

Northwest Kansas Research Update

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NW Area Agronomy Research Program

- Conduct applied research relevant to the 29 county territory and the region
- 100% Funded by Industry
 - Contract projects with private firms
(Valent Biosciences, Deere & Co., Syngenta, etc.)
 - Field Pea Performance Test Entries
 - Cover Your Acres Proceeds
- Industry funds also subsidize my extension activities



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Outline

- Wheat
 - Solid-Stem Wheat Varieties
 - In-Furrow Urea
 - Variety x Seeding Rate
 - Durum Wheat Management
- Peas
 - Variety Testing
 - Seeding Rates
 - Winter Peas
- Corn
 - Dryland Hybrid x Seeding Rate
- Challenges, Opportunities, Priorities



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Adaptability of Northern Plains Solid-Stemmed Wheat to Northwest Kansas

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Wheat Stem Sawfly

- Adults emerge late May or early June
- $\frac{3}{4}$ " long, smokey-brown wings
- Flight period 3-6 weeks
- Females lay 30-50 eggs (one per plant)
- Larvae move down to base of plant, cut stem and pack frass behind them
- Wheat plants then lodge, almost immediately prior to harvest



Figure 1: Adult wheat stem sawfly.



Figure 2: Sawfly larva in stub.



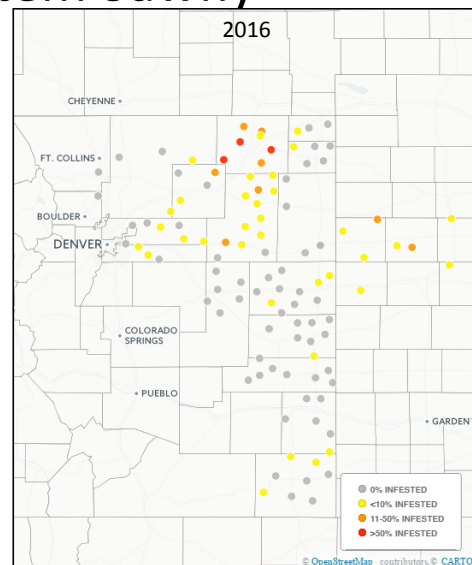
Figure 3: Stubs in which wheat stem sawfly larvae overwinter.



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Wheat Stem Sawfly

- Has infested spring wheat in the Northern Plains for decades
- Moved into winter wheat in the 1980's
- Infestations first noticed in Northeast Colorado in 2010



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Cropping Systems Impact

- Intensified rotations in the Central Great Plains rely on good stubble
- Good news on stubble height and parasitoids
 - One more good reason to adopt stripper head technology
- Control options (other than solid stem) are counter-productive to high plains dryland production = residue destruction



Materials and Methods

- 10 Site-years (Tribune-4, Colby-4, Herndon-2)
- RCBD with 4 replications, plots 5' x 40'
- Seeded at 60 (Tribune) or 90 lb ac⁻¹ (Colby, Herndon)
- Machine harvested for yield
- Biomass and Yield Components
- Heading Date (Tribune)



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Varieties Evaluated

Variety	Source	Type	2014			2015			2016			2017			2018	
			Colby	Tribune	Herndon	Colby	Tribune	Herndon	Colby	Tribune	Herndon	Colby	Tribune	Herndon	Colby	Tribune
Denali	CSU	Local	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Langin	CSU	Local									X	X	X	X	X	X
LCS Chrome	LimaGrain	Local												X	X	X
TAM111	TAMU	Local	X	X	X	X	X	X	X	X						
TAM112	TAMU	Local	X	X	X	X	X	X	X	X						
TAM114	TAMU	Local			X											
Tatanka	KSU	Local									X	X	X	X	X	X
Winterhawk	Westbred	Local	X		X	X	X	X	X	X	X	X	X	X	X	X
KS14H180-4-6	KSU	Local Experimental												X	X	X
CO155FD061	CSU	Local/Solid-Stem Experimental												X	X	X
CO155FD092	CSU	Local/Solid-Stem Experimental												X	X	X
CO155FD095	CSU	Local/Solid-Stem Experimental												X	X	X
CO155FD107	CSU	Local/Solid-Stem Experimental												X	X	X
Bearpaw	MSU	Solid-Stem	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bynum	MSU	Solid-Stem	X	X	X	X	X	X	X	X						
Genou	MSU	Solid-Stem	X	X	X	X	X	X	X	X						
Judee	MSU	Solid-Stem	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Loma	MSU	Solid-Stem									X	X	X	X	X	X
Rampart	MSU	Solid-Stem	X	X	X	X	X	X	X	X						
Spur	MSU/Wyoming	Solid-Stem									X	X	X	X	X	X
Warhorse	MSU	Solid-Stem	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WB-4483	Westbred	Solid-Stem						X	X	X	X	X	X	X	X	X
WB-Quake	Westbred	Solid-Stem	X		X	X	X	X	X	X	X	X	X	X	X	X
MTS1588	MSU	Solid-Stem Experimental												X	X	X
Norris	MSU	Montana Hollow-Stem	X	X		X	X									



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Tribune Heading Date

2014		2015	
Variety	Heading Date	Variety	Heading Date
	May		May
TAM112	15.5 a	TAM112	4.5 a
TAM111	18.8 b	Winterhawk	6.3 b
Norris	19.3 b	Norris	7.0 b
Bynum	20.8 c	TAM111	7.5 b
Denali	21.3 c	Bynum	11.3 c
Bearpaw	22.3 d	Denali	12.0 c
Judee	22.5 d	Rampart	14.0 d
Genou	22.8 d	Judee	14.5 d
Rampart	23.0 d	Bearpaw	14.5 d
Warhorse	24.0 e	Genou	16.3 e
		Warhorse	16.5 e
		WB-Quake	17.3 e

† Letters within a column and an effect represent differences at LSD (0.05) unless noted otherwise



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2014-2017 Yields

Year	Location	Mean Yield of Local Varieties	Mean Yield of Solid-Stemmed Varieties	%
2014	Tribune	59.7	39.7	66%
	Colby	74.3	66.0	89%
2015	Tribune	60.0	53.4	89%
	Colby	37.3	36.7	99%
	Herndon	27.4	24.7	90%
2016	Tribune	84.3	70.3	83%
	Colby	85.5	72.6	85%
	Herndon	73.5	65.6	89%
2017	Tribune	55.8	31.4	56%
	Colby	89.6	59.6	67%
			Max	99%
			Min	56%
			Average	81%



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Conclusions

- Solid stemmed wheats from the Northern Plains can be consistently grown in Northwest Kansas
- A reduction in yield should be expected
- If sawfly advances rapidly, these varieties could be used as a stop-gap until locally adapted varieties become available



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In-Furrow Placement of Enhanced Urea Products with Wheat

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Department of Agronomy, Manhattan



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In-Furrow Urea Materials and Methods

