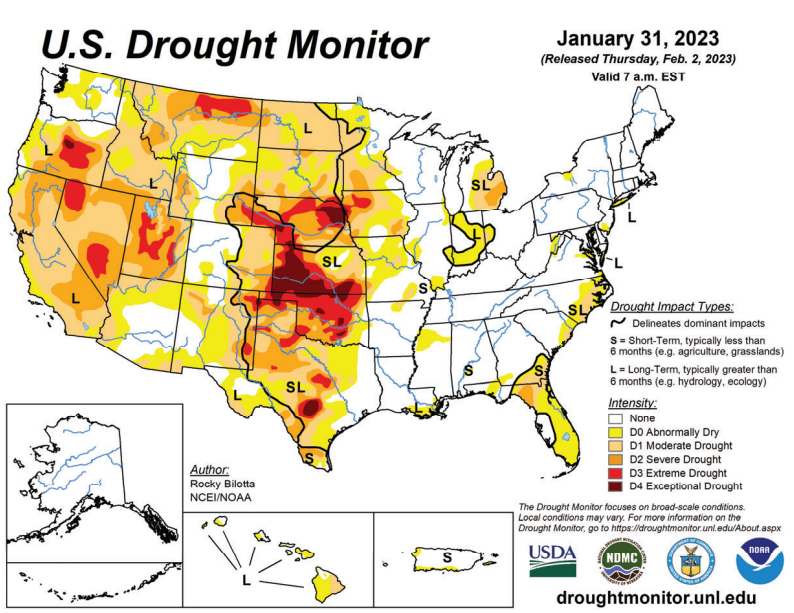
Forage Options through the Drought

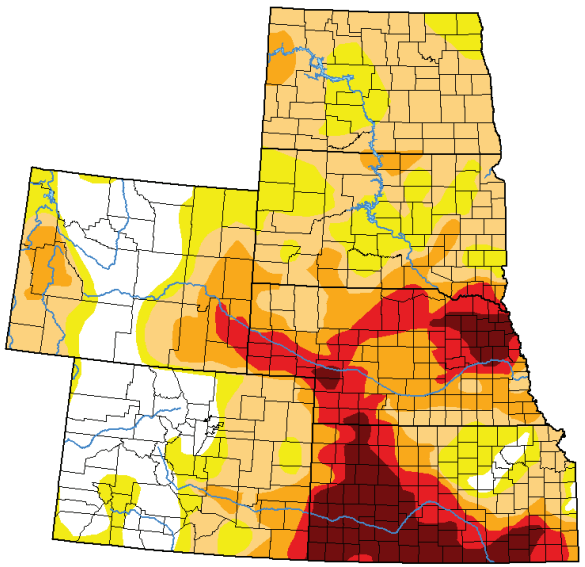
John Holman, Augustine Obour, Yared Assefa,
Nick Detter, Payton Mauler, Sandy Johnson

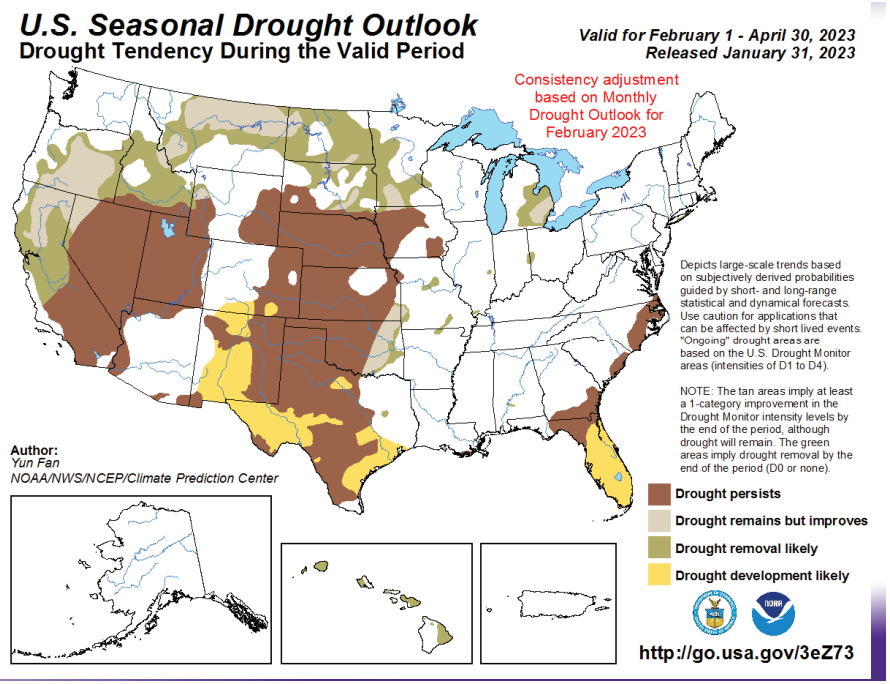
K-State Crop Talk, Webinar Series
Feb 7, 2023

