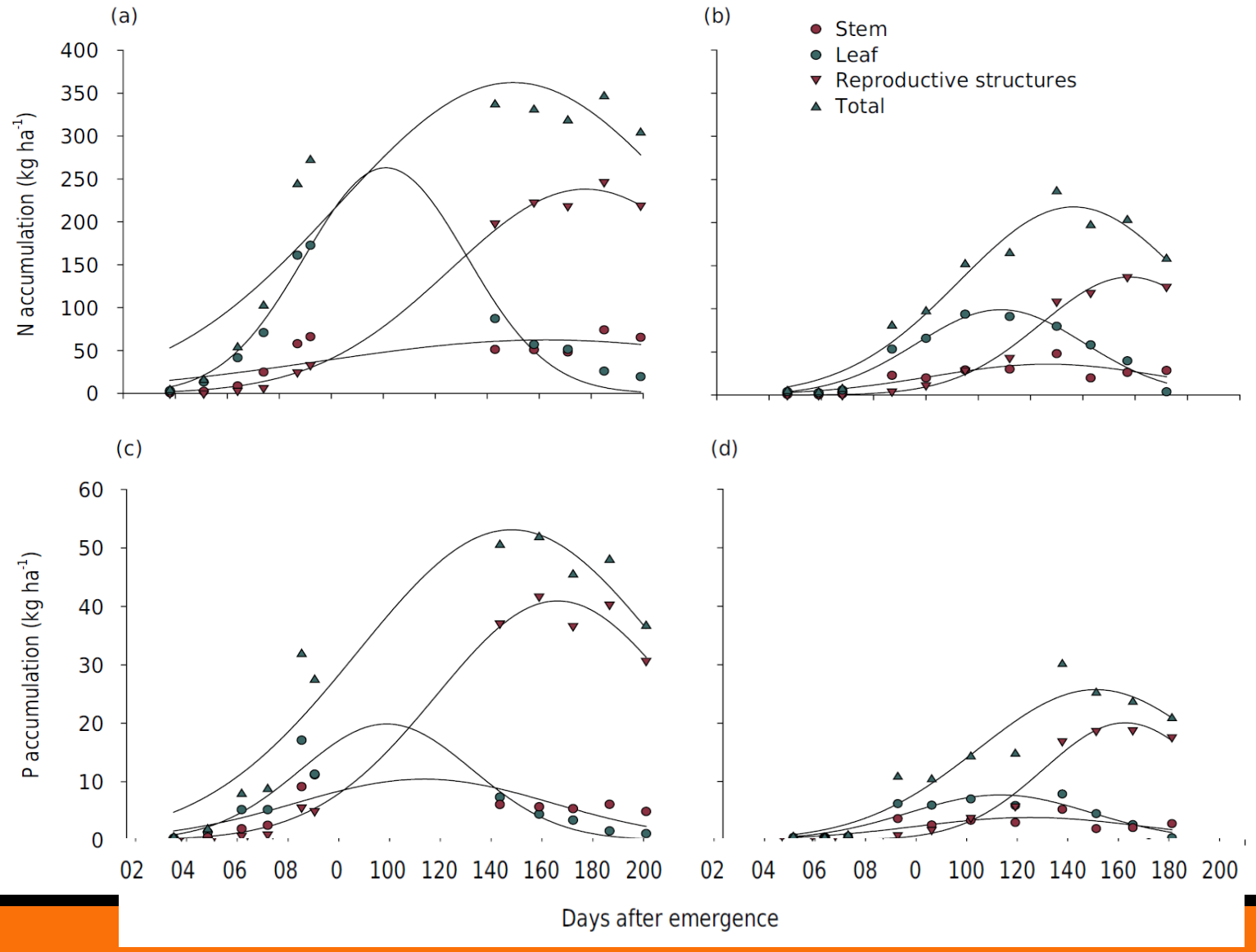
Cotton Fertility

BRIAN ARNALL

OKSTATE PRECISION NUTRIENT MANAGEMENT

5 bale vs 2.5 bale



Importance of Proper Fertility

In-Season Apps

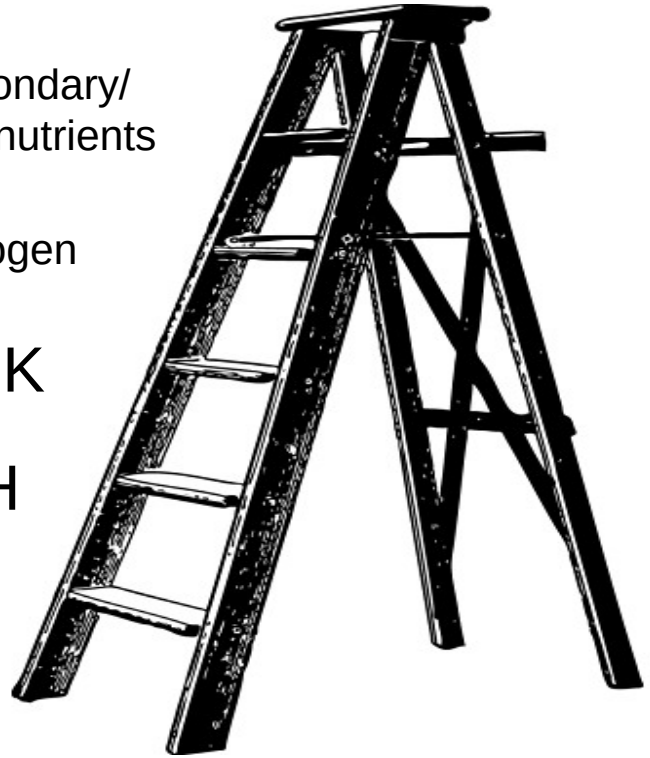
Secondary/
Micronutrients

Nitrogen

P & K

Soil pH

Soil Test



OSU Recs

Table 1. Primary Nutrient Soil Test Interpretations for Selected Small Grains and Row Crops.

Nitrogen Requirements

SMALL GRAIN				*GRAIN SORGHUM*		*CORN*		*COTTON*		*CANOLA*	
Yield Goal (bu/A)			***N***	*Yield Goal*	***N***	*Yield Goal*	***N***	*Yield Goal*	***N***	*Yield Goal*	***N***
Wheat	*Barley*	*Oats*	***(lbs/A)***	*(lbs/A)*	***(lbs/A)***	*(bu/A)*	***(lbs/A)***	*(bales/A)*	***(lbs/A)***		***(lbs/A)***
15	20	25	**30**	2000	**30**	40	**25**	0.50	**30**	1000	**50**
20	25	35	**40**	2500	**40**	50	**37**	0.75	**45**	1500	**75**
30	35	55	**60**	3000	**50**	60	**50**	1.00	**60**	2000	**100**
40	50	70	**80**	4000	**70**	85	**67**	1.25	**75**	2500	**125**
50	60	90	**100**	4500	**85**	100	**75**	1.50	**90**	3000	**150**
60	75	105	**125**	5000	**100**	120	**87**	1.75	**105**	3500	**175**
70	90	125	**155**	7000	**160**	160	**100**	2.00	**120**		
80	100	140	**185**	8000	**195**	180	**112**	2.25	**135**		
100	125	175	**240**	9000	**230**	200	**125**	2.50	**150**		

Per 10 ppm of NO3 you get 2.25 lbs N per acre inch
10 ppm and 12 inches = 27 lbs N.

OSU Recs

Phosphorus Requirements

P SOIL TEST INDEX	SMALL GRAINS		GRAIN SORGHUM		CORN		COTTON		CANOLA	
	Percent Sufficiency	P_2O_5 (lbs/A)	Percent Sufficiency	P_2O_5 (lbs/A)	Percent Sufficiency	P_2O_5 (lbs/A)	Percent Sufficiency	P_2O_5 (lbs/A)	Percent Sufficiency	P_2O_5 (lbs/A)
0	25	80	40	60	30	80	55	75	25	80
10	45	60	60	50	60	60	70	60	45	60
20	80	40	80	40	80	40	85	45	80	40
40	90	20	95	20	95	20	95	30	90	20
65+	100	0	100	0	100	0	100	0	100	0