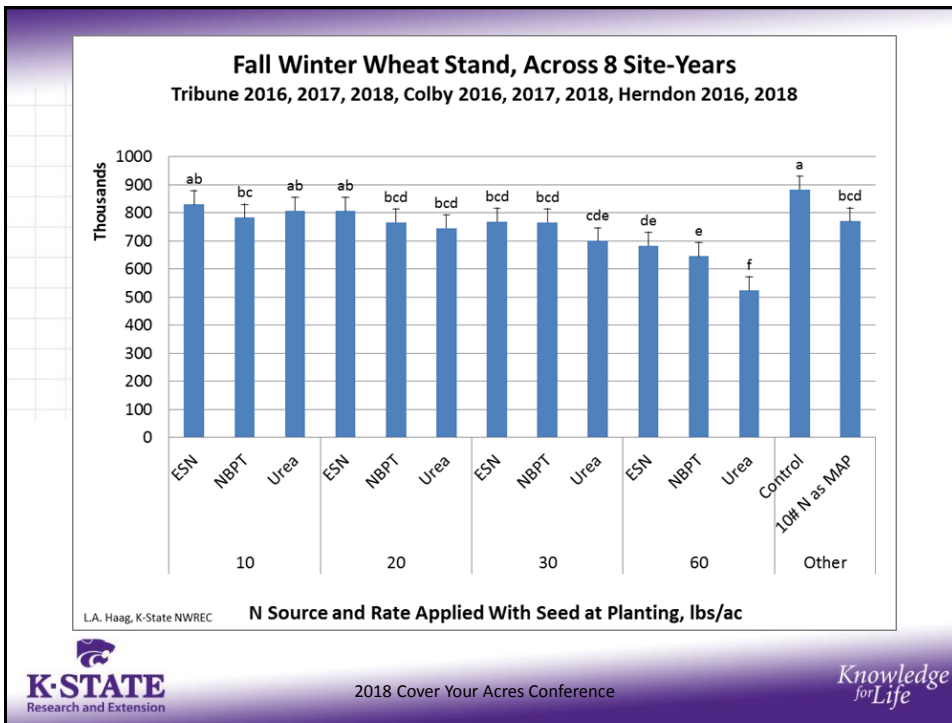
- Western Sites: No-till into chem-fallow, Certified CSU-Byrd, target 1.05 million seeds/ac
- Hunter 2017: No-till into wheat stubble, Certified KSU-Larry
- Treatments (in addition to grower practice):
 - 10, 20, 30, 60 lbs/ac N as ESN, NBPT, or Urea
 - MAP to get 10 lbs/ac N (91 lbs/ac of MAP)
 - Control
- Locations:
 - Tribune, Colby, Herndon, and Hunter (2017)
- Measurements

Fall stand count	Spring Vigor
Head Counts	Grain Yield and Protein

Visual – Mitchell Co. 2/9/17

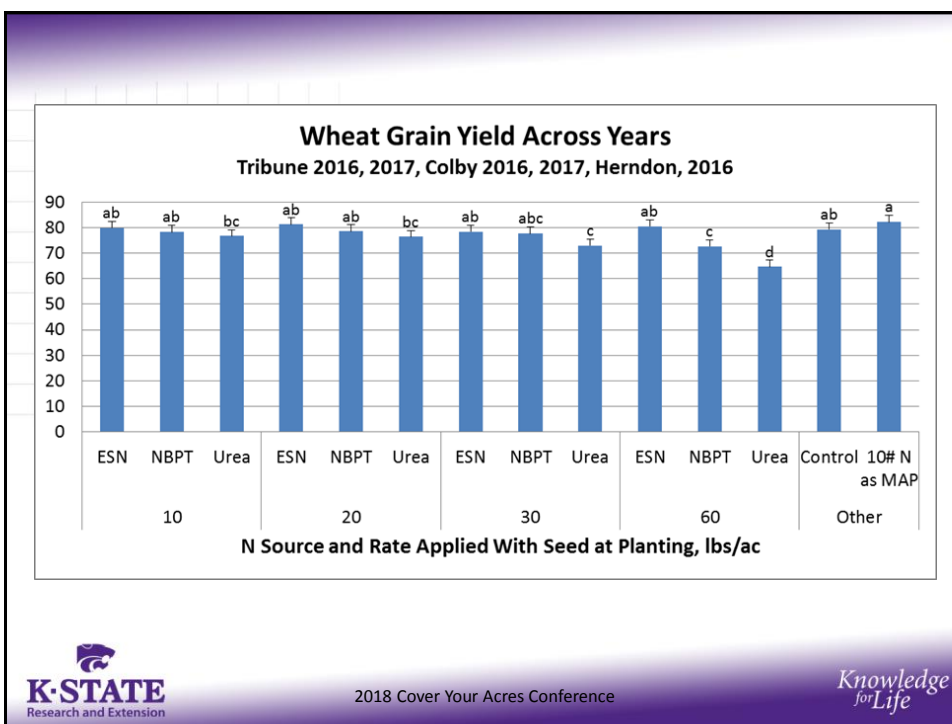
60 lb/ac Urea 60 lb/ac ESN





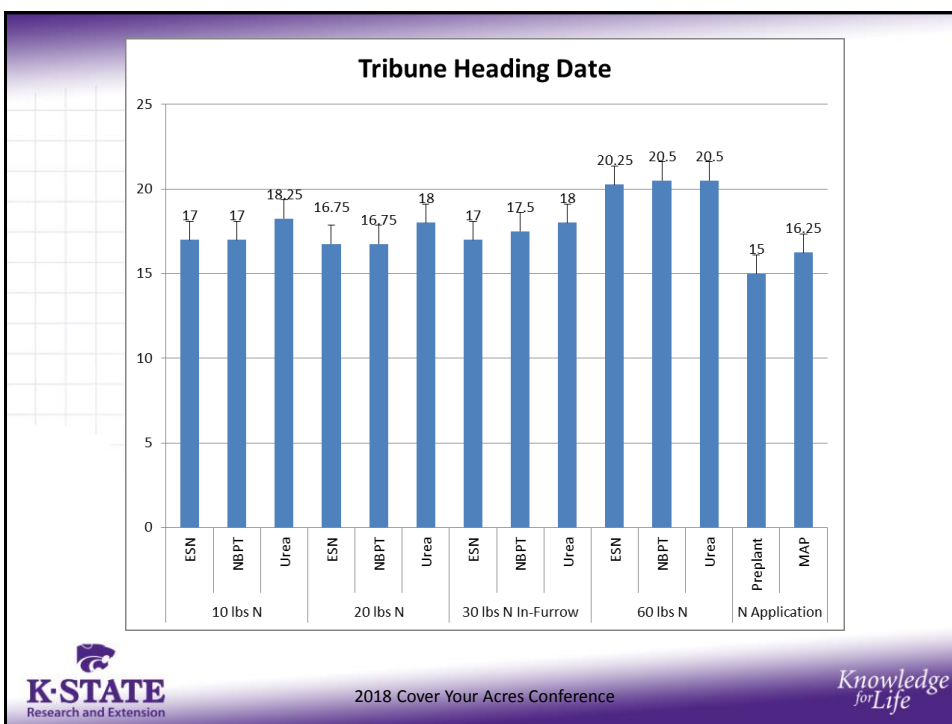
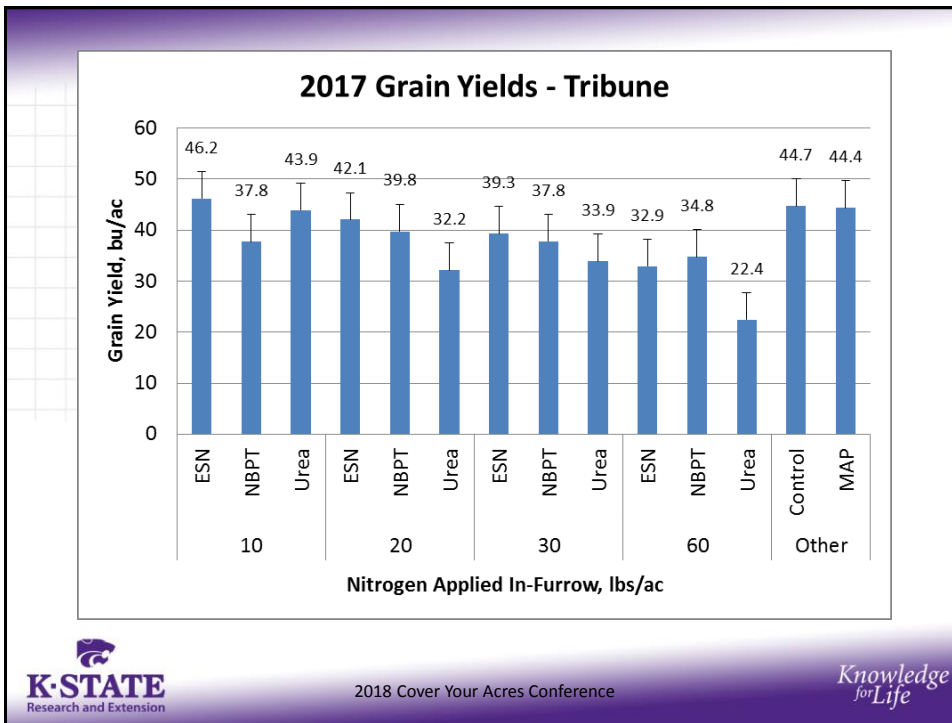
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Conclusions