K-STATE Research and Extension

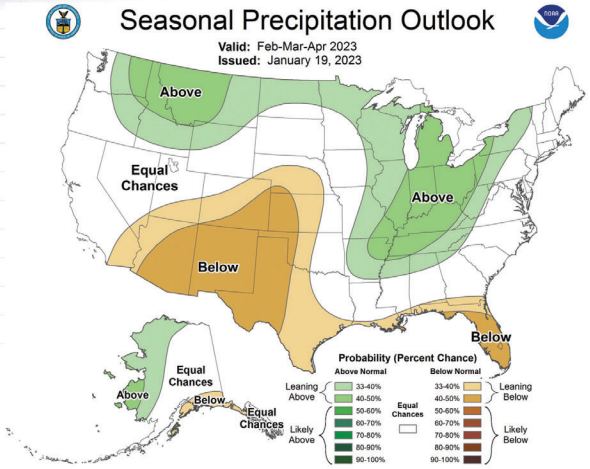
Knowledge for Life



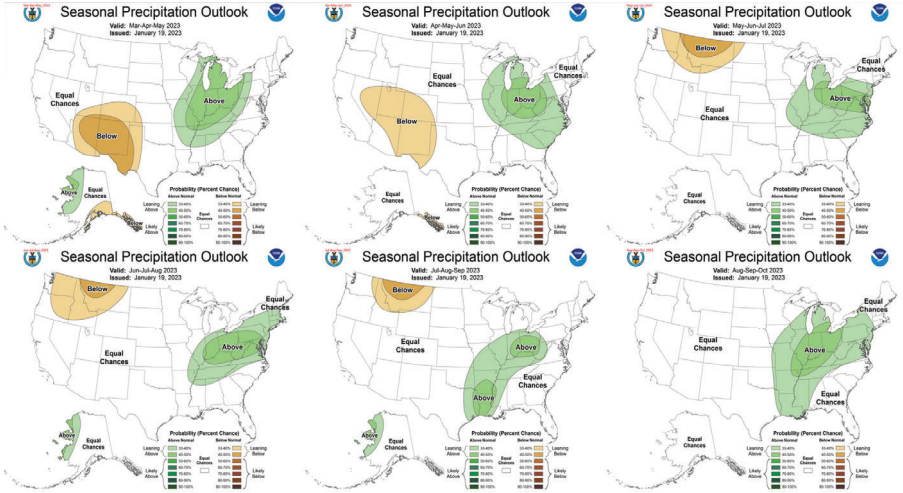




3 Month Outlook

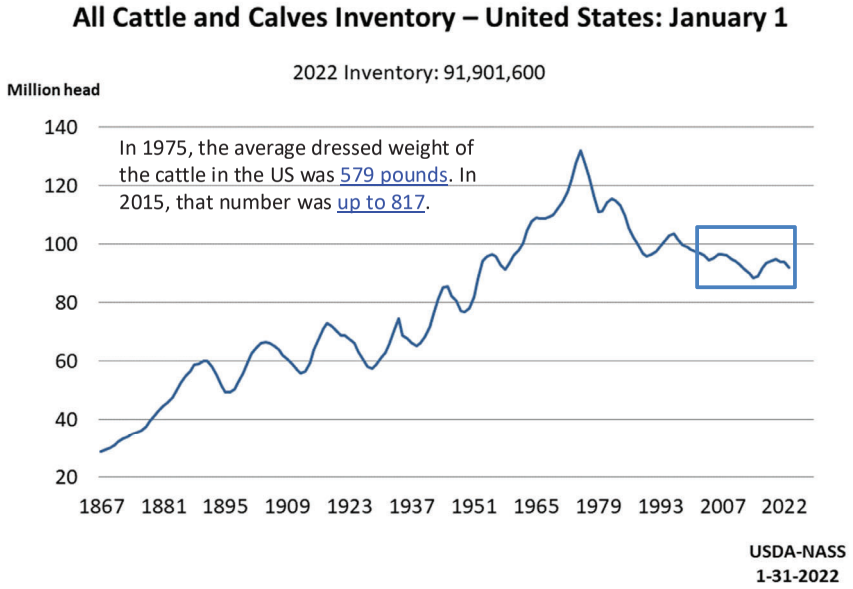


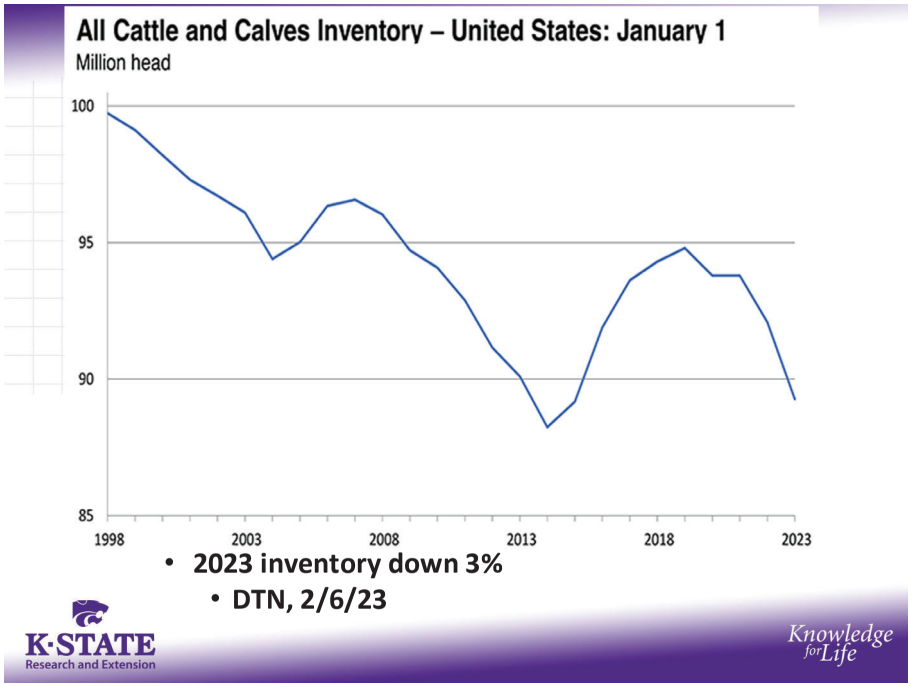
- **Precipitation needed for crop establishment**
  - **Outlook isn't good**



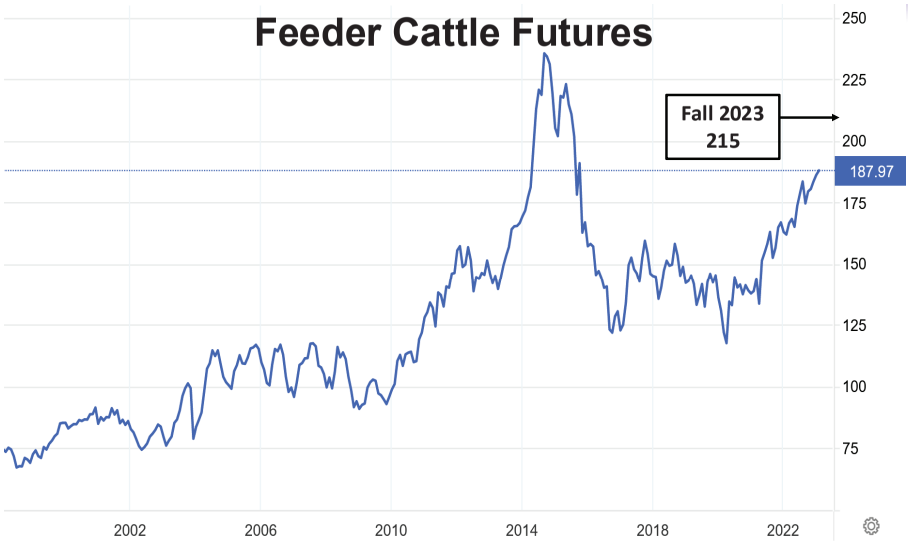
- **Outlook bleak for spring moisture**
- **Conditions hopefully improve for summer moisture**

- My outlook of the cattle market:
  - Optimistic (higher profit potential)
  - Neutral (no change in profit potential)
  - Pessimistic (less profit potential)





- **2023 inventory down 3%**
  - **DTN, 2/6/23**



- **Market bullish due to tight supplies**
  - **Inflation, economy, and imports**

- My feed supply will last:
  - What feed supply I am out
  - Until planting spring forages
  - Until planting summer forages
  - Until weaning 2023 calf crop
  - Until 2024

Determine Forage Inventory and Need

- Hay Inventory Calculator
  - https://www.agmanager.info/hay-inventory-calculator
- Test all feed and develop feed rations
- Evaluate livestock inventory (cull, early wean, etc.)
- Minimize feed loss and waste
- Flexibility & adjust to conditions

Knowledge for Life

Managing Rangeland through Drought

- Avoid overgrazing
- Healthy range will recover quicker
- Utilize smaller sacrificial pasture or field to supplemental feed
- Delay grazing to allow plant recovery
- Expect lower forage production following drought
- Monitor weed growth

Forage Options in High Plains

Item	J	F	M	A	M	J	J	A	S	O	N	D
Native pasture												
Crop Residue												
Winter Annuals												
Spring Annuals												
Summer Annuals												

- Spring to Fall:
  - Failed wheat and wheat residue
  - Spring triticale and spring oat
    - Midwest Cover Crop Tool: http://mccc.msu.edu/covercroptool/covercroptool.php
  - Summer annual forages- best potential for 2023
  - CRP- graze every other year, hay every 3rd year

K-STATE Research and Extension

Knowledge for Life

Wheat and Triticale Grazing

- 2 acres per 500 lbs fall
- 1 acre per 500 lbs spring
- Target 2 lbs/day gain
- Remove cattle prior to insurance date or first hollow stem