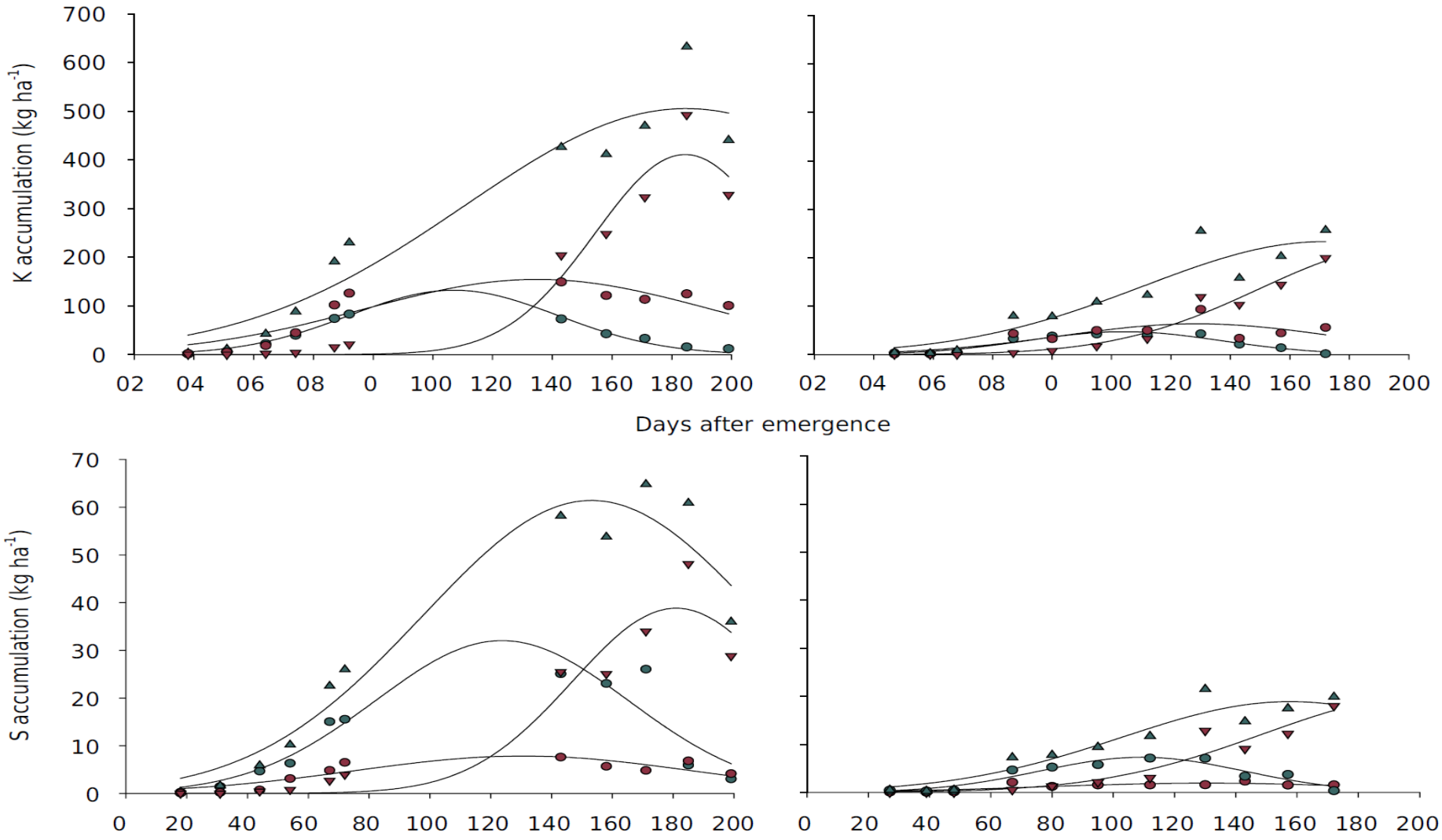
Potassium Requirements

K SOIL TEST INDEX	SMALL GRAINS		GRAIN SORGHUM		CORN		COTTON		CANOLA	
	Percent Sufficiency	K_2O (lbs/A)	Percent Sufficiency	K_2O (lbs/A)	Percent Sufficiency	K_2O (lbs/A)	Percent Sufficiency	K_2O (lbs/A)	Percent Sufficiency	K_2O (lbs/A)
0	50	60	40	100	40	120	40	110	50	60
75	70	50	65	75	60	80	60	80	70	50
125	80	40	80	50	75	60	75	60	80	40
200	95	20	95	30	90	40	90	40	95	20
250+	100	0	100	0	100	0	100	0	100	0

K Sufficiency / Removal

Soil test K	***K_2O***		***Yield Bale***	***K_2O***
0	110		1	16
75	80		2	32
125	60		3	48
200	40		4	64
250	0		5	80

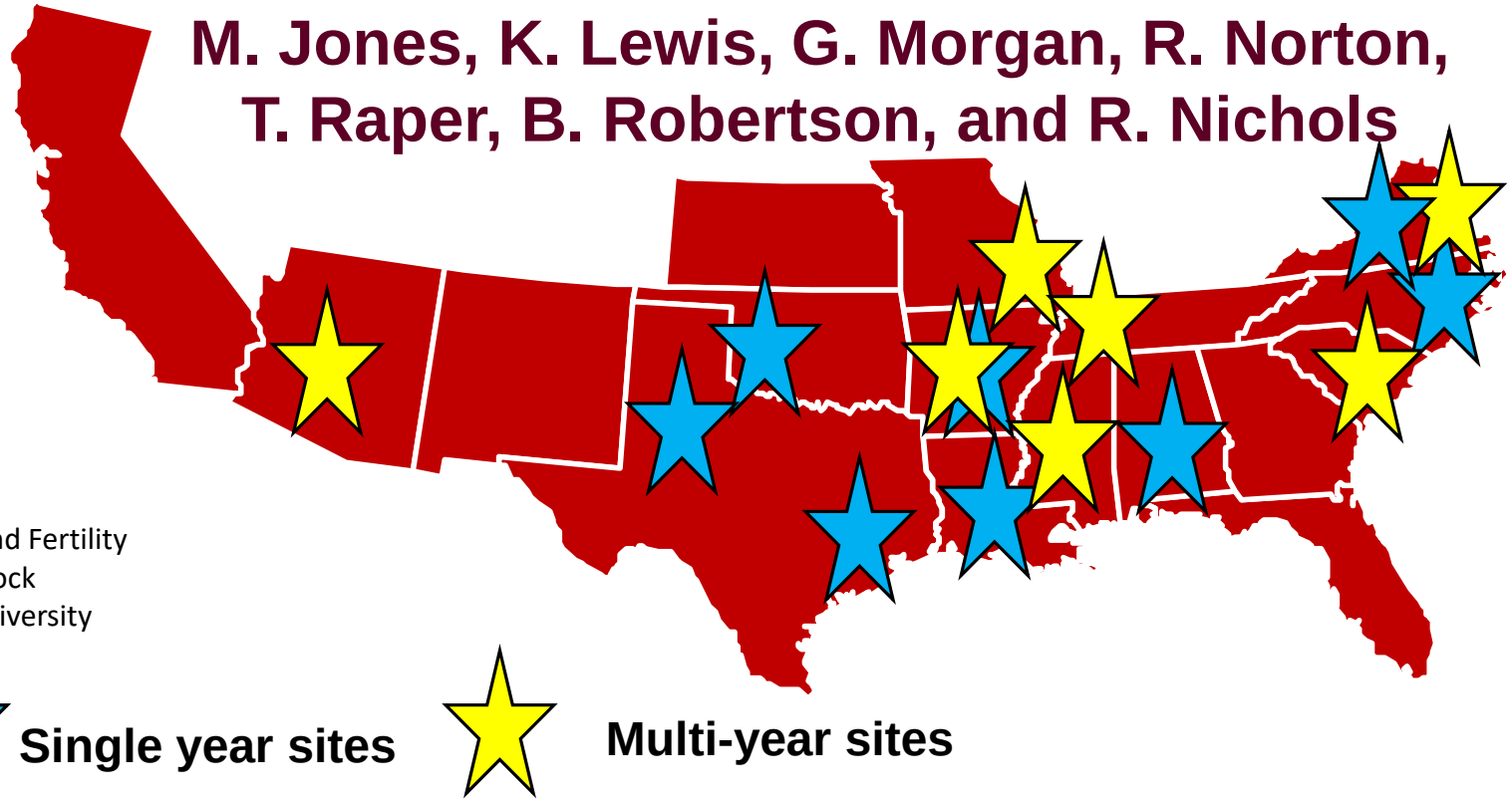
K and S


K accumulation (kg ha-1)
700
600
500
400
300
200
100
0
02 04 06 08 0 100 120 140 160 180 200
02 04 06 08 0 100 120 140 160 180 200
Days after emergence
S accumulation (kg ha-1)
70
60
50
40
30
20
10
0
0 20 40 60 80 100 120 140 160 180 200
0 20 40 60 80 100 120 140 160 180 200

MATERIALS AND METHODS

2015-2017 Locations

R. Boman, T. Cutts, D. Delaney, D. Dodds, K. Edmisten, H. Frame D. Fromme, A. Jones, M. Jones, K. Lewis, G. Morgan, R. Norton, T. Raper, B. Robertson, and R. Nichols



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Texas A&M AgriLife Research – Lubbock
Plant and Soil Science, Texas Tech University