- Some indication that ESN and NBPT coated urea provides some safety over untreated urea if used in-furrow
- Not enough site-years yet to truly evaluate the risk of various levels
- Low levels (10 lb/ac) of ESN urea appear to offer minimal risk



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Wheat Variety x Seeding Rate Study

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Southwest Research-Extension Center, Tribune

John Holman, Ph.D., Associate Professor and Cropping Systems Agronomist
Southwest Research-Extension Center, Garden City

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Northwest-Research-Extension Center, Colby



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Wheat Variety x Seeding Rate Study

Questions:

1. Are current seeding rate recommendations appropriate for current varieties
2. Is there a need for variety specific seeding rate recommendations OTHER THAN adjusting for seeds per lb.



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Wheat Variety x Seeding Rate Study

- 2014 preliminary study at Garden City and Tribune
 - Garden City hailed out (<10 bu/ac yields)
 - Tribune showed no response to increasing seeding rate from 30 to 75 lb/ac)
- Garden City, Tribune, and Colby
- No-Till into sorghum stalks (W-S-F rotation)



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Treatment Structure

- Seeding Rates
 - 2014
 - 30, 45, 60, 75 lb/ac
 - 2015-present
 - 30, 45, 60, 75 and 90 lb/ac
- Seed Size
- Varieties
 - TAM113 (2014 only)
 - TAM111 (prior to '17)
 - TAM114 (17-current)
 - Byrd
 - Winterhawk
 - T158

	Average	Max	Min
TAM111	17627	17627	17627
Byrd	15796	16142	15407
T158	13018	15479	11414
Winterhawk	14731	18421	12850
TAM114	16210	16779	15641

Results

Location	Year	Variety	P > F	
			Seeding Rate	Variety x Seeding
Tribune	2014	<0.0001	0.0020	0.1761
Tribune	2015	<0.0001	<0.0001	0.0458
Tribune	2016	<0.0001	<0.0001	0.3607
Tribune	2017	0.0135	<0.0001	0.9101
Garden City	2014	0.0084	0.0095	0.2444
Garden City	2015	<0.0001	<0.0001	0.0006
Garden City	2016	<0.0001	0.2051	0.9986
Garden City	2017	<0.0001	<0.0001	0.3760
Colby	2015	<0.0001	<0.0001	0.7308
Colby	2016	0.0286	<0.0001	0.1901
Colby	2017	<0.0001	<0.0001	0.2852

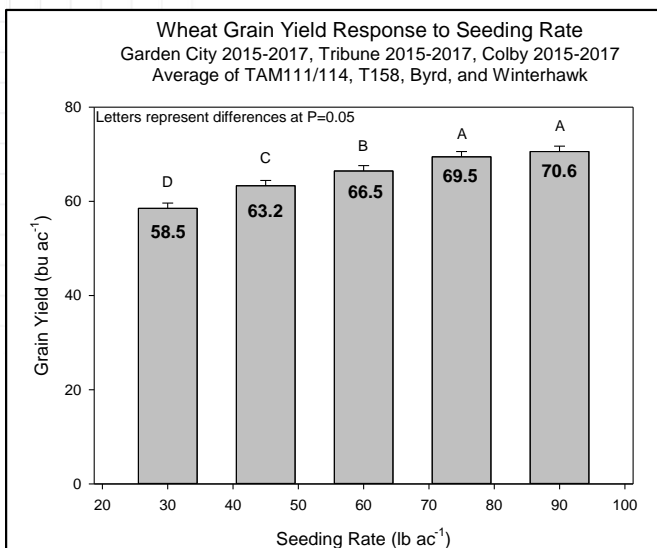
11 / 11

10 / 11

2 / 11

Results – Seeding Rate Across All Site-Years

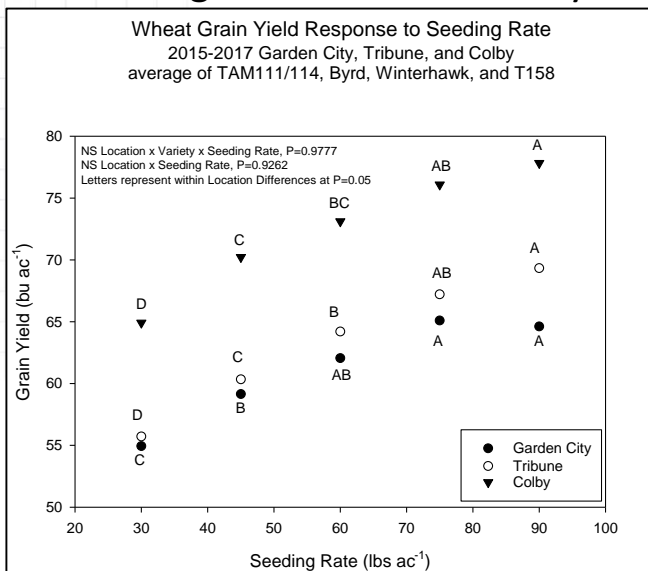
720 individual plots across 4 varieties and 11 site-years



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Optimal Seeding Rate not Affected by Location