Small Grain Forage Production

- Growth dependent on temperature (temp) and moisture
  - Growing degree base temp triticale and rye (38◦F) < than wheat (40◦F)
    - A growing degree day = the average daily temperature
    - Triticale and rye grow more than wheat in fall/winter
  - 2 to 3 lbs of forage dry matter per acre for each growing degree-day
- Average daily temp for Nov in southern Kansas is 40◦F, with 56◦F average high and 27◦F average low temp
- March average is 42◦F
- Nov & Mar limited growth, Dec-Feb little to no growth
- Warm periods in winter
- Fall growth produce 30 to 35 lbs of forage dry matter per day/acre Sep-Oct
- This assumes unlimited soil nutrients and moisture

K-STATE Research and Extension

Knowledge for Life

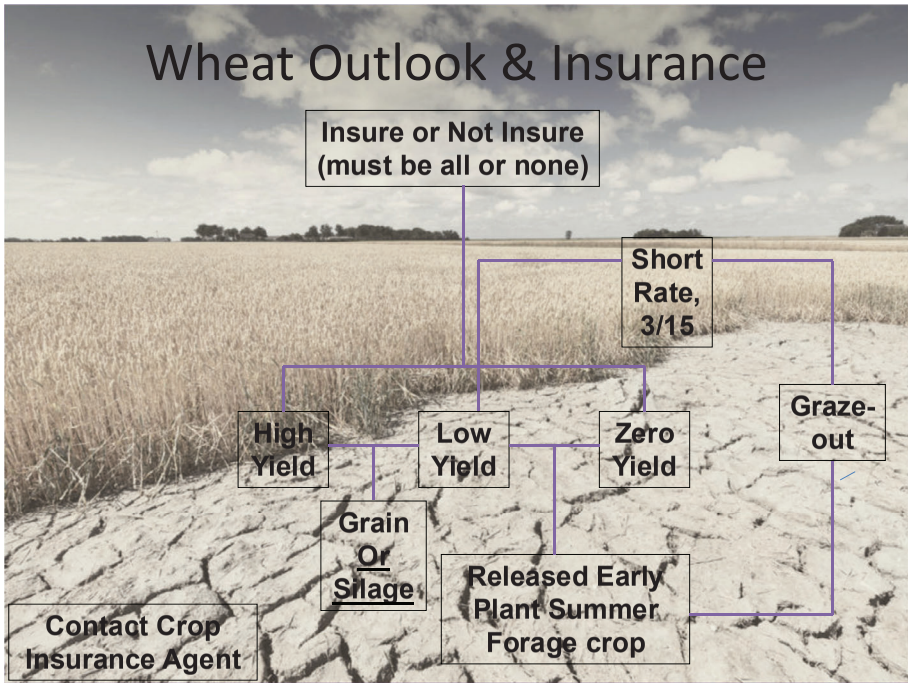
Small Grain Forage Production

- Small grains need to be 4-6" tall prior to grazing
  - Need sufficient growth for regrowth and animal performance
  - Too much growth removed early will limit production
- Approximately 200 pounds of forage dry matter per inch in height
  - 800 to 1200 pounds of forage dry matter per acre (4-6")
  - Yearlings gain 2lbs/d when stocked at 2 acres per steer through fall/winter
  - Gain 1.5 to 3 lbs/day depending on stocking rate and forage biomass
  - Excellent for growing heifers, but possibly reduced conception
- Manage pasture for later winter and early spring
  - Set appropriate stocking rate
  - Stockpile growth before turn out
  - Rotate if multiple fields

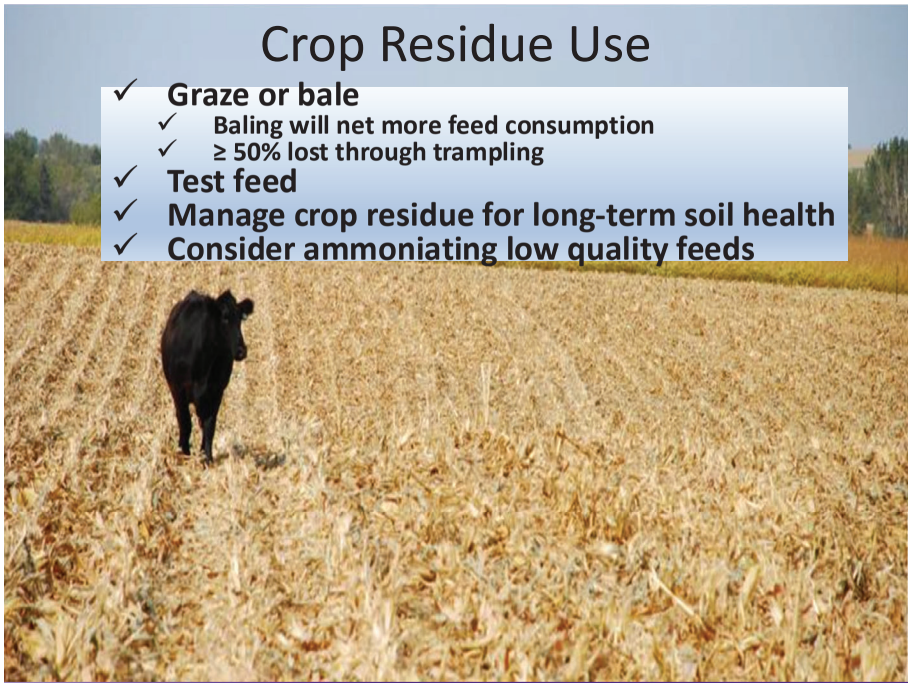
K-STATE Research and Extension

Knowledge for Life

Wheat Outlook & Insurance



Crop Residue Use



- ✓ Graze or bale
  - ✓ Baling will net more feed consumption
  - ✓ ≥ 50% lost through trampling
- ✓ Test feed
- ✓ Manage crop residue for long-term soil health
- ✓ Consider ammoniating low quality feeds