Year	Location	Mehlich-3 K concentrations at different soil depths								
		0-6"		6-12"		12-24"		*P > F*	0-12"	0-24"
		mg K kg^{-1} soil							mg K kg^{-1} soil	
2016	VA	30	a	40	a	37	a	0.748	35	36
2016	**★AL**	**39**	**b**	**56**	**a**	**44**	**b**	**0.002**	**48**	**46**
2017	AL	56	a	54	a	67	a	0.153	55	59
2015	AL	61		64		82			63	69
2017	VA	61	a	47	a	61	a	0.184	54	56
2017	NC	73	a	69	a	63	a	0.344	71	68
2016	WM	83	a	77	a	86	a	0.133	80	82
2016	**NC**	**86**	**a**	**66**	**b**	**57**	**b**	**0.007**	**76**	**70**
2015	VA	92	a	99	a	93	a	0.393	95	94
2015	WM	96	a	96	a	98	a	0.694	96	97
2017	**MS**	**100**	**a**	**90**	**b**	**89**	**b**	**0.071**	**95**	**93**
2017	**LA**	**152**	**a**	**129**	**b**	**92**	**c**	**0.003**	**140**	**124**
2017	**★AR**	**158**	**b**	**167**	**b**	**212**	**a**	**0.005**	**163**	**179**
2015	**LA**	**159**	**a**	**144**	**b**	**129**	**c**	**0.0004**	**151**	**144**
2016	**★AR**	**168**	**ab**	**153**	**b**	**174**	**a**	**0.099**	**160**	**165**
2015	**AR**	**174**	**a**	**112**	**b**	**99**	**c**	**<.0001**	**143**	**128**
2016	**LA**	**177**	**a**	**139**	**b**	**92**	**c**	**0.0004**	**158**	**136**
2016	**OK**	**204**	**a**	**178**	**b**	**171**	**c**	**0.0002**	**191**	**185**
2017	**WM**	**207**	**a**	**216**	**a**	**180**	**b**	**0.001**	**211**	**201**
2017	**LU**	**261**	**a**	**236**	**b**	**246**	**b**	**0.019**	**249**	**248**
2017	OK	267	a	267	a	259	a	0.366	267	264
2016	**LU**	**277**	**a**	**265**	**a**	**244**	**b**	**0.015**	**271**	**262**
2015	**LU**	**391**	**a**	**281**	**b**	**253**	**c**	**<.0001**	**336**	**309**

Lint Yield

Year	Loc.	Soil	Broadcast K, lb K_2O acre^{-1}					*P > F*	LSD	Injected K, lb K_2O acre^{-1}					*P > F*	LSD
		K	0	40	80	120	160			0	40	80	120	160		
		mg kg^{-1}	lb acre^{-1}							lb acre^{-1}						
2016	VA	30	78	236	427	406	321	**0.002**	**268**	114	319	456	296	469	**0.004**	**302**
2016	AL	39	1123	1120	1093	1166	1147	0.888	ns	1130	1176	1129	1159	1112	0.652	ns
2017	AL	56	1777	1569	1609	1526	1552	**0.034**	**347**	1657	1386	1489	1583	1499	0.428	ns
2015	AL	61	1382	1500	1407	1530	1334	0.630	ns	1393	1429	1453	1536	1619	0.174	ns
2017	VA	61	1342	1633	1970	1868	1597	**0.005**	**486**	1806	1932	1588	1638	1691	0.541	ns
2017	NC	73	1411	1497	1426	1475	1478	0.515	ns	1344	1425	1518	1430	1533	**0.067**	**257**
2016	WM	83	219	246	218	306	317	**0.094**	**112**	185	209	257	244	309	**0.031**	**111**
2016	NC	86	661	590	648	743	636	0.924	ns	627	654	655	609	625	0.956	ns
2015	VA	92	1237	1216	1228	1220	1235	0.850	ns	1260	1210	1173	1224	1283	0.599	ns
2015	WM	96	318	343	416	385	392	**0.032**	**107**	298	377	434	363	421	**0.001**	**98**
2017	MS	100	600	506	507	528	537	0.228	ns	543	545	530	561	512	0.926	ns
2017	LA	152	904	902	842	944	891	0.899	ns	953	886	951	871	820	0.357	ns
2017	AR	158	1177	1099	1231	1103	1072	0.691	ns	1204	1303	1226	1257	1131	0.838	ns
2015	LA	159	1549	1454	1464	1309	1355	0.281	ns	1322	1368	1297	1551	1553	0.374	ns
2016	AR	168	1132	1105	1088	1116	1163	0.909	ns	1096	1140	1145	1295	1267	0.375	ns
2015	AR	174	1382	1401	1343	1343	1312	0.772	ns	1342	1362	1272	1336	1433	0.928	ns
2016	LA	177	1374	1497	1473	1479	1497	0.152	ns	1522	1508	1487	1466	1525	0.752	ns
2016	OK	204	1629	1788	1779	1788	1893	**0.002**	**183**	1767	1851	1857	1768	1862	0.279	ns
2017	WM	207	800	875	734	754	788	0.881	ns	811	771	701	790	814	0.500	ns
2017	LU	261	1695	1602	1600	1847	1773	0.922	ns	1758	1871	1868	1539	1865	0.856	ns
2017	OK	267	1652	1678	1607	1685	1630	0.975	ns	1713	1723	1733	1701	1573	0.516	ns
2016	LU	277	1724	1753	1902	1649	1629	0.945	ns	1474	1695	1813	1778	1788	**0.032**	**474**
2015	LU	391	1790	1640	1739	1687	1660	0.119	ns	1670	1743	1767	1770	1868	**0.033**	**190**

SOIL TEST CORRELATION

Relative Yield (RY)

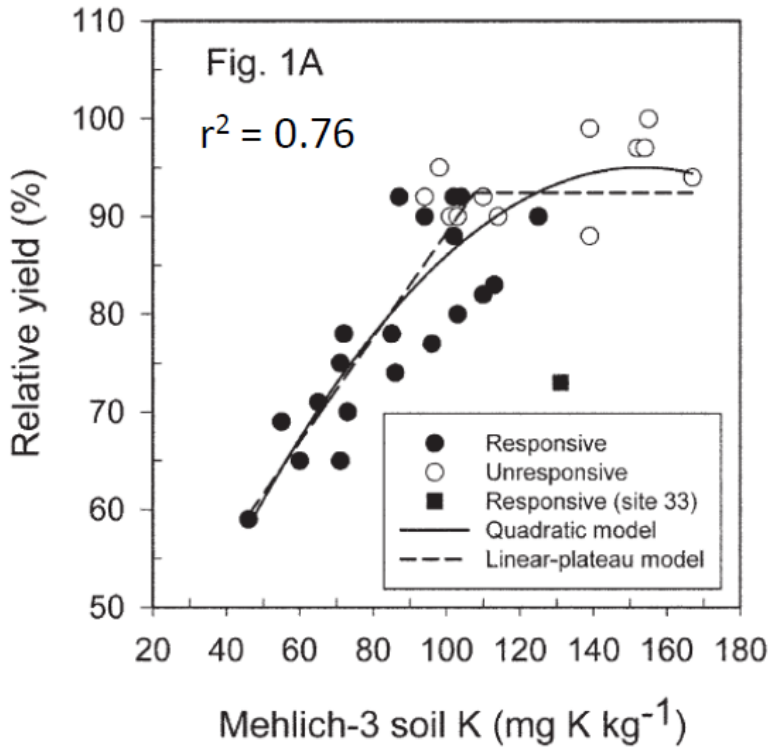
RY, % = $(K_0/K_T)*100$

RY < 100 means $K_T > K_0$ (responsive site)

RY ≥ 100 means $K_T < K_0$ (nonresponsive site)