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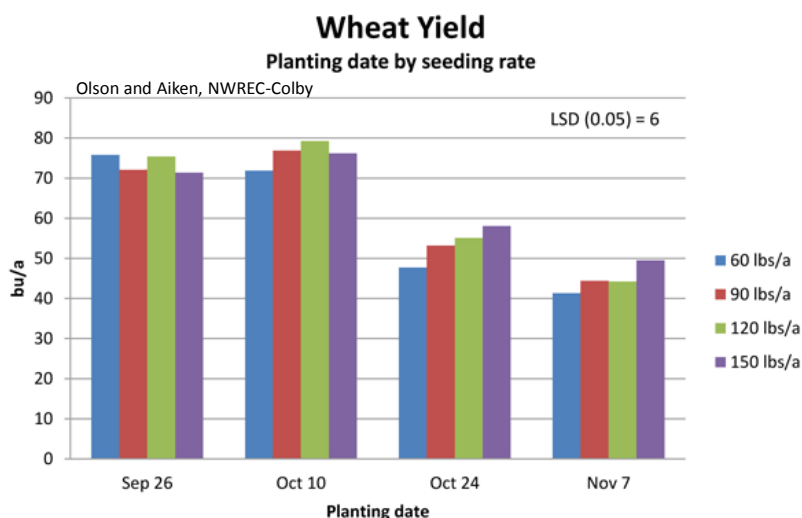
Caveats

1. Study was conducted on a lbs/acre basis
2. Through previous research and experience we know that optimal seeding rate varies by planting date
 - Our optimal seeding rates may be skewed by slightly later planting dates
3. While the locations and management were not nutrient limited, they are not super-high fertility either (i.e. no history of manure)

Conclusions Thus Far...

- The data we have collected so far is not supportive of variety specific seeding rates
- There are potential negative consequences to planting less than optimal seeding rates
 - If there is a lack of fall tillering your yield potential has been capped

Planting Date Likely Still the Biggest Driver



Durum Wheat Management

- Higher value wheat, typically used for pasta
- KSU Wheat Breeding has been working on developing winter durum wheats for over a decade
- A critical range of protein
- Target production will be on limited irrigation acres

Durum Wheat Management

- Varieties (4)
 - 2 KSU winter durum experimentals
 - Belgium line
 - SY Sunrise
- Planting Dates (4)
 - 9/15, 9/29, 10/13, 10/27
- Seeding Rates (4)
 - 0.9, 1.35, 1.8, and 2.25 million seeds/acre



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K-State Field Pea Variety Testing



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Procedures

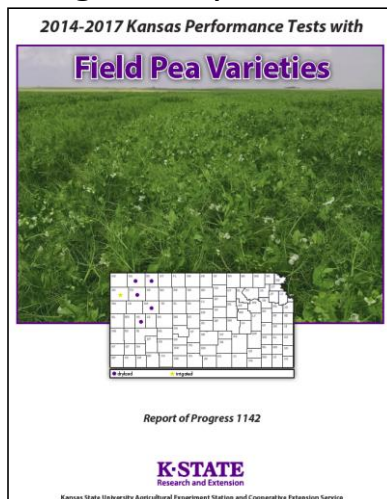
- No-Till into row-crop residue
- Seeded with Great Plains Drill on 10"
- Targeted drop of 365,000 live seed / acre
- Granular inoculant at 1.5x recommended rate
- Plots are 5' x 40'
- 5 Replications
- Machine harvested

Field Pea VPT Locations



Trial Results and Field Pea Production Info

- www.northwest.ksu.edu/agronomy



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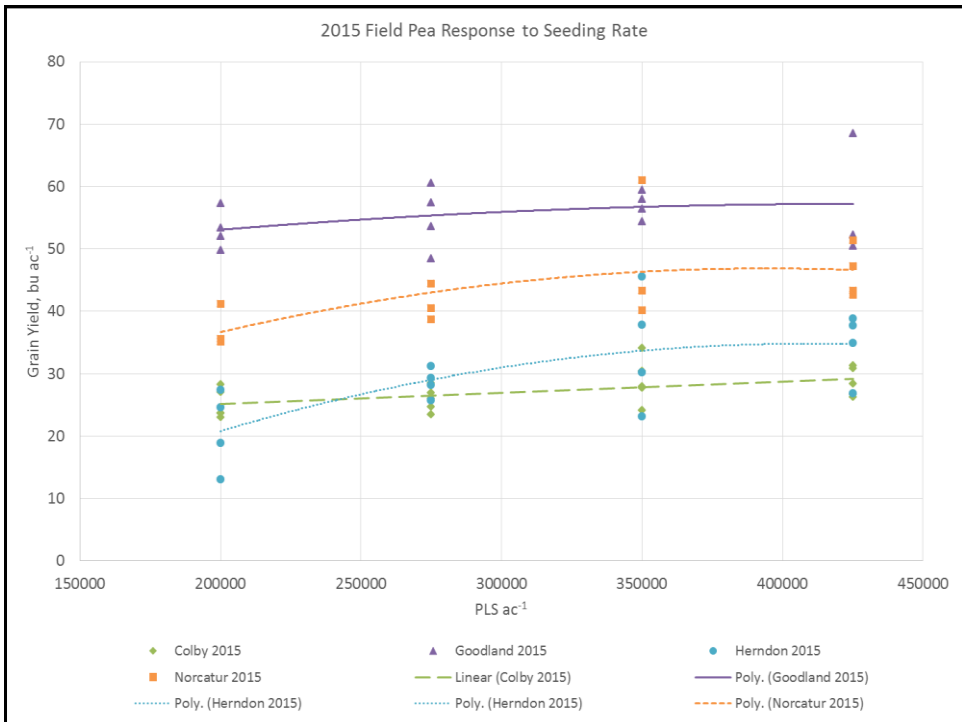
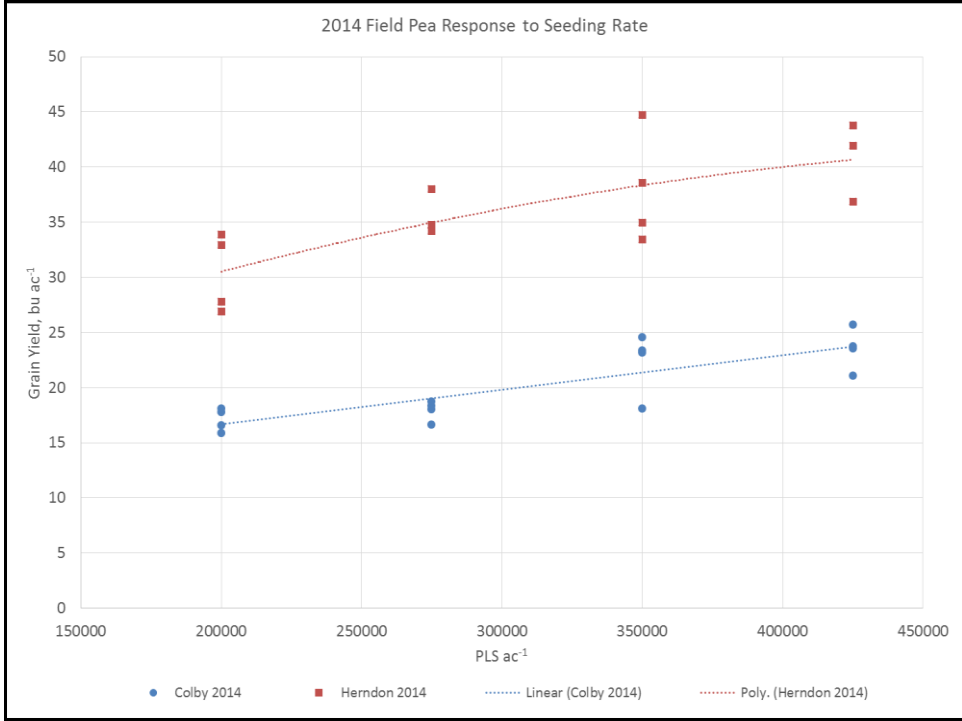
Results