Managing Stubble Height

Corn stalks with standing strips

All taken 2/24/15

Forage sorghum cut 6” tall in 2014, no regrowth

Grain sorghum residue from 2013

Residue Reduces Soil Erosion

- Be careful to leave enough residue when haying or grazing
  - Very easy to take too much
  - Important for soil erosion and precipitation storage

K-STATE Research and Extension

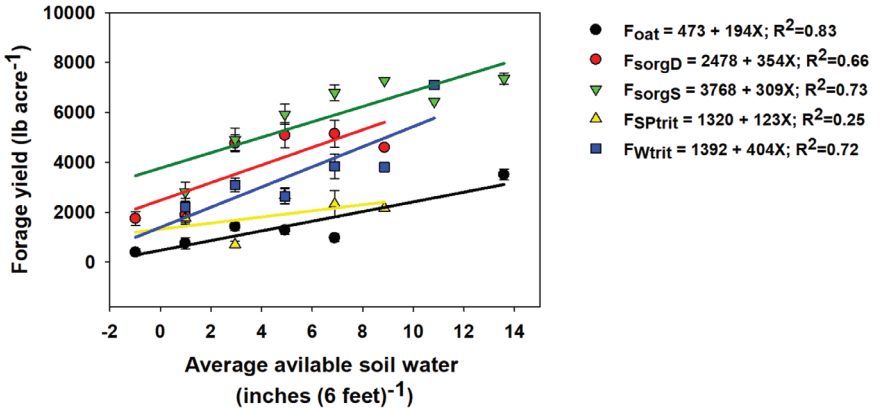
Knowledge for Life

Forages: Environment and N fertilizer

K-STATE Research and Extension

Knowledge for Life

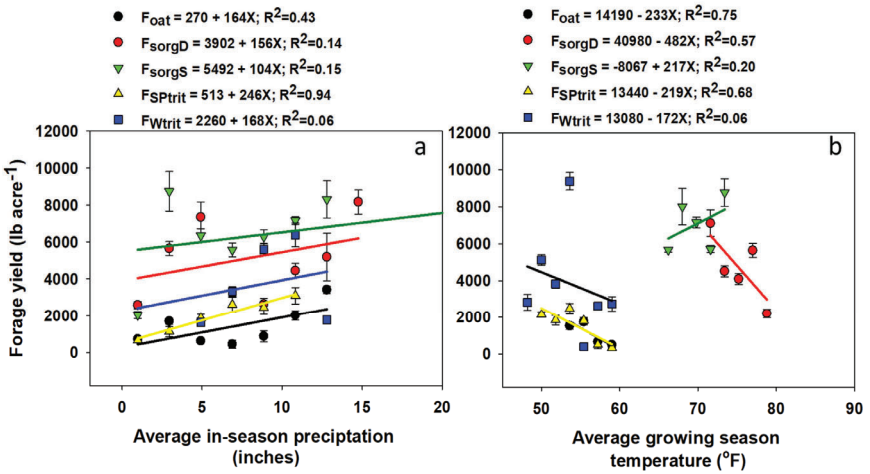
Forage Biomass 2006-2022, 17 years



K-STATE Research and Extension

Knowledge for Life

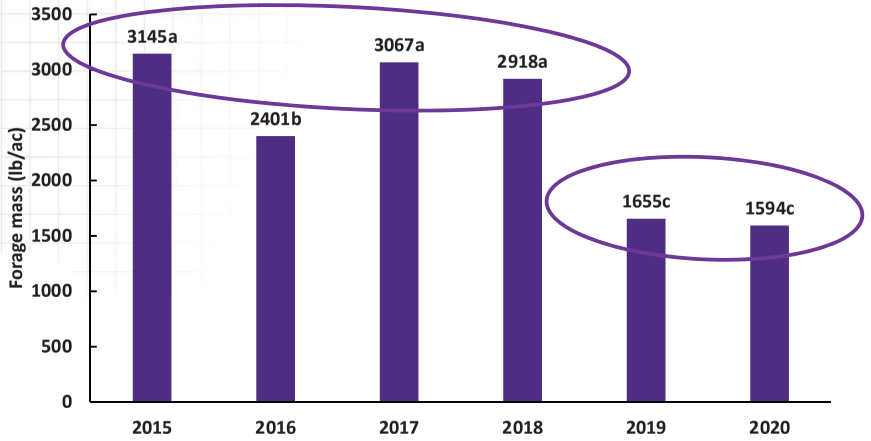
Forage Biomass 2006-2022, 17 years



K·STATE Research and Extension

Knowledge for Life

High variability in CC forage mass across years at HB Ranch



- **Forage yield > 2,400 lbs to cover expense**

K·STATE Research and Extension

Knowledge for Life

N rate effects on Triticale DM and Crude Protein

N rate	Forage dry matter	Crude protein
lb/a	lb/a	%
0	3721 d	12.8 b
10	4021 c	13.1 b
30	4269 b	14.0 a
50	4548 a	13.6 ab
70	4686 a	14.0 a