Linear plateau model in SAS 9.4 used to define the critical level

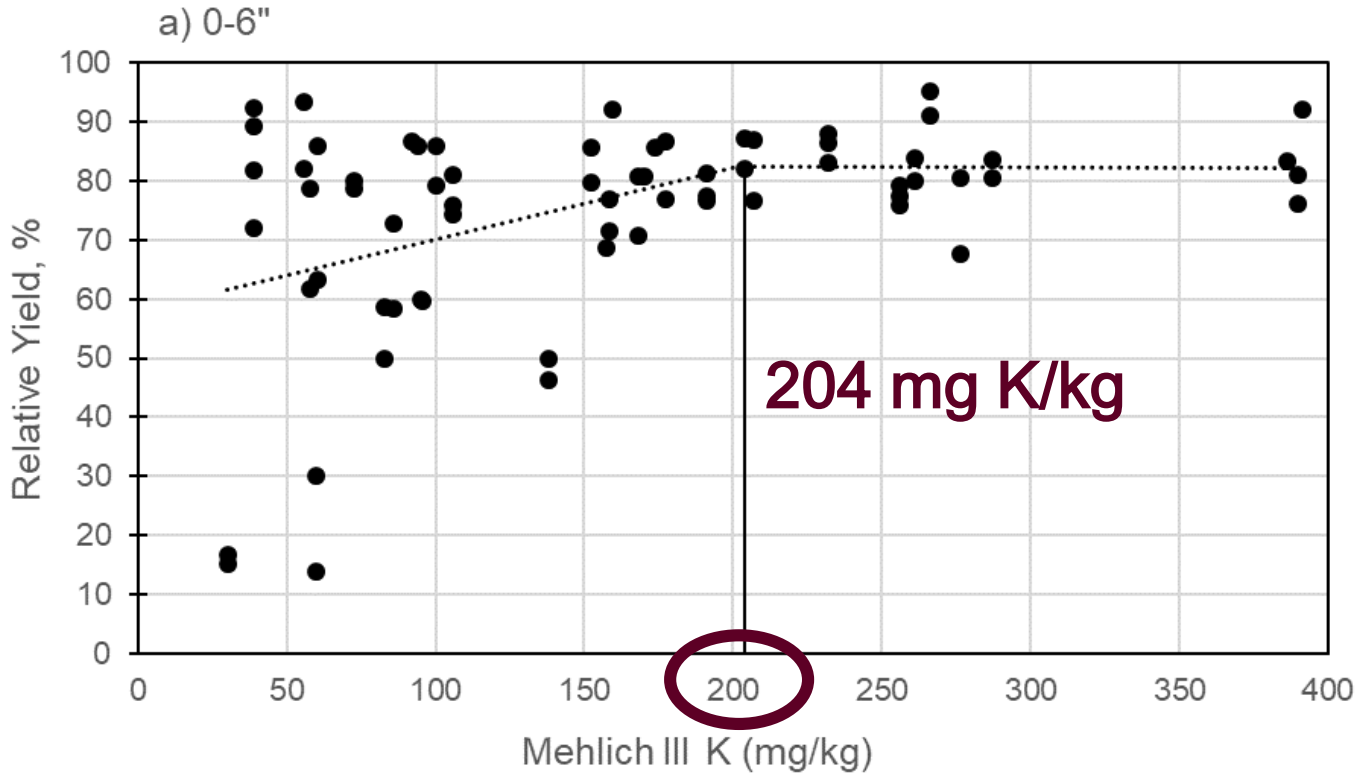
Additional Texas site years added (2012 – 2014) including locations in Wharton and Williamson Counties – 10 sites years (68 total observations)



Slaton et al. (2010)

POTASSIUM SOIL TEST CORRELATION

Mehlich III K critical level is currently 125 mg/kg



Observations	Plateau	Joint	*P*-value
68	83%	204 mg/kg	0.001

Relative Yield = mean of check lint yield divided by highest numerical treatment lint yield; multiplied by 100.

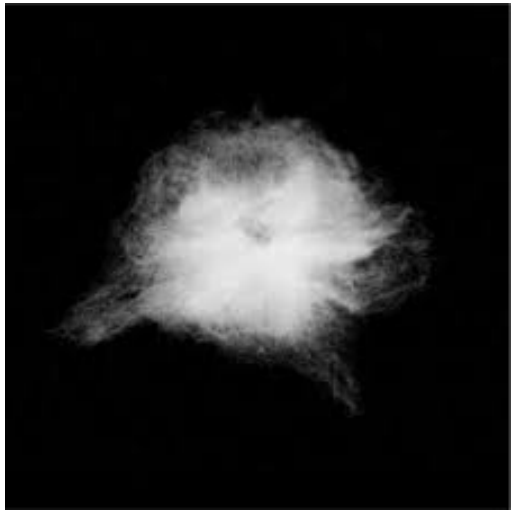
Fertility “Mis-Managemant” Impact on Quality

Altus Long term, 25 years of Data.

Increasing K rate Increased Fiber Length

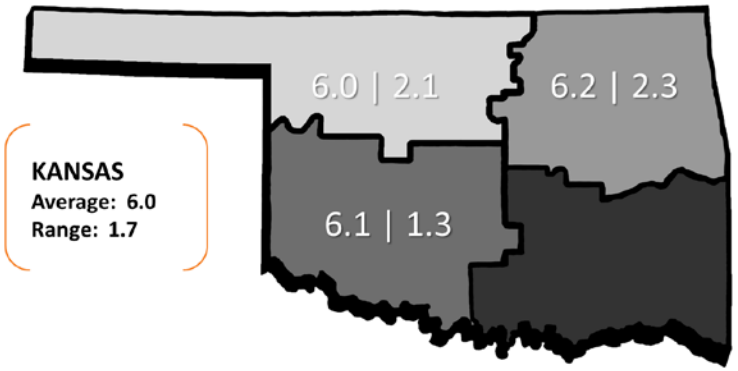
- Over application of N and under application of K Sig Decreased Length

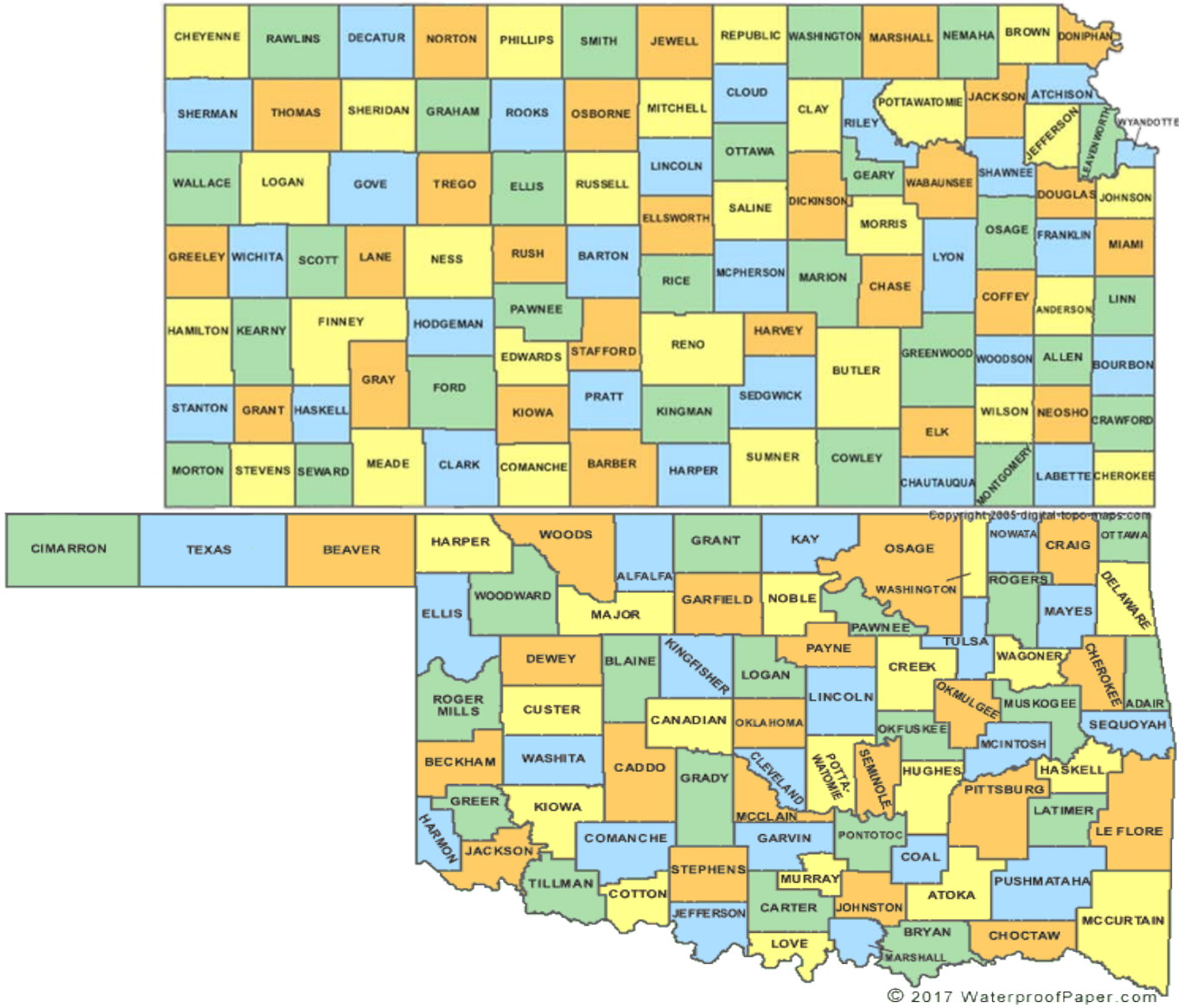
When All over nutrients sufficient **Increasing N** above optimum Sig **Decreased Fiber Strength**