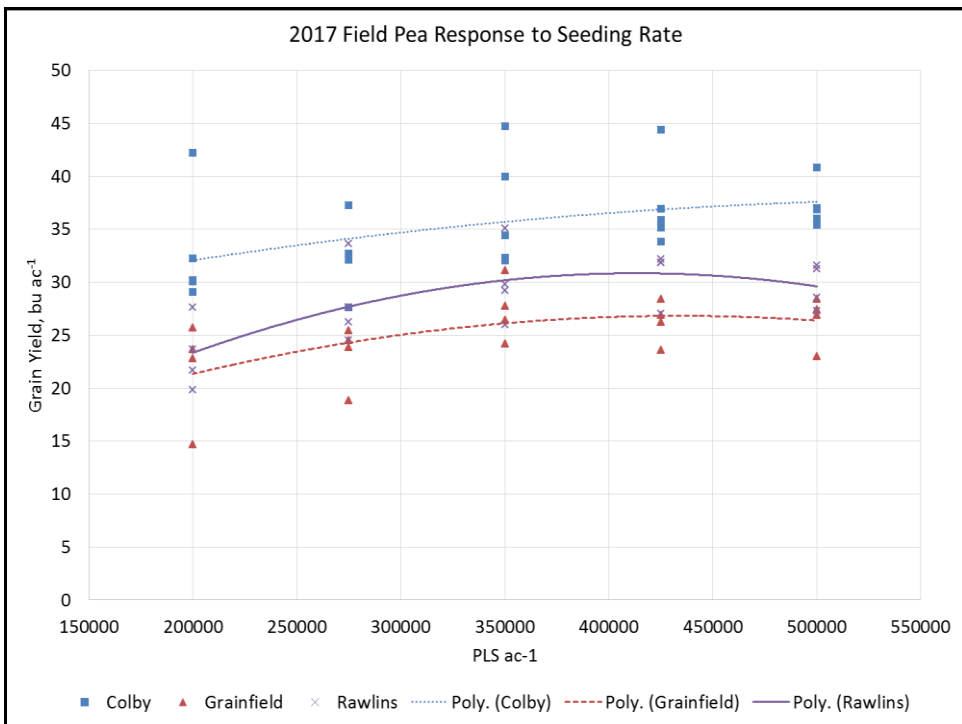
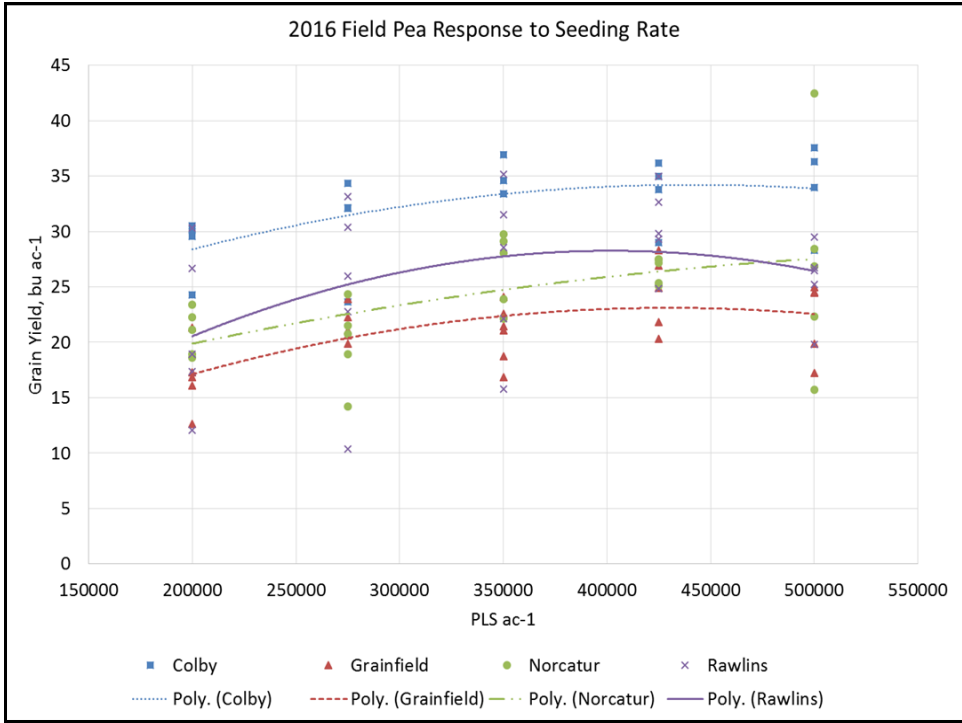
Location	2014		2015		2016		2017		Across Years
	Entries	Top Group Average Yield	Entries	Top Group Average Yield	Entries	Top Group Average Yield	Entries	Top Group Average Yield	
Rawlins	6	49.2	17	40.9	18	31.4	18	29.7	37.8
Thomas	6	28.2	18	30.6	22	33.8	20	39.3	33.0
Decatur	0	-	9	47.5	18	31.7	18	-	39.6
Gove	-	-	-	-	14	27.9	18	29.6	28.8
Scott	4	4.6	-	-	-	-	-	-	4.6
Sherman IRR	-	-	11	55.2	-	-	-	-	55.2