K·STATE Research and Extension

Knowledge for Life

N rate effects on Oat DM and Crude Protein

N rate	Forage dry matter	Crude protein
lb/a	lb/a	%
0	2891 c	11.7 d
10	3246 b	12.0 d
30	3906 a	12.5 c
50	4018 a	13.2 b
70	4085 a	13.8 a

K·STATE Research and Extension

Knowledge for Life

N rate effects on Triticale fiber concentration

N rate	ADF	NDF	IVDMD
lb/a		%	
0	37.7 a	63.5 a	72.0 b
10	37.6 a	63.6 a	72.1 b
30	36.8 b	62.5 b	73.3 a
50	37.1 ab	63.1 ab	72.5 b
70	37.0 ab	62.4 b	73.3 a

K-STATE Research and Extension

Knowledge for Life

Oat EONR based on hay and fertilizer price

Urea N price ($/ton)	Forage Value ($ ton^{-1} dry matter)							
	50	60	70	80	90	100	110	120
	EONR (lb N/ac)							
500	54	58	60	62	64	65	66	67
550	52	56	59	61	63	64	65	66
600	50	54	57	60	61	63	64	65
650	47	52	56	58	60	62	63	64
700	45	50	54	57	59	61	62	63
750	43	49	53	55	58	60	61	62
800	41	47	51	54	57	59	60	61
850	39	45	49	53	55	57	59	61

Holman et al., 2019

K-STATE Research and Extension

Knowledge for Life

N rate effects on Forage Sorghum yield

N rate	Western Kansas	Randolph, KS
	Forage DM (lb/a)	
0	3854 c	4235 c
25	4623 b	4790 c
50	5025 ab	5777 b
75	5366 a	6349 ab
100	5357 a	6643 a
125	5485 a	-----

Holman et al., 2019

K-STATE Research and Extension

Knowledge for Life

Forage Sorghum EONR based on hay and fertilizer price

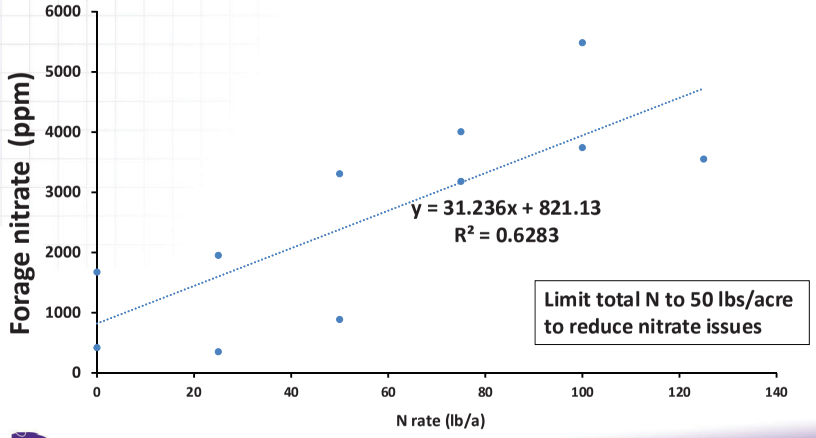
Urea N price ($/ton)	Forage Value ($ ton^{-1} dry matter)							
	50	60	70	80	90	100	110	120
	EONR (lb N/ac)							
500	39	46	52	56	59	61	63	65
550	35	43	48	53	56	59	61	63
600	30	39	45	50	54	57	59	61
650	26	35	42	47	51	54	57	59
700	21	32	39	45	49	52	55	57
750	17	28	36	42	46	50	53	56
800	12	24	33	39	44	48	51	54
850	8	21	30	36	41	46	49	52

