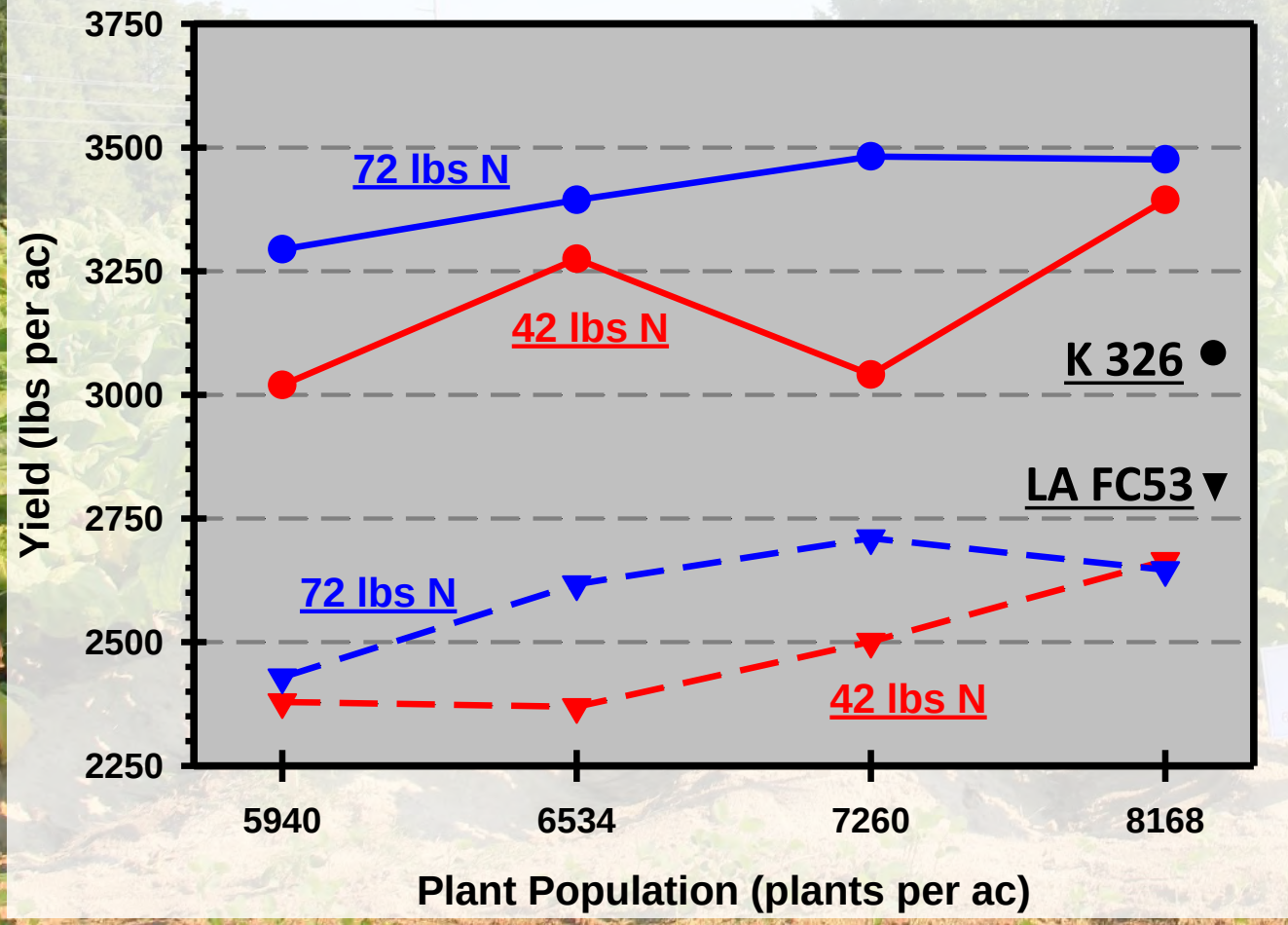
- Nitrogen rates (42 and 72 lbs per acre)
- Varieties Grown:
  - K 326 - widely grown, popular conventional variety
  - LA FC53 - publicly available low alkaloid variety
- Split-split-plot design with 4 replications

Planting Population Treatments

Plants per acre	In-row plant spacing (in.)	Plants per 40 ft row
5940	22	21
6534	20	24
7260	18	27
8168	16	30

