

Early season fertility

Michael J. Mulvaney

Cropping Systems Specialist, UF/IFAS WFREC, Jay, FL

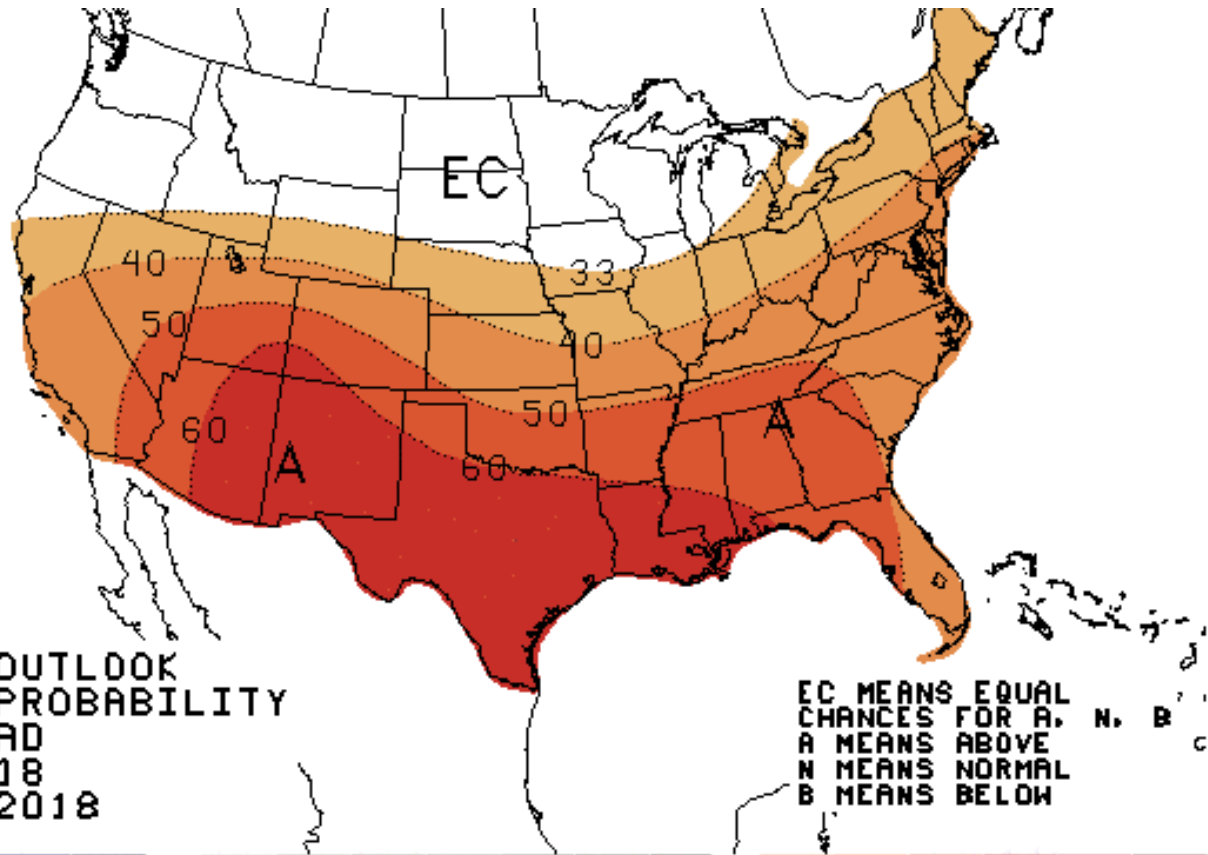
Row Crop Short Course

Marianna, FL

Mar. 1, 2018

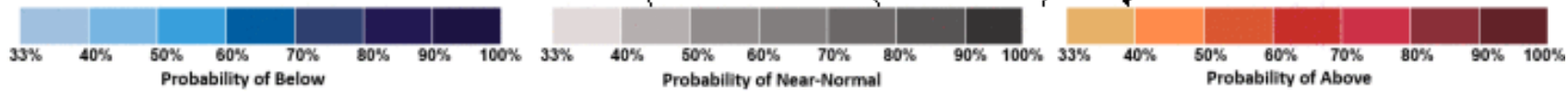


Temp probability, 3-mo outlook

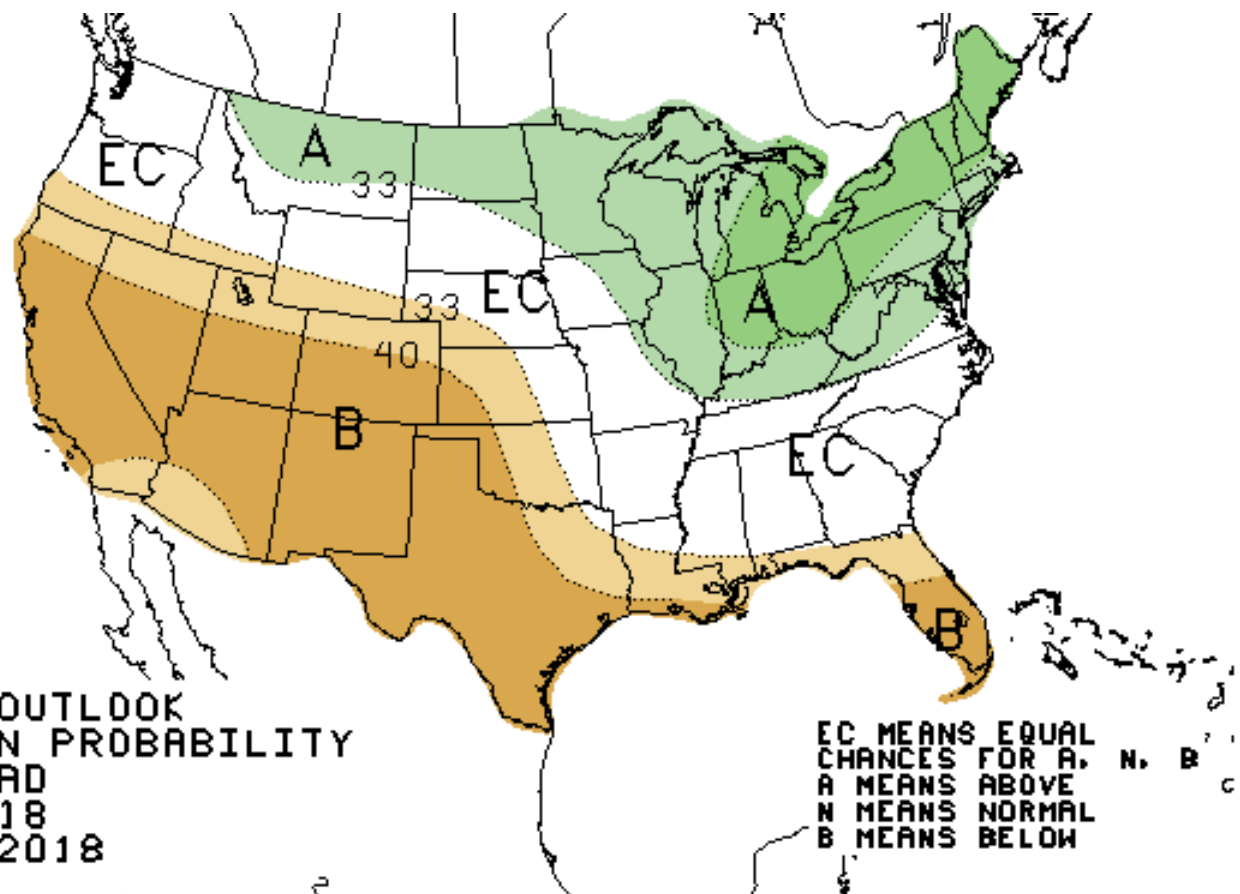


THREE-MONTH OUTLOOK
 TEMPERATURE PROBABILITY
 1.5 MONTH LEAD
 VALID AMJ 2018
 MADE 15 FEB 2018

EC MEANS EQUAL CHANCES FOR A, N, B
 A MEANS ABOVE
 N MEANS NORMAL
 B MEANS BELOW

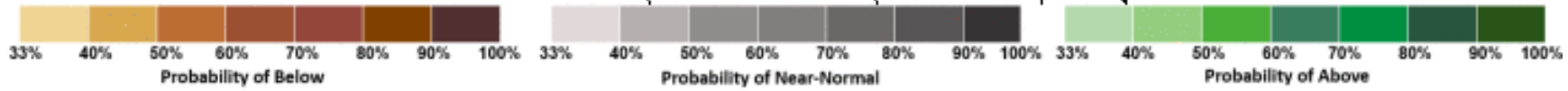


Precip. probability, 3-mo outlook



THREE-MONTH OUTLOOK
 PRECIPITATION PROBABILITY
 1.5 MONTH LEAD
 VALID AMJ 2018
 MADE 15 FEB 2018

EC MEANS EQUAL CHANCES FOR A, N, B
 A MEANS ABOVE
 N MEANS NORMAL
 B MEANS BELOW



Corn operational costs

Corn production costs and returns per planted acre, excluding Government payments, Southern Seaboard, 2010-2016

Operating costs, corn, Southern Seaboard:

<u>Item</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>Ave. %</u>
	dollars per planted acre							
Seed	67.14	69.49	75.64	80.33	82.97	83.56	81.51	21%