Holman et al., 2019

K-STATE Research and Extension

Knowledge for Life

N rate and forage nitrate concentration

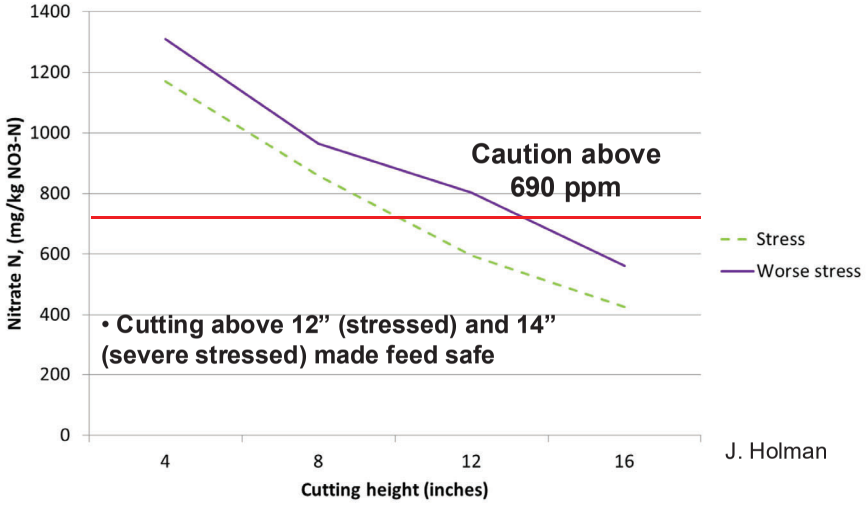


Holman et al., 2019

N application and Nitrate toxicity

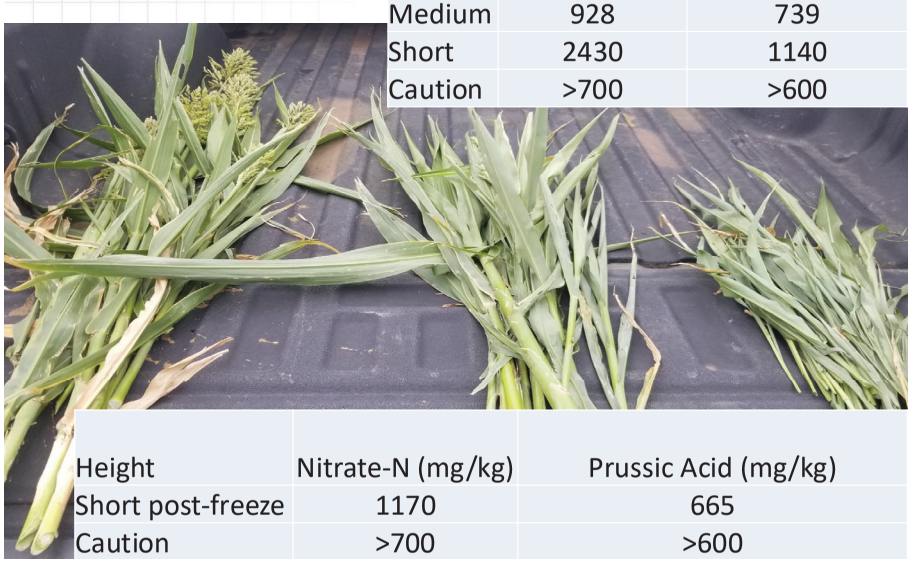
- Nitrate toxicity is an issue with oats, forage sorghum and other forages
- Factors that contribute to nitrate accumulation
  - ✓ Soils with high residual nitrogen from fertilizer or manure
  - ✓ Nutrient imbalances
  - ✓ Environmental stress that limit growth (drought, cloudy conditions, frost)

Forage Sorghum Cutting Height



Field Variability

Height	Nitrate-N (mg/kg)	Prussic Acid (mg/kg)
Tall	983	335
Medium	928	739
Short	2430	1140
Caution	>700	>600



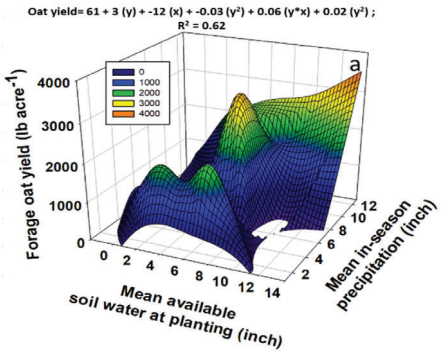
Height	Nitrate-N (mg/kg)	Prussic Acid (mg/kg)
Short post-freeze	1170	665
Caution	>700	>600

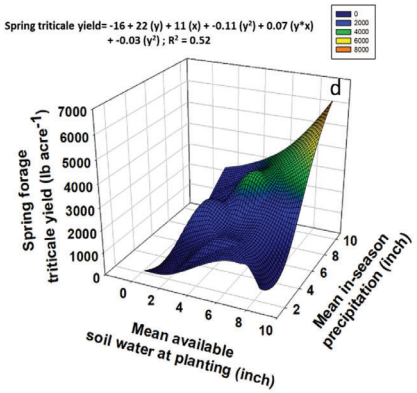
- I purchase rainfall insurance for:
  - Rangeland
  - Annual Forages
  - Both Rangeland and Annual Forages
  - I do not purchase rainfall insurance