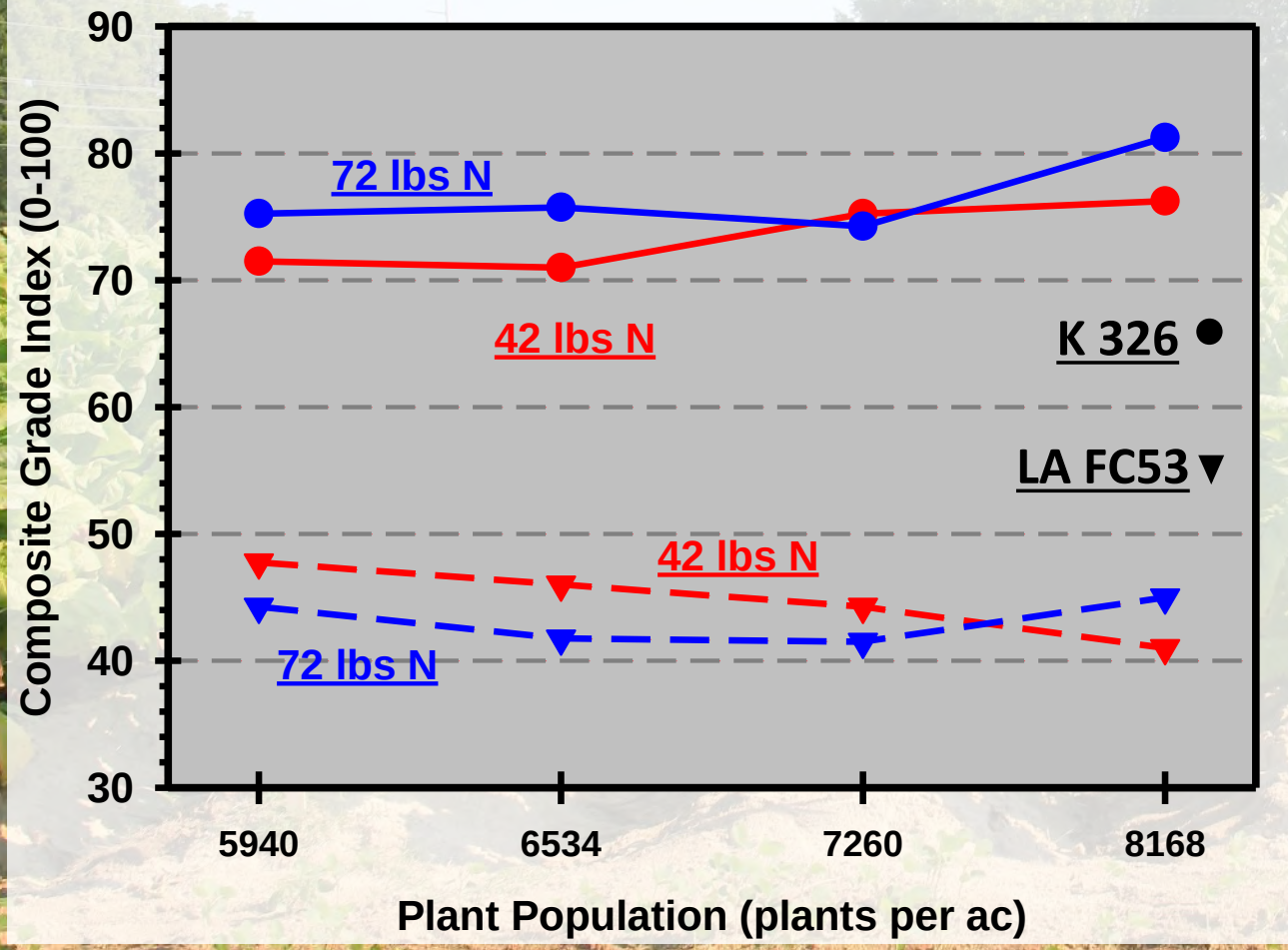
*standard population range is from 5940 to 6534 plants per acre

Plant Population: *Yield*



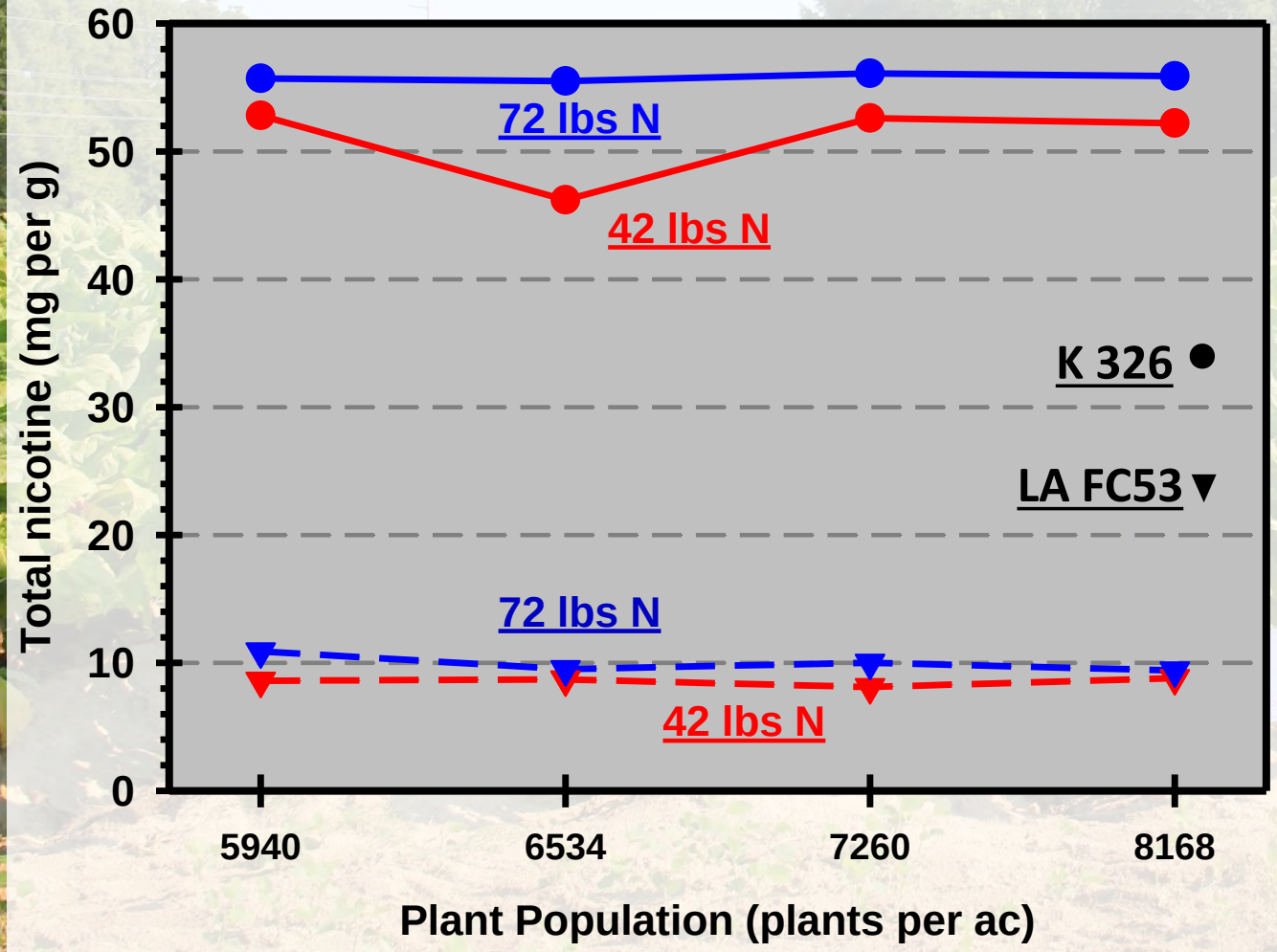
ANOVA	
Effect	**Pr > F**
N Rate	0.1333
Variety	<0.0001
Plant Pop.	0.0048
*all interactions were not significant	

