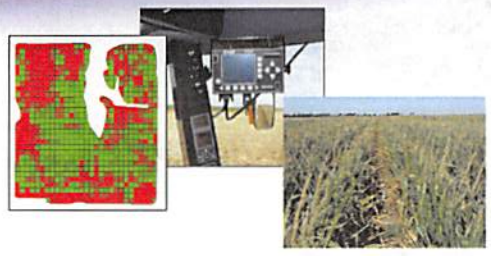


Dryland Corn Hybrid Maturity x Planting Dates

Lucas Haag, Ph.D., K-State Northwest Research Extension Center, Colby
Alan Schlegel, Ph.D., K-State Southwest Research-Extension Center, Tribune
Alicia Boor, Cottonwood Extension District, Great Bend
Stacy Campbell, Cottonwood Extension District, Hays
Sandra Wick, Post Rock Extension District, Smith Center

K-STATE Research and Extension

Knowledge for Life

Matching Hybrid Maturity and Planting Dates

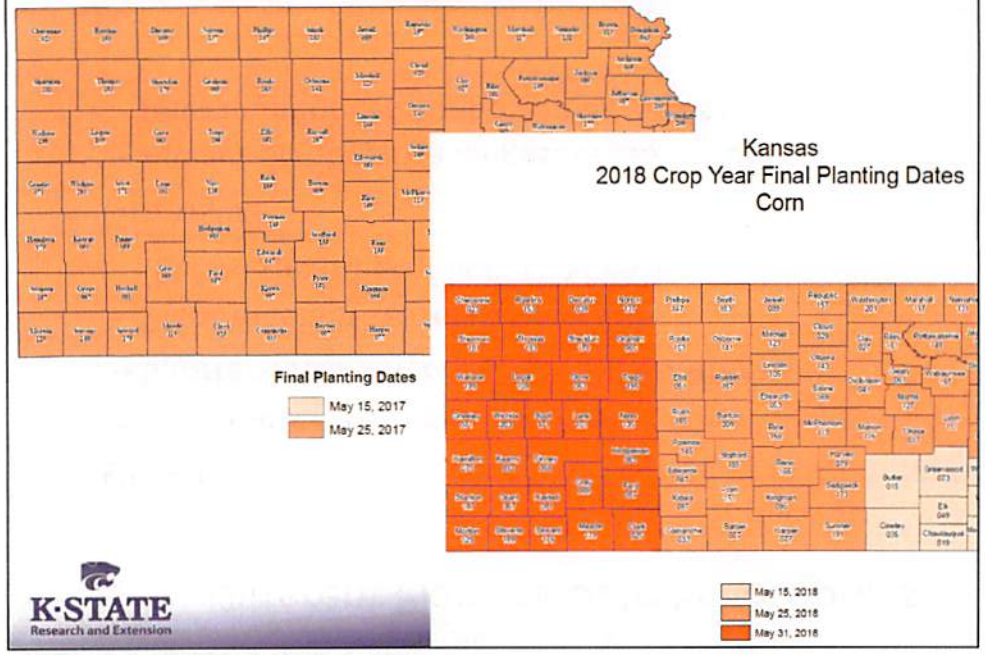
- The only dryland corn planting date work in western Kansas was done in the mid 1990's at Garden City
- We hear from a lot of producers (and I have experienced myself) improved yields from later planting
- Is this real? Is it a function of recent years? How does hybrid maturity play a role?

Different Planting Date Philosophies

- Defensive
  - Early Corn Early (beat the heat)
  - Shorter-season hybrids to reduce water use
  - Plant medium season hybrids late (get on the other side of the heat)
- Offensive
  - Always planting the longest season hybrid the environment can support (max yields)

What's Changed since we've started growing dryland corn

- Improved cold vigor and emergence, especially important for no-till wheat stubble
- Yield competitiveness of mid and short season hybrids has improved
  - Chicken and egg: lots of focus from the companies on this maturity group to expand acres
- Some reduction of ear-flex in full season hybrids potentially reducing their adaptability to dryland production
- Climate variability?
- Machinery capacity – acres/row, acres/day



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Predicting Probabilities of Success

- Implies that we should be planting the longest hybrid the season we support (might be true?)
- Utilize historical weather data to look at cumulative GDU's from planting to freeze for various planting dates
- Assumes the book value GDU's to blacklayer are correct and stable

Planting Date x Maturity Probabilities
St. Francis

Historical Probability of Reaching Black Layer Before a 28° F Freeze - St. Francis, 1908-2016

Hybrid		Planting Date										
Relative Maturity	Black Layer GDU	17-Apr	24-Apr	1-May	8-May	15-May	22-May	29-May	5-Jun	12-Jun	19-Jun	26-Jun
118	2815	94.5%	89.5%	82.9%	78.1%	71.4%	54.3%	30.5%	12.4%	5.7%	1.0%	0.0%
113	2768	94.5%	92.4%	88.6%	81.0%	76.2%	63.8%	39.0%	18.1%	9.5%	1.0%	0.0%
110	2670	96.3%	96.2%	94.3%	93.3%	81.0%	75.2%	65.7%	36.2%	15.2%	4.8%	1.0%
108	2604	98.2%	97.1%	96.2%	95.2%	92.4%	79.0%	73.3%	55.2%	22.9%	10.5%	1.0%
105	2520	99.1%	99.0%	98.1%	96.2%	96.2%	88.6%	79.0%	70.5%	41.0%	16.2%	6.7%
103	2463	100.0%	100.0%	100.0%	98.1%	96.2%	95.2%	81.9%	76.2%	58.1%	23.8%	10.5%
96	2357	100.0%	100.0%	100.0%	100.0%	99.0%	97.1%	96.2%	83.8%	74.3%	51.4%	18.1%
91	2250	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	98.1%	96.2%	84.8%	71.4%	35.2%
Average GDU		3188	3126	3064	2991	2911	2817	2716	2605	2482	2347	2199
Maximum GDU		3861	3797	3726	3602	3465	3373	3298	3156	3009	2875	2708
Minimum GDU		2515	2515	2476	2447	2326	2294	2196	2076	1979	1888	1770

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Need to take a blended approach
example: St. Francis vs. Atwood

Historical Probability of Reaching Black Layer Before a 28° F Freeze - Atwood, 1939-2016

Hybrid		Planting Date										
Relative Maturity	Black Layer GDU	17-Apr	24-Apr	1-May	8-May	15-May	22-May	29-May	5-Jun	12-Jun	19-Jun	26-Jun
118	2815	91.0%	88.5%	79.5%	79.5%	66.7%	46.2%	20.5%	10.3%	3.8%	0.0%	0.0%
113	2768	96.2%	92.3%	87.2%	80.8%	74.4%	56.4%	33.3%	11.5%	6.4%	1.3%	0.0%
110	2670	97.4%	97.4%	96.2%	93.6%	80.8%	70.5%	57.7%	28.2%	10.3%	3.8%	0.0%
108	2604	98.7%	98.7%	97.4%	96.2%	91.0%	79.5%	66.7%	48.7%	15.4%	7.7%	1.3%
105	2520	98.7%	98.7%	98.7%	97.4%	94.9%	89.7%	76.9%	57.7%	32.1%	10.3%	3.8%
103	2463	98.7%	98.7%	98.7%	98.7%	97.4%	93.6%	84.6%	69.2%	52.6%	17.9%	7.7%
96	2357	98.7%	98.7%	98.7%	98.7%	98.7%	97.4%	94.9%	83.3%	66.7%	35.9%	10.3%
91	2250	100.0%	100.0%	100.0%	100.0%	98.7%	98.7%	97.4%	96.2%	83.3%	59.0%	30.8%
Average GDU		3158	3098	3033	2960	2877	2781	2680	2567	2442	2305	2157
Maximum GDU		3778	3726	3650	3532	3404	3318	3241	3095	2941	2814	2646
Minimum GDU		2346	2346	2317	2295	2245	2186	2145	2071	1994	1858	1712

Planting Date x Maturity Probabilities Goodland

Historical Probability of Reaching Blacklayer Before a 28° F Freeze - Goodland, 1948-2016

Hybrid		Planting Date										
Relative Maturity	Blacklayer GDU	17-Apr	24-Apr	1-May	8-May	15-May	22-May	29-May	5-Jun	12-Jun	19-Jun	26-Jun
118	2815	88.4%	81.2%	76.8%	59.4%	42.0%	26.1%	13.0%	4.3%	2.9%	0.0%	0.0%
113	2768	95.7%	89.9%	82.6%	76.8%	53.6%	29.0%	18.8%	8.7%	2.9%	0.0%	0.0%
110	2670	98.6%	98.6%	97.1%	89.9%	78.3%	56.5%	29.0%	18.8%	4.3%	2.9%	0.0%
108	2604	100.0%	100.0%	100.0%	95.7%	88.4%	78.3%	50.7%	23.2%	11.6%	2.9%	0.0%
105	2520	100.0%	100.0%	100.0%	100.0%	98.6%	88.4%	78.3%	44.9%	18.8%	7.2%	2.9%
103	2463	100.0%	100.0%	100.0%	100.0%	100.0%	97.1%	84.1%	60.9%	30.4%	13.0%	2.9%
96	2357	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	97.1%	88.4%	56.5%	27.5%	7.2%
91	2250	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	97.1%	85.5%	44.9%	18.8%
Average GDU		3063	3006	2951	2883	2808	2720	2628	2524	2403	2272	2128
Maximum GDU		3643	3589	3527	3411	3281	3213	3146	3015	2876	2750	2582
Minimum GDU		2657	2653	2623	2596	2495	2367	2332	2235	2096	1971	1870

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June 12 Planting Date - Across Locations

Hybrid		June 12th Planting Date										
Relative Maturity	Black Layer GDU	Tribune	Sharon Springs	Goodland	St. Francis	Benkelman	Brewster	Bonny Reservoir	Oberlin	Atwood	Colby	Hoxie	Burlington
118	2815	1.9%	13.0%	2.9%	5.7%	4.3%	5.8%	1.6%	12.4%	3.8%	10.5%	17.9%	2.0%
113	2768	4.8%	17.4%	2.9%	9.5%	7.2%	5.8%	3.1%	16.2%	6.4%	11.4%	24.4%	4.0%
110	2670	12.4%	37.7%	4.3%	15.2%	13.0%	10.1%	9.4%	24.8%	10.3%	17.1%	46.2%	9.1%
108	2604	24.8%	49.3%	11.6%	22.9%	21.7%	11.6%	10.9%	38.1%	15.4%	21.0%	59.0%	10.1%
105	2520	37.1%	79.7%	18.8%	41.0%	33.3%	18.8%	18.8%	53.3%	32.1%	40.0%	74.4%	20.2%
103	2463	48.6%	88.4%	30.4%	58.1%	49.3%	36.2%	26.6%	63.8%	52.6%	50.5%	82.1%	36.4%
96	2357	75.2%	94.2%	56.5%	74.3%	71.0%	69.6%	53.1%	78.1%	66.7%	72.4%	89.7%	58.6%
91	2250	86.7%	100.0%	85.5%	84.8%	88.4%	85.5%	76.6%	87.6%	83.3%	85.7%	96.2%	81.8%
Average GDU		2475	2628	2403	2482	2460	2425	2374	2533	2442	2470	2640	2394
Maximum GDU		2977	3085	2876	3009	2972	2924	2886	3230	2941	2944	3060	2892
Minimum GDU		1942	2294	2096	1979	2098	1993	1966	1819	1994	1841	2166	1994