Fertilizer 2/	137.78	181.05	192.25	188.52	182.92	168.64	142.91	46%
Chemicals	35.30	35.30	37.08	38.51	39.22	37.54	38.75	10%
Custom operations 3/	17.76	18.09	18.45	19.18	19.72	20.57	20.91	5%
Fuel, lube, and electricity	31.67	39.38	41.93	43.27	42.30	26.61	24.18	10%
Repairs	26.03	26.84	27.64	27.91	28.45	28.40	28.45	8%
Purchased irrigation water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%
Interest on operating capital	0.31	0.19	0.26	0.17	0.13	0.31	0.77	0%
Total, operating costs	315.99	370.34	393.25	397.89	395.71	365.63	337.48	100%

Cotton operational costs

Operating costs, cotton, Southern Seaboard

<u>Item</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>Ave %</u>
	Dollars per planted acre			
Seed	116.15	118.21	92.59	19%
Fertilizer	149.37	137.71	127.01	24%
Chemicals	97.92	93.72	96.43	17%
Custom operations	25.82	26.94	23.78	4%
Fuel, lube, and electricity	54.00	34.39	32.86	7%
Repairs	38.04	37.97	50.15	7%
Ginning	140.81	131.55	115.03	22%
Purchased irrigation water	0.00	0.00	0.00	0%
Interest on operating inputs	0.20	0.49	1.24	0%
Total, operating costs	622.31	580.98	539.09	100%

