

# *Past Forage Studies and Economics in Western Kansas*

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- ✓ **Opportunity to Integrate Annual Forages into Traditional Grain Only Cropping Systems**
- ✓ **Reliably Increase Cropping Intensity**
- ✓ **Improve Water Use Efficiency and Soil Health**
- ✓ **Build Flexibility into Cropping System**

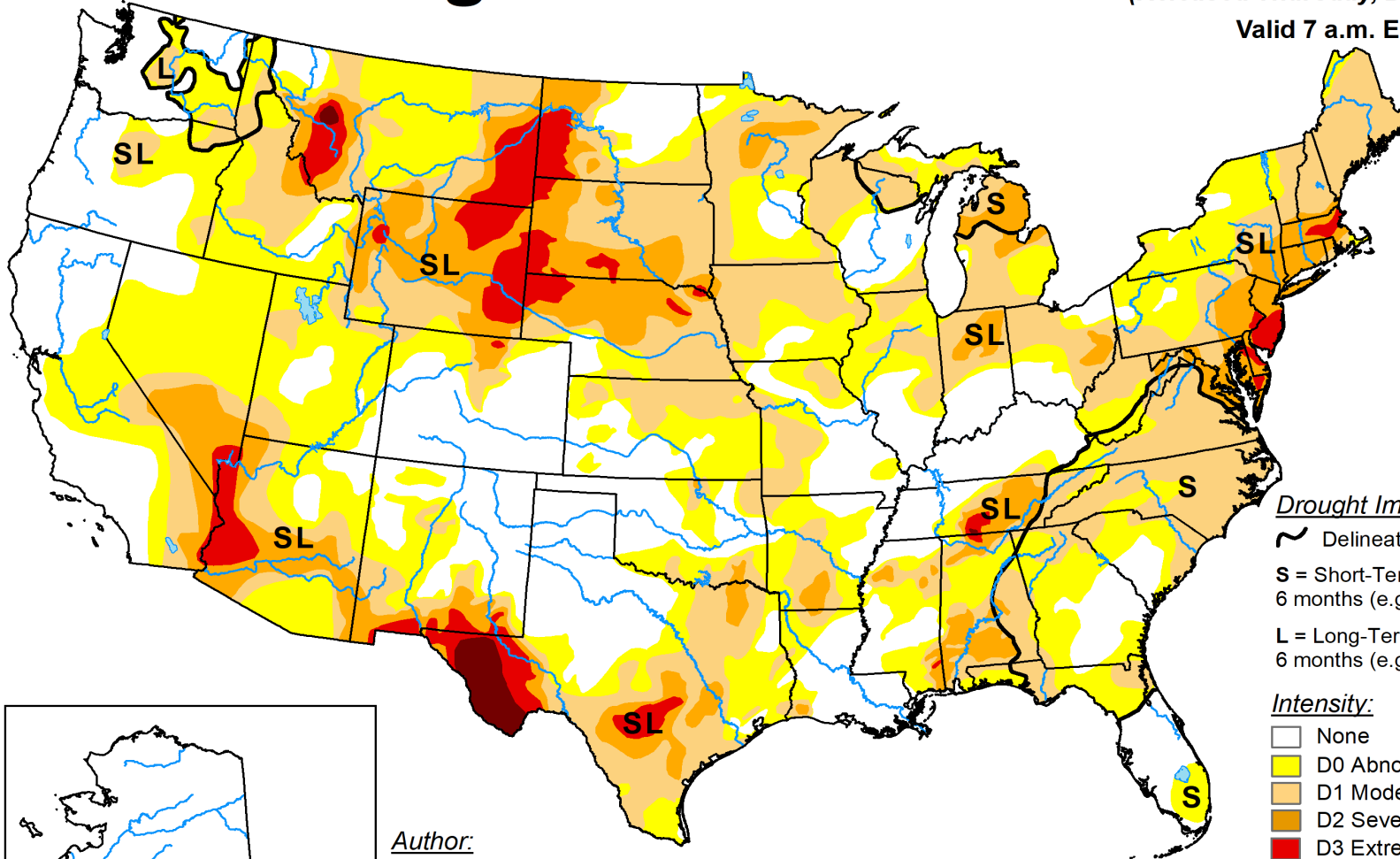


# U.S. Drought Monitor

December 3, 2024

(Released Thursday, Dec. 5, 2024)

Valid 7 a.m. EST



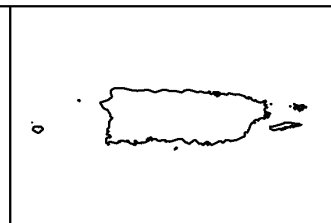
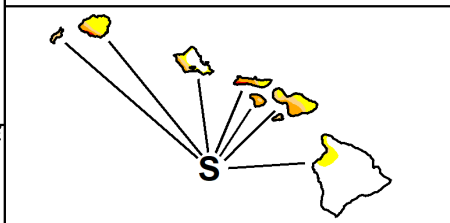
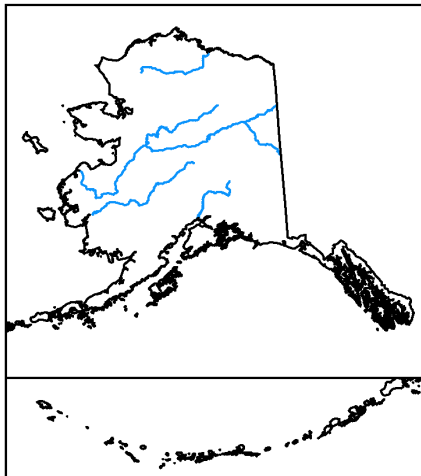
### Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

### Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Author:  
David Simeral  
Western Regional Climate Center

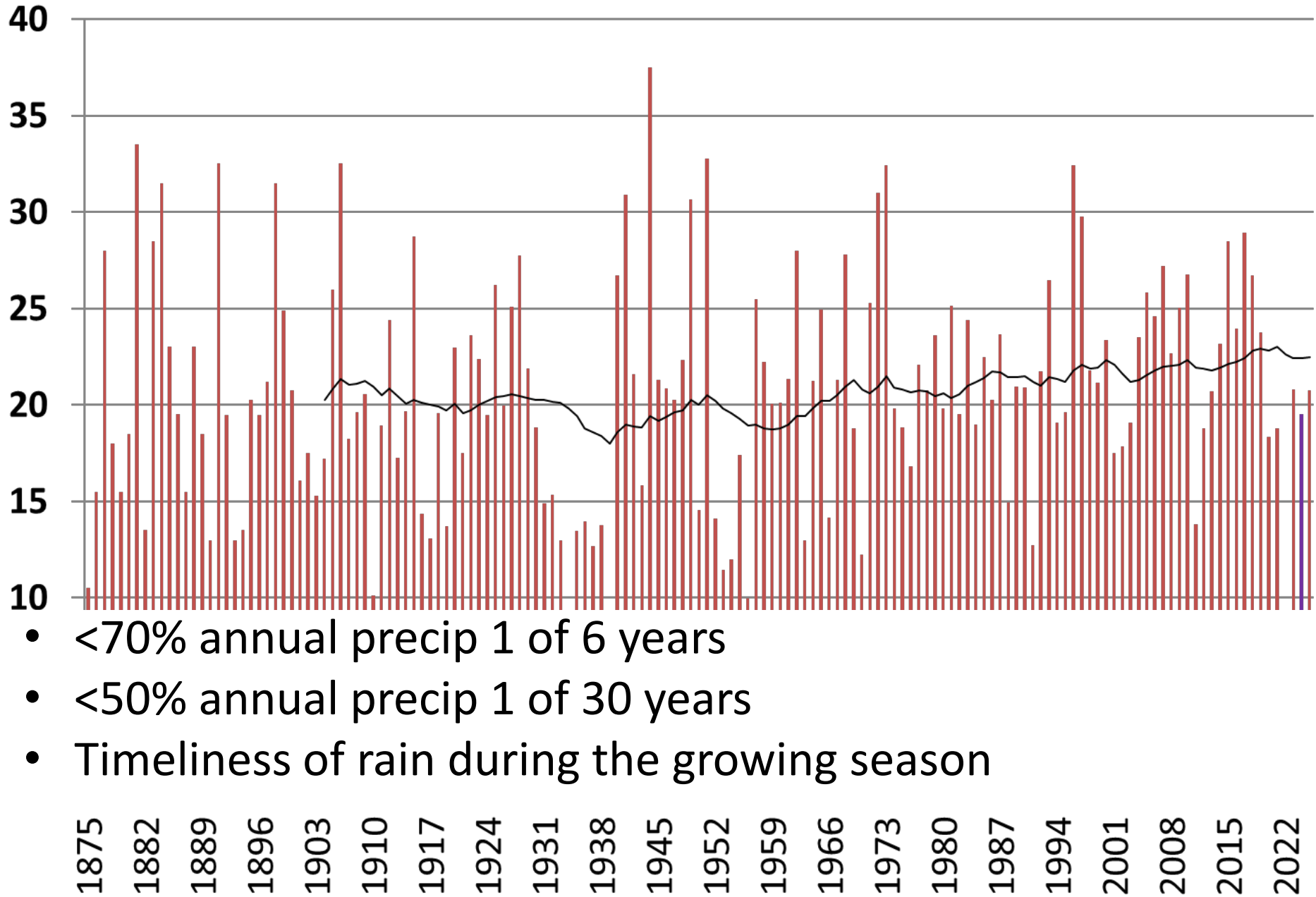


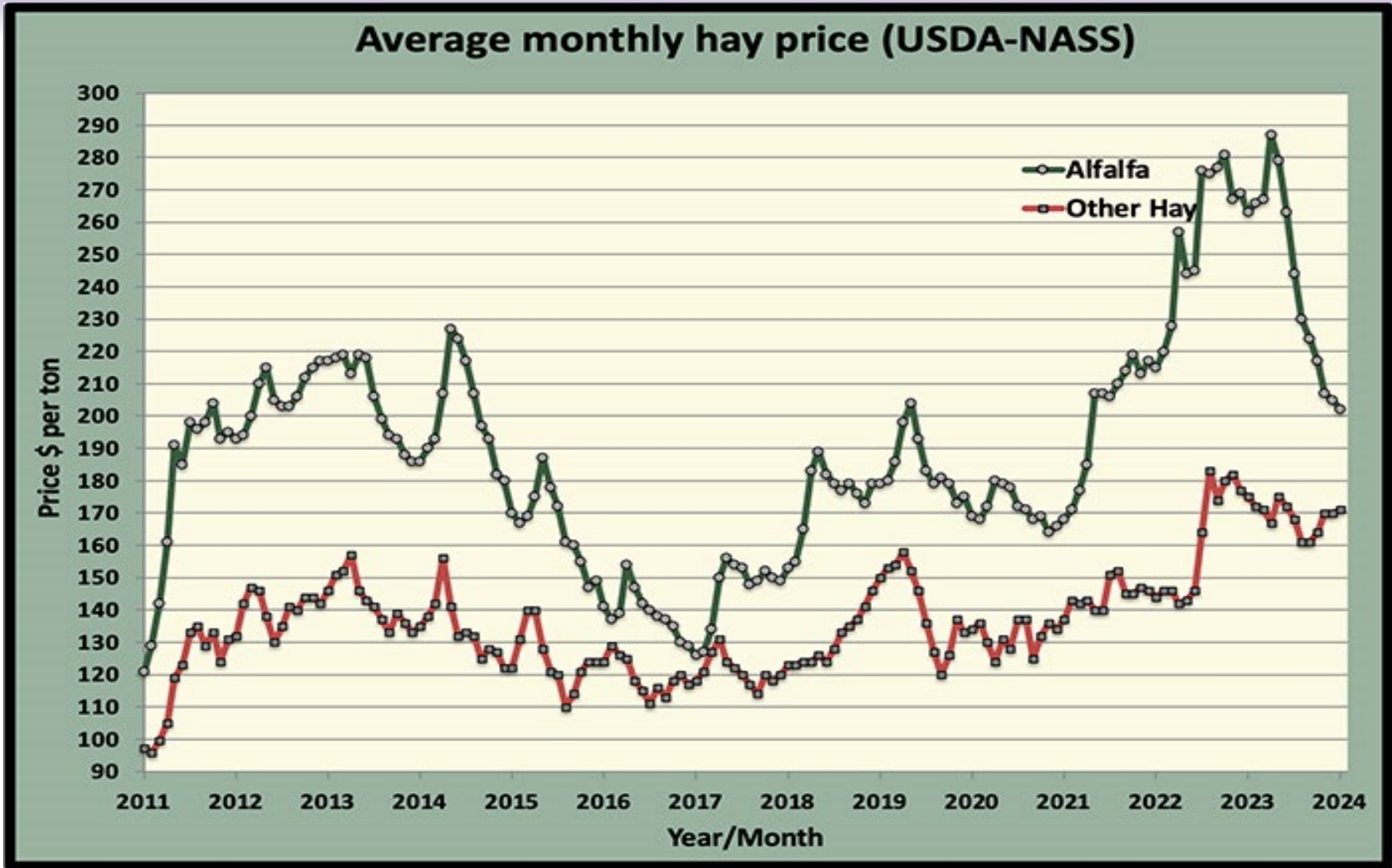
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