"Without data you're just another person with an opinion"

-W. Edwards Deming

Objectives

- Evaluate a combination of hybrid maturities and planting dates across western and central Kansas.
- Is there an advantage to planting later?
- Do hybrids adjust when planted later?
- Collect a solid dataset for crop modeling

Materials and Methods

- Dryland corn planted no-tilled into wheat stubble (except Barton County, soybean stubble)
- Region appropriate seeding rates
  - Tribune and Colby, 17,400
  - Olmitz and Smith Center 19,500

Materials and Methods – 2018 Planting Dates

	Tribune	Colby	Barton Co.	Smith Center
mid-April	4/19	-	-	-
early-May	5/3	5/9	5/15	5/9
mid-May	5/17	5/22	5/21	5/21
early-June	5/31	6/3	6/1	6/1
mid-June	6/14	6/17	6/16	6/16

Materials and Method - Hybrids

- Utilize multiple, genetically independent hybrids to represent each maturity class

Company	Hybrid	CRM	SilkCRM	GDU_Pollen	GDU_Silk	GDU_PM
DupontPioneer	P9998AMXT	99	99	.	1240	2350
AgReliant/LG	LG5494	99	late for mat	1255	1265	2460
Monsanto/DeKalb	DKC51-20DGVT2PRIB	101	.	1282	1282	2525
AgReliant/LG	LG5525	105	early for mat	1260	1260	2480
DupontPioneer	P0657AMXT	106	104	.	1300	2500
Monsanto/DeKalb	DKC57-99RIB	107		.	1264	2675
AgReliant/LG	LG2602	112	late for mat	1360	1370	2710
DupontPioneer	P1751AM	117	114	.	1420	2830
Monsanto/Channel	216-36DGVT2PRIB	116	.	1387	1387	2910

Planting Date affects on Phenology

Company	Hybrid	CRM	Planted 4/19		Planted 5/3		Planted 5/17		Planted 5/31		Planted 6/14	
			Silking Date	Silking GDU	Silking Date	Silking GDU	Silking Date	Silking GDU	Silking Date	Silking GDU	Silking Date	Silking GDU
AgReliant/LG	LG5494	99	7/15	1655	7/16	1551	7/24	1515	8/2	1445	8/13	1395
AgReliant/LG	LG5525	105	7/16	1679	7/16	1551	7/24	1533	8/3	1467	8/15	1421
AgReliant/LG	LG2602	112	7/22	1810	7/21	1666	7/28	1617	8/5	1514	8/19	1511
Monsanto/DeKalb	DKC51-20DGVT2PRIB	101	7/13	1602	7/14	1493	7/23	1509	8/2	1439	8/11	1348
Monsanto/DeKalb	DKC57-99RIB	107	7/14	1632	7/16	1545	7/24	1533	8/3	1467	8/14	1405
Monsanto/Channel	216-36DGVT2PRIB	116	7/18	1715	7/19	1624	7/26	1577	8/4	1485	8/15	1426
Dupont/Pioneer	P9998AMXT	99	7/13	1590	7/15	1510	7/23	1491	7/30	1390	8/11	1337
Dupont/Pioneer	P0657AMXT	106	7/15	1655	7/17	1557	7/25	1545	8/1	1418	8/13	1390
Dupont/Pioneer	P1751AM	117	7/28	1934	7/28	1812	7/30	1654	8/6	1531	8/18	1503

Planting Date affects on Phenology

Corn Hybrid x Date of Planting Study, Silking Dates, Olmitz Kansas. 2018 PRELIMINARY DATA

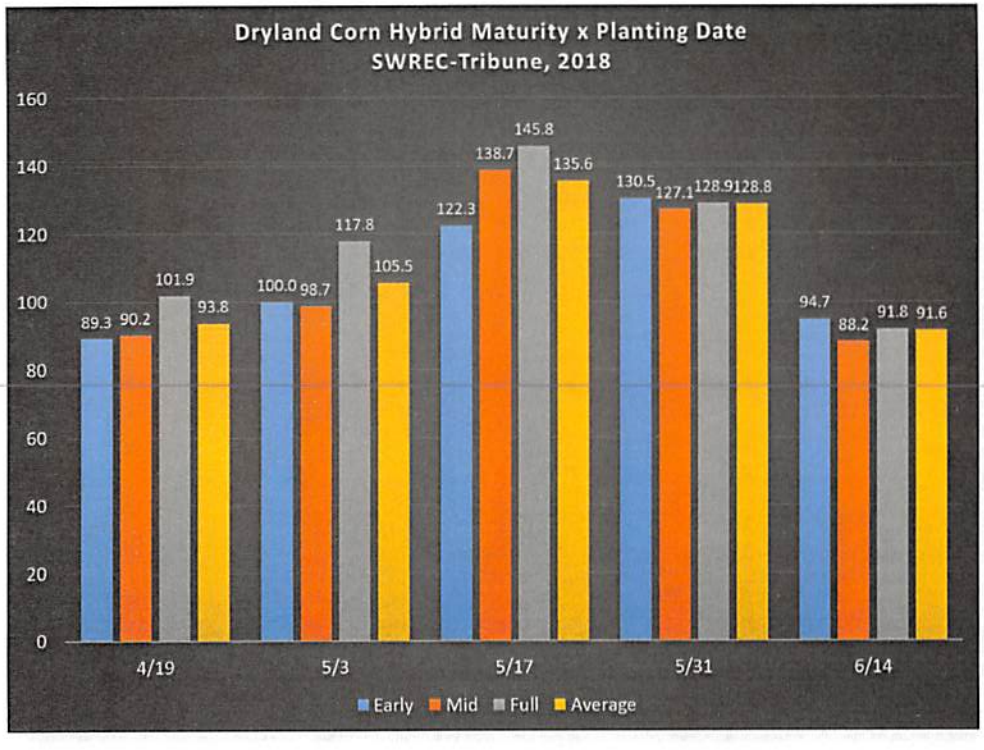
Company	Hybrid	CRM	Planted 5/15/2018		Planted 5/21/2018		Planted 6/1/2018		Planted 6/16/2018	
			Silking	Silking GDU	Silking	Silking GDU	Silking	Silking GDU	Silking	Silking GDU
AgReliant/LG	LG5494	99	7/11	1406	7/15	1393	7/23	1370	8/7	1352
AgReliant/LG	LG5525	105	7/11	1386	7/16	1407	7/23	1383	8/8	1371
AgReliant/LG	LG2602	112	7/15	1515	7/17	1447	7/27	1467	8/9	1414
Monsanto/DeKalb	DKC51-20DGVT2PRIB	101	7/11	1392	7/15	1393	7/24	1390	8/7	1365
Monsanto/DeKalb	DKC57-99RIB	107	7/12	1421	7/16	1413	7/23	1383	8/8	1371
Monsanto/Channel	216-36DGVT2PRIB	116	7/13	1461	7/18	1461	7/25	1435	8/8	1384
Dupont/Pioneer	P9998AMXT	99	7/10	1360	7/14	1359	7/22	1343	8/6	1327
Dupont/Pioneer	P0657AMXT	106	7/11	1393	7/15	1386	7/22	1350	8/7	1346
Dupont/Pioneer	P1751AM	117	7/16	1542	7/17	1447	7/27	1479	8/9	1409

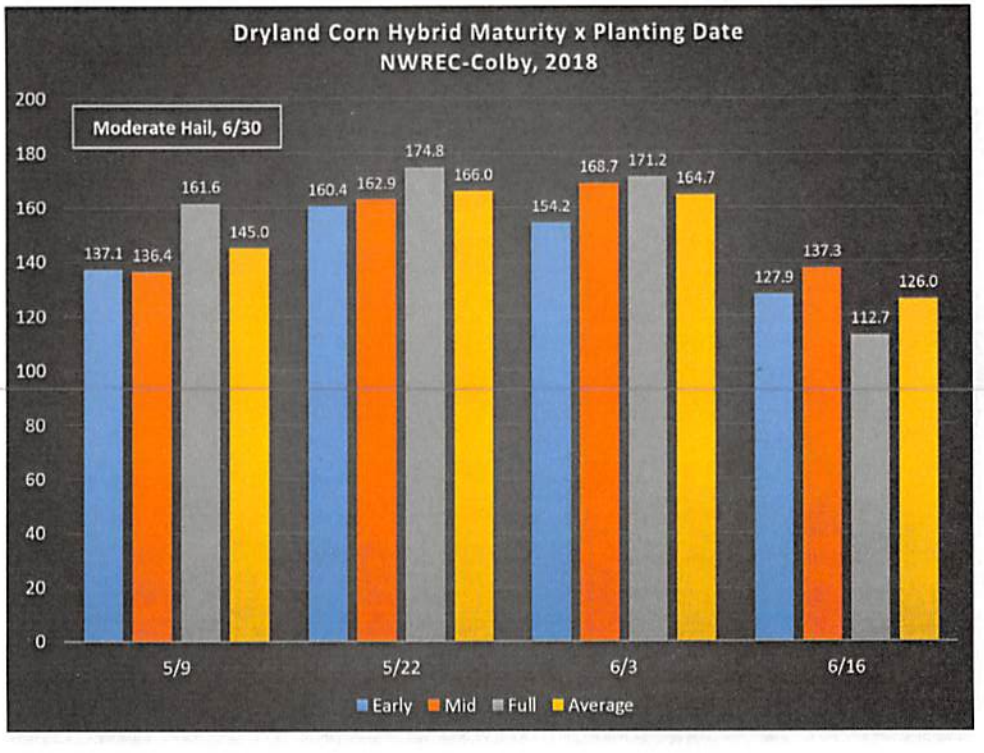
Hybrids did make some adjustments due to planting date, BUT....