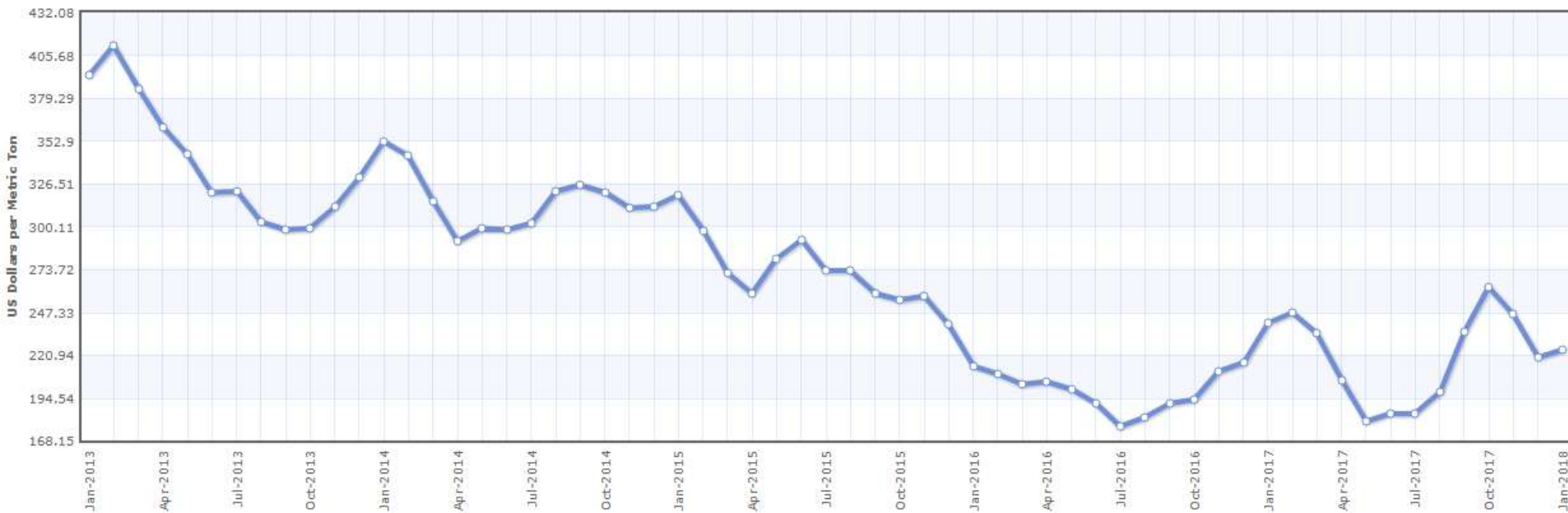
Peanut operational costs

Peanut production costs and returns per planted acre, excluding Government payments, Southern Seaboard (AL, GA), 2013-2016 1/

Item	2013	2014	2015	2016	% of operational costs
dollars per planted acre					
Gross value of production:					
Primary product: Peanuts	1,109.50	735.66	778.14	691.05	
Secondary product: Peanut hay	19.25	16.58	16.32	15.35	
Total, gross value of production	1,128.75	752.24	794.46	706.40	
Operating costs:					
Seed	109.86	114.43	115.24	112.41	23%
Fertilizer 2/	79.93	76.42	71.00	60.17	14%
Chemicals	140.27	142.53	136.95	141.36	29%
Custom operations	12.70	13.08	13.38	13.36	3%
Fuel, lube, and electricity	57.97	57.68	37.41	33.34	9%
Repairs	52.90	53.87	53.92	54.02	11%
Purchased irrigation water and hay baling	0.77	0.80	0.83	0.85	0%
Commercial drying	80.62	73.87	50.67	42.48	11%
Interest on operating inputs	0.24	0.16	0.41	1.05	0%
Total, operating costs	535.26	532.84	479.81	459.04	100%

Urea prices

- Granular urea (46-0-0): \$390-415/ton
- Liquid 28-0-0-5: \$259-280/ton
- Near 5-yr lows



Starter fertilizer

- Most efficient near row
 - May reduce rates by 25% when banded
 - Also, greater response from granular micros
 - More response on sandy soils
 - Dribble or 2x2" placement
 - If dribbled, keep distance 1" from seed per 10 lbs N/ac
 - Sandy soils have greater response to starter
 - Do not place in-furrow

In-furrow vs. 2x2" starter for cotton

TABLE 3. Effect of starter fertilizer placement and rate on 1995 and 1996 yield.

Rate of 10-34-0	Placement	Yield	
		1995	1996
		-----lint, kg ha ⁻¹ -----	
Check		928.1a	1248.0ab
7.56 L	in-furrow	341.5b	1001.8ab
15.12 L	in-furrow	254.2bc	940.1b
26.46 L	in-furrow	111.3bc	527.6c
37.80 L	in-furrow	66.2c	136.9d
49.14 L	in-furrow	320.4bc	442.3cd
7.56 L	5 cm x 5 cm	829.0a	1331.3a
15.12 L	5 cm x 5 cm	916.2a	1229.0ab
26.46 L	5 cm x 5 cm	878.4a	1162.8ab
37.80 L	5 cm x 5 cm	929.6a	1251.5ab
49.14 L	5 cm x 5 cm	926.6a	1210.7ab
LSD _{0.10}		262.1	342.4
C.V. (%)		36.6	29.8

Means followed by the same letter do not differ significantly (P=0.10).

Cotton topdress N application

- Have all N out by first square on heavy soils
- Sands may need 2 splits (1st square & 1st bloom)
- Petiole testing can track N needs