# Ford Co, KS Annual Precipitation





- Price variability based on supply (precipitation)



- **Unlike grain crops:**
  - Do not have a futures market
  - Storage loss
  - Insurance products limited
  - Transportation challenge



## Hay Inventory Calculator

Estimated Hay Needs

Estimated Hay Available

Definitions & Suggestions

Number of Mature Cows (Dry):

500

Average Weight per Mature Cow (lbs):

1400

DMI as % of Body Weight (%):

2.5

Number of Days:

60

Number of Mature Cows (Lactating):

500

Average Weight per Mature Cow (lbs):

1400

DMI as % of Body Weight (%):

This tool was developed by Kiran Elam, Jennifer Ifft, John Holman, and Robin Reid. For questions, contact Dr. Ifft: Email- [jiff@ksu.edu](mailto:jiff@ksu.edu) Phone- (785) 532-4486

### Instructions:

Input the values that reflect your operation into the sidebar to estimate your hay needs. All calculations are automatic. Refer to the Definitions & Suggestions tab for further information. For a more detailed calculator, please see <https://agmanager.info/hay-inventory-calculator>.

Estimated Hay Needs (as fed): 1,575 tons

<https://www.agmanager.info/hay-inventory-calculator>

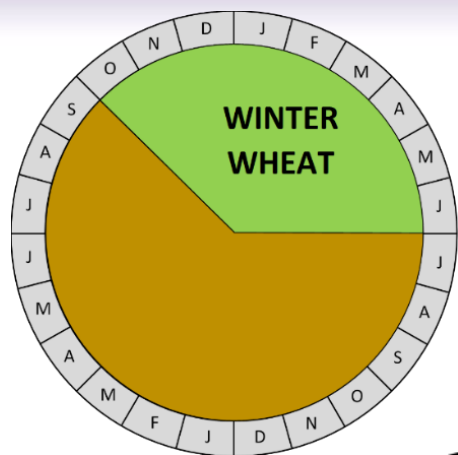
# Forage demand & yield potential for the region?

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

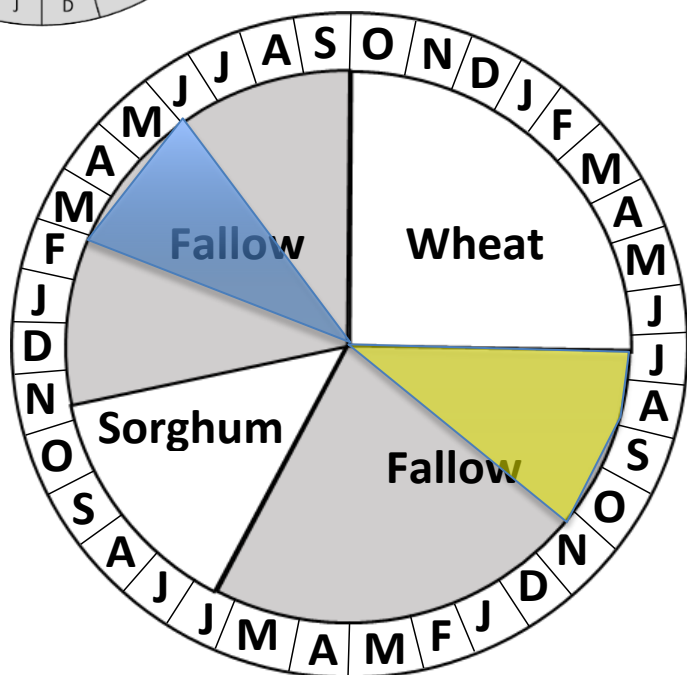
- **Crop residue:** grain sorghum, corn
- **Winter:** dual-purpose wheat, triticale, rye
- **Spring:** oat, triticale
- **Summer:** forage sorghum, sorghum-sudan, millet



# **Growing Cover Crops/Forage Crops in Place of Fallow**



A. Spring planted cover crop into sorghum stubble



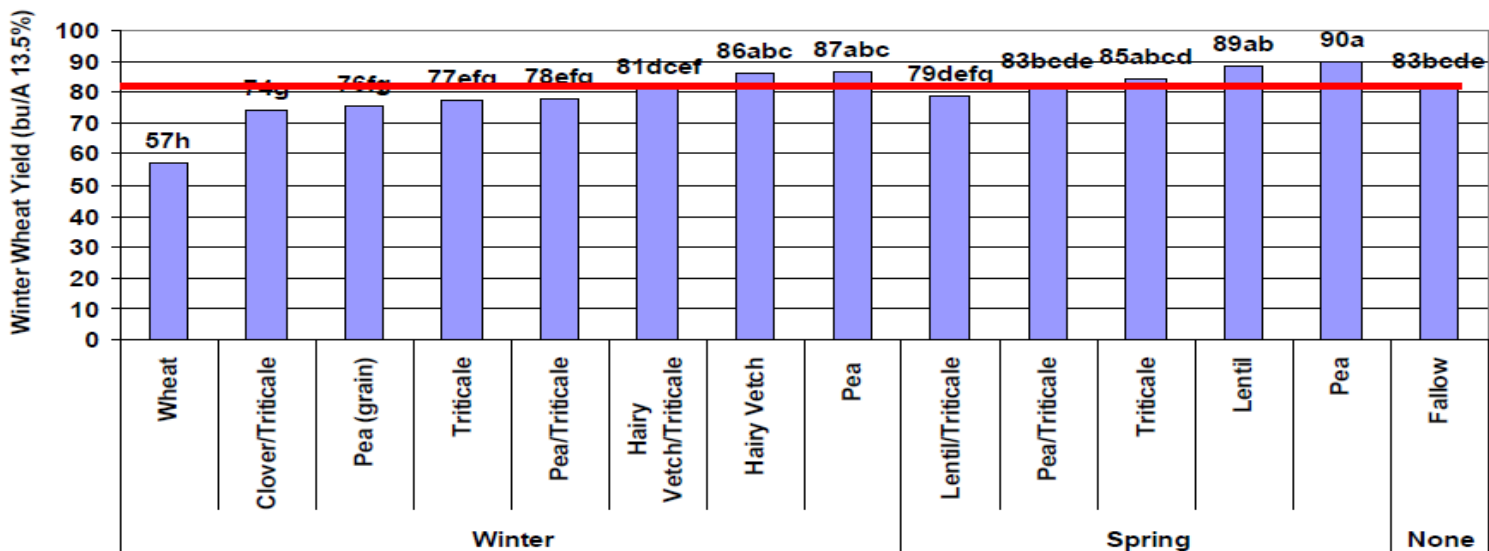
B. Summer/fall planted cover crop after wheat harvest