Plant Population: *Grade Index*



ANOVA	
Effect	**Pr > F**
N Rate	0.6531
Variety	<0.0001
Plant Pop.	0.7597
*all interactions were not significant	

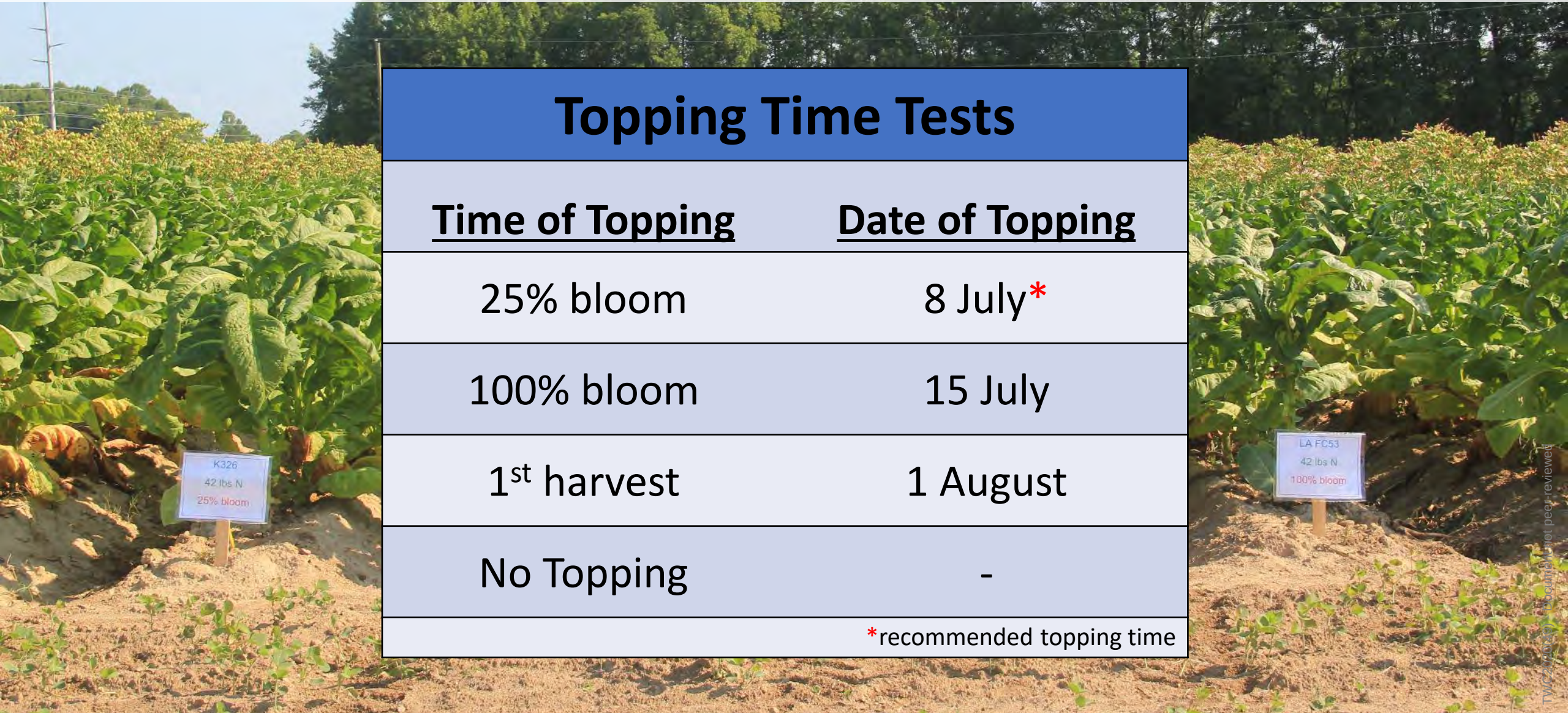
Plant Population: *Nicotine (tips)*



*data only from 4th of 4 harvest (tip leaves)

ANOVA	
Effect	**Pr > F**
N Rate	0.1911
Variety	<0.0001
Plant Pop.	0.2348
*all interactions were not significant	