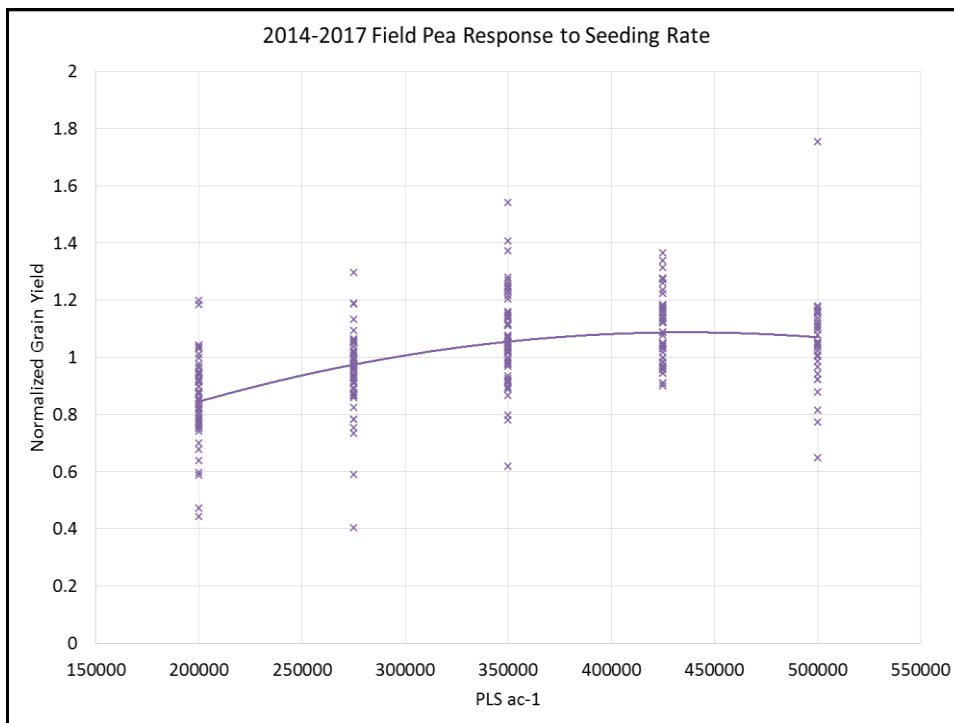


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Ongoing / Future Work

- Continuing Seeding Rate Studies
- In-Furrow Placement of MAP
- Fungicide Seed Treatments
- Identification of differences in heat stress tolerance



Supported by Industry – Thank You

- Legume Logic
- Pulse USA
- Great Northern Ag
- Kauffman Seed
- Photosyntech
- Meridian Seeds



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Winter Peas for Grain

- 8 Varieties
- 3 Planting Dates
 - 10/18; 10/30; and 11/15
- 2 Locations
 - NWREC, planted into summerfallow
 - Rawlins County, planted into fresh corn stalks
- Will evaluate for winter survival and yield



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On-Farm Hybrid Characterization

Developing data for VRS implementation

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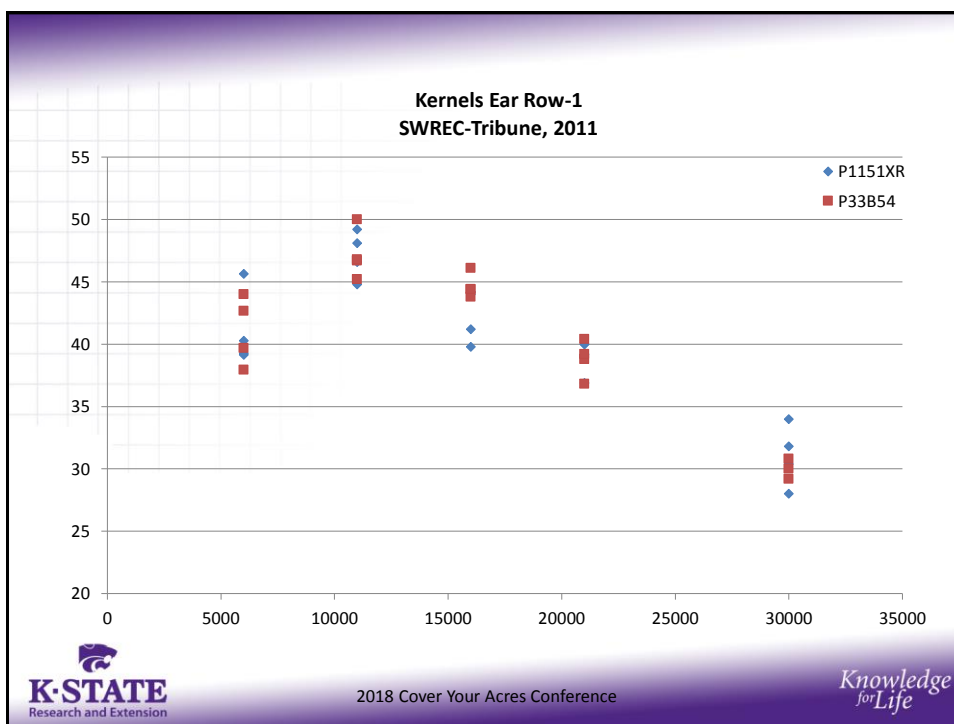
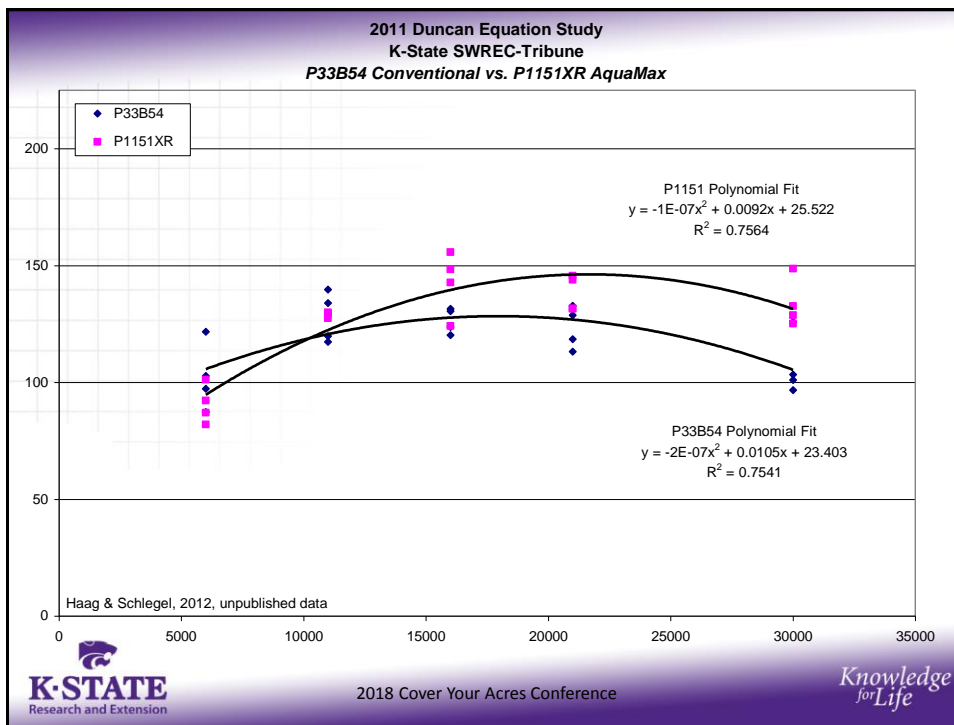
Hybrids and VRS

- Hybrid characterization is the key to effective VRS strategies
- Our ability to create VRT seeding prescriptions has exceeded our ability to characterize hybrids
 - Rapid hybrid turnover has further complicated this
- Yield components flex differently, at different rates, for different hybrids
- Fewer companies publicizing the “ear flex” scorings of products
 - Definition of ear flex, how much, what components