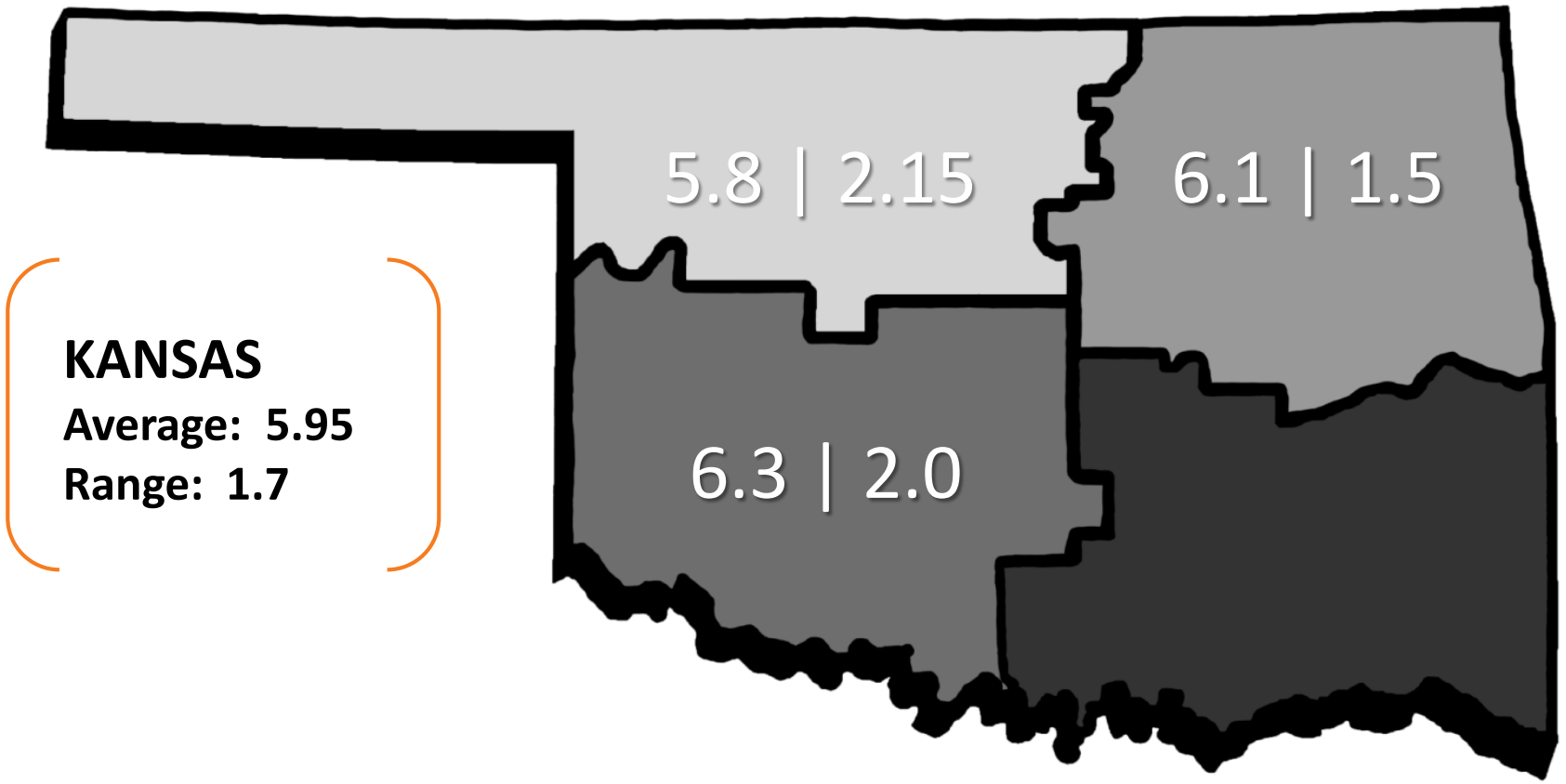
Data by County

Region	Number of fields	# samples	# Samples /per field
NW	138	4673	34
NE	95	2420	25
SW	107	3087	29
KS	127	3745	29