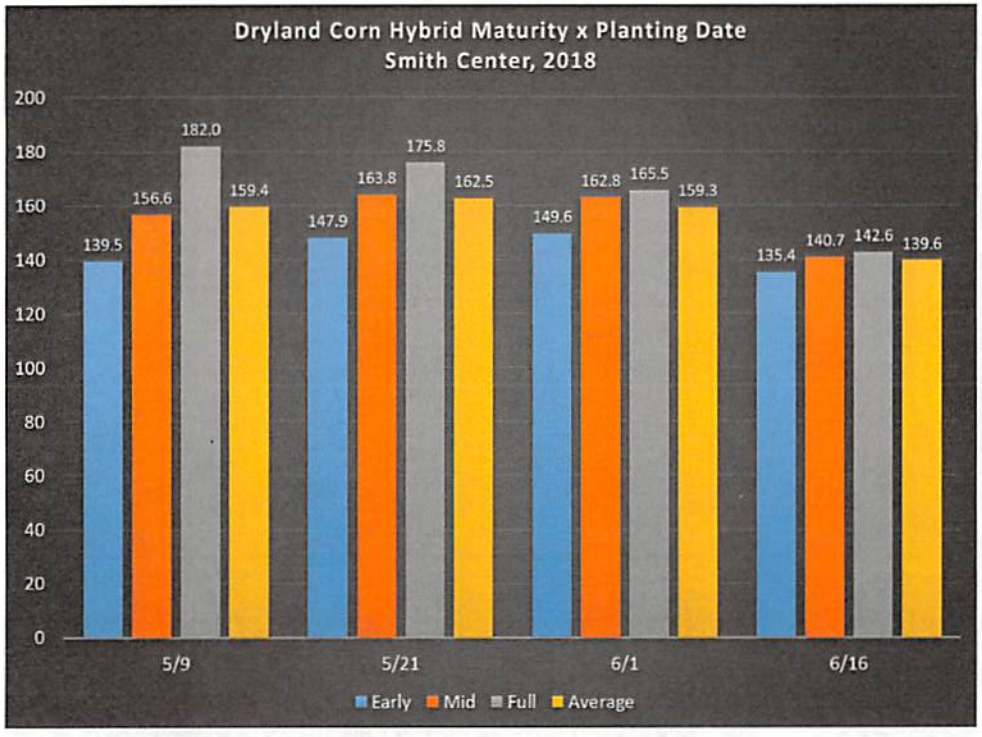
Planting Date affects on Phenology varied by location

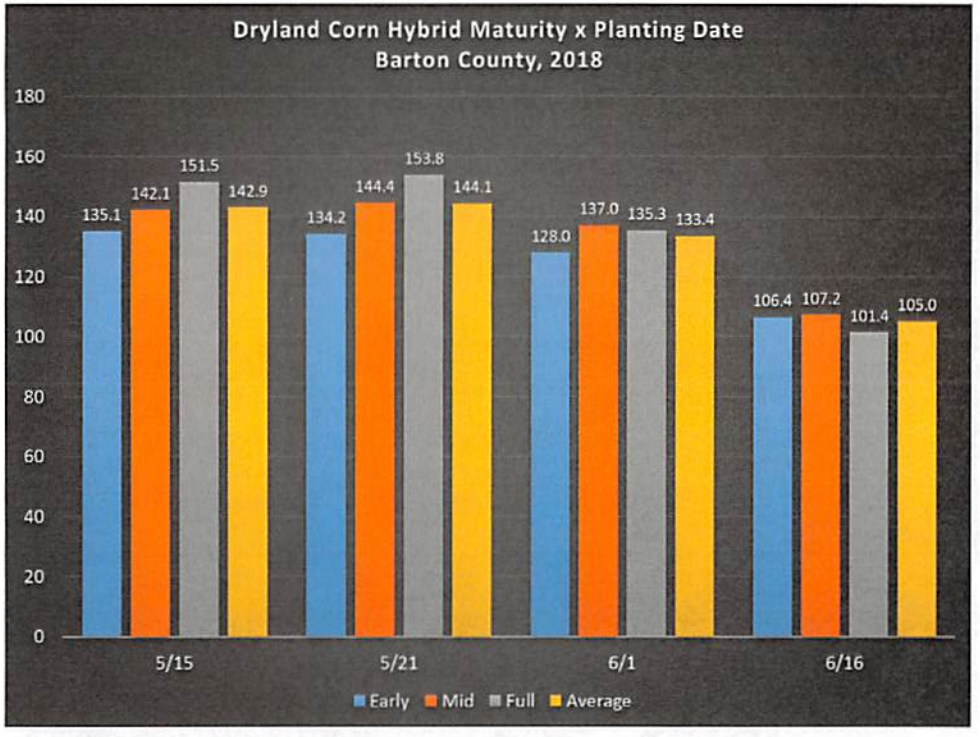
Company	Hybrid	CRM	5/15 to 6/15 Reduciton in GDU to Silk		
			Tribune	Great Bend	Difference
AgReliant/LG	LG5494	99	120	54	66
Dupont/Pioneer	P9998AMXT	99	154	33	121
Monsanto/DeKalb	DKC51-20DGVT2PRIB	101	161	27	134
AgReliant/LG	LG5525	105	112	15	97
Dupont/Pioneer	P0657AMXT	106	155	47	108
Monsanto/DeKalb	DKC57-99RIB	107	128	50	79
AgReliant/LG	LG2602	112	106	101	5
Monsanto/Channel	216-36DGVT2PRIB	116	151	77	74
Dupont/Pioneer	P1751AM	117	151	133	18

Also note, this was an adjustment to silking date.
We do not yet know the affects of delayed planting on reaching blacklayer









Moving Forward

- Continue searching for funding opportunities to collect more data
- Field trials will not provide us **the** answer we need
- A given combination isn't always going to be the right answer
- The real question we want to answer is what hybrid x maturity combination minimizes risk and maximizes profits over the long-term
- Crop modeling is how we will get to that answer

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Knowledge for Life

On-Farm Hybrid Characterization

Developing data for VRS implementation

Lucas A. Haag Ph.D.

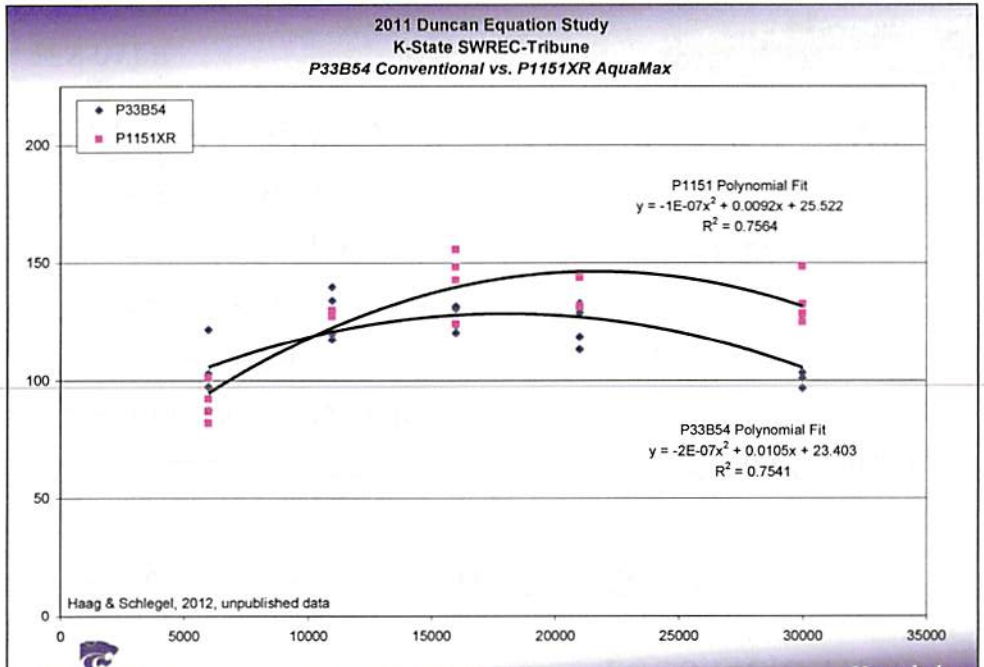
Assistant Professor / Northwest Area Agronomist
K-State Northwest Research-Extension Center, Colby, Kansas

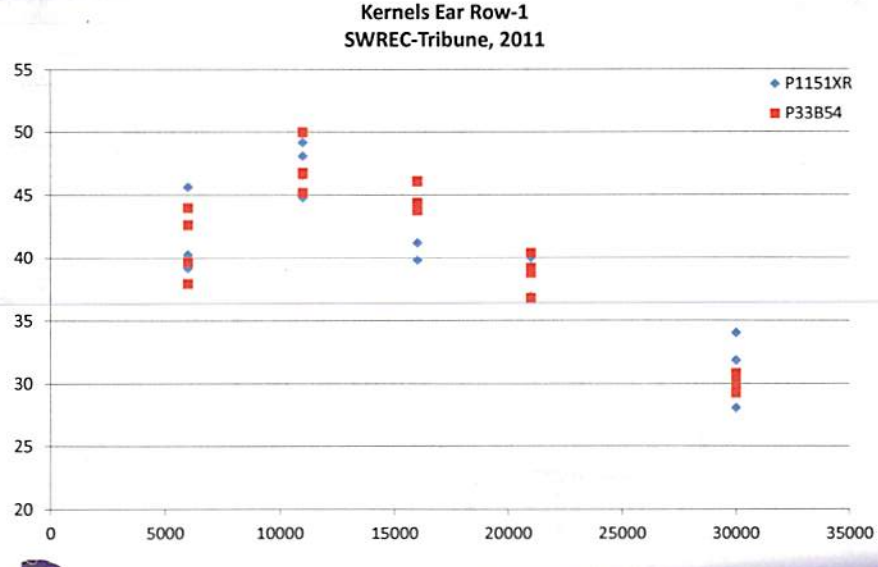
K-STATE Research and Extension

Knowledge for Life

Hybrids and VRS

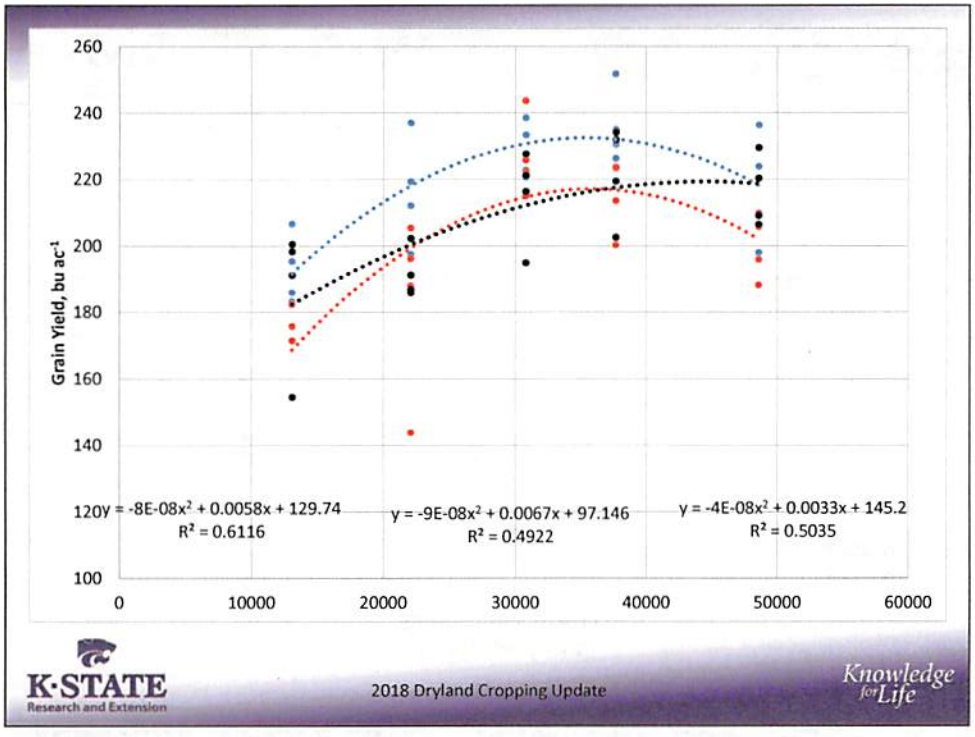
- Hybrid characterization is the key to effective VRS strategies
- Our ability to create VRT seeding prescriptions has exceeded our ability to characterize hybrids
  - Rapid hybrid turnover has further complicated this
- Yield components flex differently, at different rates, for different hybrids
- Fewer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





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.