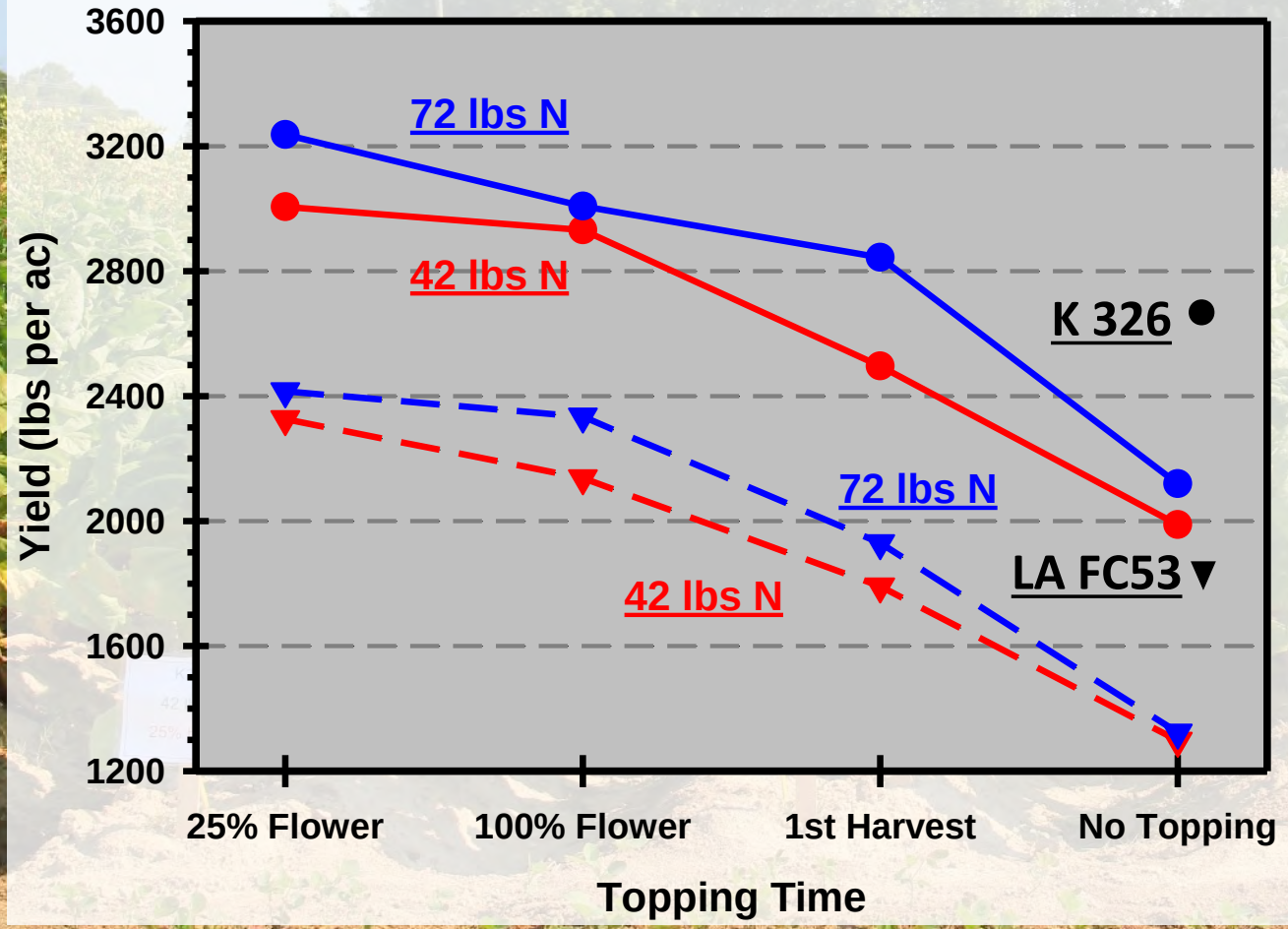
Topping Time Treatments



Topping Time Tests	
Time of Topping	**Date of Topping**
25% bloom	8 July*
100% bloom	15 July
1st harvest	1 August
No Topping	-