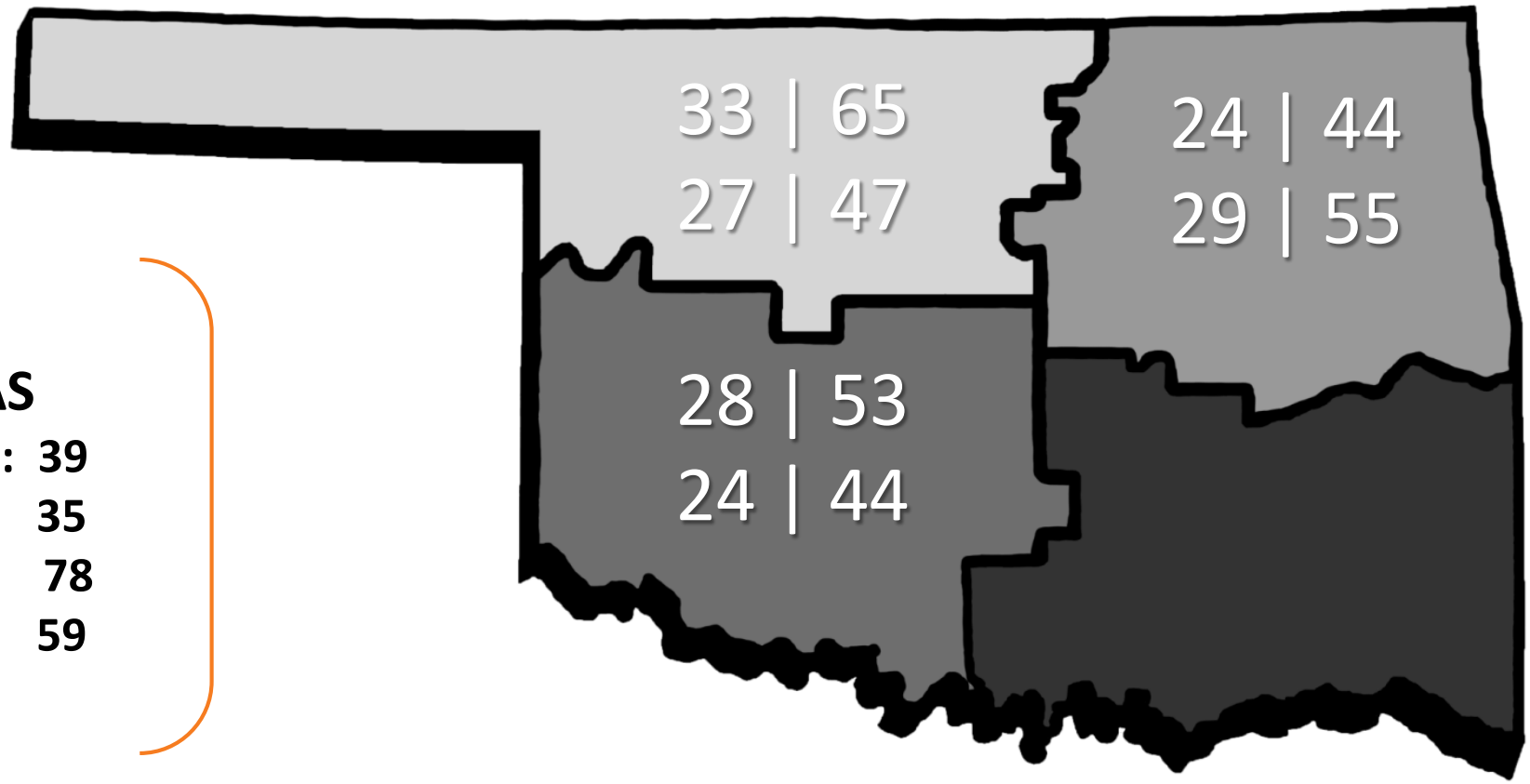


Grid Data Results Soil pH



KANSAS
Average: 5.95
Range: 1.7

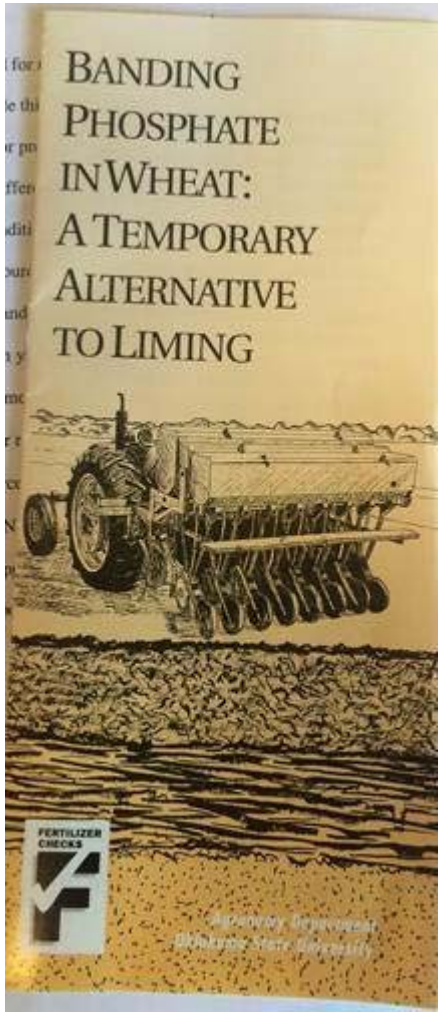
Grid Data Results M3P and Bray P1 ppm



KANSAS

Average:	**39**	
	35	
Range:	**78**	
	59	

OK and KS Has been dealing with Acidity



pH 4.0. Tolerant, Moderate and non-tolerant

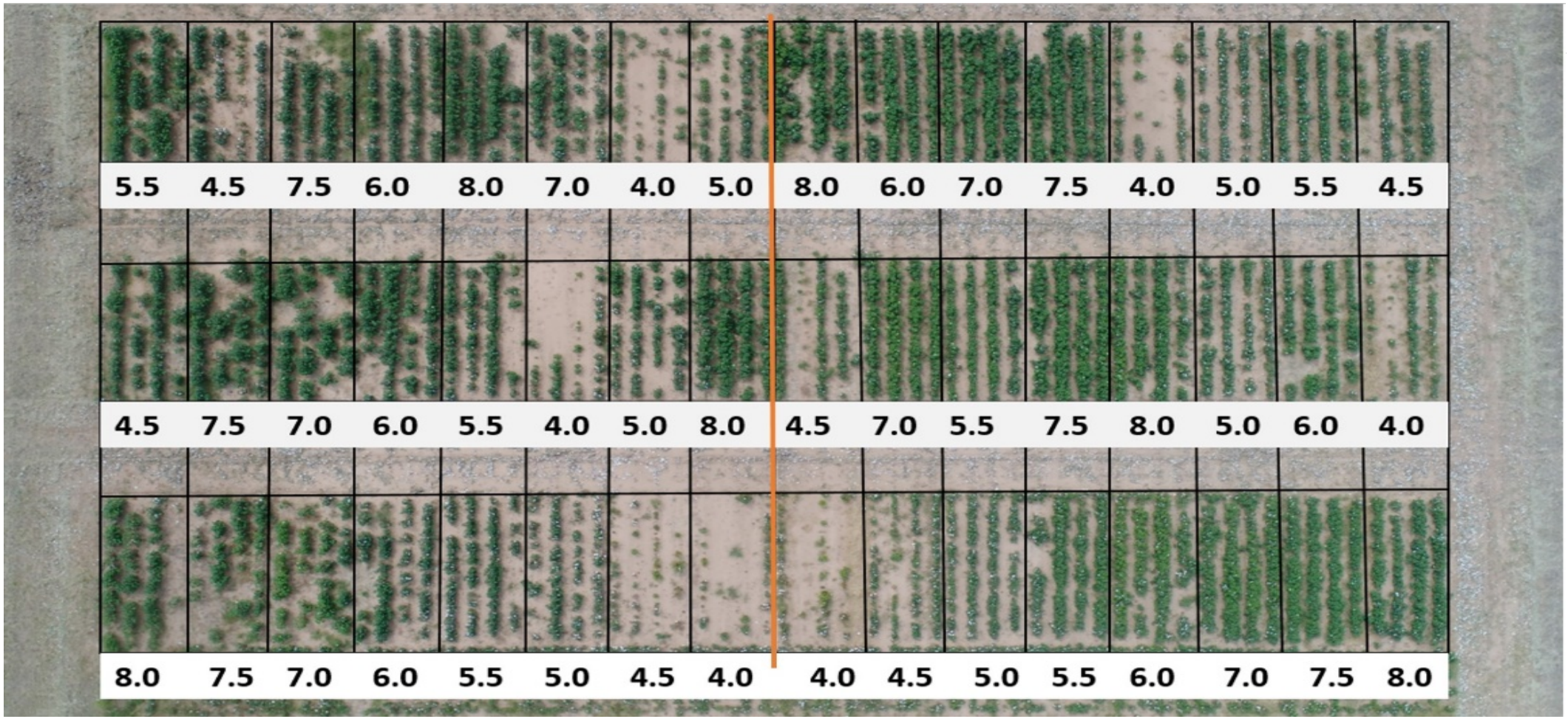
Soil pH and cotton

Trials initiated in 2009.

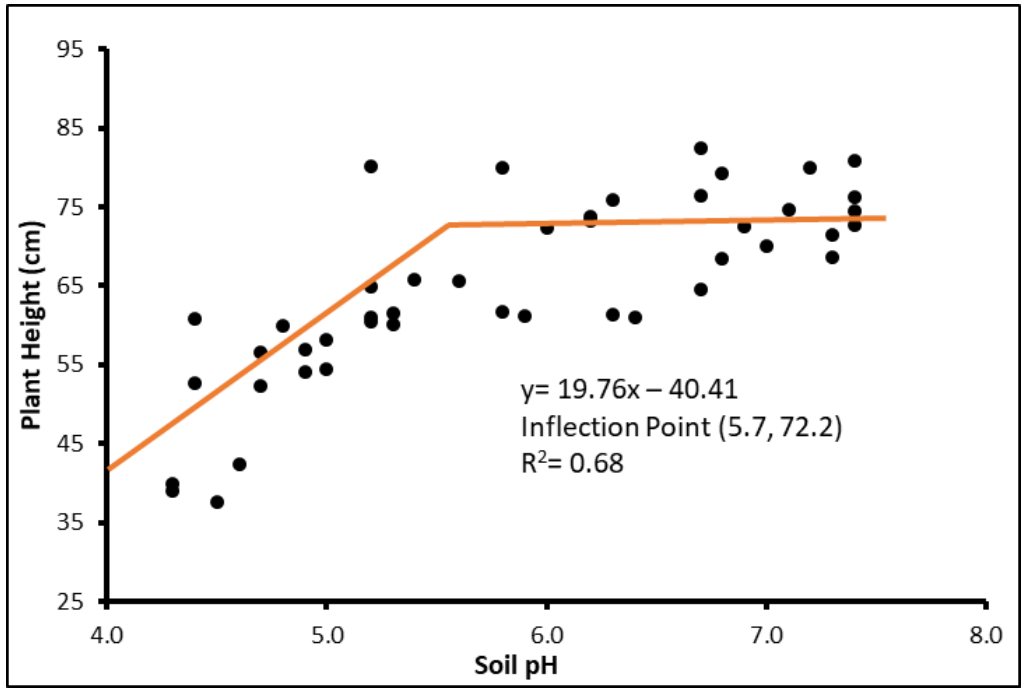
Created a range of soil pH from 4.0 – 7.0

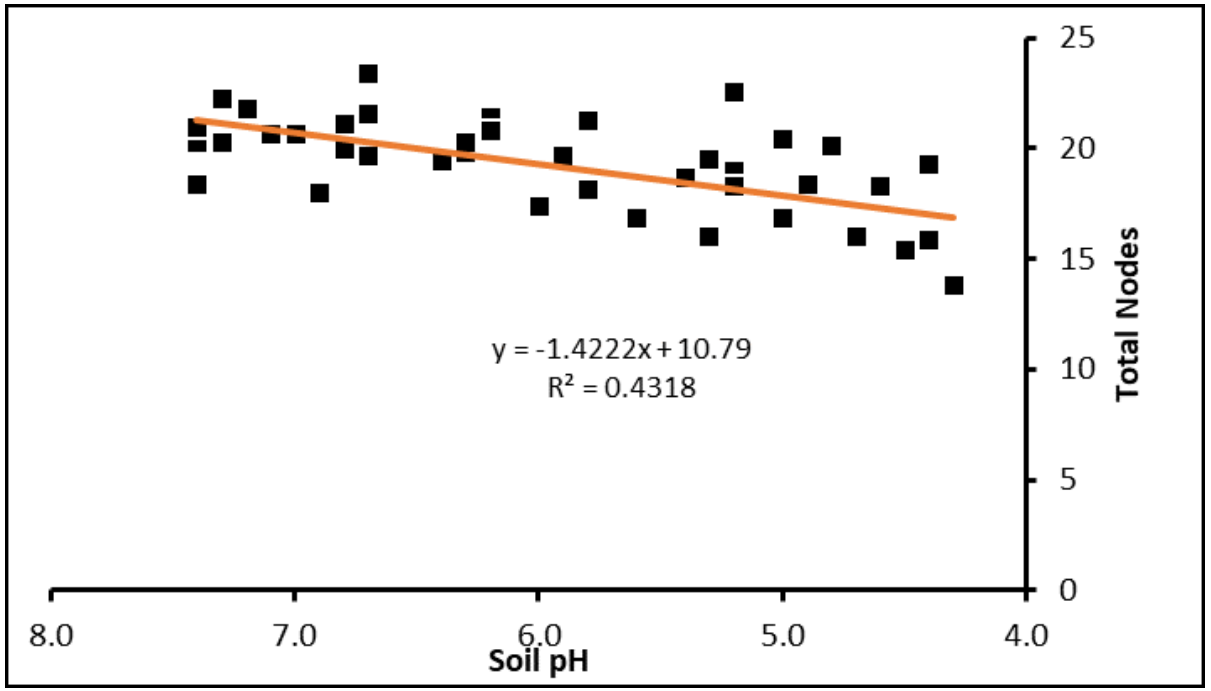
Add treatments of 7.5 and 8.0.