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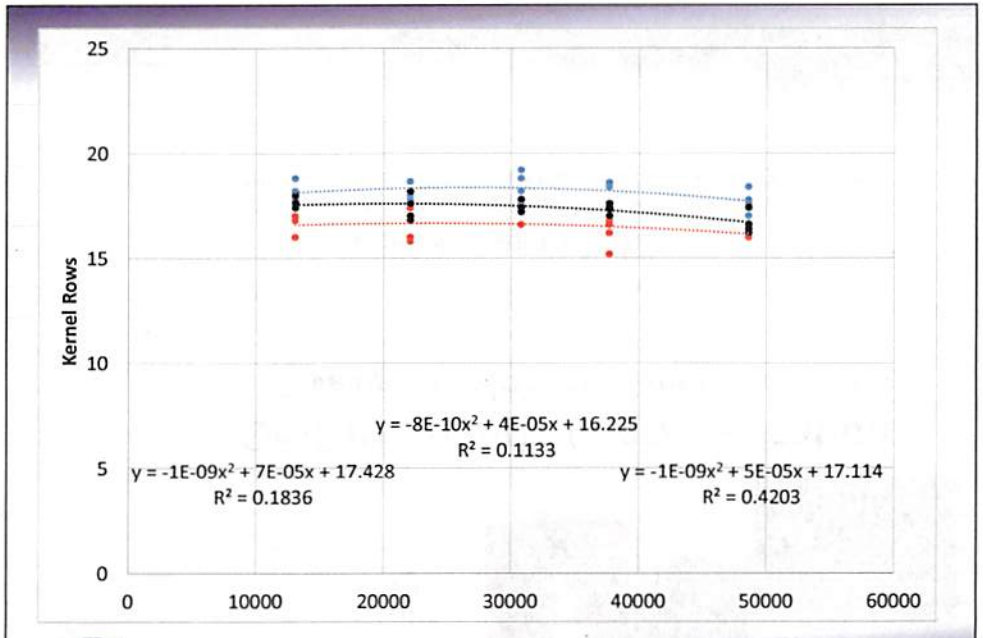

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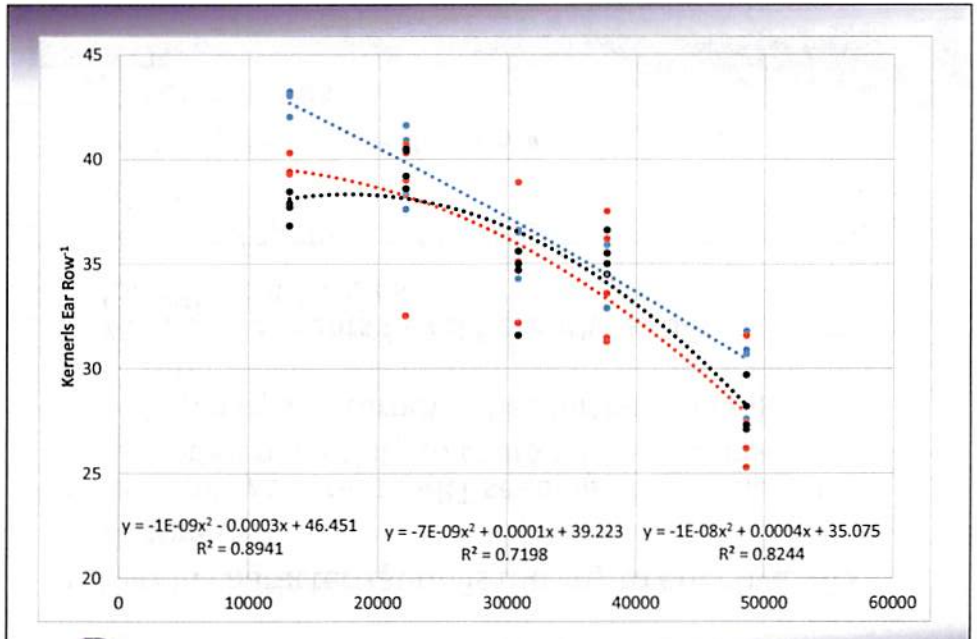

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2016-2018 Field Trials

- 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.

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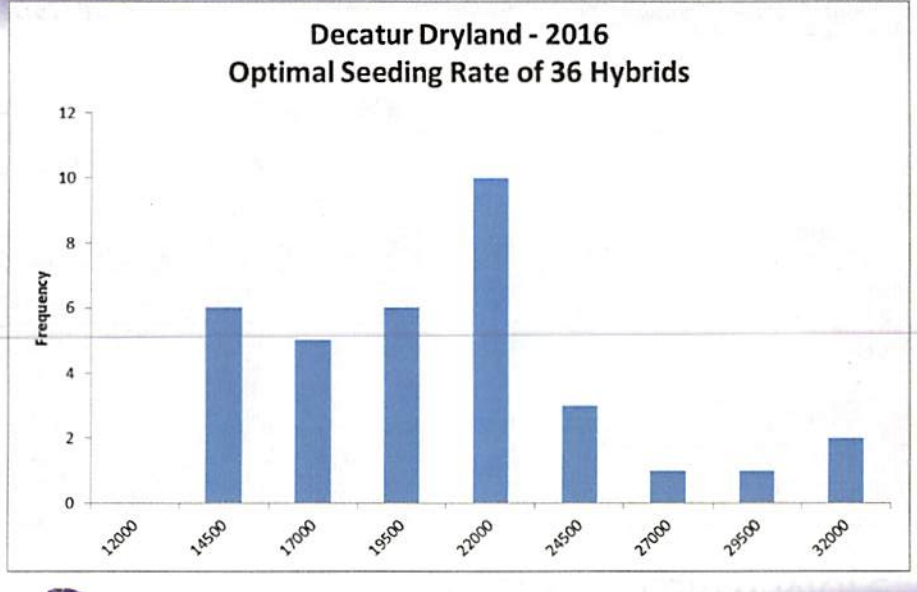

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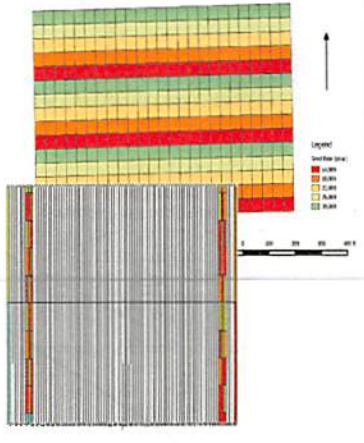
On-Farm Seeding Rate Trials

- 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?



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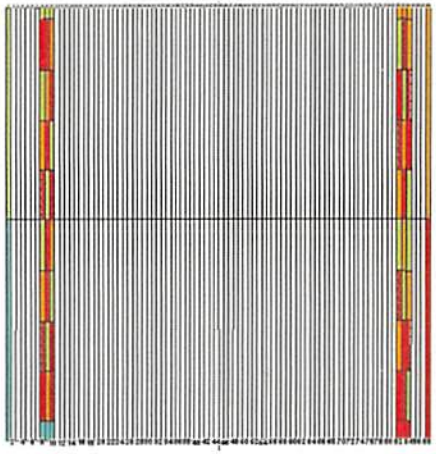
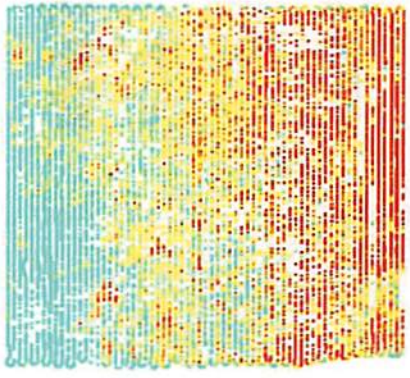
Using Field Variability to Guide Plot Placement….. Learn More





0-3' Soil EC

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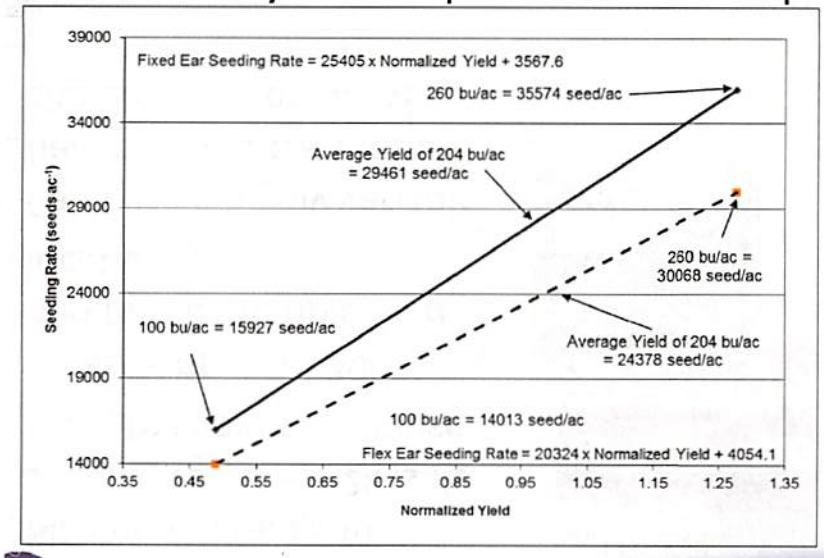
Hybrid Response to VRS Scripts



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2018 Dryland Cropping Update

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Questions / Comments?

northwest.ksu.edu/agronomy

lhaag@ksu.edu 785.462.6281

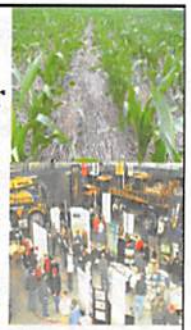
Twitter @LucasAHaag or www.facebook.com/NWKSAgronomy

2018 Dryland Cropping Update

Cover Your Acres

Winter Conference

January 15 & 16
Gateway Convention Center
Oberlin, KS



Over 10 locally relevant, research-backed sessions

- **Getting peak performance from paraquat**
- **New research in dryland corn hybrids and seeding rate decisions**
- **Spray adjuvants – Which ones, when, and why**
- **Avoiding the biggest mistakes in wheat production**
- **Reclaiming eroded high pH soils with manure**
- **Land values and rental rates – Where are we going?**

….and much more!