*recommended topping time

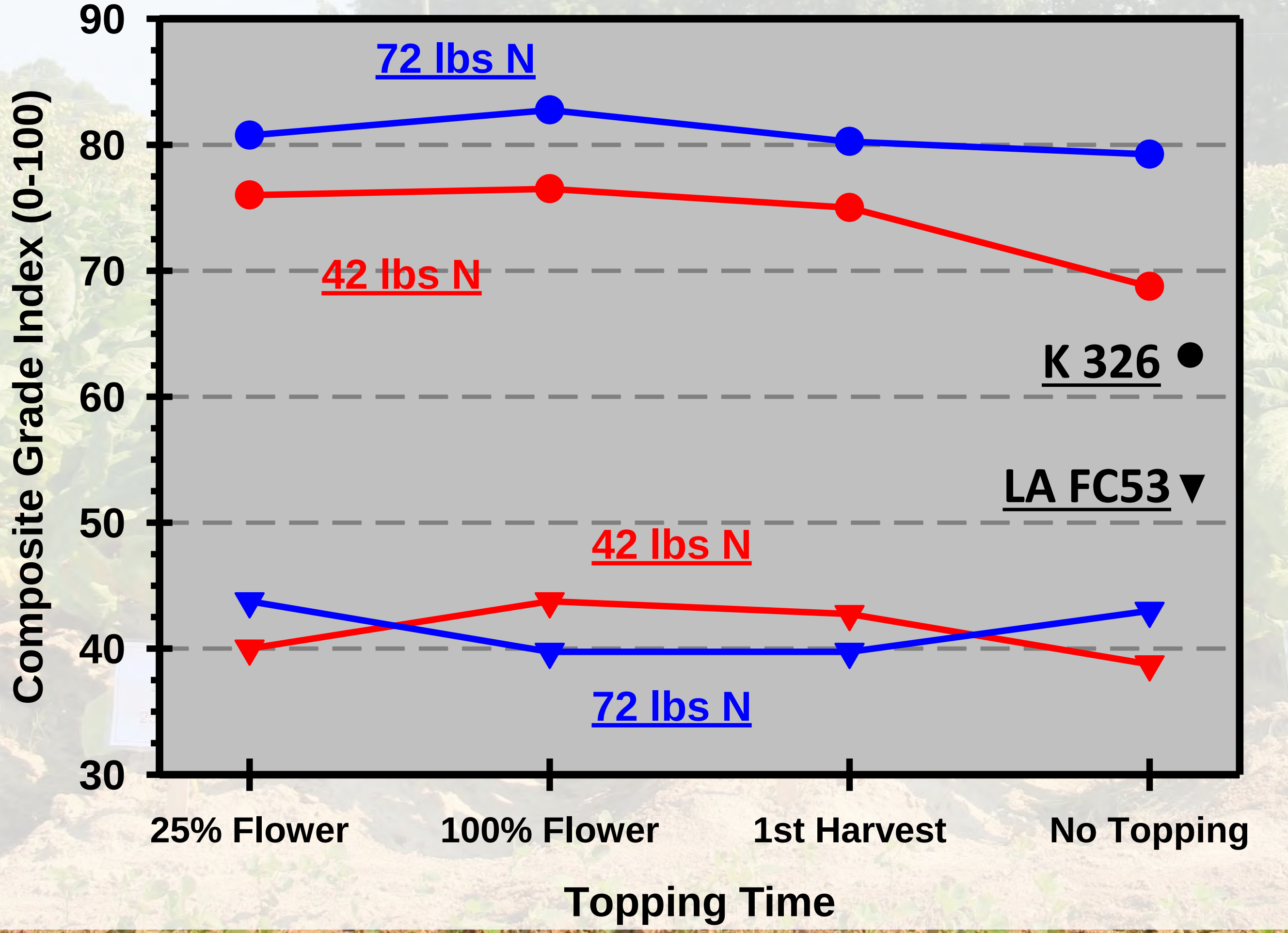
Topping Time: *Yield*



ANOVA	
Effect	**Pr > F**
N Rate	0.0948
Variety	<0.0001
Topping Time	<0.0001

*all interactions were not significant

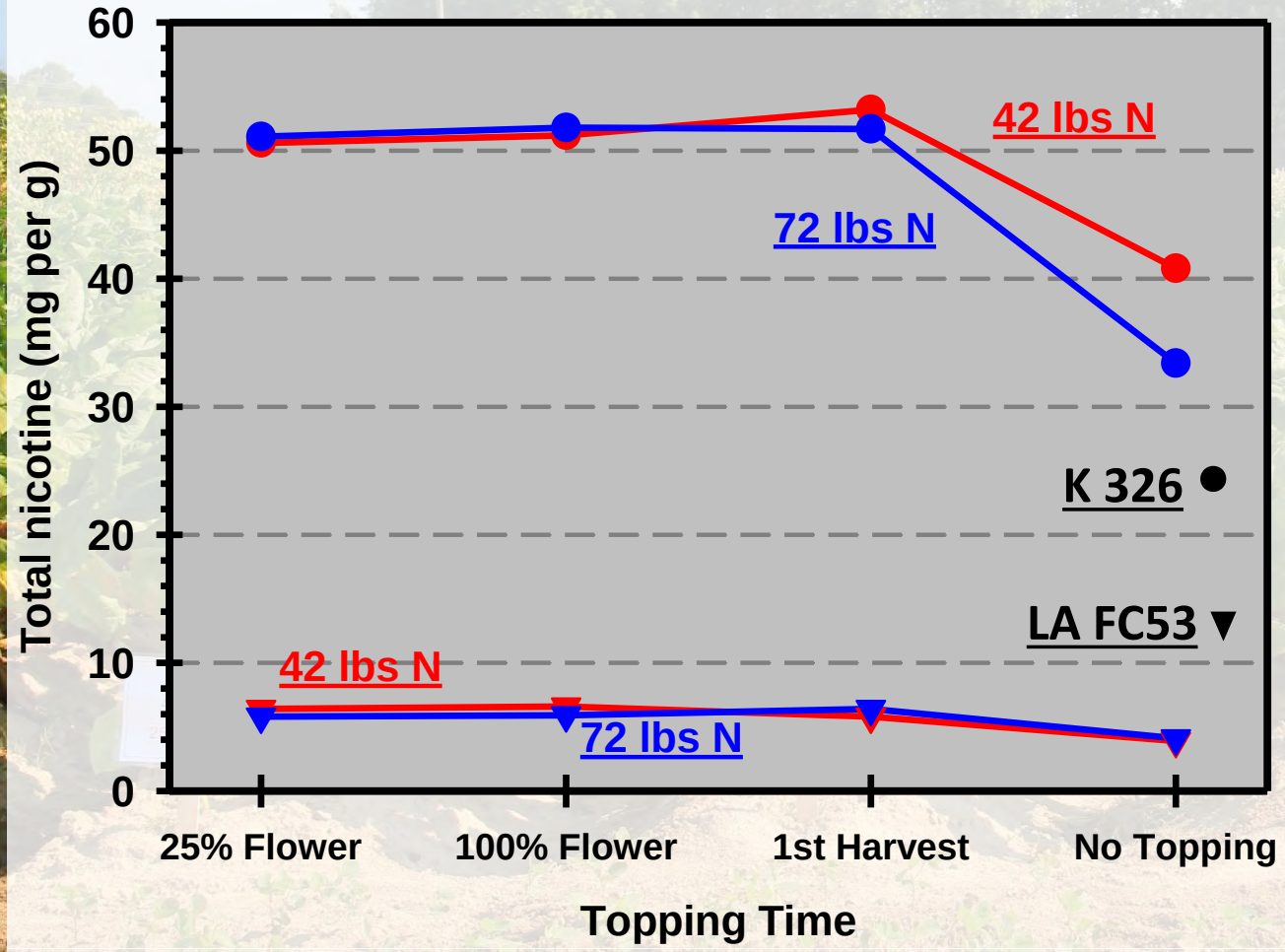