Soil pH has an impact

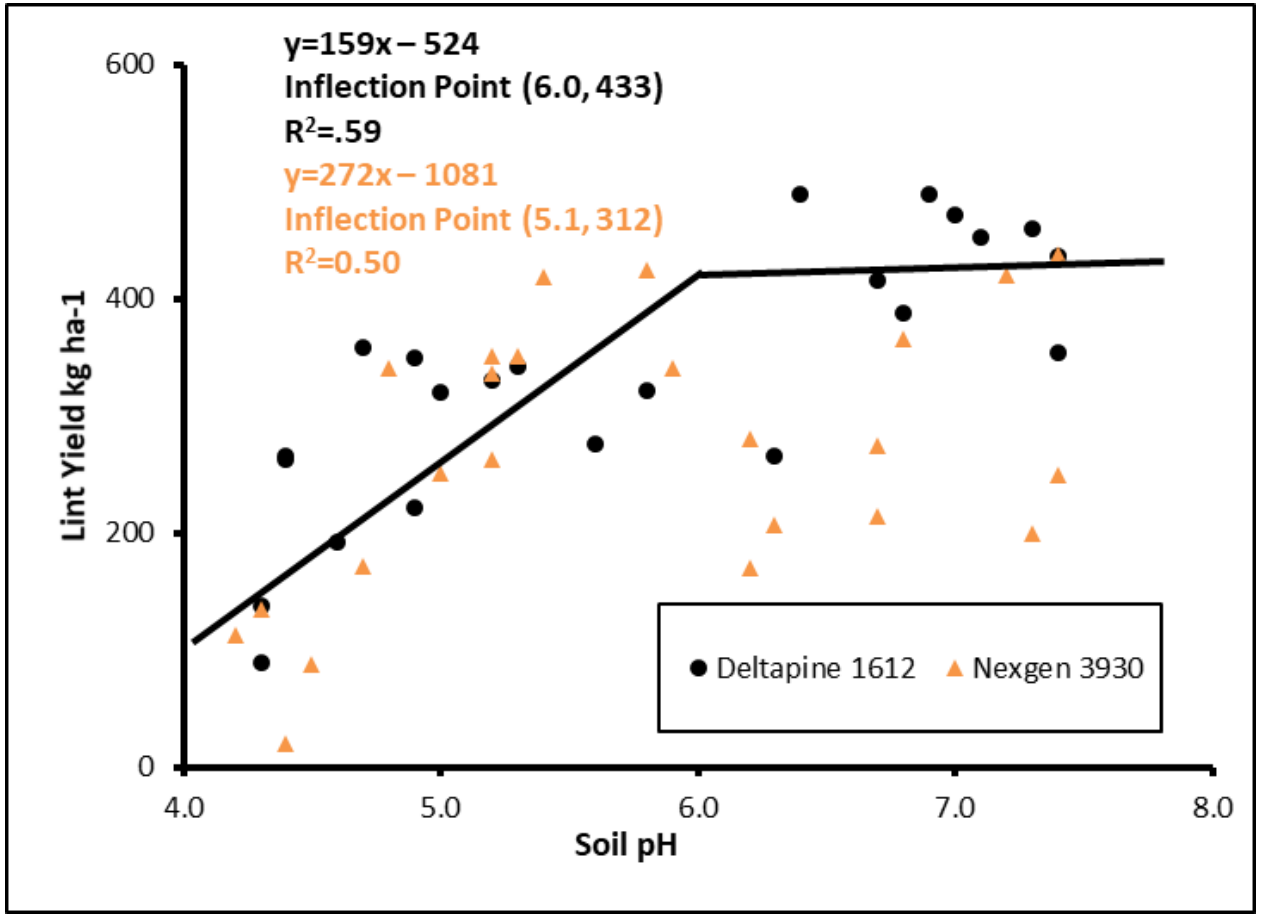


1st year results



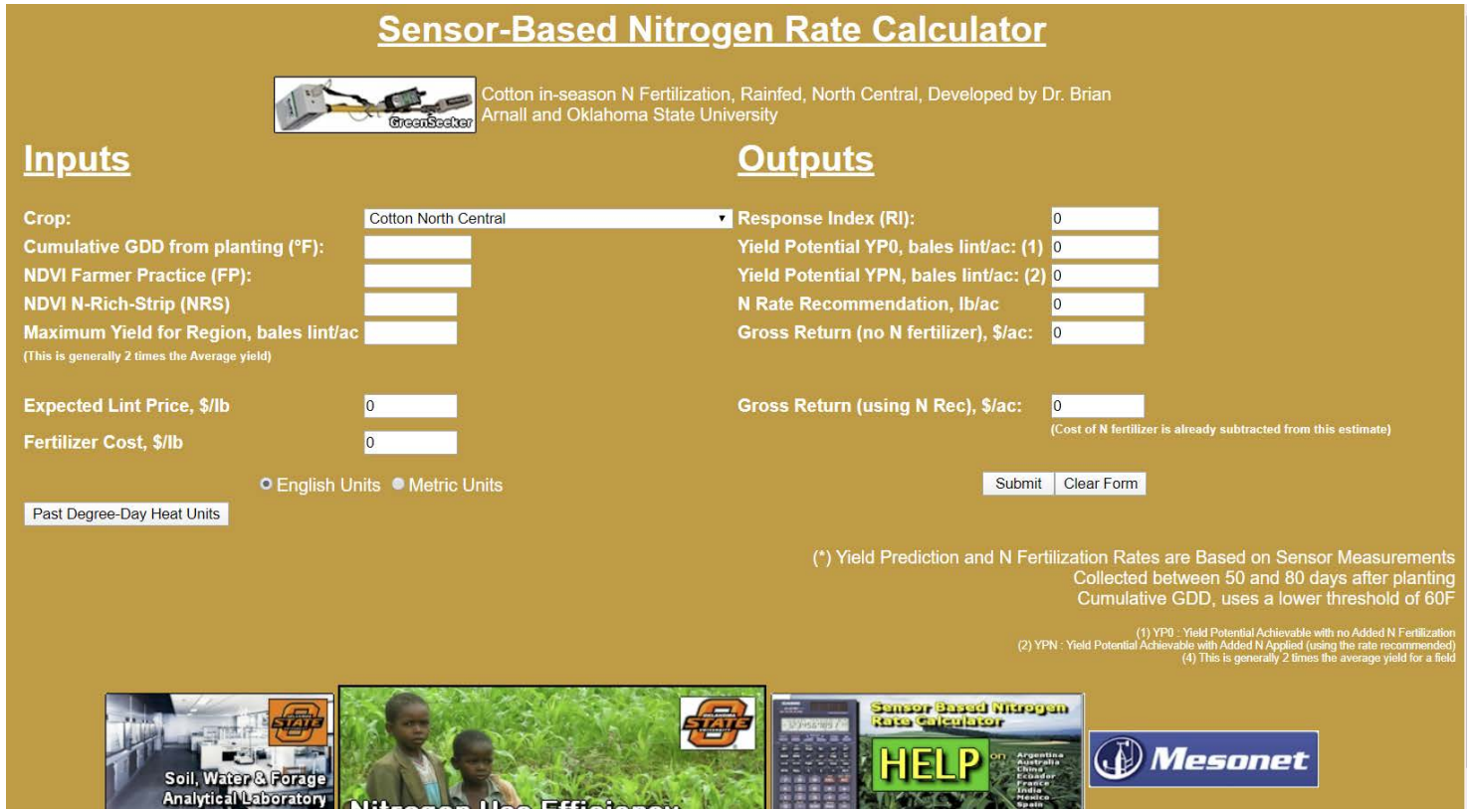


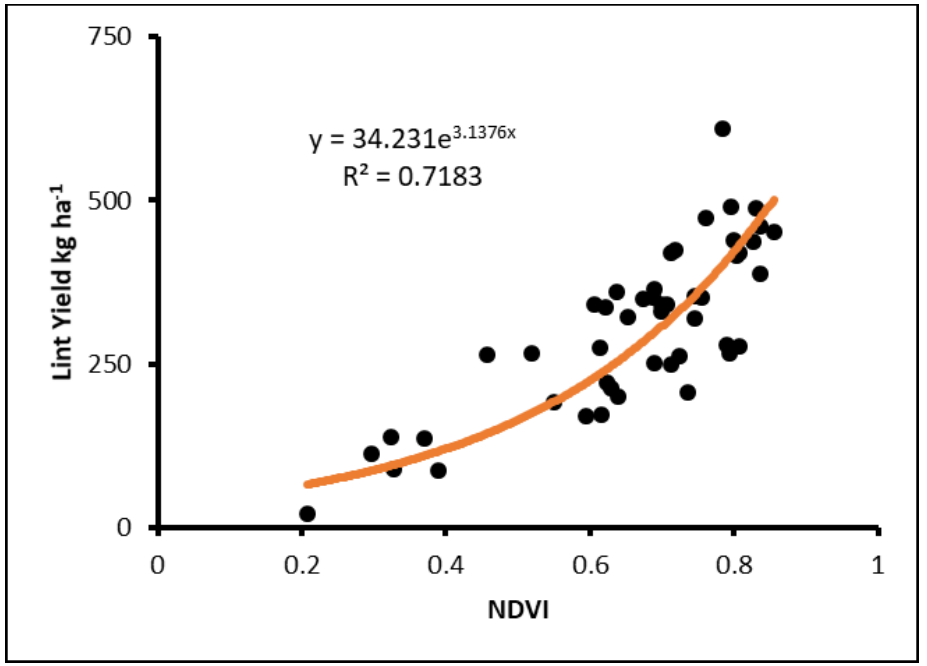
Yield by Variety



N-Rich/Zero N strip in Cotton

Been online since 2010





2019 Crop "On-Farm Testing"

Grant County							
Sample	# of Bolls (5')	Total Grams	Bolls per FT	Avg Grams/Boll	Seed Cotton lbs/ac	Lint lbs/ac (33%)	Lint lbs/ac (35%)
NCheck 1	118	412	23.6	3.492	3165.23	1044.52	1107.83
NCheck 2	113	424	22.6	3.752	3257.42	1074.95	1140.10
NCheck 3	112	400	22.4	3.571	3073.04	1014.10	1075.56
NCheck 4	112	398	22.4	3.554	3057.67	1009.03	1070.18
Ncheck AVG's	**114**	**408.5**	**23**	**4**	**3138.34**	**1035.65**	**1098.42**
FP 1	118	428	23.6	3.627	3288.15	1085.09	1150.85
FP 2	112	448	22.4	4.000	3441.80	1135.79	1204.63
FP 3	110	430	22	3.909	3303.51	1090.16	1156.23
FP 4	108	380	21.6	3.519	2919.38	963.40	1021.78
FP AVG's	**112**	**421.5**	**22**	**4**	**3238.21**	**1068.61**	**1133.37**

QUALITY ANALYSIS							
Sample ID	Turnout	Color	Mic	Length	Strength	Uniformity	Staple
NCHECK	**47.56**	**21**	**4.95**	**1.23**	**34.7**	**83.7**	**39**
FP	**47.29**	**31**	**4.94**	**1.17**	**34.6**	**82.9**	**37**

PREMIUMS AND DISCOUNTS						
Sample ID	Grade & Length	Strength	Mic	Uniformity	Net Prem (Points)	Loan Val (Cents/lb)
NCHECK	**475**	**50**	**0**	**10**	**535**	**57.35**