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Discount Registration of $45 before Jan. 9th
Full schedule and online registration at:
www.northwest.ksu.edu/CoverYourAcres

Dryland Cropping Systems Research in Western Kansas

Alan Schlegel
Southwest Research-Extension Center – Tribune, Kansas

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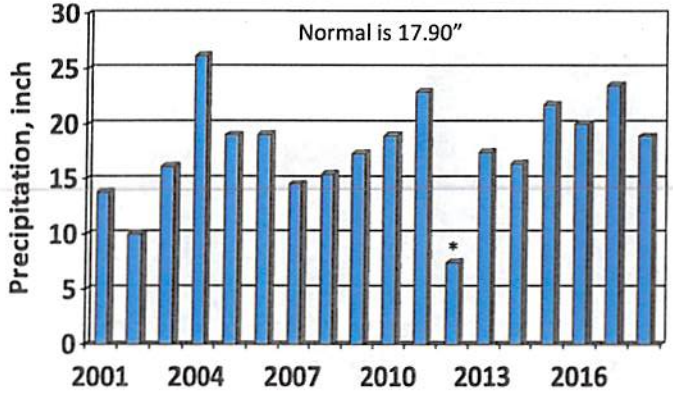
Site characteristics

- Richfield silt loam soil
- Level (<1% slope)
- Annual precipitation - 18 inches

Annual Precipitation, Tribune, KS



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* 7.49" lowest on record

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Current Rotations

- Wheat-Fallow (WF), reduced tillage.
- Wheat-Sorghum-Fallow (WSF).
- Wheat-Sorghum-Corn-Fallow (WSCF).
- Wheat-Corn-Fallow (WCF).
- Wheat-Corn-Sorghum-Fallow (WCSF).
- Continuous Sorghum (SS).

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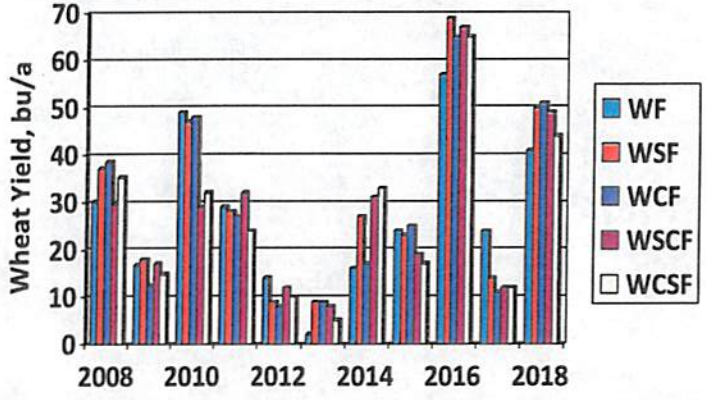
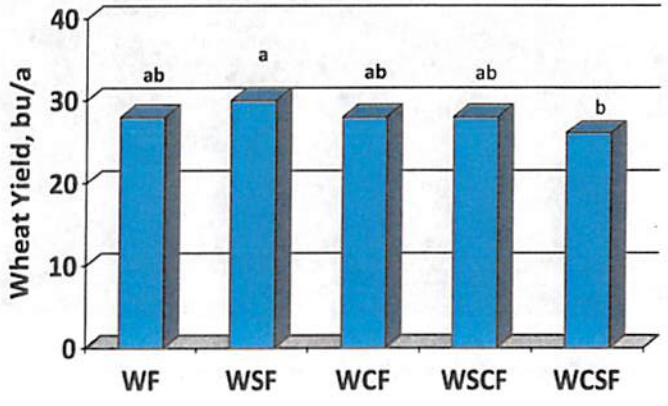
Wheat Yields from Cropping Systems



TAM 113 winterkilled in 2015, wheat streak mosaic in 2017

Average Wheat Yields, 2008-2018



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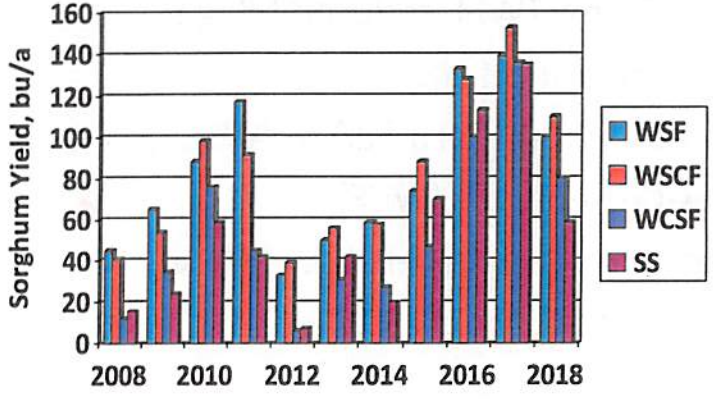
Sorghum Yields from Cropping Systems



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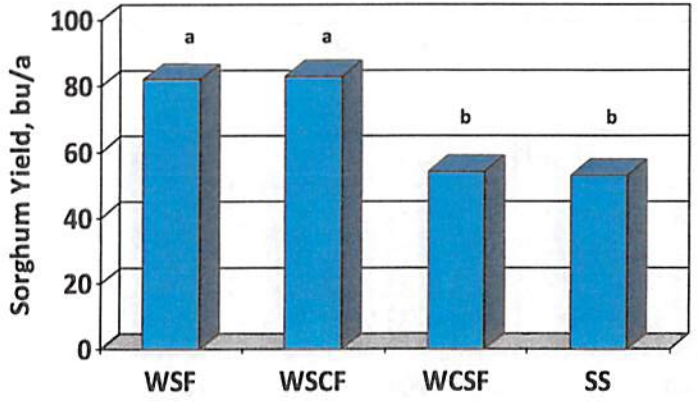
Average Sorghum Yields, 2008-2018



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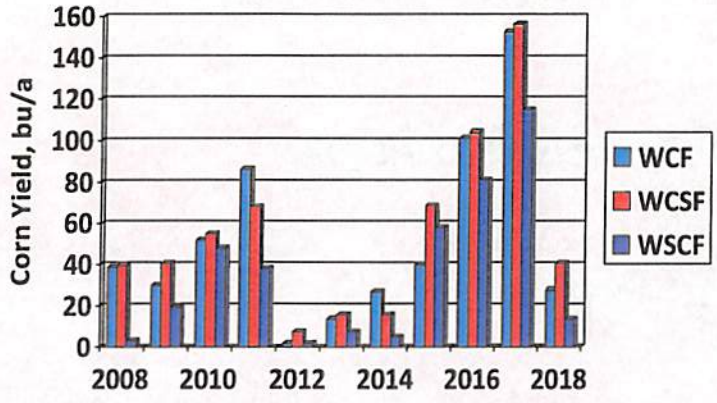
Corn Yields from Cropping Systems



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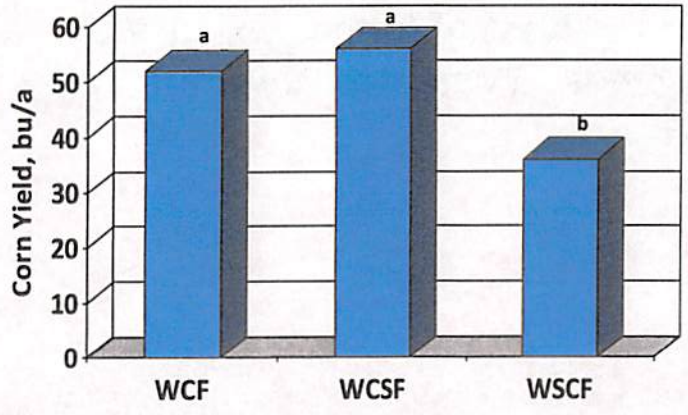
Average Corn Yields, 2008-2018



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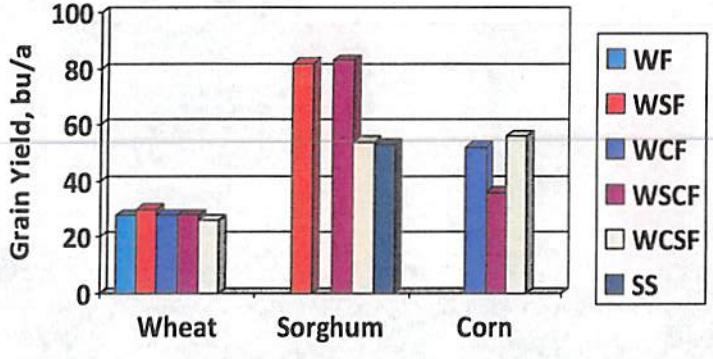
Grain Yields from Cropping Systems 2008-2018



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Summary

- Wheat yields similar in 2-, 3-, and 4-yr rotations.
- Corn and sorghum yields about 50% greater following wheat than row crop.
- Sorghum yields about 40% greater than corn yields in similar rotations.
- No rotation better than WSF.