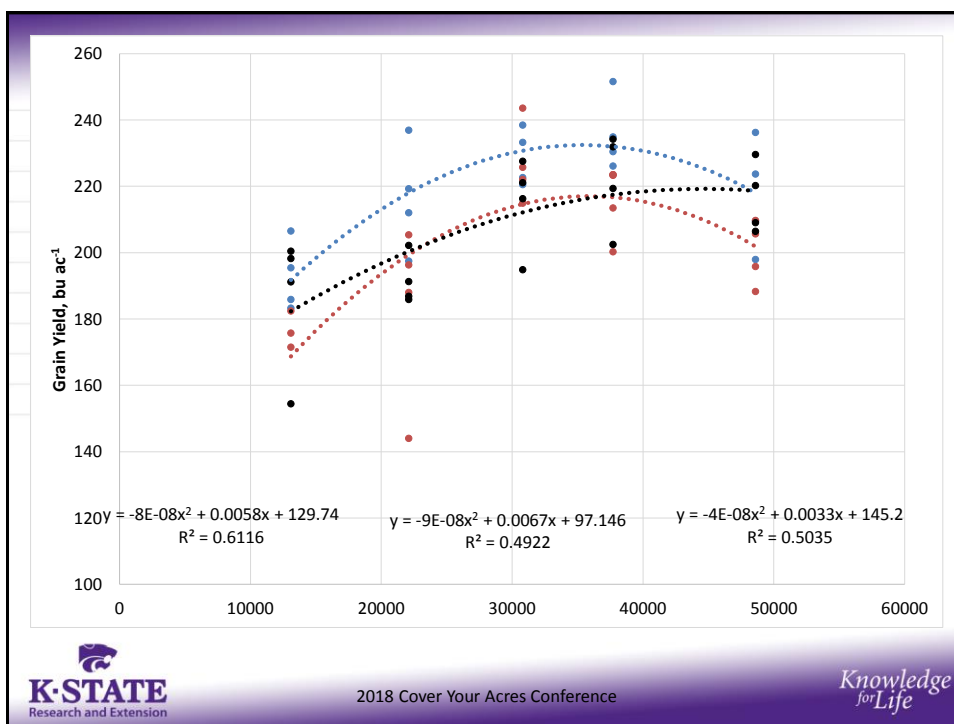
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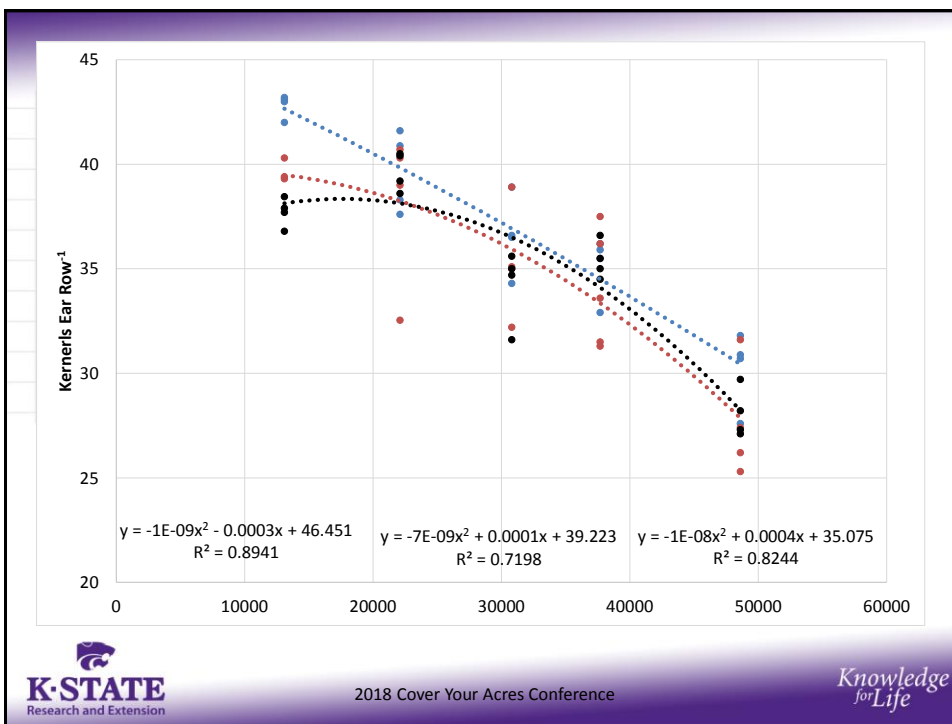
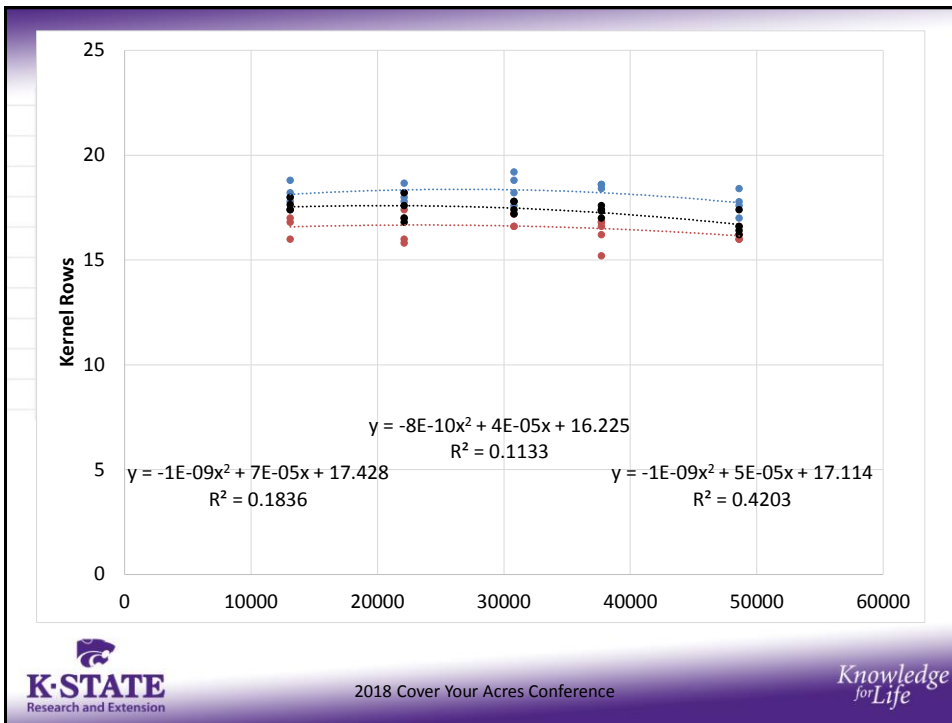
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2016 Field Trials

- Fully irrigated trial at NWREC-Colby
 - 3 Hybrids
 - 5 Seeding Rates: 13.1, 22.1, 30.8, 37.8, and 48.6k/ac
 - 4 Replications in RCBD
- Dryland trial on-farm in Decatur County
 - 38 Hybrids
 - 5 Seeding Rates: 8.1, 14.2, 17.2, 20.7, 27k/ac
 - 4 Replications in a SPD
- Yield, Kernel Rows, Kernels per Row, Kernel Wt.