FP	**420**	**50**	**0**	**5**	**475**	**56.75**

2019 Crop “On-Farm Testing”

Sumner County							
Sample	# of Bolls (5')	Total Grams	Bolls per FT	Avg Grams/Boll	Seed Cotton lbs/ac	Lint lbs/ac (33%)	Lint lbs/ac (35%)
NCheck 1	149	548	29.8	3.678	4210.06	1389.32	1473.52
NCheck 2	144	578	28.8	4.014	4440.54	1465.38	1554.19
NCheck 3	114	462	22.8	4.053	3549.36	1171.29	1242.27
NCheck 4	113	452	22.6	4.000	3472.53	1145.94	1215.39
Ncheck AVG's	**130**	**510**	**26**	**4**	**3918.12**	**1292.98**	**1371.34**
FP 1	124	418	24.8	3.371	3211.32	1059.74	1123.96
FP 2	124	464	24.8	3.742	3564.72	1176.36	1247.65
FP 3	119	452	23.8	3.798	3472.53	1145.94	1215.39
FP 4	116	402	23.2	3.466	3088.40	1019.17	1080.94
FP AVG's	**121**	**434**	**24**	**4**	**3334.24**	**1100.30**	**1166.99**

QUALITY ANALYSIS							
Sample ID	Turnout	Color	Mic	Length	Strength	Uniformity	Staple
NCHECK	**45.67**	**31**	**4.88**	**1.26**	**34.7**	**84.3**	**40**
FP	**45.92**	**41**	**5.00**	**1.26**	**35.4**	**84.6**	**40**

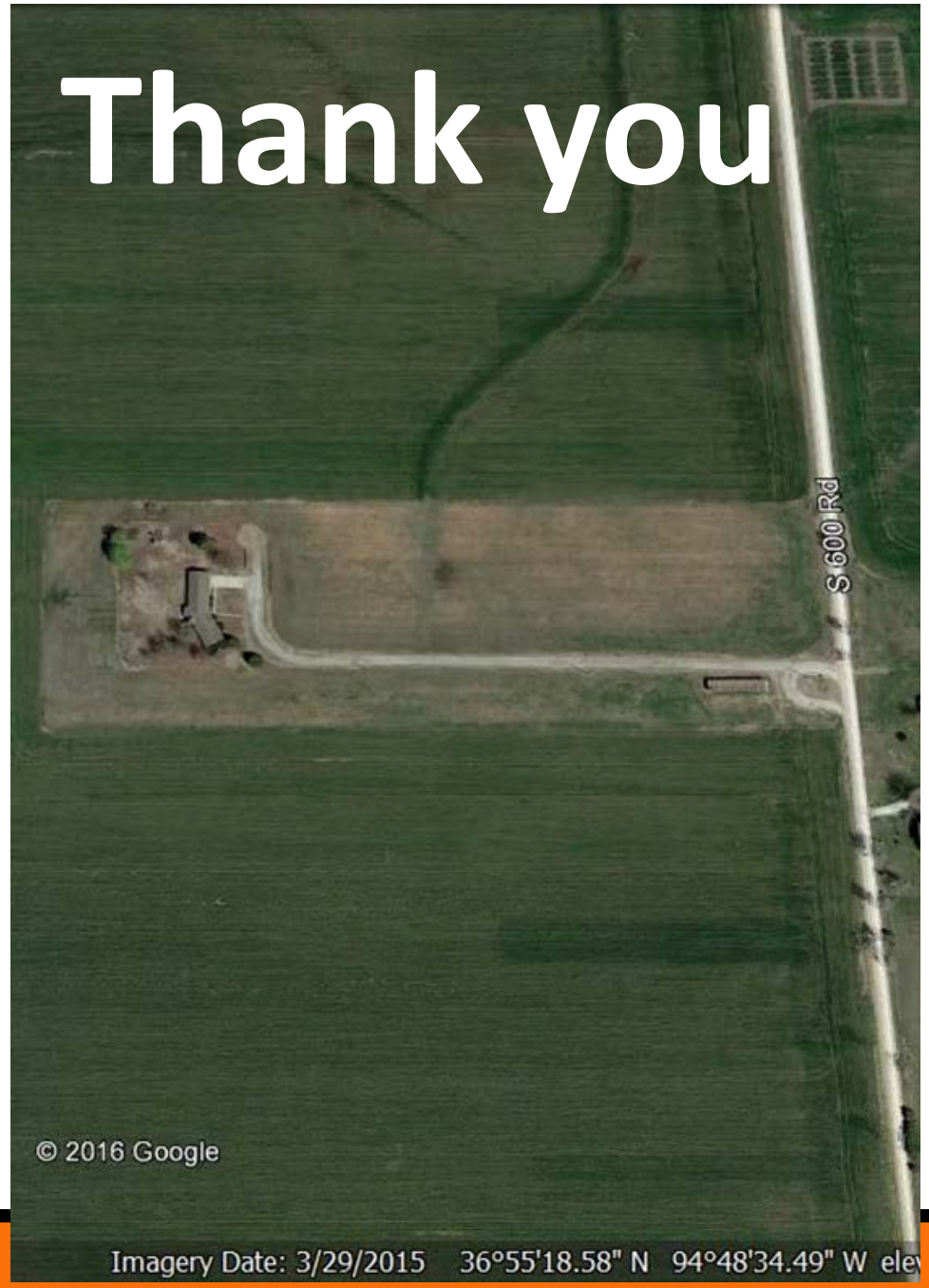
PREMIUMS AND DISCOUNTS						
Sample ID	Grade & Length	Strength	Mic	Uniformity	Net Prem (Points)	Loan Val (Cents/lb)
NCHECK	**430**	**50**	**0**	**15**	**495**	**56.95**
FP	**225**	**50**	**-230**	**15**	**60**	**52.6**

Things at the wall

Why not Check/Reference Strips,

On Farm testing.

Thank you



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