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Objectives

Determine effect of long-term tillage practices in a wheat-sorghum-fallow rotation

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WSF rotation

- Conventional tillage
- Reduced tillage
- No-till

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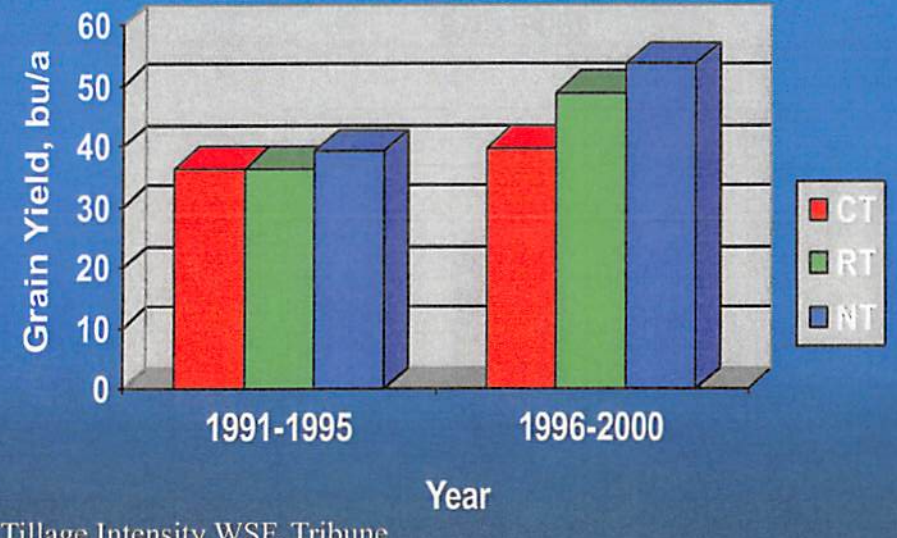
Weed control during fallow

	Tillage	Chemical
	---- # of operations ----	
CT	4-5	0
RT	2-3	2
NT	0	4

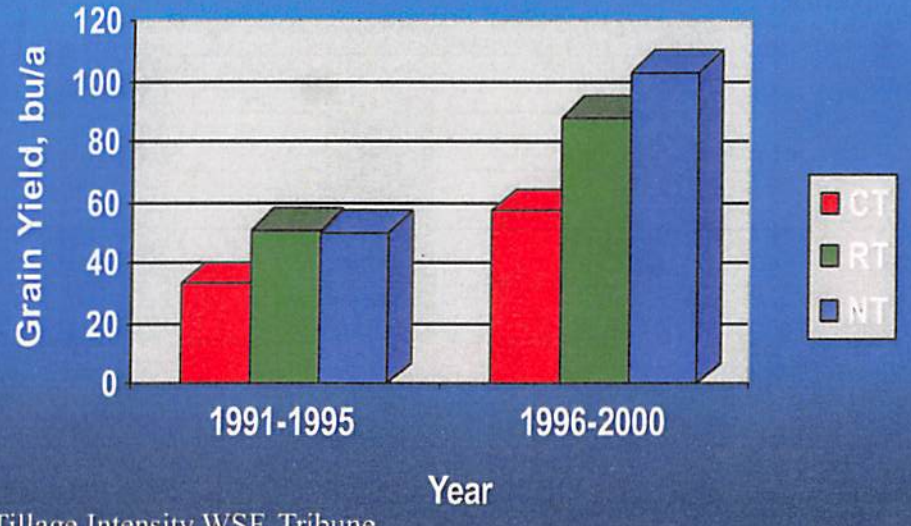
1991-2000

Average Wheat Yield



Tillage Intensity WSF, Tribune

Average Sorghum Yield



Tillage Intensity WSF, Tribune

Weed control during fallow

	Tillage	Chemical
	---- # of operations ----	
CT	4-5	0
RT	4-5 (W)	4 (S)
NT	0	4

2001 thru current

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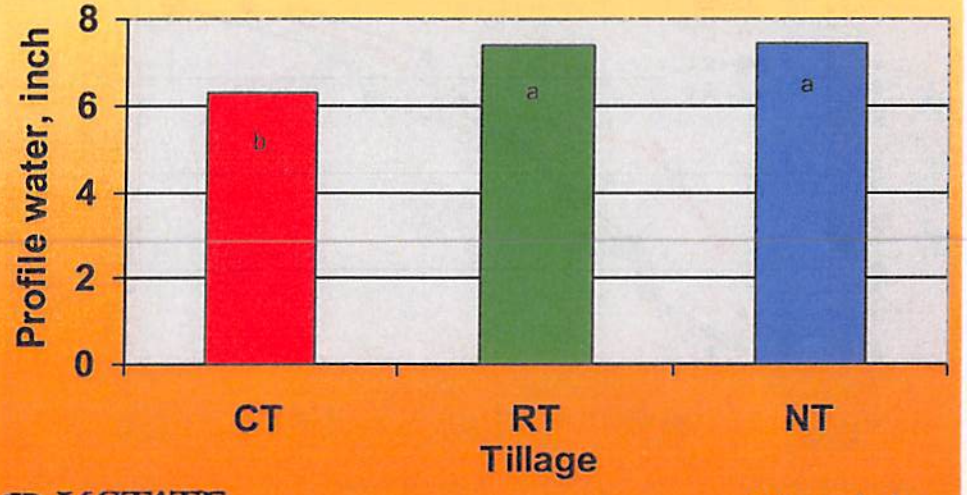
Soil Water at Wheat Planting

WSF, Tribune, 2001-2018



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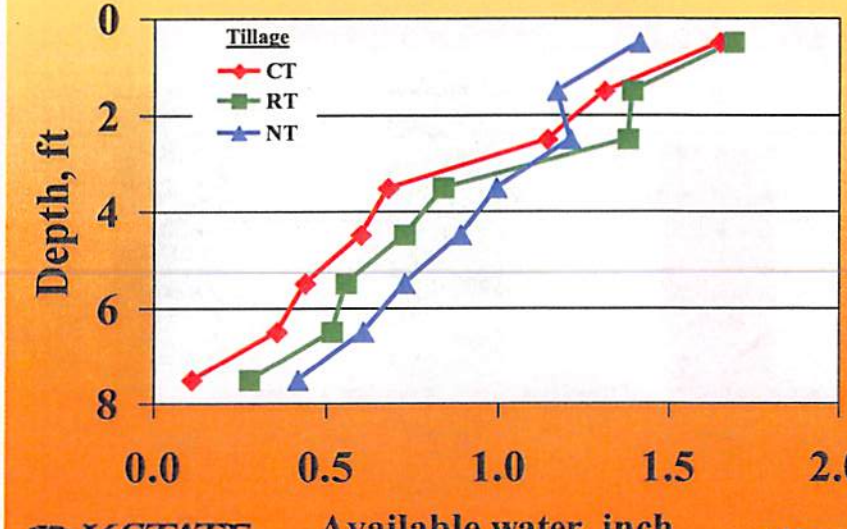
Wheat Planting



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Tillage Intensity, Tribune, KS 2001-2018

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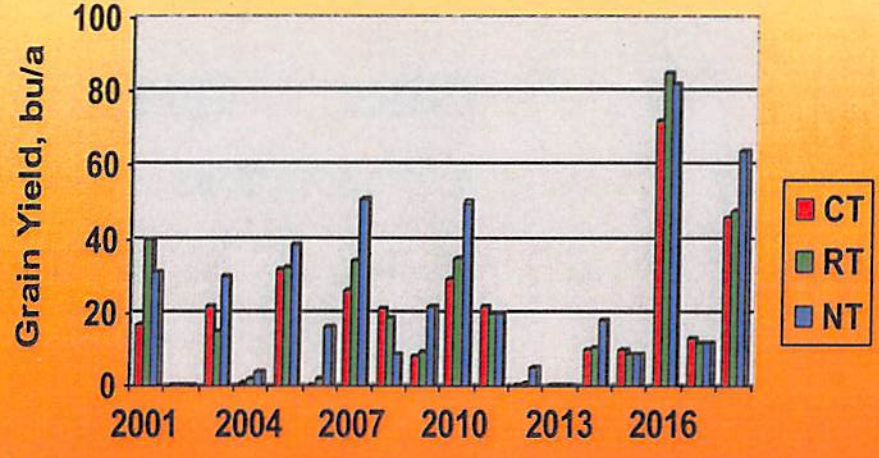
Wheat Yields

WSF, Tribune



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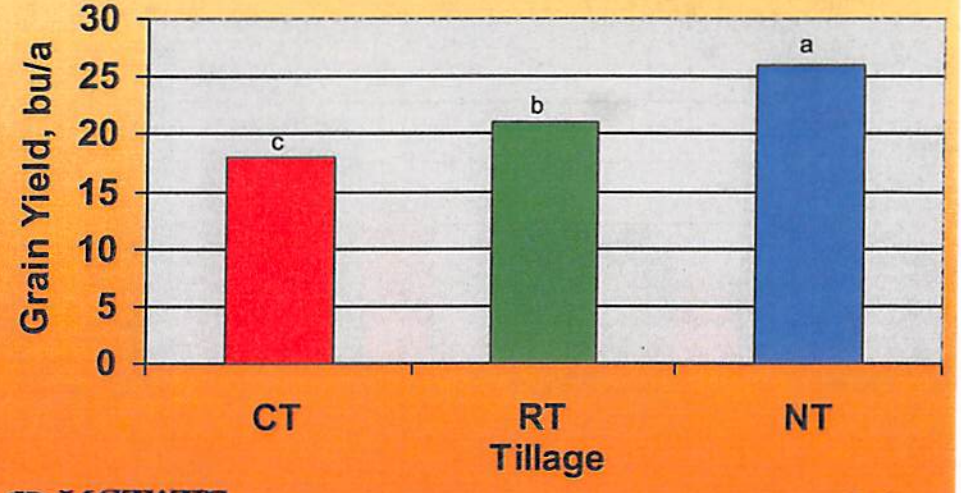
Average Wheat Yields

WSF, Tribune, 2001-2018



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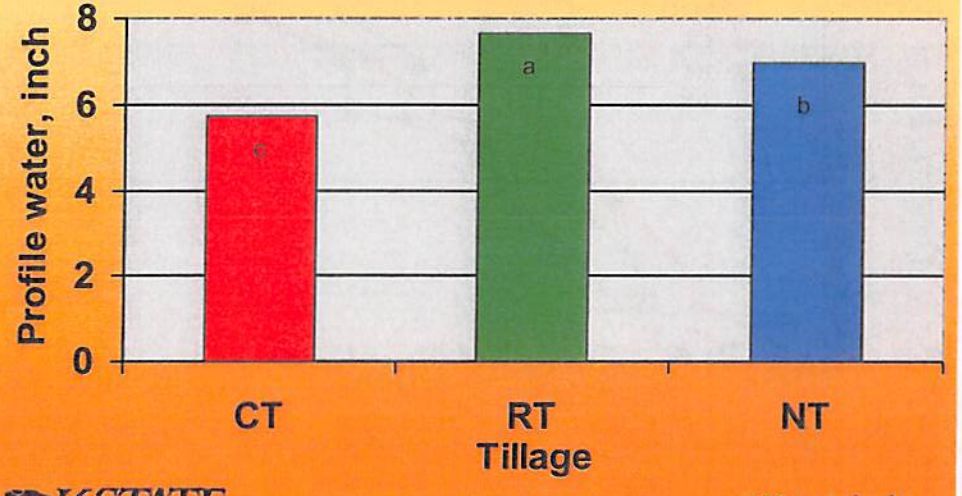
Soil Water at Sorghum Planting