# Yield Variability Following CC

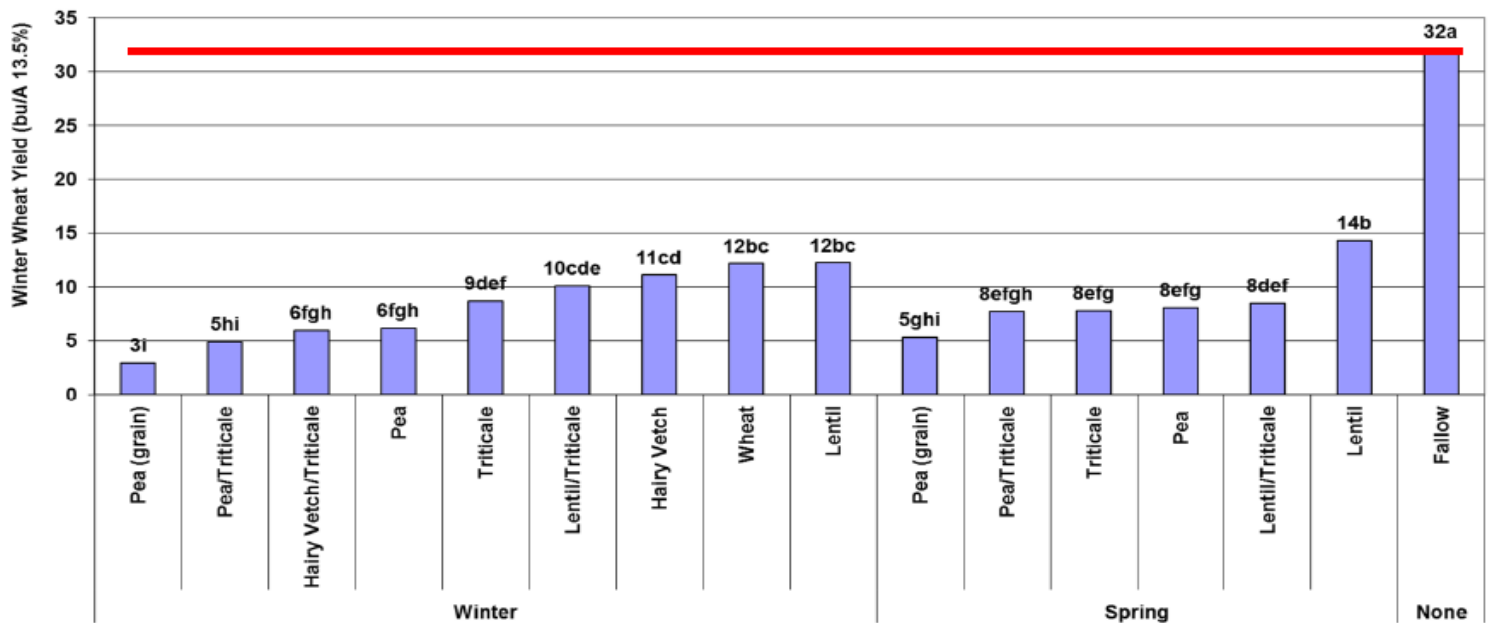
**High  
Precipitation  
Year**

**Low  
Precipitation  
Year**

2009 Winter Wheat Yield following 2008 Cover Crops



2012 Winter Wheat Yield following 2011 Cover Crops



**Corn stalks with standing strips**

**All taken 2/24/15**



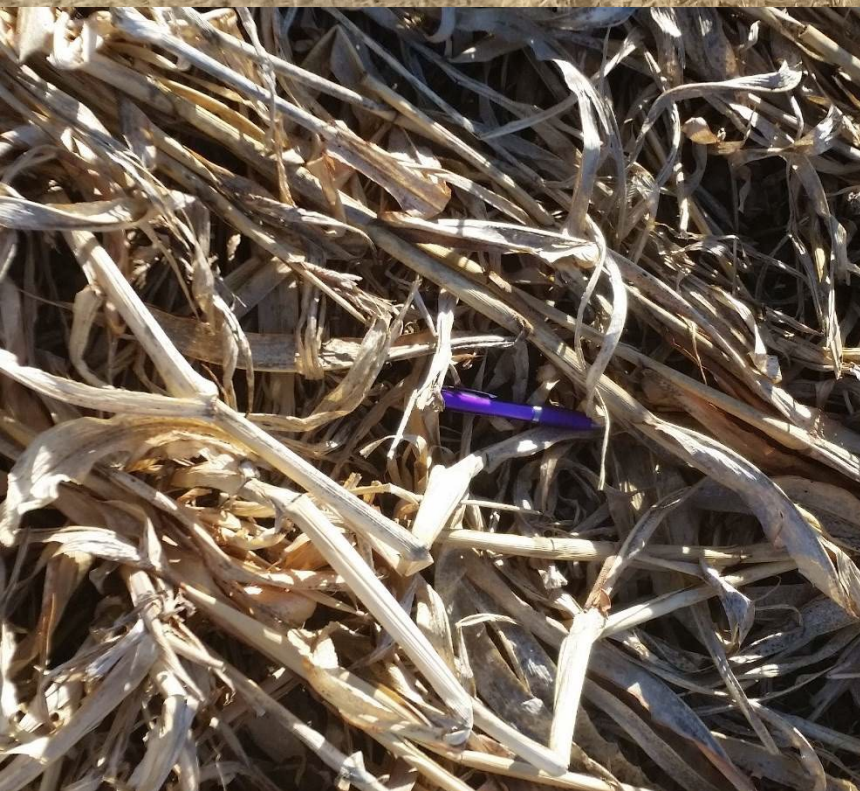
**Forage sorghum cut 6" tall in 2014, no regrowth**



**Grain sorghum residue from 2013**



Picture taken March 16, 2016:  
4,700 lbs of production cut at 6" plus regrowth



**Ideal situation:**

- 1. Good hay crop**
- 2. Left adequate residue to prevent soil erosion, capture precipitation, and reduce soil water evaporation**



**Spring Pea & Triticale  
Cover Crop Residue**

- **Planting CC destroys residue and without rain, produces no new residue**

- **Jan-Jun: 2" accumulative precipitation, average 7"**

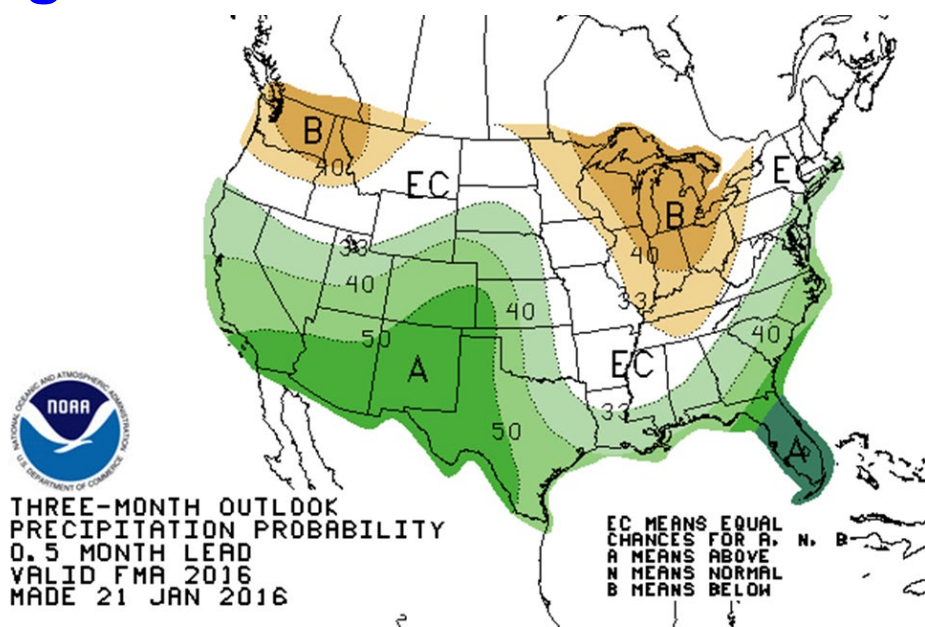
**Fallow**

**At time of planting spring crop measure soil moisture profile with Paul Brown Probe**

**Plant if >12" of soil moisture & Precipitation Outlook is neutral or favorable**

**Otherwise implement fallow**

**Trying to reduce losses and take advantage of wet years**





	Spring Species						Winter Species						Cont W		
	Fallow	Lentil/ Triticale	Pea/ Triticale	Pea (grain)	Pea Triticale	Triticale	Hairy Vetch/ Triticale	Hairy Vetch/ Triticale	Lentil/ Triticale	Pea/ Triticale	Pea/ Triticale	Triticale			
	Net Return (\$ acre-1)														
Cover Crop	-	-82	-104	-113	-113	-	-99	-137	-130	-84	-105	-112	-122	-110	-
Forage	-	-83	-62	-77	-57	-	-48	-140	-10	-92	4	-109	-1	7	-
Other	-55	-	-	-	-	-114	-	-	-	-	-	-	-	-	-71

HSD (0.05) = 21

- **Fallow costs ~\$55/A (2008-2018)**
- **Returns include variable costs and wheat yield**
- **Incentive for forages:**
  - Profit ↓, when wheat yield reduced >14 bu/acre
  - Profit ↑, when forage yield exceeded >2,500 lb/acre
  - Fallow most profitable in dry years
- **Flex-fallow to reduce losses and take advantage of wet years?**

Mngmnt	Unit	Cocktail		Cocktail Flex		Oat	Oat Flex	Oat & Triticale		Oat, Triticale & Pea		Triticale		Oat	Pea	Fallow
		Hay	Cover	Hay	Cover	Hay	Hay	Hay	Cover	Hay	Cover	Hay	Grn	Grn	Grn	Grn
Forage Yield	lb/ac	575	0	130	0	557	362	1087	0	686	0	1087	376	134	0	0
Price DM	\$/lb	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.09	0.14	0.18	0.00
Yield Return	\$/ac	37	0	8	0	36	23	70	0	44	0	70	32	17	0	0
Net Return \$/ac																
		-82	-93	-73	-79	-62	-58	-91	-88	-106	-123	-47	-87	-96	-167	-76
HSD <sup>1</sup>	\$/ac	52														

<sup>1</sup> HSD is minimum net return difference between two treatments at p<0.05.

- **Fallow costs ~\$76/A (2013-2020)**
- **Flex-fallow increased profit**
- **Incentive for forages:**
  - **DM yield: spring forage (1100 lbs) below 2500 lb threshold**

## Spring CC in WSF rotation

### Treatments

1. Chem-Fallow
2. Standing cover crop
3. Hayed cover crop
4. Grazed cover crop
5. Flex-hayed cover crop

### Hayed Cover Crops

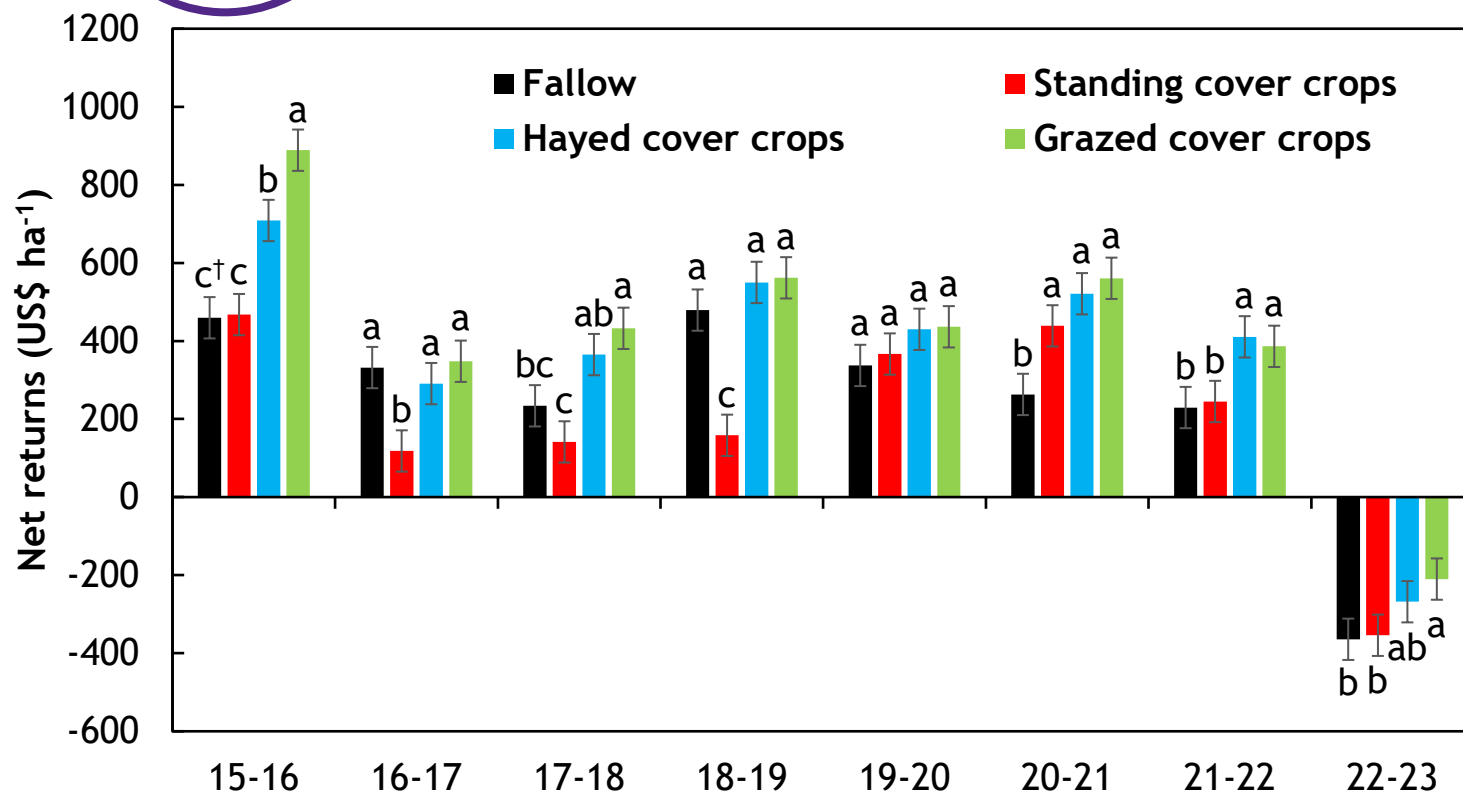
- At grass heading stage
- 6 inch cutting height