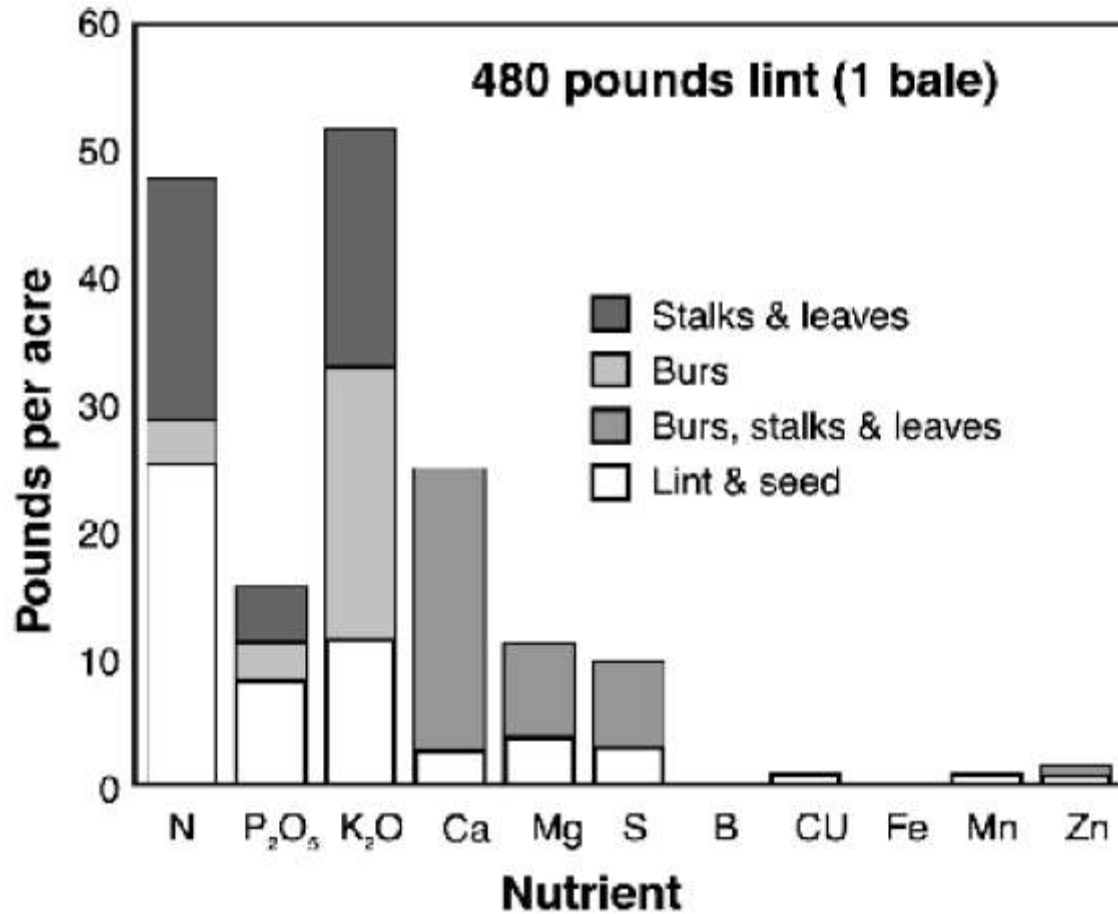
Lessons from 2016: Gypsum

- Heavy rain in June
- Delayed or skipped gypsum applications
- Prioritize fields <250 ppm Ca (500 lbs Ca/ac)
- Seed fields still require 1000 lbs gypsum/ac