K-STATE Research and Extension

Knowledge for Life

Spring Oat & Triticale

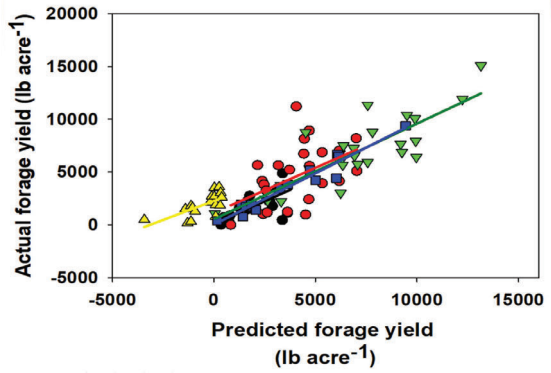




K-STATE Research and Extension

Correlation between yield and monthly temperature & precipitation

Forage	R and P	Jan	Feb	Mar	Apr	May	Jun
		Precipitation					
Spring Oat	R	-0.07	**0.38**	0.06	-0.03	**0.59**	**-0.23**
	P	0.2542	**<.0001**	0.3207	0.6201	**<.0001**	**0.0003**
Spring Triticale	R	0.07	0.11	**0.25**	0.00	0.13	**-0.53**
	P	0.5861	0.3592	**0.0378**	0.9944	0.2693	**<.0001**
		Temperature					
Spring Oat	R	**-0.30**	**-0.12**	**-0.13**	**0.51**	**-0.51**	**-0.23**
	P	**<.0001**	**0.0541**	**0.0385**	**<.0001**	**<.0001**	**0.0003**
Spring Triticale	R	**-0.39**	**-0.37**	**-0.25**	0.12	**-0.49**	-0.02
	P	**0.0013**	**0.0014**	**0.0326**	0.3069	**<.0001**	0.8766



- Modeling forage yield with monthly precipitation and temperature

Predicted forage yield with weather variables

- **Foat** = 5569+(1242*Pfeb)+(510*Pmay)+(413*Pjun)- (208*Tjan)+(248*Tmar)-(61*Tapr) - (98*Tmay); R^2=0.58
- **FsorgD** = 27901+(305*Pjun)+(459*Pjul)- (338*Tjul); R^2=0.27
- **FsorgS** = -79349+(654*Papr)+(1893*Pmay)+(1281*Pjun)+(681*Pjul)+(1160*Paug)+(884*Psep)-(297*Poct)-(831*Tapr)- (1661*Tmay)-(308*Tjun)+(1905*Tjul)-(123*Tsep)+(152*Toct); R^2=0.66
- **FSPtrit** = 5450-(337*Pjun)- (33*Tjun); R^2=0.40
- **FWtrit** = -112872+(978*Pjul)+(2772*Psep)+(2075*Poct)-(4992*Pdec) + (1277*Pmay) + (835*Tjul) + (210*Tsep) + (758*Tjan) – (734*Tfeb) + (594*Tapr); R^2=0.82

K-STATE Research and Extension

Forage crops	Insurance selection	USDA-RMA four growing seasons (GS) and 2-month insurance periods													
		GS1			G2			G3			G4				
	Odd months	Sep-Oct		Nov-Dec		Jan-Feb		Mar-Apr		May-Jun		Jul-Aug		Sep-Oct	
	Even months		Oct-Nov		Dec-Jan		Feb-Mar		Apr-May		Jun-Jul		Aug-Sep		Oct-Nov
		r and p-value													
		Early planted triticale													
					Late planted triticale										
Winter Triticale	r	-0.06	-0.11	-0.13	-0.02	0.03	-0.11	**-0.20**	-0.02	-0.07	-	-	-	-	-
	p	0.348	0.115	0.05	0.753	0.60	0.080	**0.002**	0.777	0.3081	-	-	-	-	-
					Early planted spring forage										
								Late planted spring forage							
Spring Oat	r	-	-	-	**0.36**	0.12	**0.16**	0.00	**0.52**	**0.25**	**-0.23**	**-0.16**	**-0.57**	-	-
	p	-	-	-	**<0.01**	0.06	**0.012**	0.974	**<.0001**	**<.0001**	**0.0002**	**0.012**	**<.0001**	-	-
Spring Triticale	r	-	-	-	0.17	0.12	**0.25**	0.10	0.10	**-0.42**	**-0.65**	**-0.53**	**-0.43**	-	-
	p	-	-	-	0.72	0.33	**0.036**	0.391	0.417	**0.0003**	**<.0001**	**<.0001**	**0.0002**	-	-
Single Sorghum	r	-	-	-	-	-	-	-	-	-	**0.22**	**0.38**	-0.03	0.08	**0.33**
	p	-	-	-	-	-	-	-	-	-	**<.0001**	**<.0001**	0.629	0.124	**<.001**
Double Sorghum	r	-	-	-	-	-	-	-	-	-	**0.48**	**0.30**	-0.05	**0.19**	**0.35**
	p	-	-	-	-	-	-	-	-	-	**<.0001**	**<.0001**	0.292	**0.001**	**<0.001**

Funding and Contact Info

Contact information

Dr. John Holman

jholman@ksu.edu

620-276-8286

Ogallala Aquifer Program

NORTH CENTRAL SARE Sustainable Agriculture Research & Education

NRCS Natural Resources Conservation Service

K-STATE Research and Extension

Knowledge for Life