### Grazed Cover Crops

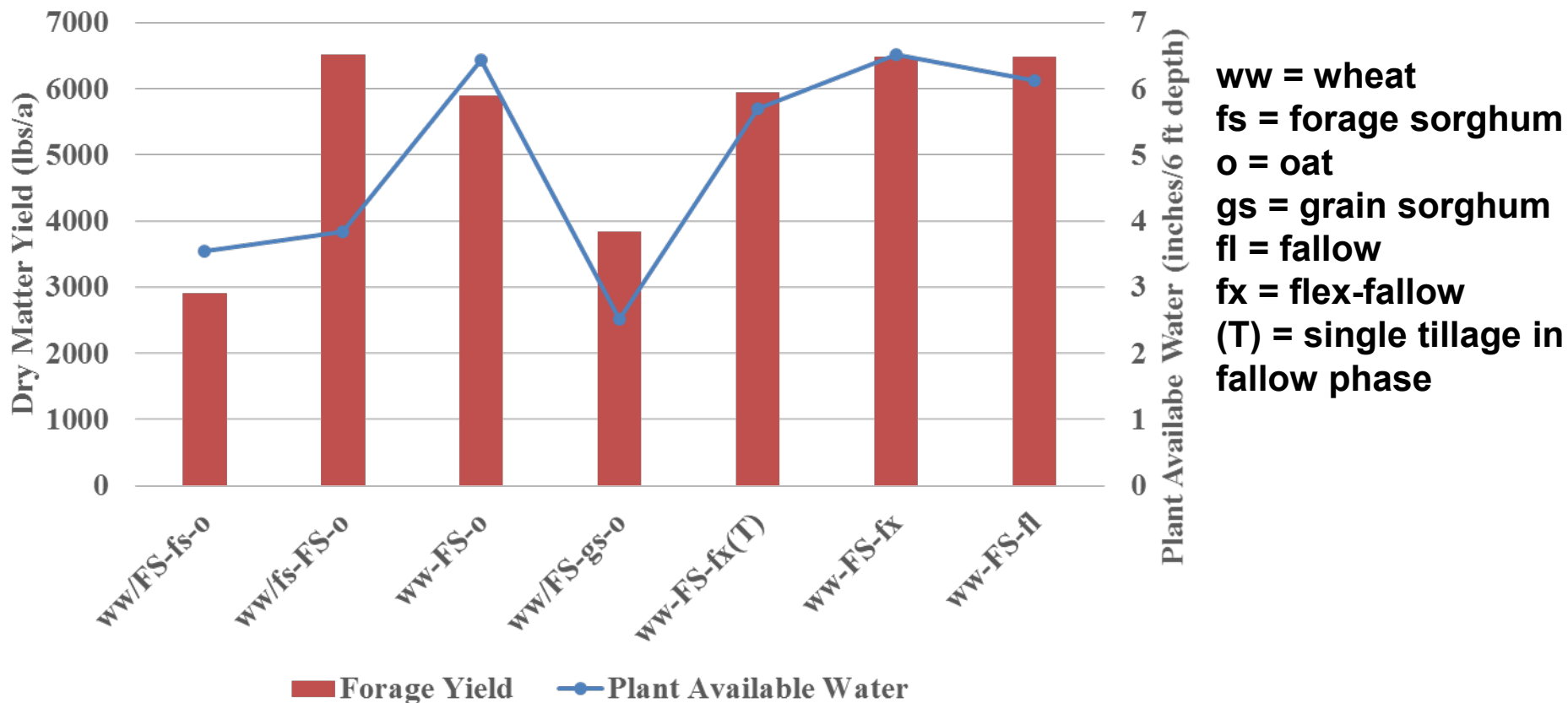
- Yearling heifers
- Generally, one week before haying
- 1300 lb live weight per acre for four to seven days



Treatments	Net returns US\$ ha <sup>-1</sup>
Fallow management	
Fallow	<u>246.22<sup>b</sup></u>
Standing cover crops	<u>197.68<sup>b</sup></u>
Hayed cover crops	<u>375.96<sup>a</sup></u>
Grazed cover crops	<u>425.50<sup>a</sup></u>

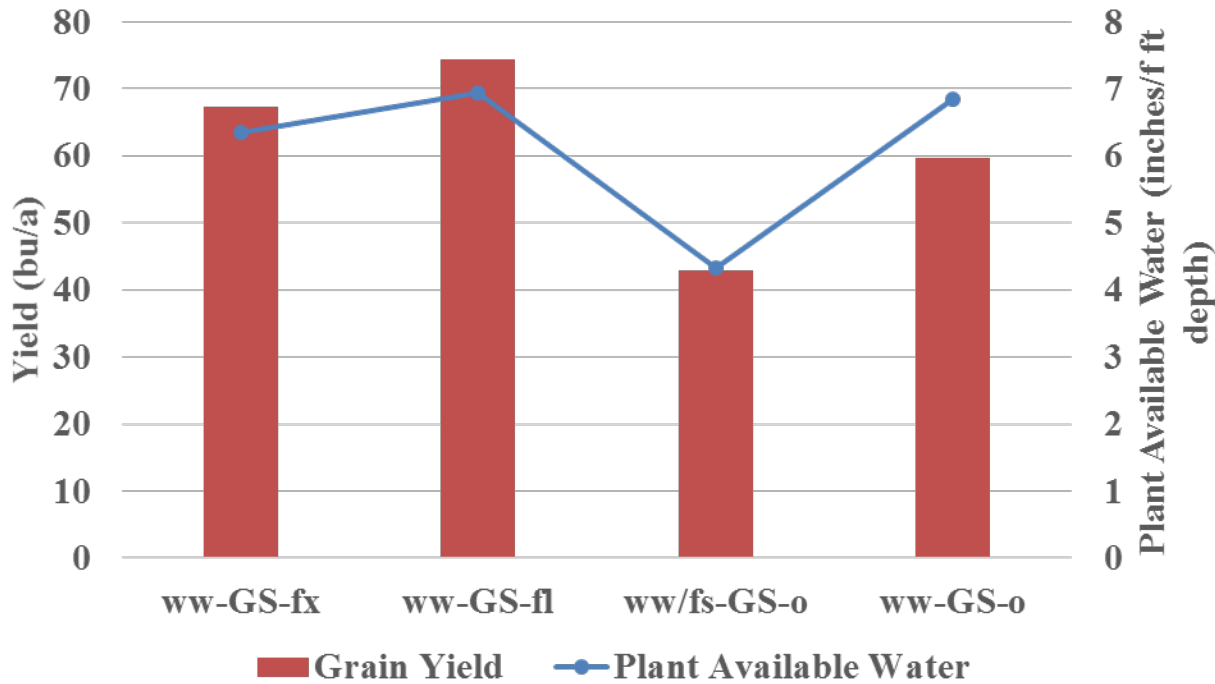


Forage Sorghum (Average 2014-2016)



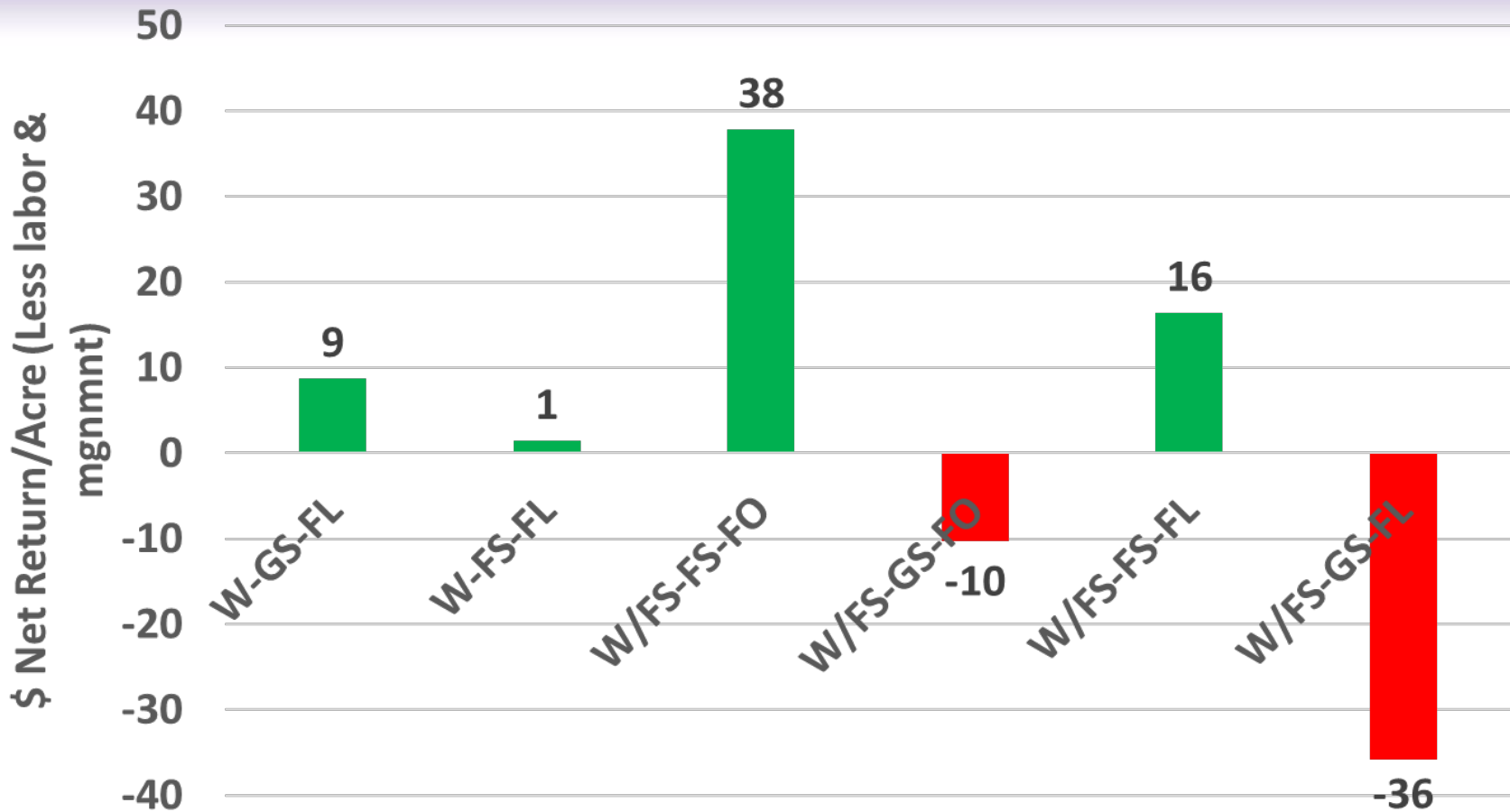
- **Double-crop forage sorghum (ww/fs) yielded 50% of full-season forage sorghum (fs)**
- **FS no yield penalty following double-crop (ww/fs)**

## Grain Sorghum



ww = wheat  
fs = forage sorghum  
o = oat  
gs = grain sorghum  
fl = fallow  
fx = flex-fallow

- **40% yield penalty for double-crop forage sorghum (ww/fs) ahead of grain sorghum (gs)**