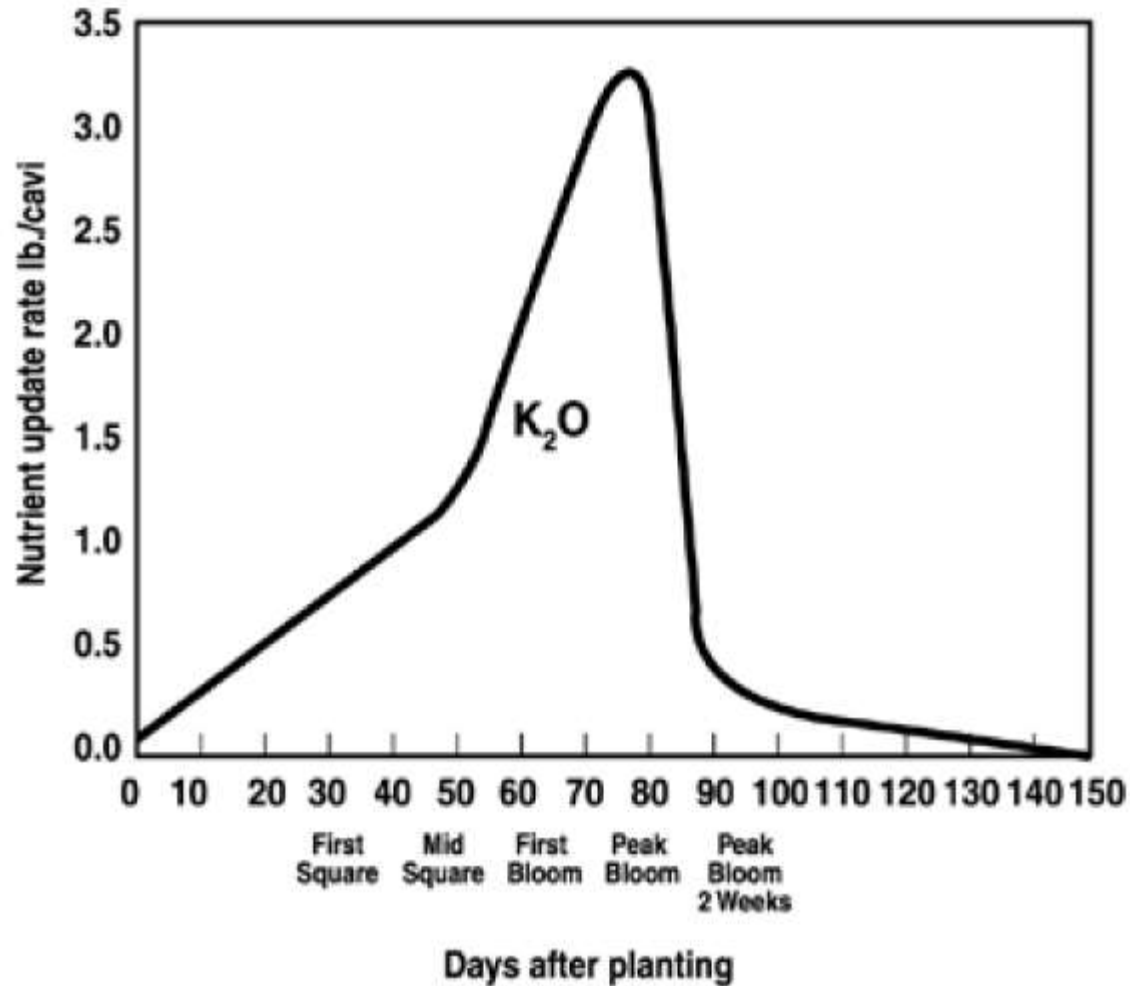


Glen Harris, UGA

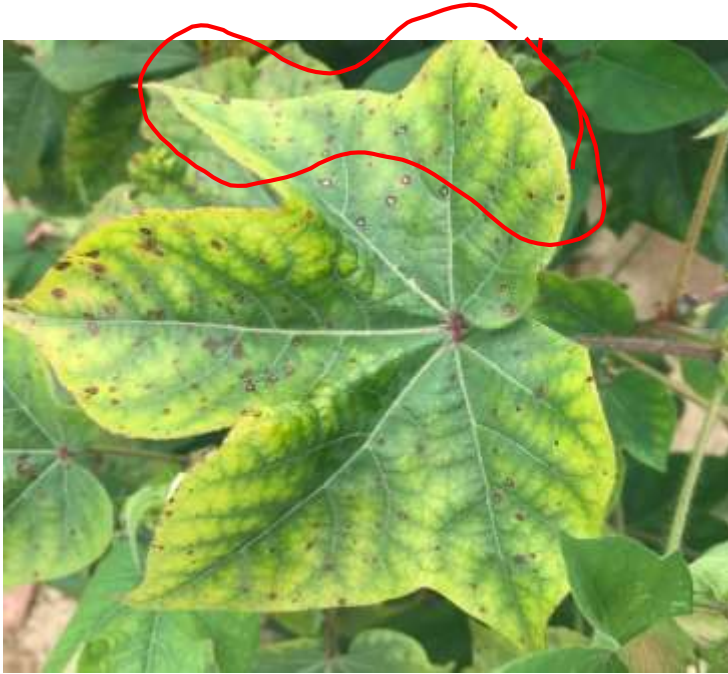
Cotton nutrient removal



Cotton K demand



K deficiency in cotton



Tyson Raper, Univ. Tenn.



- Poor fiber quality
- Reduced translocation of CHOs
- Damaged stomata
- Increased stemphylium
- Reduced photosynthesis

K strategies

- Deep K
 - No evidence that deep K improves yield
- Foliar K
 - Difficult to maintain peak demand
- Surface/broadcast applications
 - Currently the best option for ease & uptake
 - Split apply on sands

Poultry litter recommendations

- Many growers spread it, and give themselves no credit.
- 89% of N is organic
- 50% of total N will be available to crop
- Little build-up of nutrients
 - Except P: Consider hay

Table 1. Average nutrient content of various types of poultry litter.

Constituent	Broiler Litter	Broiler Stockpiled	Broiler Cake
		lbs/ton	
Nitrogen	63	55	47
P ₂ O ₅	55	57	59
K ₂ O	47	47	46
Calcium	43	36	54
Magnesium	9	10	81
Sulfur	15	12	91
		ppm	
Manganese	334	362	340
Copper	319	313	366
Zinc	265	286	272

Data from the Agricultural and Environmental Services Laboratory, University of Georgia.



Micro management

- Apply as a liquid if you can
- Banded near row may improve chances of a response
- Soil test some proportion of grid samples for micros
 - And maintain sufficiency! Fixing micro deficiencies is difficult.

Producer Soil Test Report

Mehlich-3 Extractable

Phosphorus (mg/Kg or ppm P)	27
Potassium (mg/Kg or ppm K)	113
Magnesium (mg/Kg or ppm Mg)	50
Calcium (mg/Kg or ppm Ca)	383

LOW	MED	HIGH

LIME AND FERTILIZER RECOMMENDATIONS

Crop: Cotton

Lime:	1600	lbs per acre
Nitrogen(N):	60	lbs per acre
Phosphorous(P ₂ O ₅):	60	lbs per acre
Potassium(K ₂ O):	0.00	lbs per acre
Magnesium(Mg):	0.00	lbs per acre

Producer Soil Test Report

Mehlich-3 Extractable

Phosphorus (mg/Kg or ppm P)	25
Potassium (mg/Kg or ppm K)	111
Magnesium (mg/Kg or ppm Mg)	92
Calcium (mg/Kg or ppm Ca)	575