Topping Time: *Grade Index*



ANOVA	
Effect	**Pr > F**
N Rate	0.2287
Variety	<0.0001
Topping Time	0.4896

*all interactions were not significant

Topping Time: *Nicotine (tips)*

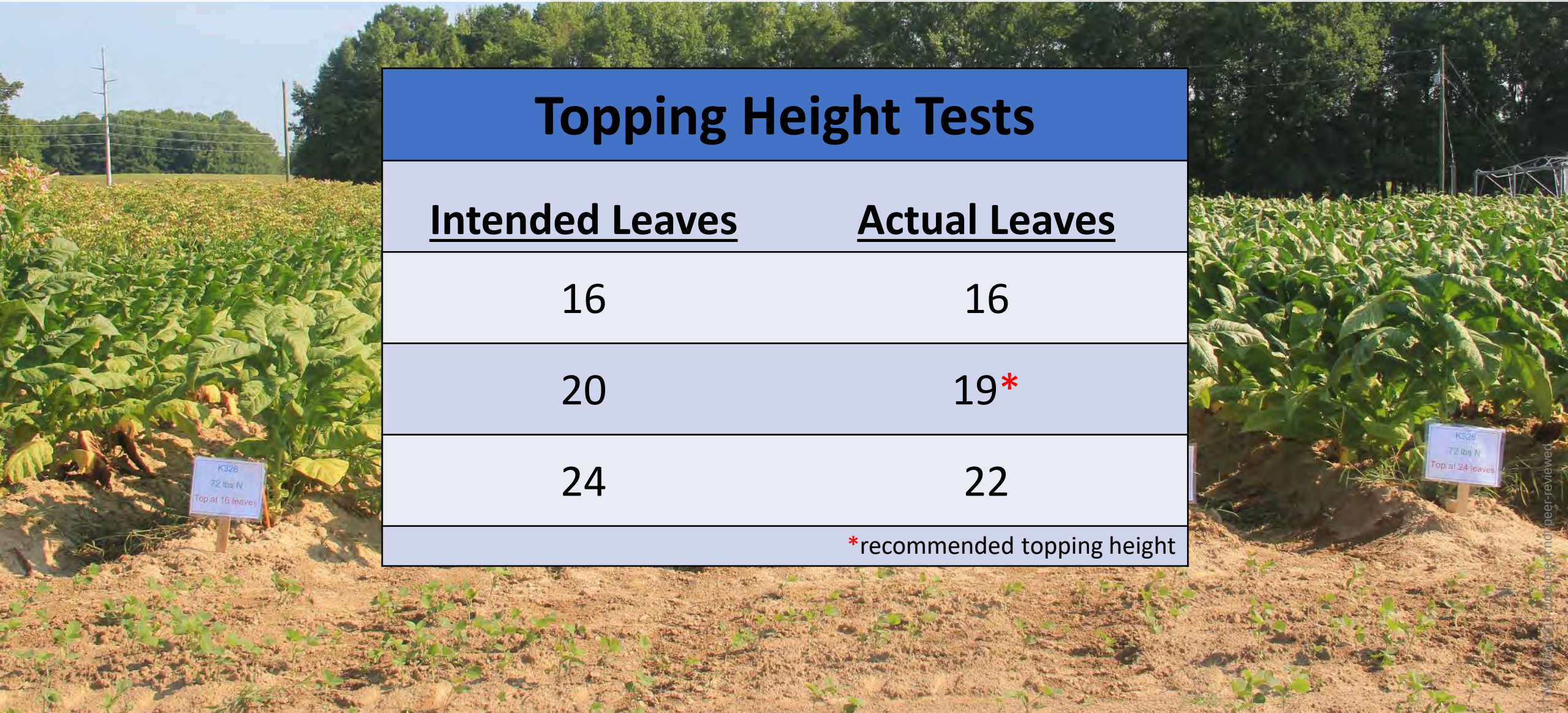


*data only from 4th of 4 harvest (tip leaves)