- **Wheat yields low (2013-2020)**
- **Diversified grain/forage systems can increase profit**
  - GS yields following FS reduced
- **Flex-oat forage (FO) profit > fallow (FL)**



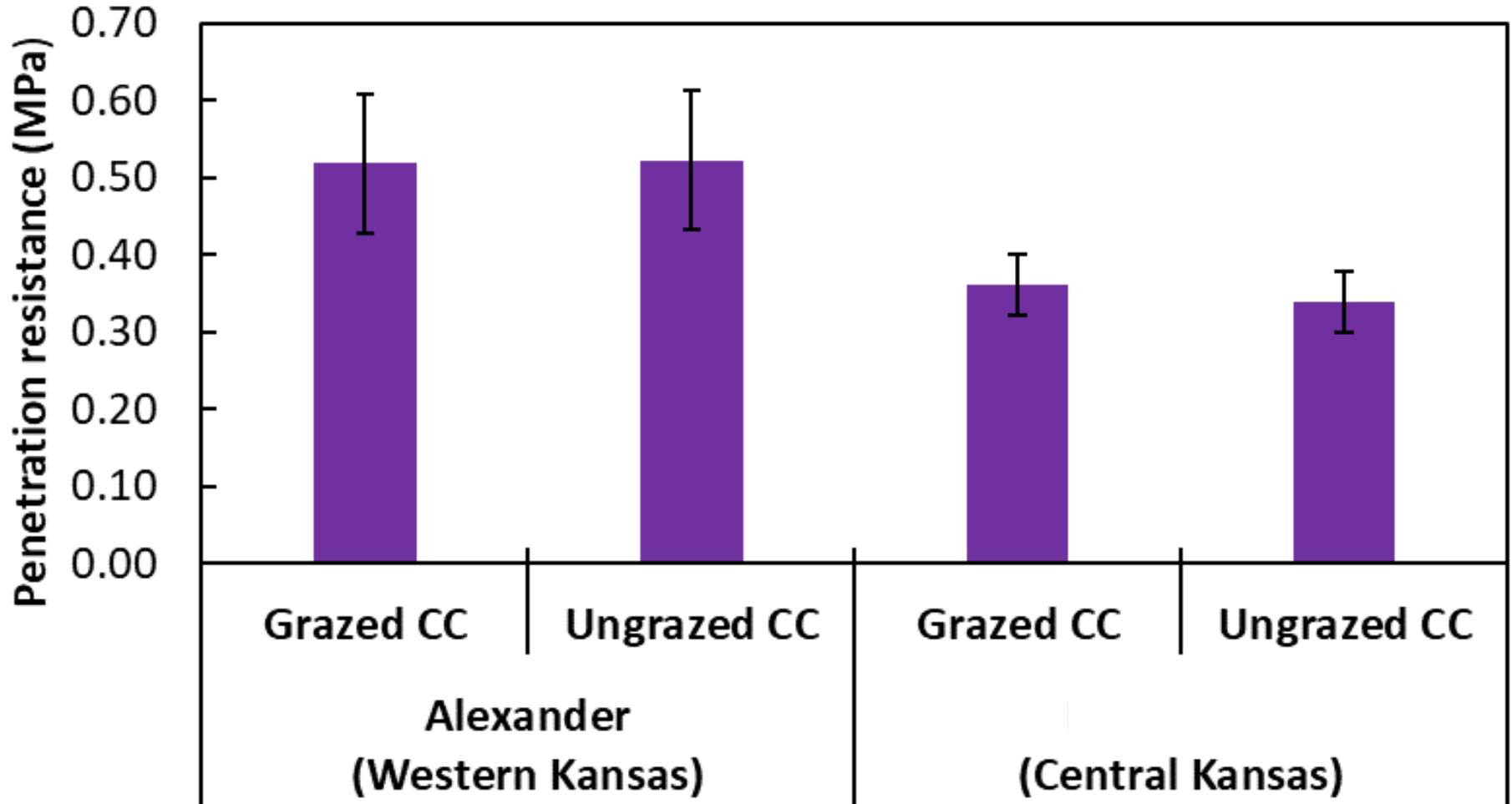
# Grazing effects on soils



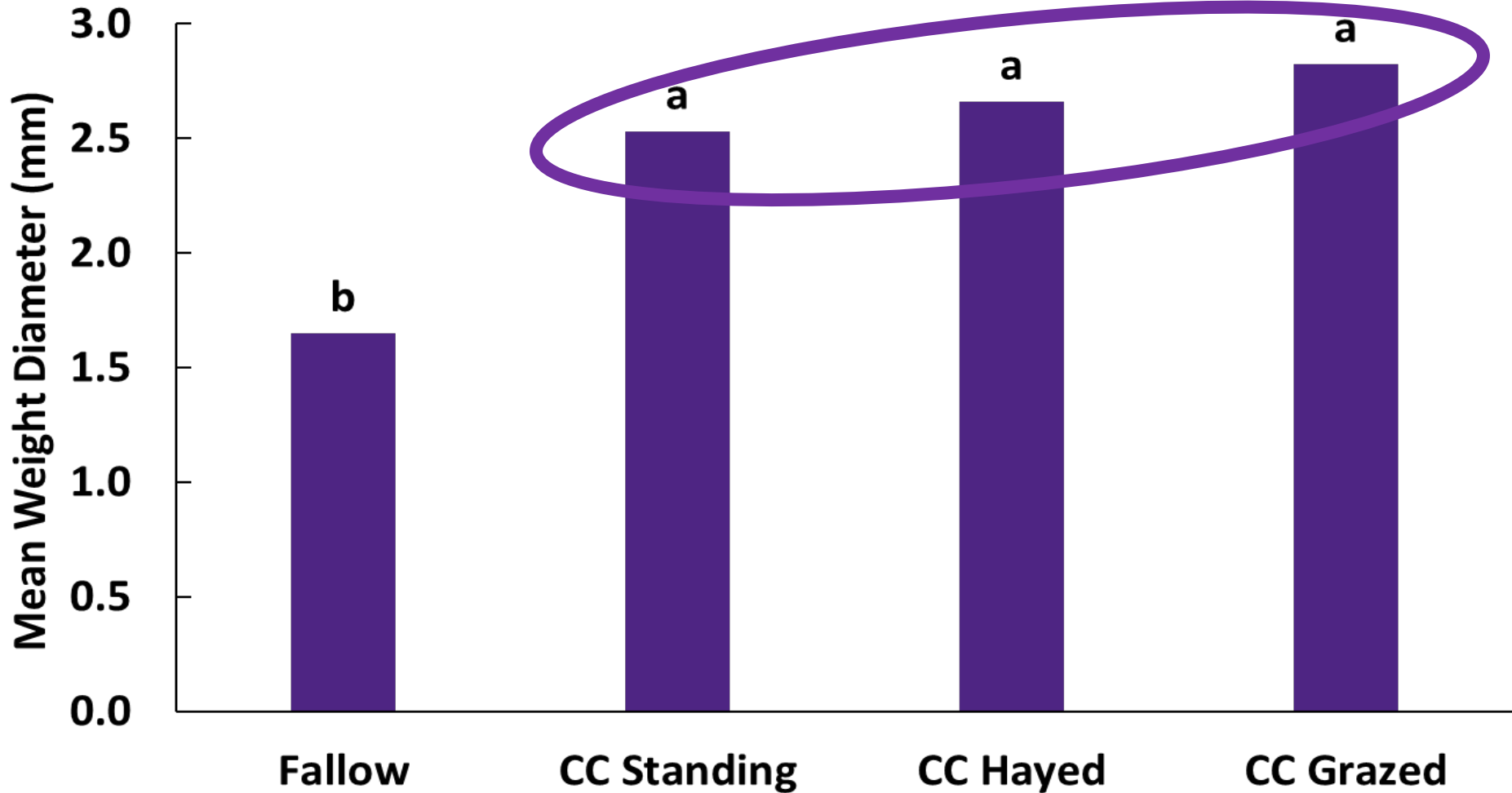




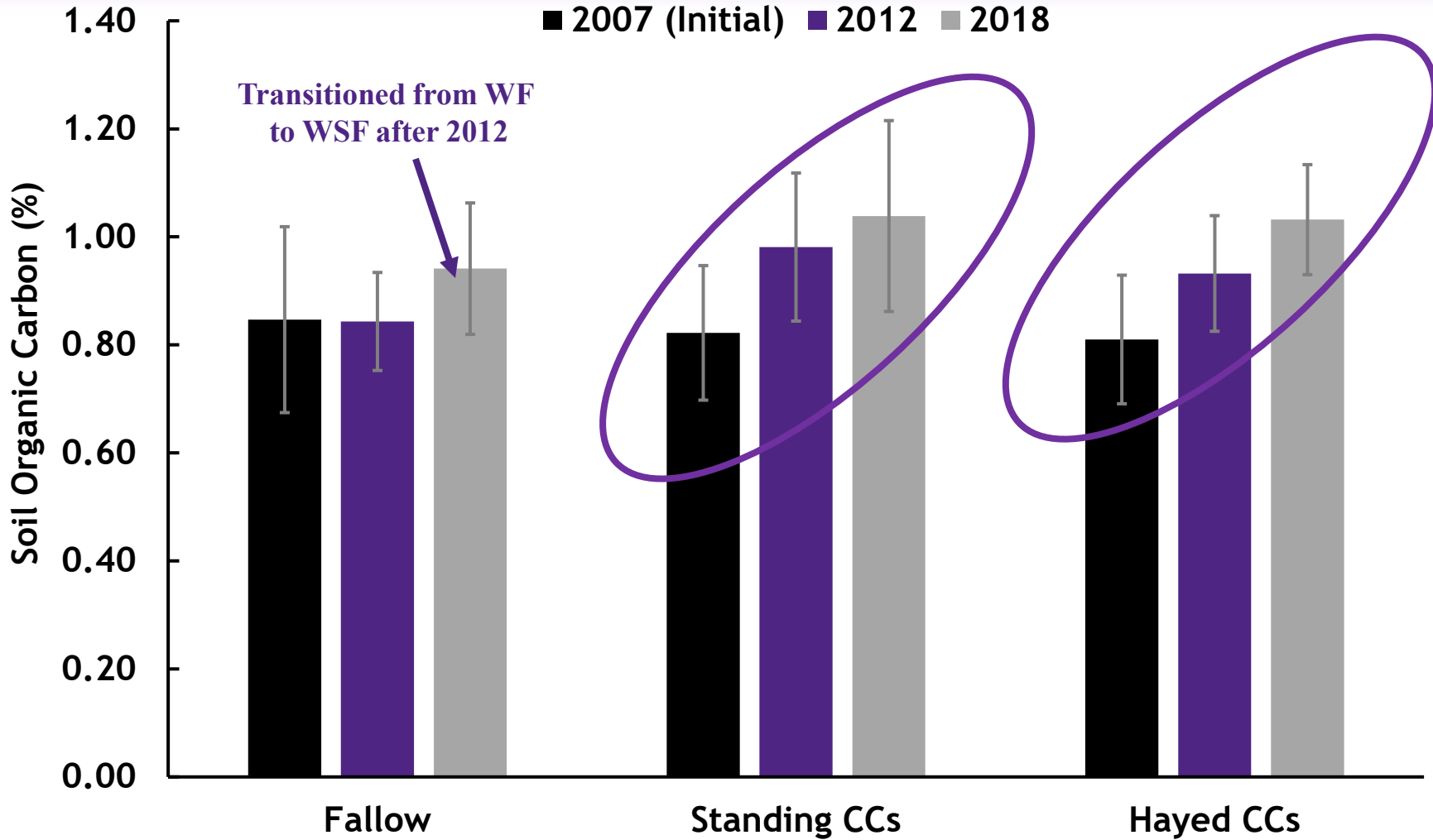
## Obvious signs of hoof traffic but no measurable differences