LOW	MED	HIGH
25		
111		
92		
575		

LIME AND FERTILIZER RECOMMENDATIONS

Crop: Cotton

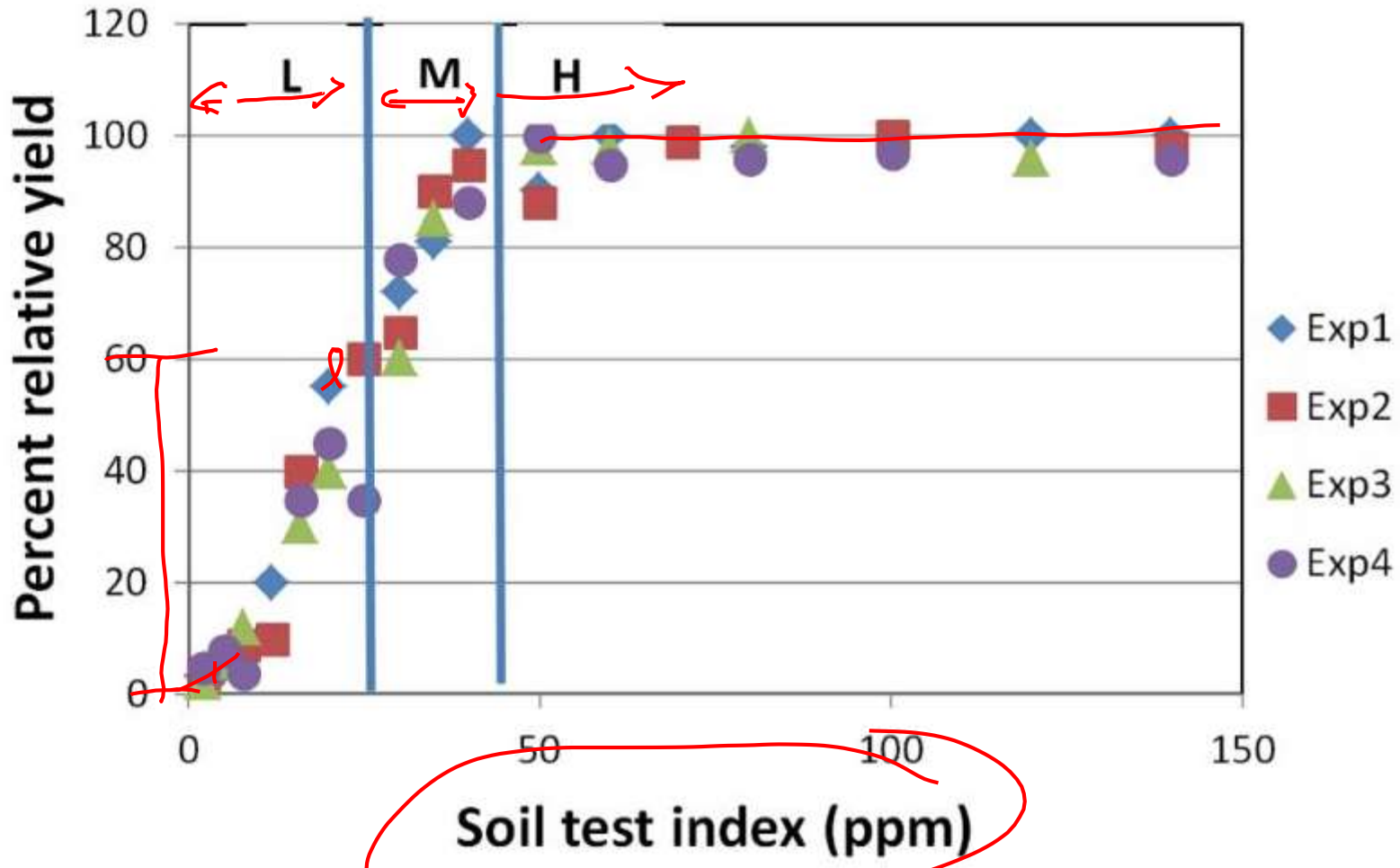
Lime: 0.00 lbs per acre

Nitrogen(N): 60 lbs per acre

Phosphorous(P₂O₅): 120 lbs per acre

Potassium(K₂O): 0.00 lbs per acre

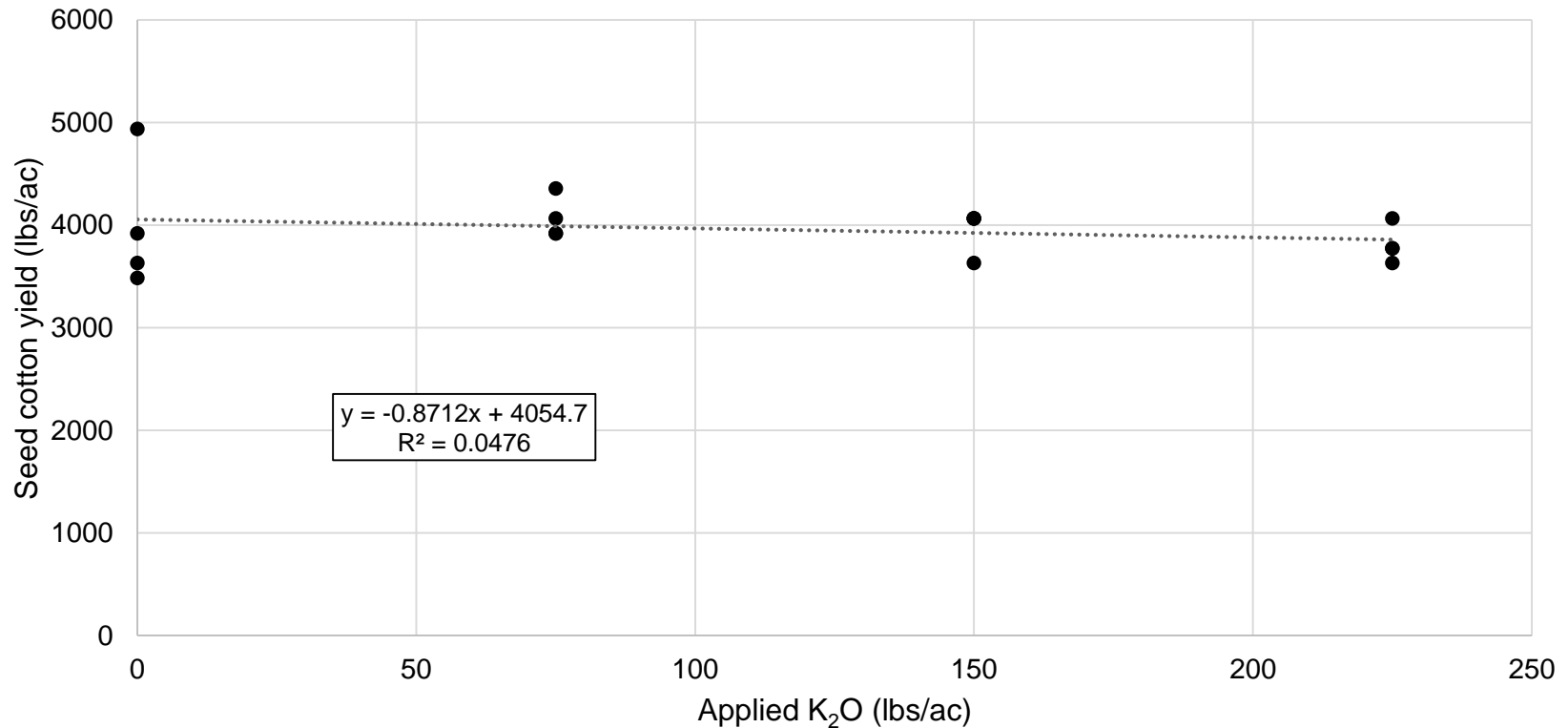