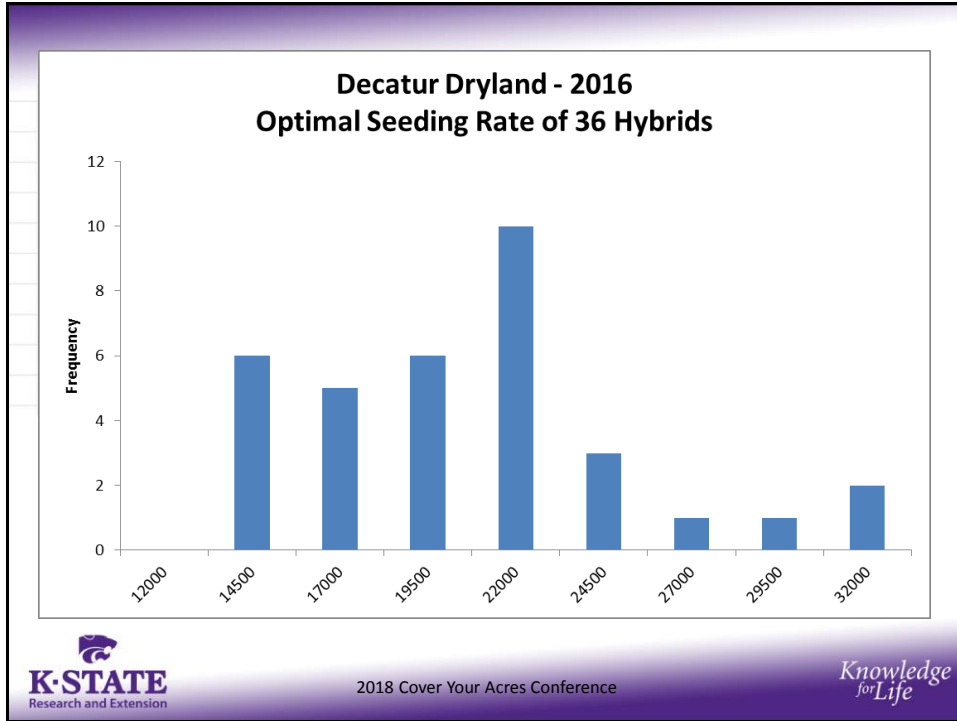




2016-2017 Field Trials

- Dryland trial on-farm in Decatur County
 - 38 Hybrids
 - 5 Seeding Rates:
 - 8,100
 - 14,200
 - 17,200
 - 20,700
 - 27,000/ac
 - 4 Replications in a split-plot design
- Yield, Kernel Rows, Kernels per Row, Kernel Wt.





On-Farm Seeding Rate Trials

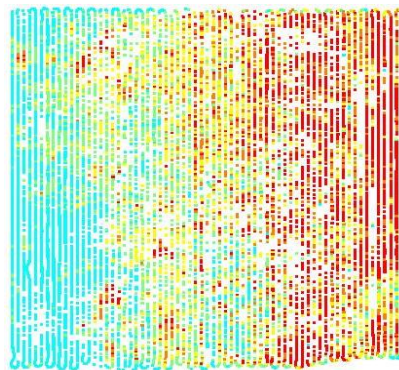
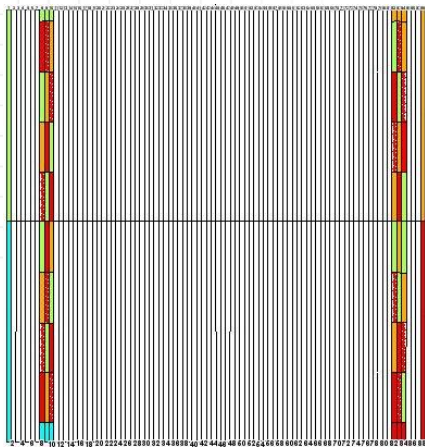
- Big enough range in seeding rates, +/- 2k isn't likely to show a response
- Treatment areas 300' long minimum, multiple field locations
- Can I use a highly variable field to generate a lot of characterization data?

K-STATE
Research and Extension

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Using Field Variability to Guide Plot Placement..... Learn More



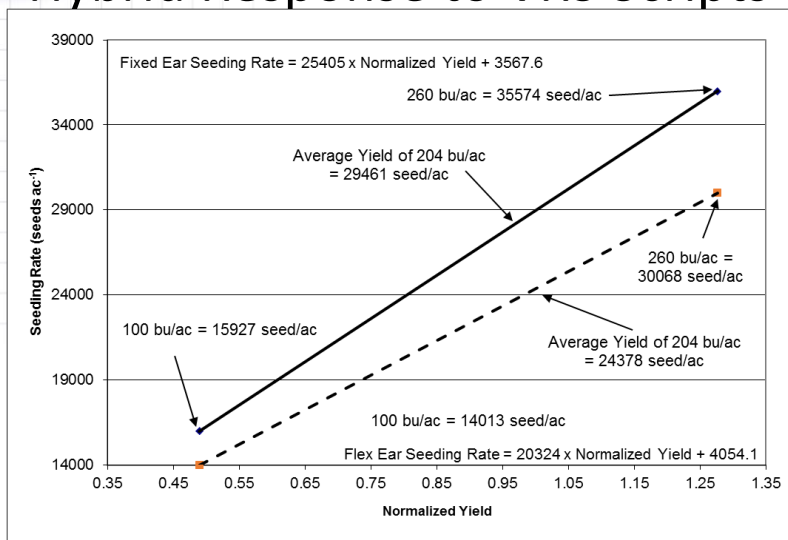
0-3' Soil EC



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Hybrid Response to VRS Scripts



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Planting Date x Maturity Probabilities

Historical Probability of Reaching Black Layer Before a 28° F Freeze - Oberlin, 1893-2016												
Relative Maturity	Black Layer GDU	Planting Date										
		17-Apr	24-Apr	1-May	8-May	15-May	22-May	29-May	5-Jun	12-Jun	19-Jun	26-Jun
118	2815	96.0%	91.4%	88.6%	84.8%	74.3%	65.7%	43.8%	22.9%	12.4%	1.9%	1.0%
113	2768	96.8%	94.3%	89.5%	88.6%	78.1%	70.5%	55.2%	33.3%	16.2%	2.9%	1.0%
110	2670	98.4%	97.1%	95.2%	91.4%	87.6%	76.2%	71.4%	51.4%	24.8%	10.5%	1.9%
108	2604	98.4%	98.1%	97.1%	94.3%	91.4%	86.7%	76.2%	60.0%	38.1%	17.1%	2.9%
105	2520	99.2%	99.0%	98.1%	97.1%	93.3%	91.4%	83.8%	73.3%	53.3%	25.7%	9.5%
103	2463	99.2%	99.0%	99.0%	98.1%	97.1%	93.3%	88.6%	79.0%	63.8%	34.3%	15.2%
96	2357	100.0%	99.0%	99.0%	99.0%	98.1%	98.1%	92.4%	87.6%	78.1%	56.2%	26.7%
91	2250	100.0%	100.0%	100.0%	99.0%	99.0%	98.1%	98.1%	93.3%	87.6%	76.2%	49.5%
Average GDU		3270	3207	3141	3066	2981	2882	2777	2661	2533	2391	2239
Maximum GDU		4143	4074	3960	3846	3723	3620	3502	3368	3230	3038	2869
Minimum GDU		2399	2331	2279	2223	2168	2050	1952	1904	1819	1719	1605

www.northwest.ksu.edu/agronomy



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Questions / Comments?

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