# Cover crops improved soil structure and aggregation with hay or graze



# SOC (0-6 inch) GC

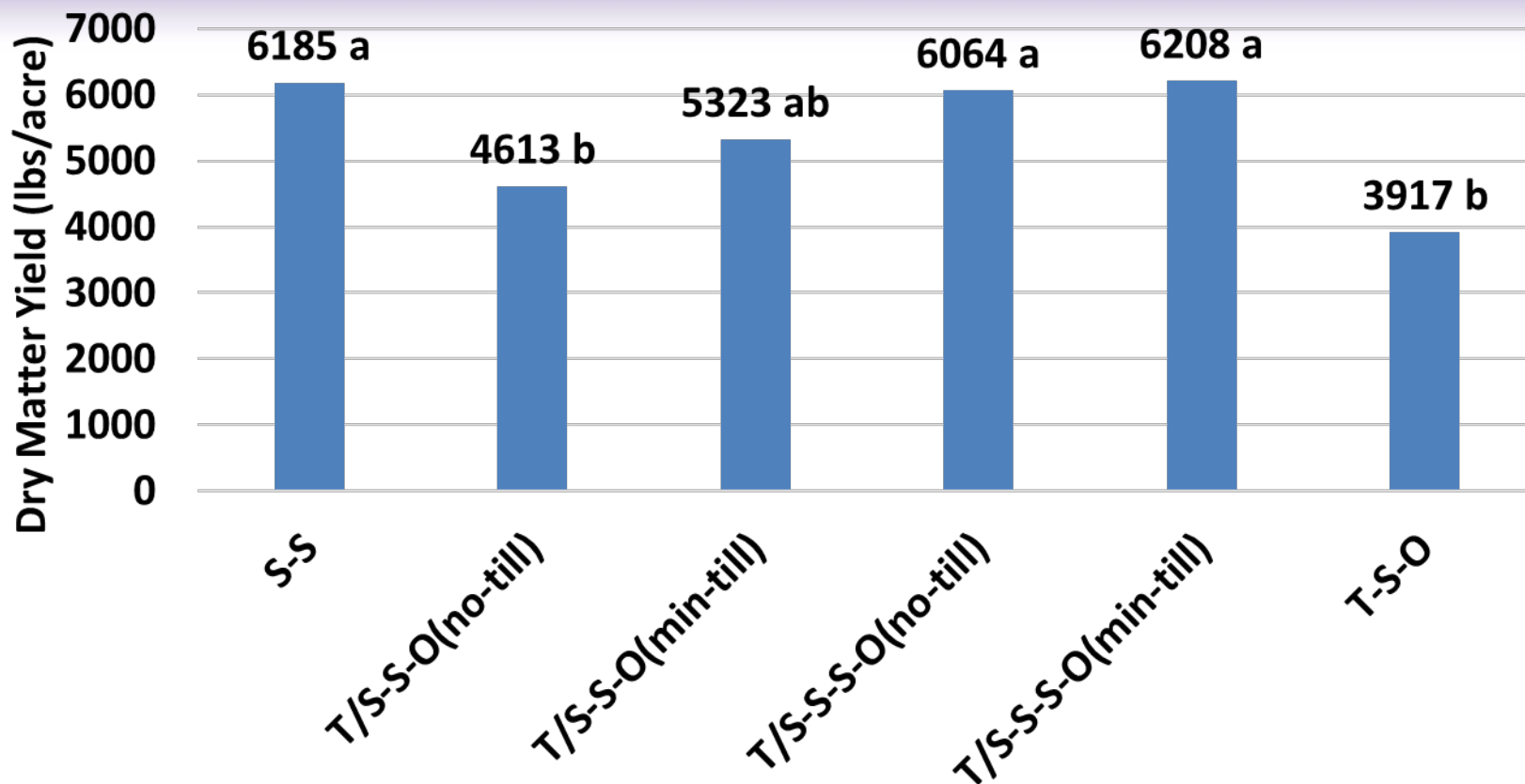


**Cropping intensification with WSF had significant impact on SOC**



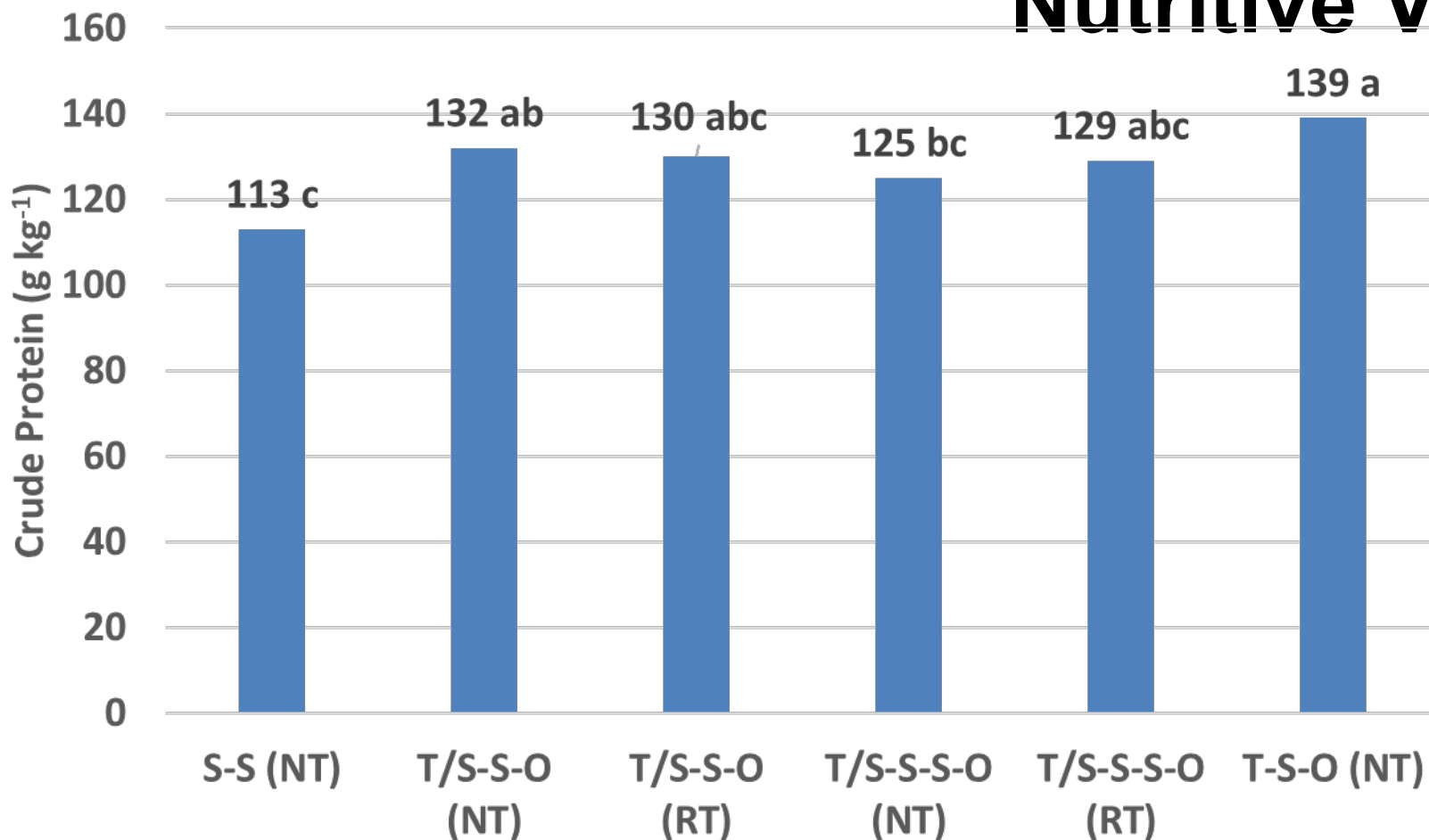
# Developing Profitable Annual Forage Rotations

# Annual Treatment Yield (2013-2020)



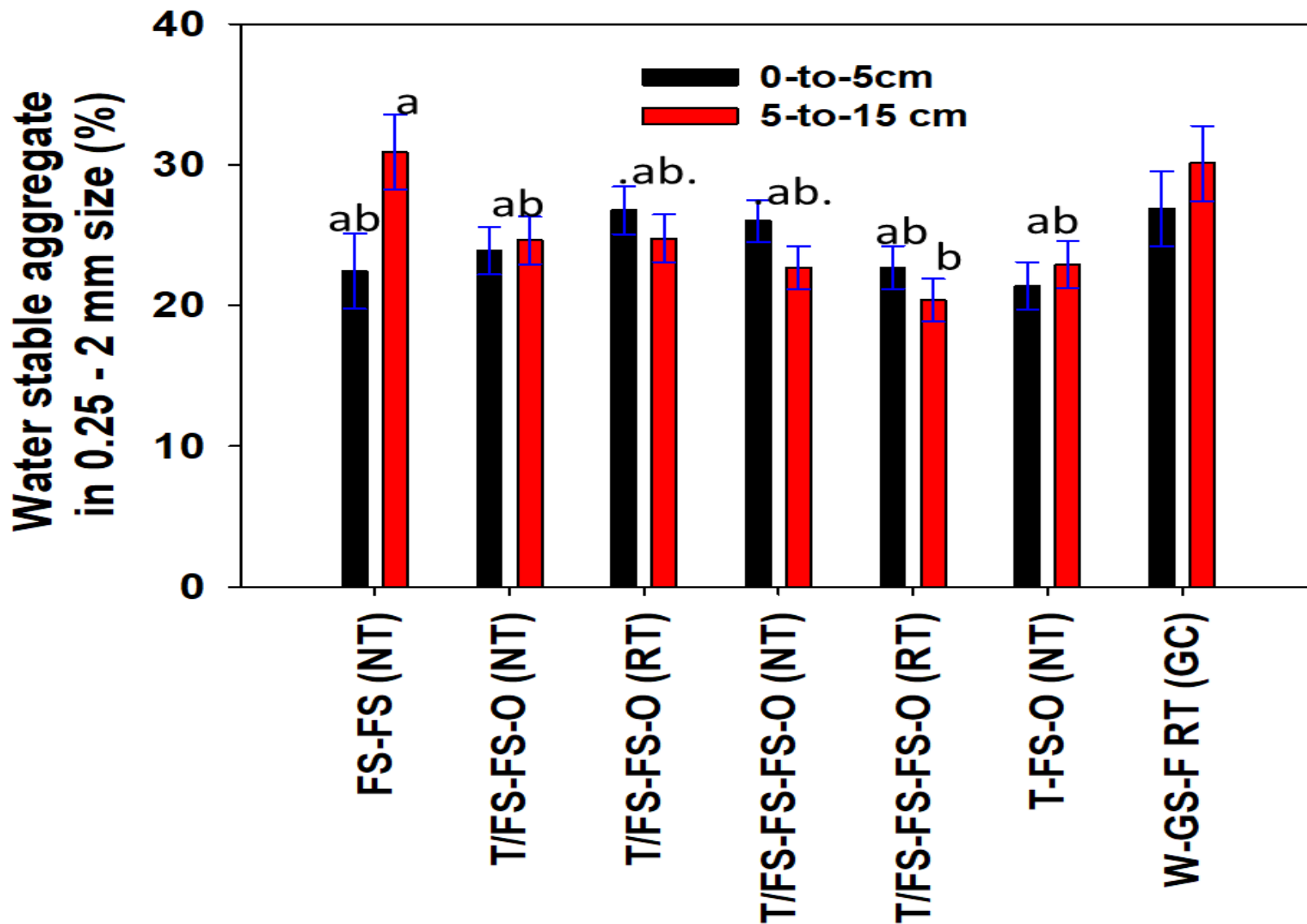
- Annual yield due to rotations of different lengths
- Tillage increased triticale yield
  - 1.5” more PAW
- Consider forage quality and other available feed sources