WSF, Tribune, 2001-2018



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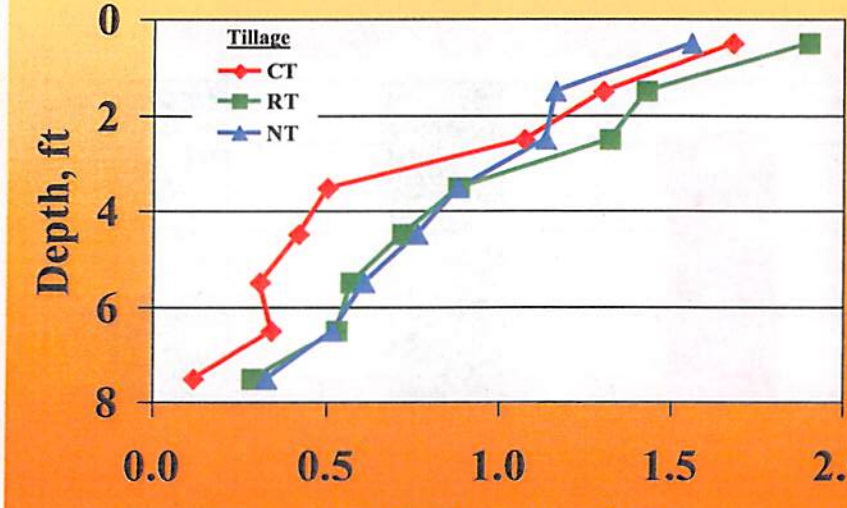
Sorghum Planting



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Tillage Intensity.
Tribune, KS 2001-2018

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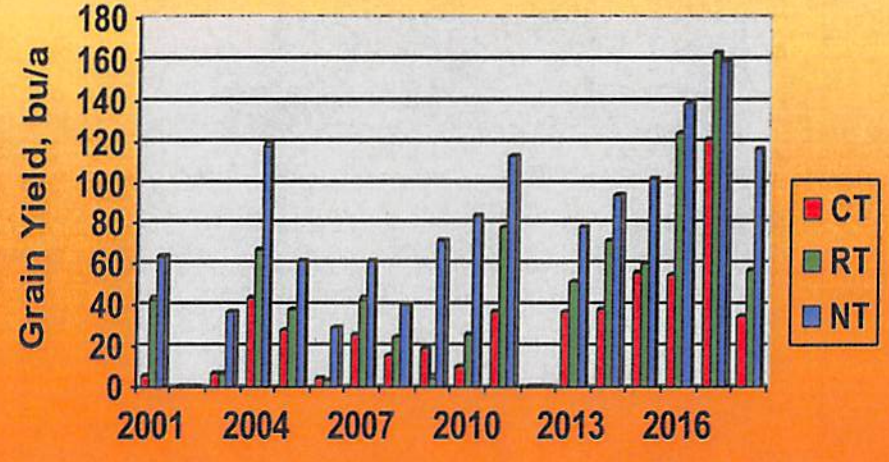
Sorghum Yields

WSF, Tribune



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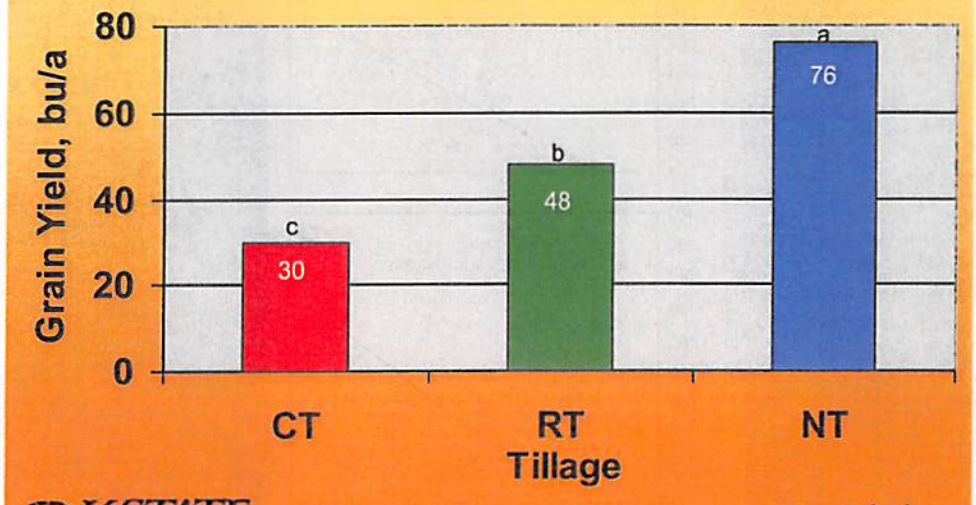
Average Sorghum Yields

WSF, Tribune, 2001-2018



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Summary

(2001-2017)

Grain yield:

wheat: NT ~35% greater than CT
~20% greater than RT

sorghum: NT ~2.5X greater than CT
~60% greater than RT

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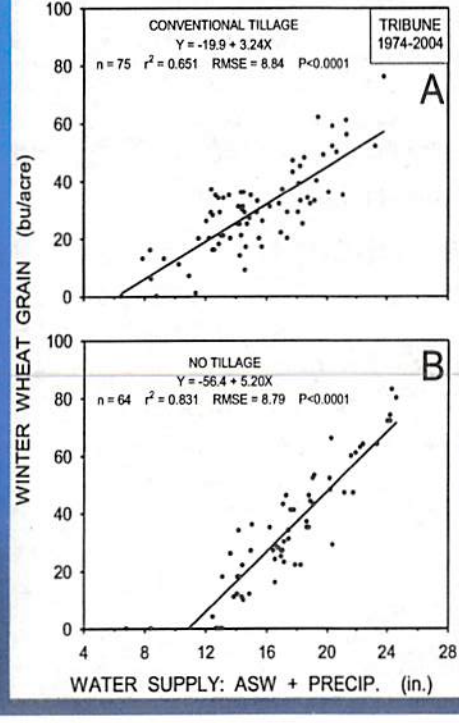

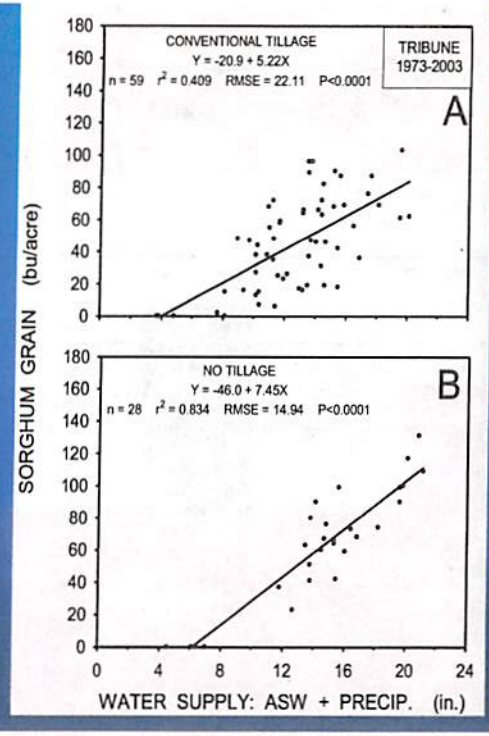

Occasional tillage in a WSF rotation

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Materials and Methods

- One tillage (sweep plow) every 3-yr
  - -May/June in fallow or
  - -July after wheat harvest
- Continuous no-till

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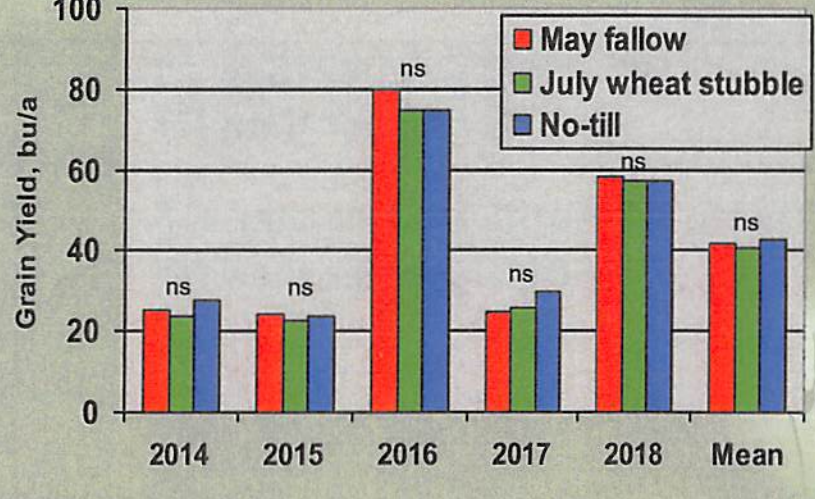
Wheat Yields - Tribune



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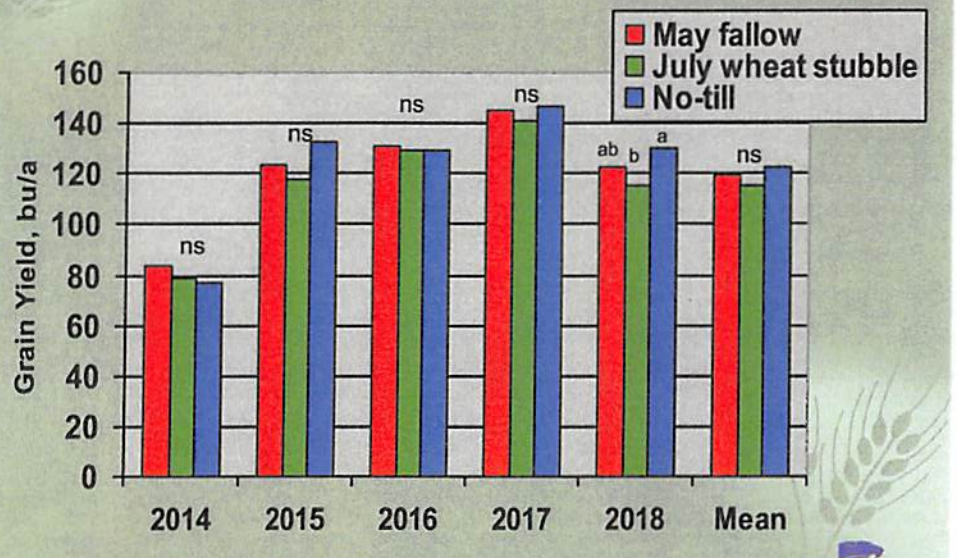
Sorghum Yields - Tribune



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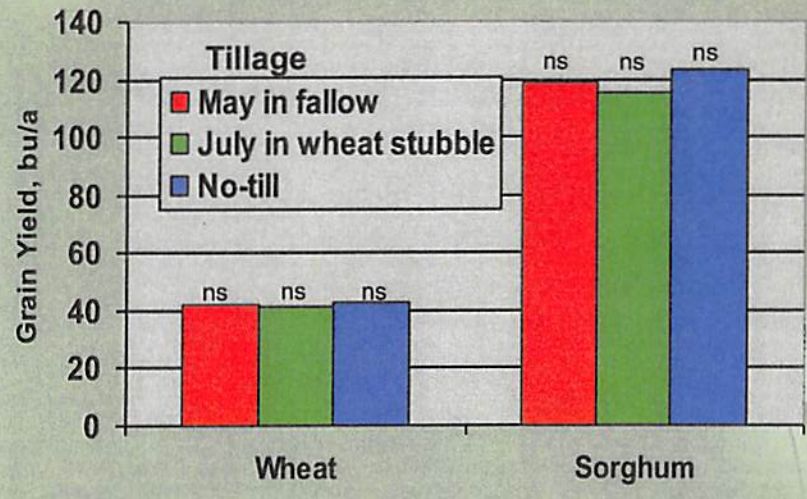
Occasional Tillage, Tribune,5-yr average