ANOVA	
Effect	**Pr > F**
N Rate	0.1998
Variety	<0.0001
Topping Time	<0.0001

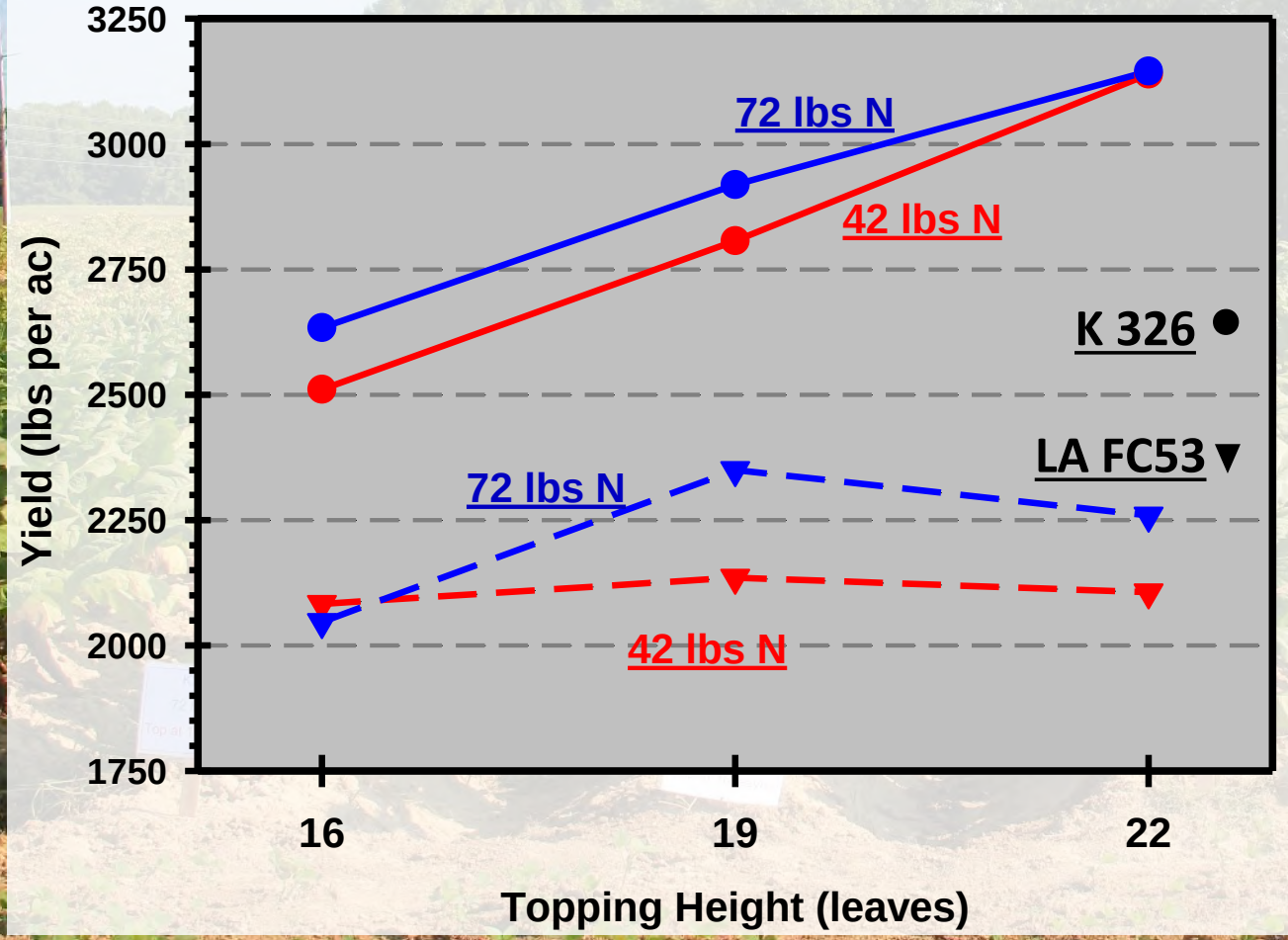
*all interactions were not significant

Topping Height Treatments



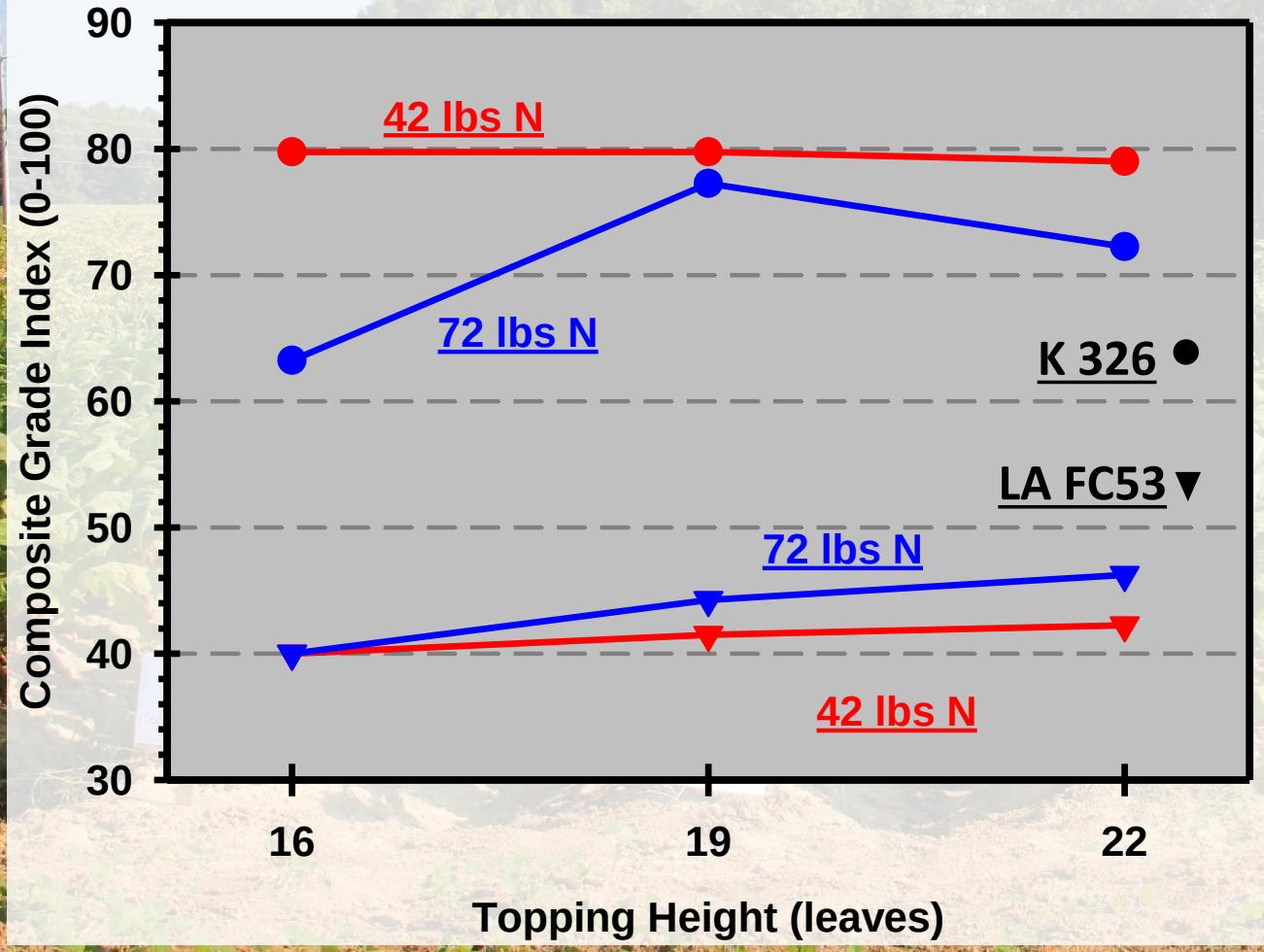
Topping Height Tests	
Intended Leaves	**Actual Leaves**
16	16
20	19*
24	22
	*recommended topping height