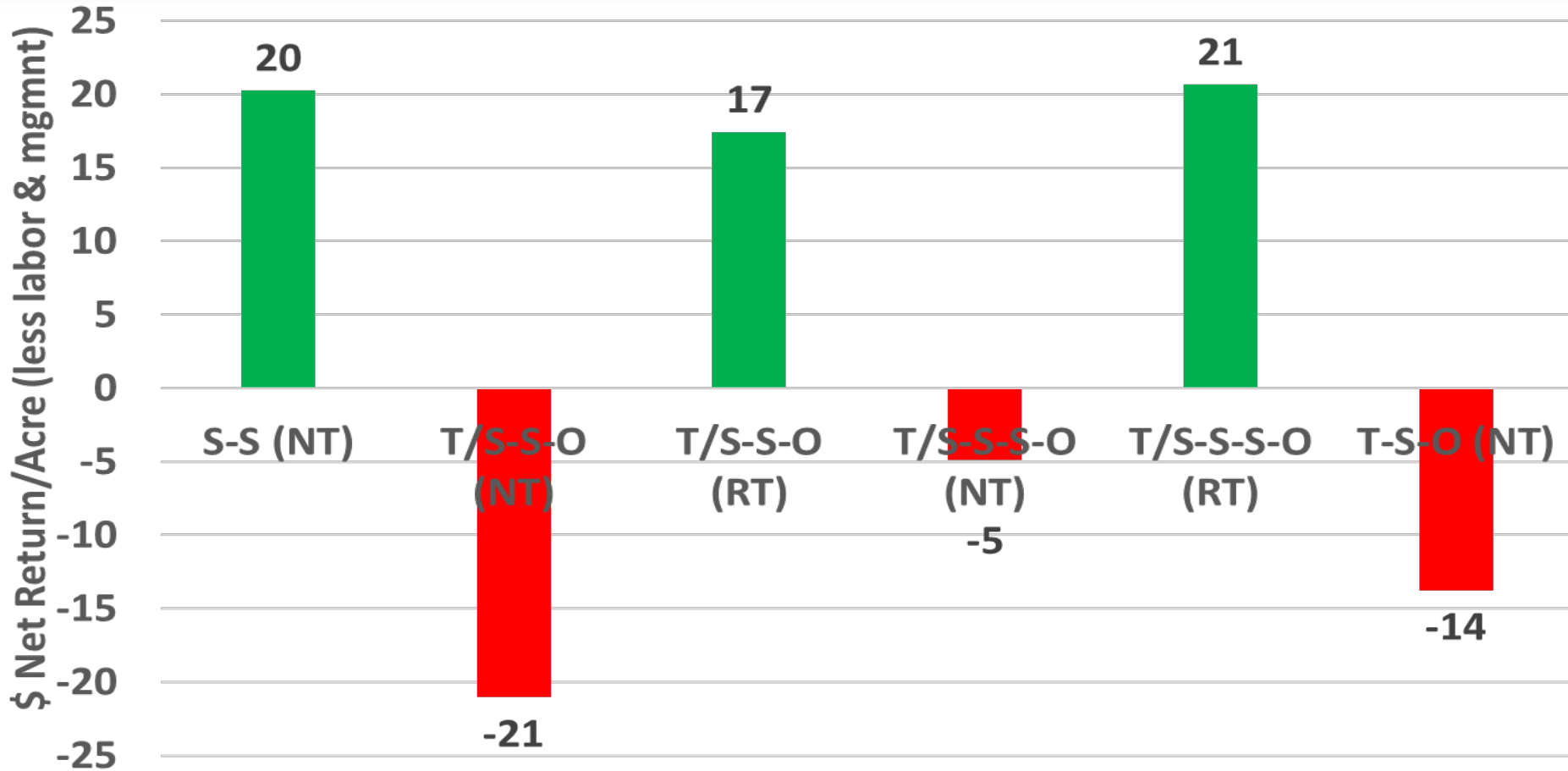
# Weighted Average Forage Nutritive Value



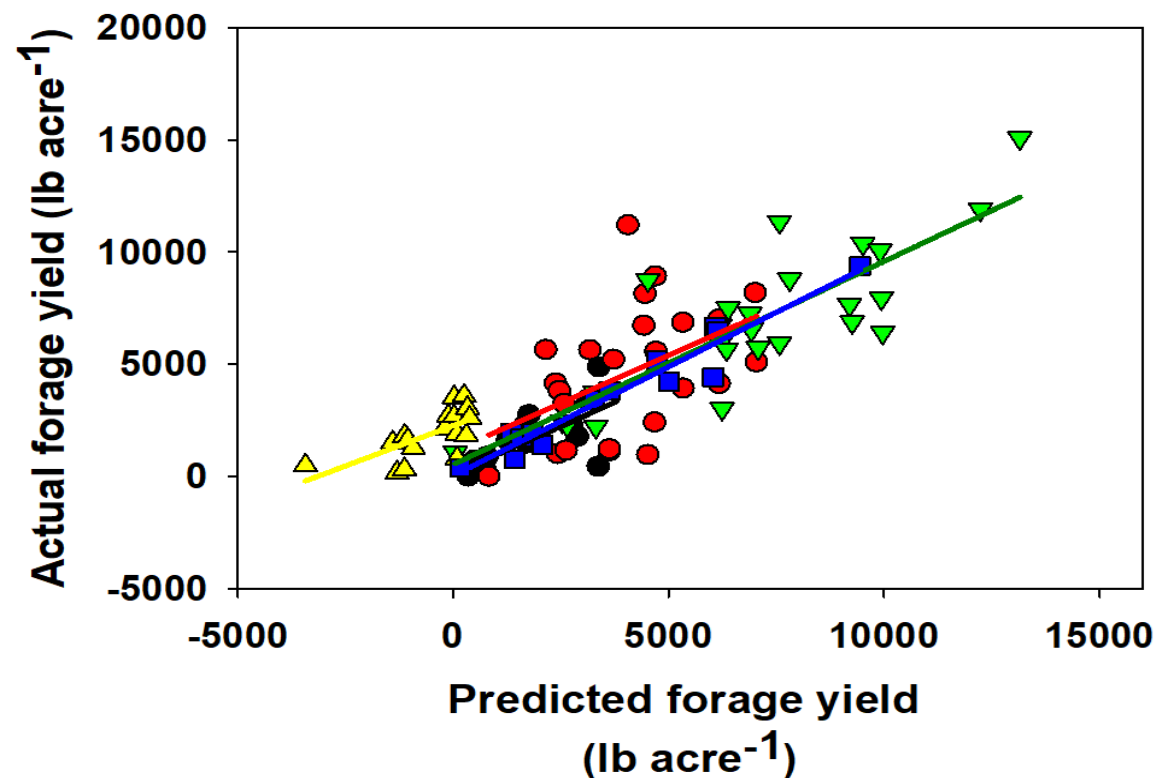
- **Rotation Treatment: ADF, NDF, IVTD, NFC, & Nitrate NS**







- Income driven by yield & forage nutritive value (price/ton)
- Expense side driven by cost of weed control



- 2006-2024
- Modeling forage yield with monthly precipitation and temperature

## Predicted forage yield with weather variables

- $F_{oat} = 5569 + (1242 * P_{feb}) + (510 * P_{may}) + (413 * P_{jun}) - (208 * T_{jan}) + (248 * T_{mar}) - (61 * T_{apr}) - (98 * T_{may}); R^2 = 0.58$
- $F_{sorgD} = 27901 + (305 * P_{jun}) + (459 * P_{jul}) - (338 * T_{jul}); R^2 = 0.27$
- ▼  $F_{sorgS} = -79349 + (654 * P_{apr}) + (1893 * P_{may}) + (1281 * P_{jun}) + (681 * P_{jul}) + (1160 * P_{aug}) + (884 * P_{sep}) - (297 * P_{oct}) - (831 * T_{apr}) - (1661 * T_{may}) - (308 * T_{jun}) + (1905 * T_{jul}) - (123 * T_{sep}) + (152 * T_{oct}); R^2 = 0.66$
- ▲  $F_{SPtrit} = 5450 - (337 * P_{jun}) - (33 * T_{jun}); R^2 = 0.40$
- $F_{Wtrit} = -112872 + (978 * P_{jul}) + (2772 * P_{sep}) + (2075 * P_{oct}) - (4992 * P_{dec}) + (1277 * P_{may}) + (835 * T_{jul}) + (210 * T_{sep}) + (758 * T_{jan}) - (734 * T_{feb}) + (594 * T_{apr}); R^2 = 0.82$

# Annual Forage Insurance

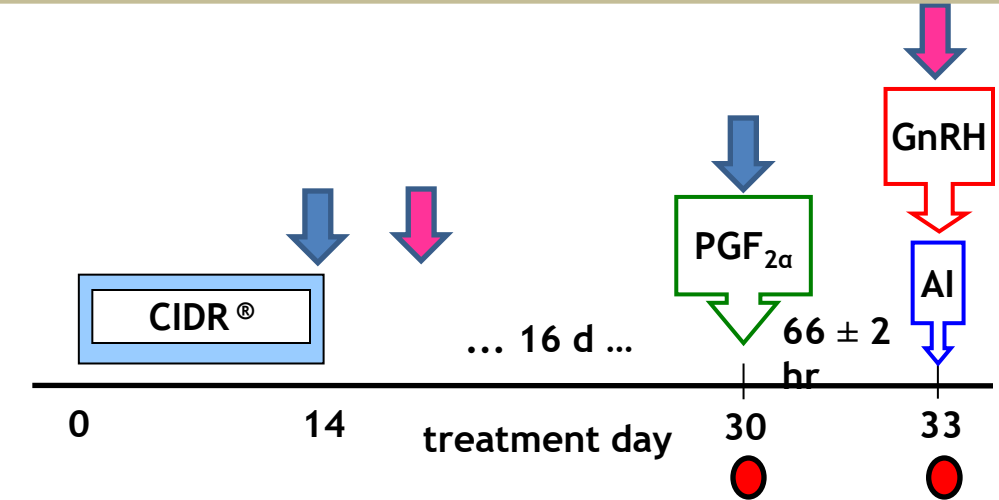
Forage crops	Insure select	USDA-RMA four growing seasons (GS) and 2-month insurance periods															
		.....GS1.....				.....G2.....				.....G3.....				.....G4.....			
		Odd months	Sep-Oct	Nov-Dec	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Even months	Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep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