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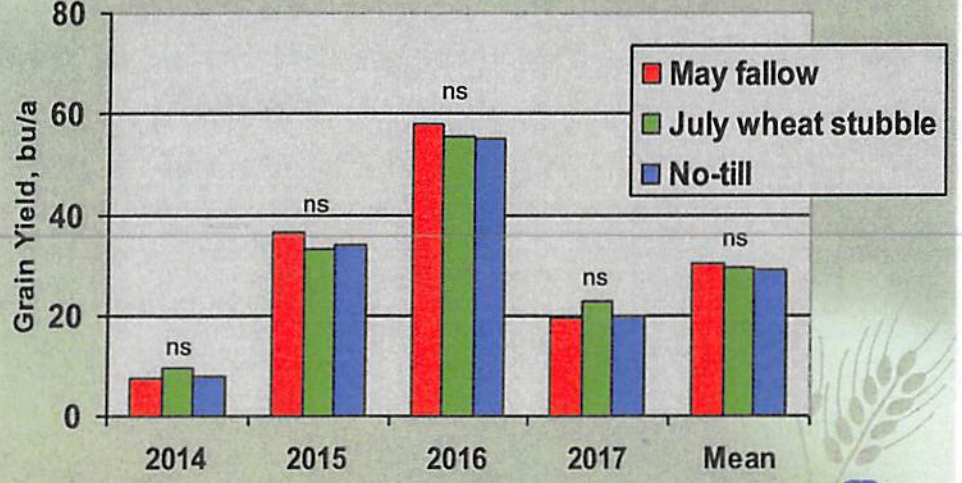
Wheat Yields - Garden City



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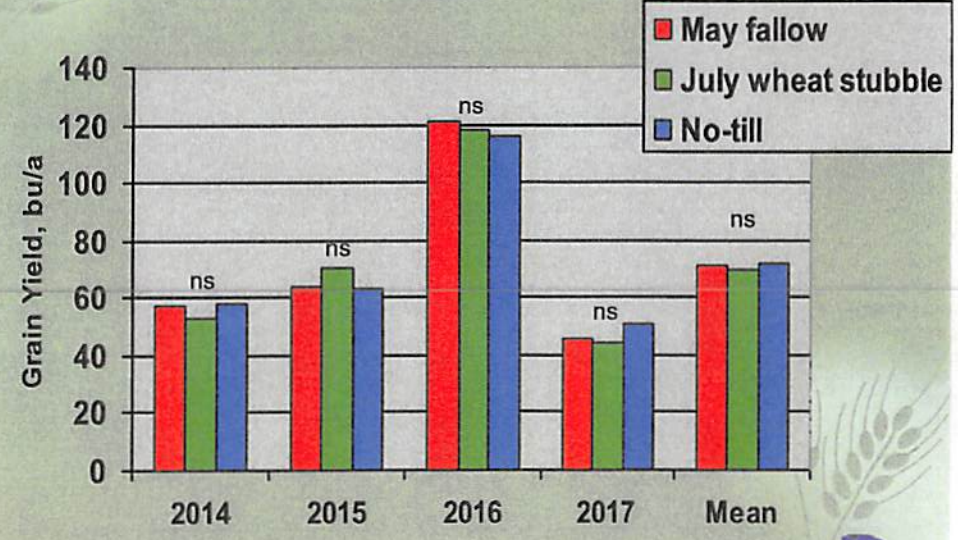
Sorghum Yields - Garden City



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Conclusions

- A single tillage (sweep plow) every 3-yr seems to have little effect on grain yield in a wheat-sorghum-fallow rotation.

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Wheat Stubble Height on Subsequent Crops

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Materials and Methods

- No-till production practices for all crops
- Wheat-Corn-Fallow (WCF) and Wheat-Sorghum-Fallow (WSF) rotations

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Materials and Methods

- Three wheat harvest treatments (2007-2018)
  - Stripped ~ 24 inches (range 17-36")
  - Optimal (High) height ~16 inches (range 11-24")
  - Short cut ~ 8 inches (range 5.5-12")

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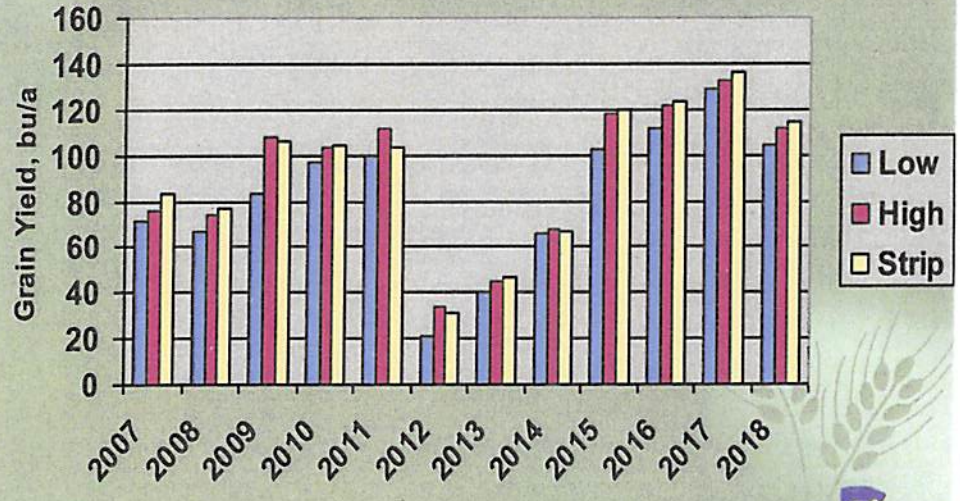
Wheat Stubble Height
Corn



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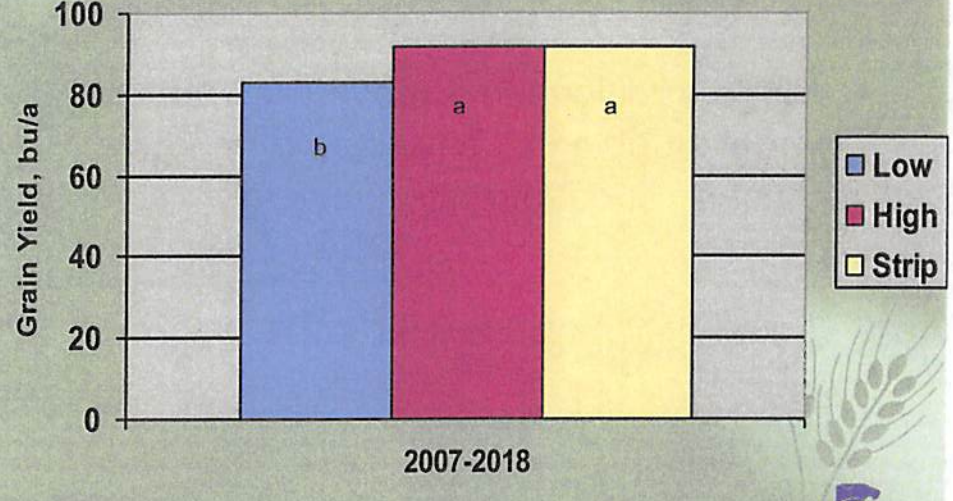
Wheat Stubble Height
Corn



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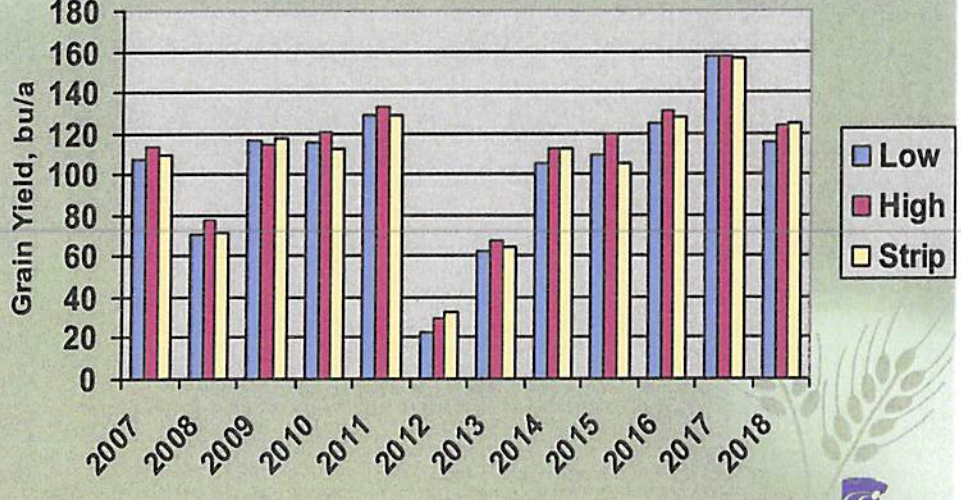
Wheat Stubble Height
Grain Sorghum



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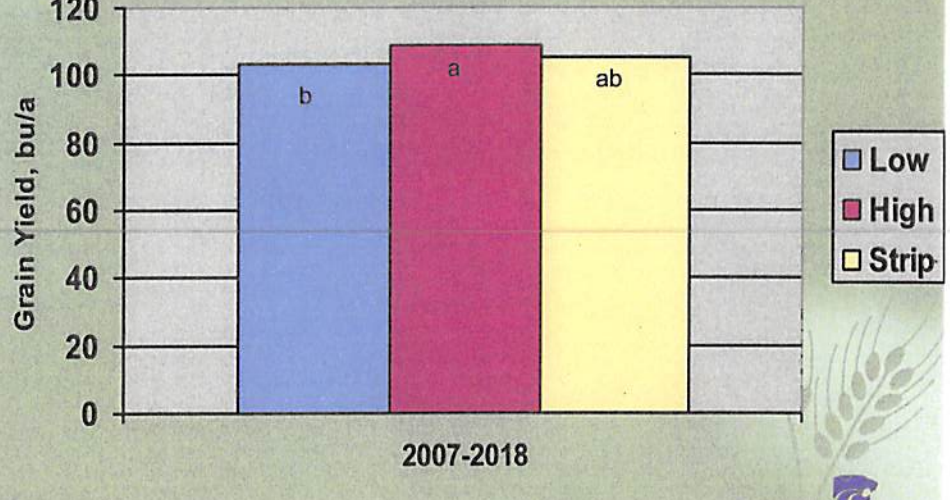
Wheat Stubble Height
Grain Sorghum



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Conclusions

- With a traditional grain platform, cutting wheat stubble low can have a negative effect on subsequent crop yields.

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