Topping Height: *Yield*



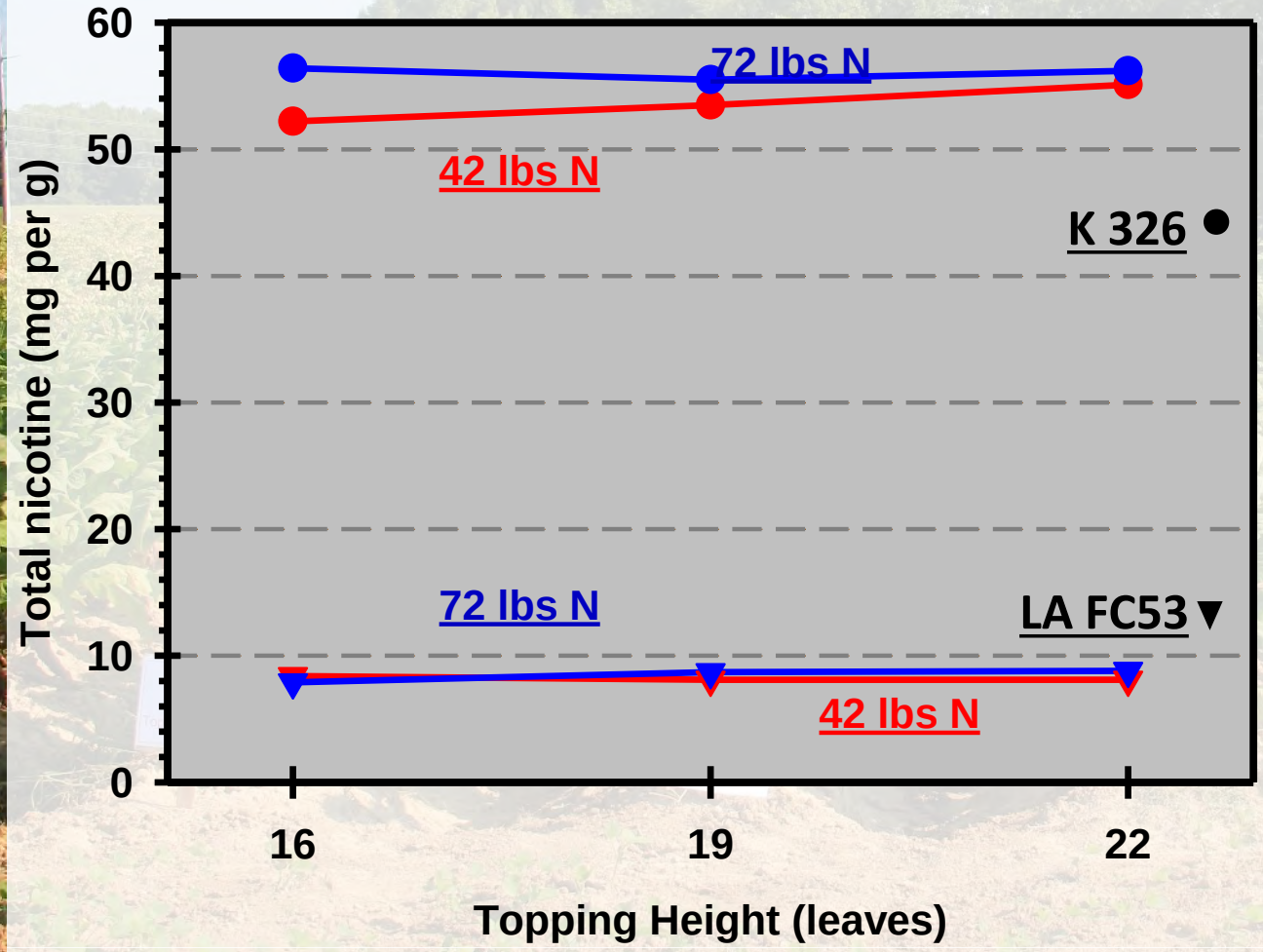
ANOVA	
Effect	**Pr > F**
N Rate	0.2264
Variety	<0.0001
Topping Height	<0.0001
Variety X Topping Height	0.0032
*all other interactions were not significant	

Topping Height: *Grade Index*



ANOVA	
Effect	**Pr > F**
N Rate	0.6121
Variety	<0.0001
Topping Height	0.0478
N Rate X Variety	0.0498
*all other interactions were not significant	

Topping Height: *Nicotine (tips)*



*data only from 4th of 4 harvest (tip leaves)

ANOVA	
Effect	**Pr > F**
N Rate	0.1496
Variety	<0.0001
Topping Height	0.8568
*all other interactions were not significant	

Summary

Three standard production practices (plant population, topping time, and topping height) were evaluated at two nitrogen rates (42 and 72 lbs N per acre) on two varieties (K 326 and LA FC53).

Impact of Alternative Production Practices

	Yield	Grade Index	Nicotine
Population	Yes (+)	n.s.	n.s.
Topping Time	Yes (-)	n.s.	Yes (-)
Topping Height	Yes (Interaction with variety)	Yes (+)	n.s.

Summary

Nitrogen rate (42 and 72 lbs N per acre) did not have as substantial of an effect on yield, quality, and nicotine as expected. This could possibly change under different growing seasons.

Impact of Alternative Production Practices

	Yield	Grade Index	Nicotine
N Rate ***(42 & 72 lbs/ac)***	n.s.	n.s.	n.s.
Variety ***(K 326 & LA FC53)***	Yes K 326 (+) LA FC53 (-)	Yes K 326 (+) LA FC53 (-)	Yes K 326 (+) LA FC53 (-)

Conclusion

- Current production practices such as plant population, topping time, and topping height, as well as nitrogen fertilization rates, have been researched for decades and serves as the basis for our current recommendations.
- Alternative production practices in these studies resulted in a substantial agronomic impact on production without reductions in nicotine levels suggested by the FDA.
- The use of LA FC53 to address nicotine levels resulted in a considerably negative impact on the tobacco yield and quality.

Acknowledgements

- Altria
- Virginia Tobacco Board
- Staff of Virginia Tech Southern Piedmont Agricultural Research and Extension Center