# 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**

## Estrus synchronization and sampling

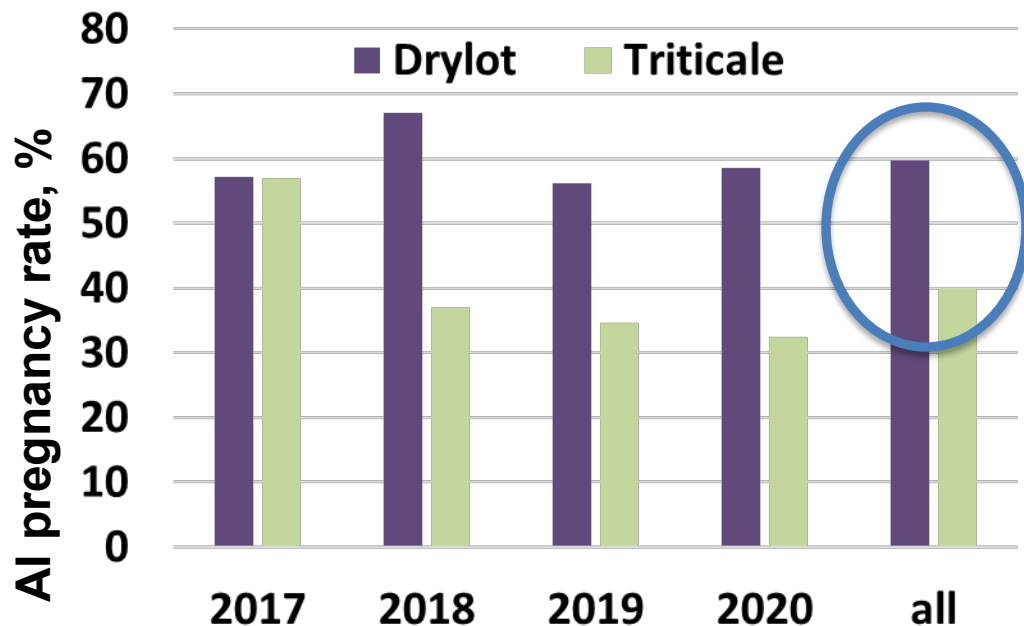


**BLACK DIAMOND  
ANGUS RANCH  
EST. 1884**

- Apply estrus detection aid
- Patch score
- Serum sample

- 2017-2020: 150 to 200 Black Angus heifers
- Grazed native pasture and triticale
  - 45d ahead of breeding split into two groups
  - 1 group remaining on triticale the other drylot

## AI pregnancy rate



Year  $P=.16$ ; Treatment  $P<0.001$ ,  
Treatment x Year  $P=0.05$

- Weight gain, condition score, and blood urea N (BUN) were greater in triticale than drylot heifers.
- Non-esterified fatty acids (NEFA) concentration was lower for triticale than drylot heifers at AI.
- High dietary protein and BUN levels are associated with reduced fertility in confinement dairy systems.



- No negative effect on cow breeding, 60% timed AI conception





# Continuous Triticale Pasture

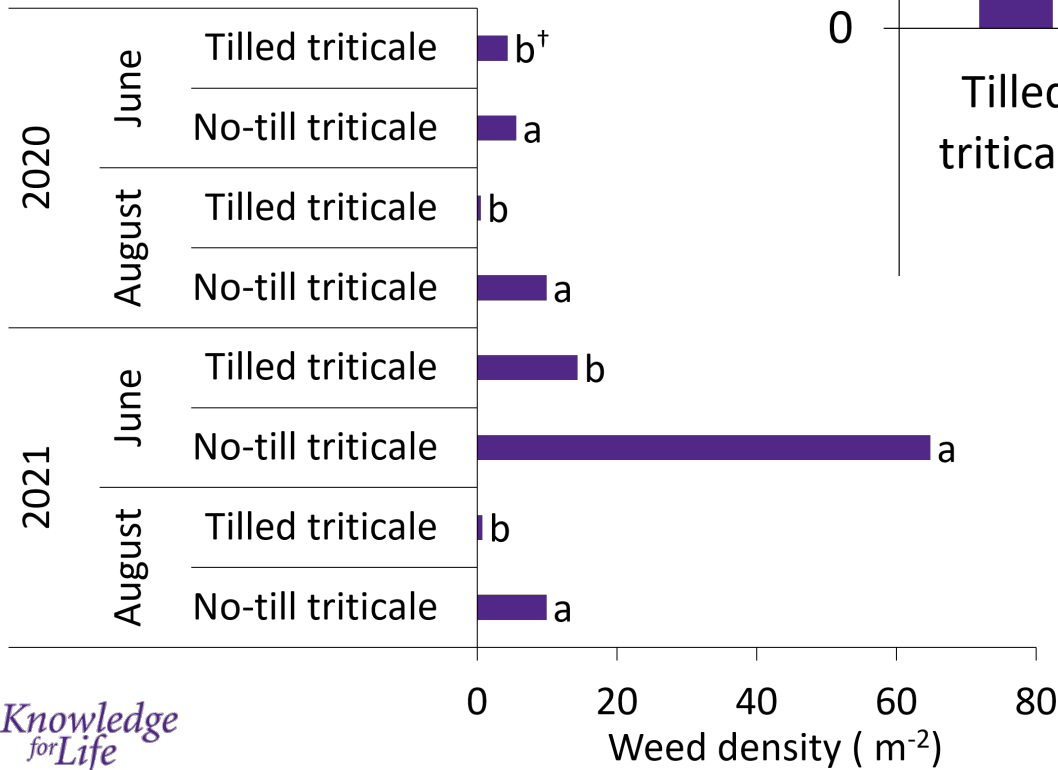
## No-till vs Sweep Plow

### 2016-2021 (6 years)

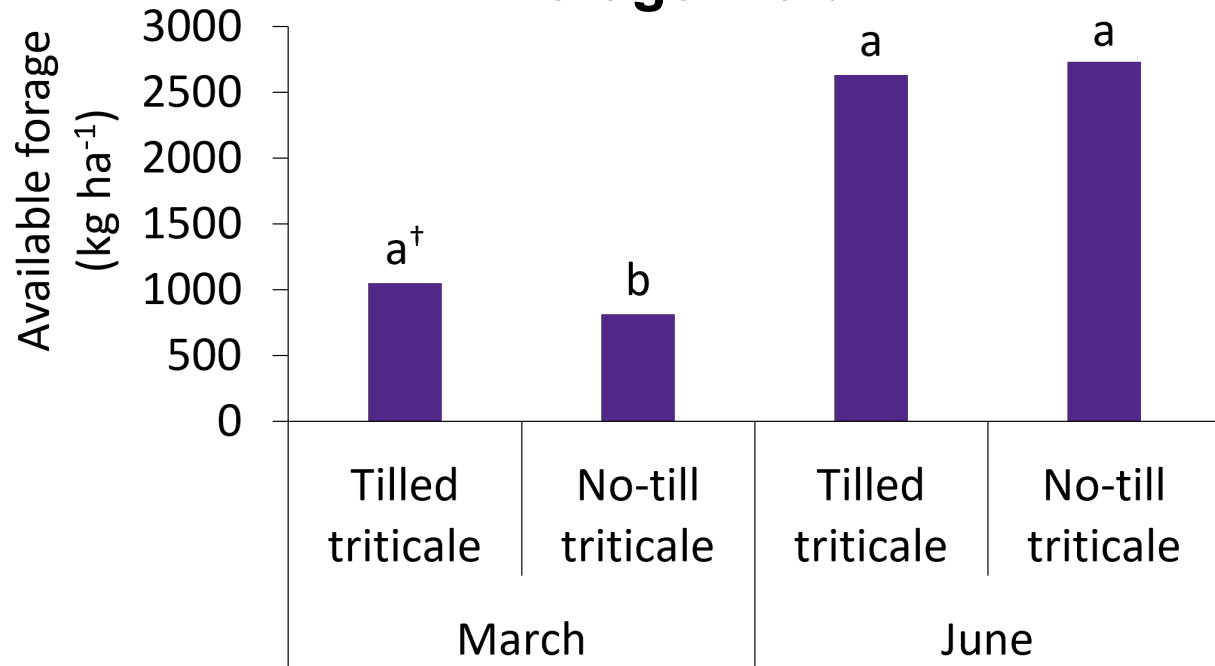




## Weed Density



## Forage Yield



- **No difference in penetration resistance, bulk density, or SOC**

# Beef-cow Returns over Variable Cost

## KFMA (2015-2020)

	Profit Category				Difference between	
	All	High 1/3	Mid 1/3	Low 1/3	High 1/3 and Low 1/3	
	Farms	Head / \$	Head / \$	Head / \$	Absolute	%
Number of Farms	81	27	27	27		
Age of Operator	55.1	52.8	56.2	56.4	-3.6	-6%
Number of Operators	0.99	1.09	0.92	0.96	0.13	13%
Labor allocated to livestock, %	29.2	34.0	30.5	23.0	11	48%
Pasture Acres per Cow	9.07	9.69	9.02	8.49	1.2	14%
Number of Cows in Herd	133	174	125	100	74	73%
Number of Calves Sold	120	159	114	88	71	80%
Calves Sold per Cow in Herd	0.903	0.913	0.908	0.878	0.04	4%
Weight of Calves Sold, lbs.	617	624	628	597	27	5%
Calf Sales Price / Cwt	\$147.45	\$148.85	\$146.56	\$146.94	\$1.91	1%
<b>Gross Income</b>	<b>\$765.46</b>	<b>\$844.58</b>	<b>\$785.36</b>	<b>\$666.43</b>	<b>\$178.15</b>	<b>27%</b>
Feed	\$343.63	\$248.06	\$377.38	\$405.44	-\$157.38	-39%
Pasture	\$176.62	\$186.57	\$176.94	\$166.35	\$20.22	12%
Interest	\$32.50	\$21.34	\$36.22	\$39.94	-\$18.59	-47%
Vet Medicine / Drugs	\$37.82	\$32.72	\$41.99	\$38.75	-\$6.03	-16%
Livestock Marketing / Breeding	\$22.39	\$15.81	\$22.39	\$28.97	-\$13.16	-45%
Machinery	\$82.35	\$66.98	\$83.86	\$96.21	-\$29.23	-30%
Labor	\$17.50	\$16.25	\$10.60	\$25.65	-\$9.40	-37%
Other	\$53.81	\$41.53	\$58.64	\$61.26	-\$19.73	-32%
<b>Total Variable Cost</b>	<b>\$766.62</b>	<b>\$629.26</b>	<b>\$808.01</b>	<b>\$862.58</b>	<b>-\$233.31</b>	<b>-27%</b>
<b>Return over Variable Costs</b>	<b>-\$1.16</b>	<b>\$215.31</b>	<b>-\$22.65</b>	<b>-\$196.15</b>	<b>\$411.46</b>	

- ✓ **Opportunity to reduce fallow if growing forages**
- ✓ **Caution growing forages ahead of grain crops**
  - ✓ **Match cropping intensity and rotation with environment**
- ✓ **Managed correctly forages can increase residue cover, soil health, and profitability**
- ✓ **Dryland biomass production in some years will be insufficient for both forage and residue cover**

✓ Let the cow graze as many days of year as possible

✓ Meet cows nutritional requirement while reducing feed expense

✓ Plan and prepare for drought while taking advantage of excess precipitation in the wet years



# Funding and Contact Info



## Contact information

Dr. John Holman

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620-276-8286