Magnesium(Mg): 0.00 lbs per acre



Credit: Hochmuth, Mylavarapu, and Hanlon

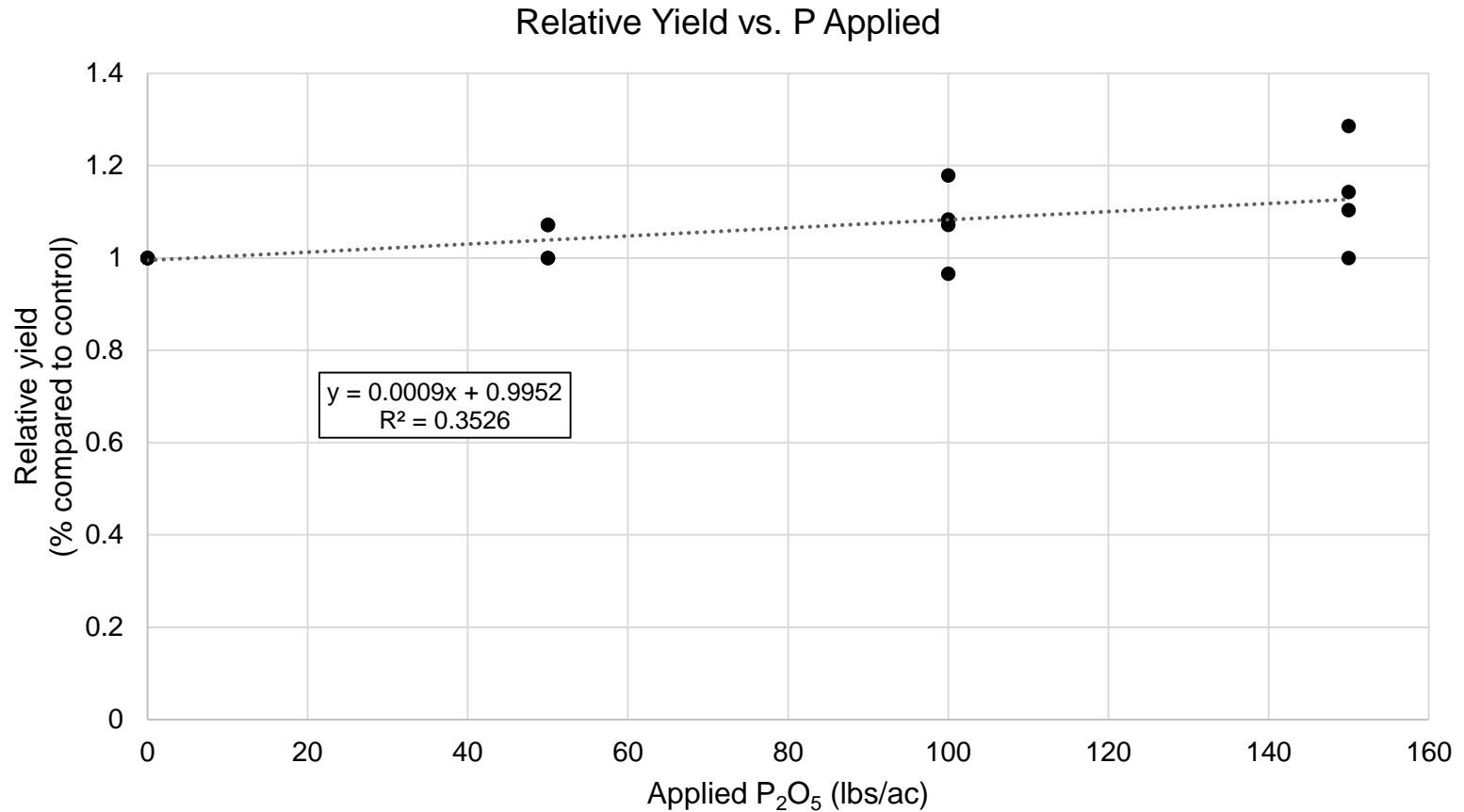
Cotton response to K in Jay, FL

Yield vs. Applied K



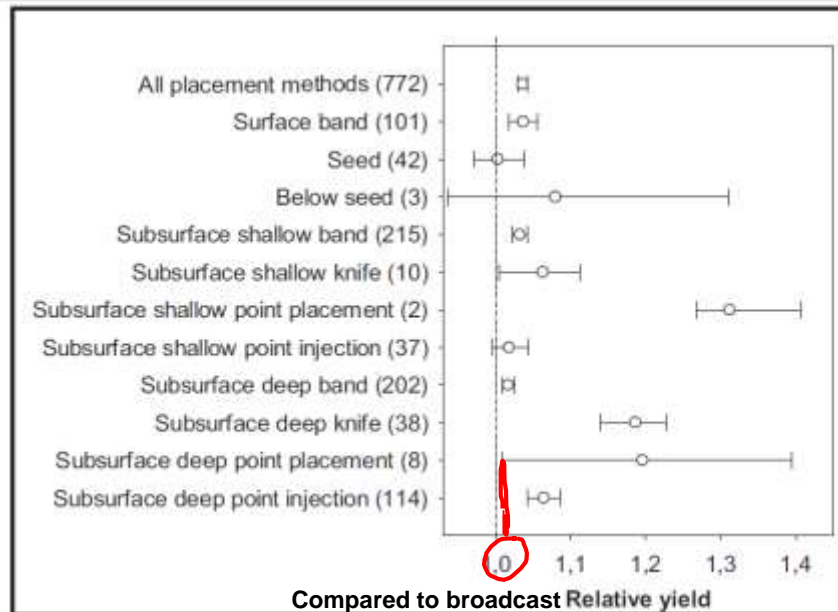
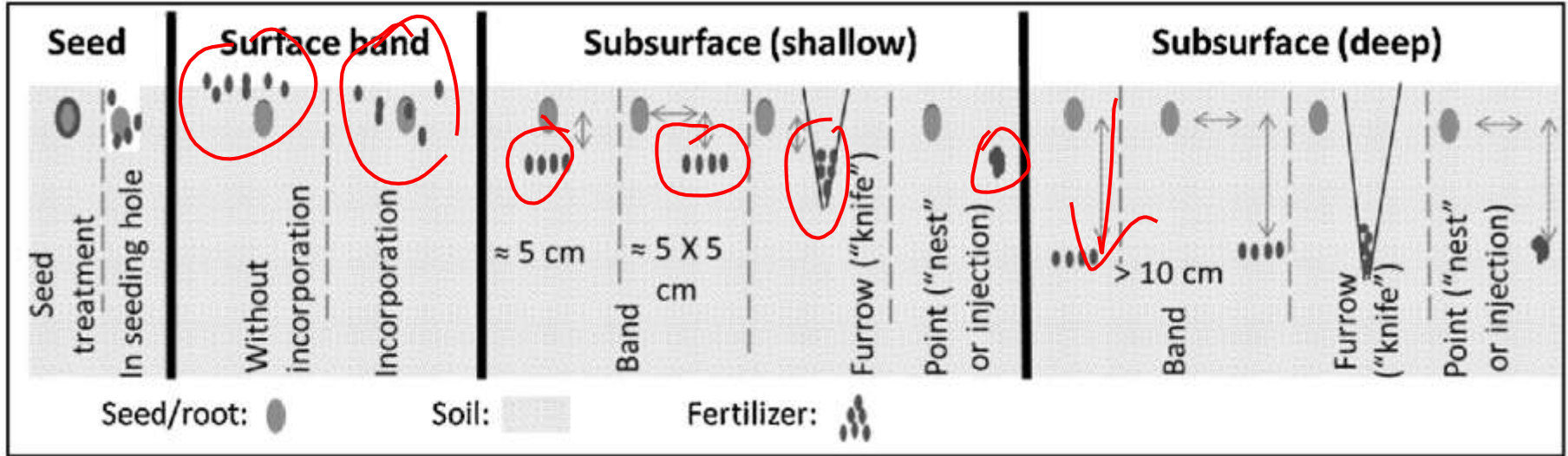
- 14/16 plots called for 0 lbs K₂O/ac

Cotton response to P in Jay, FL

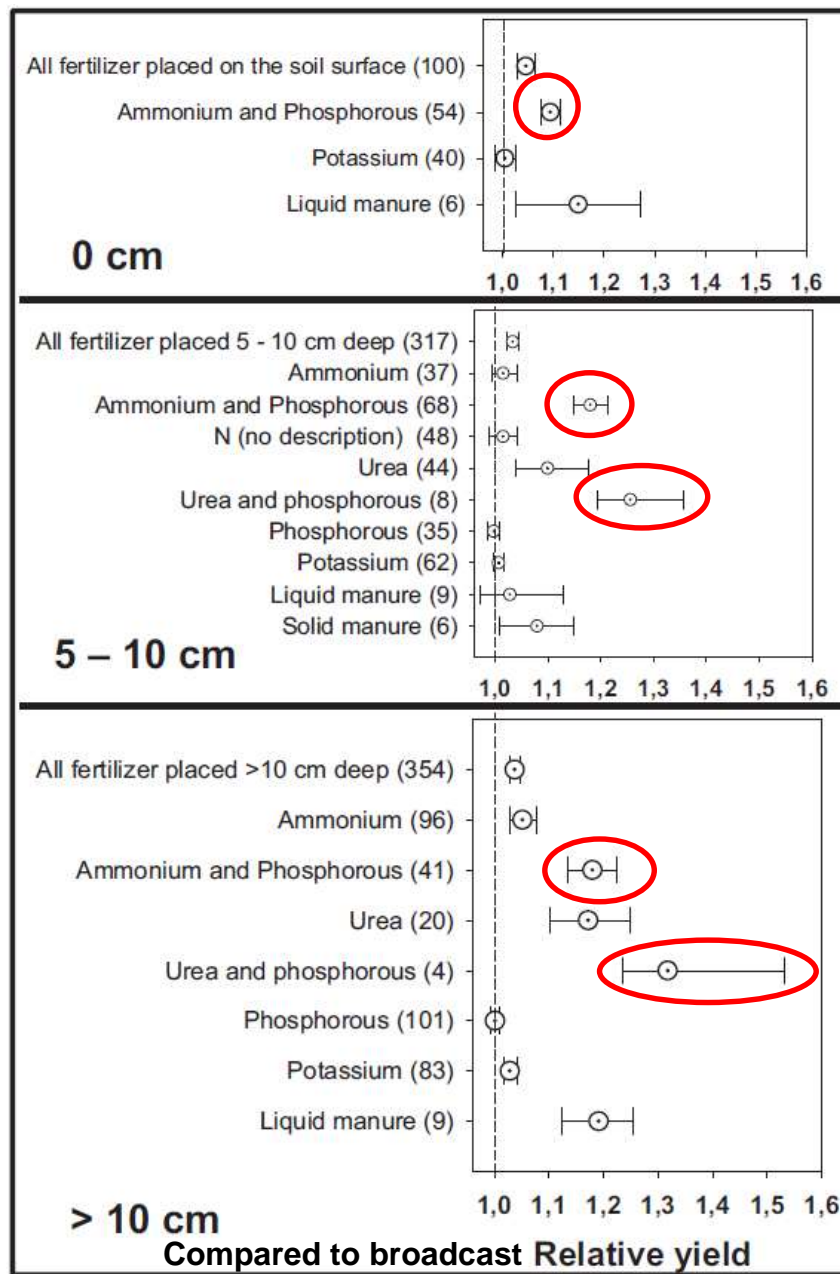


- All plots called for 60-120 lbs P₂O₅/ac

Fertilizer placement: 772 studies



Nkebiwe, P.M., M. Weinmann, A. Bar-Tal, and T. Müller. 2016. Fertilizer placement to improve crop nutrient acquisition and yield: A review and meta-analysis. *Field Crops Res.* 196: 389-401.



Nkebiwe, P.M., M. Weinmann, A. Bar-Tal, and T. Müller. 2016. Fertilizer placement to improve crop nutrient acquisition and yield: A review and meta-analysis. *Field Crops Res.* 196: 389-401.

Why?

- P uptake (by root interception) may be greater with N b/c N proliferates roots in that area.
- Deep N+P can increase lateral roots, taproot diameter & length.
- Greater soil moisture at depth converts urea to NH_4^+ , which has lower mobility than NO_3^-
 - And is protected from NH_3 volatilization
 - Lower temp. & less O_2 available at depth to oxidize NH_4^+ , to NO_3^-

Questions?

 @TheDirtDude

m.mulvaney@ufl.edu

