Grazing livestock on cover crops

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Dec. 6, 2021

Evaluating Cover Crop and Forage Mixtures for Dryland Systems

www.DrylandAg.org

Project Goal:

Support producers in the High Plains to adopt management strategies that are profitable and build soil and ecosystem health.

K-STATE Research and Extension

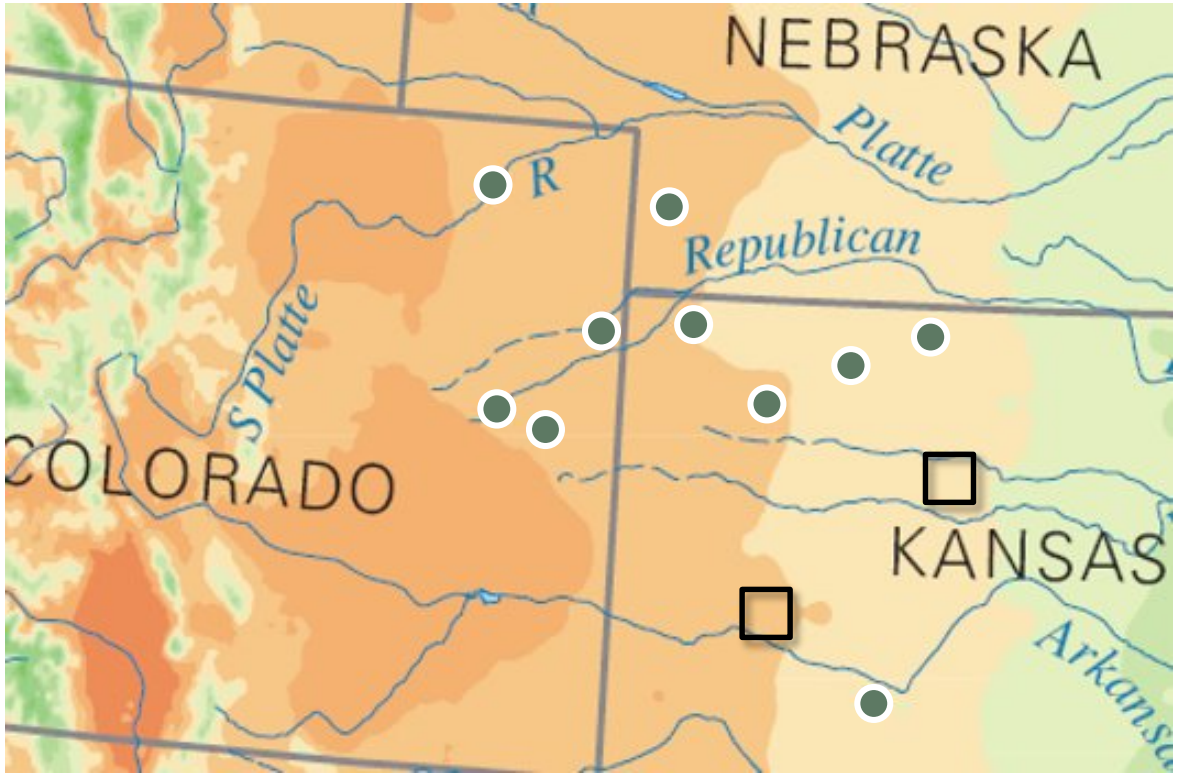
Region

On-Farm Research

- Cooperating producers

Research Station Trials

- ❑ KSU cropping systems experiments



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Spring Planted Mixtures

2016 spring mix

15# forage barley
15# oats
5# spring peas
5# hay millet
2# rapeseed
1# flax
1# safflower
1# sunflower

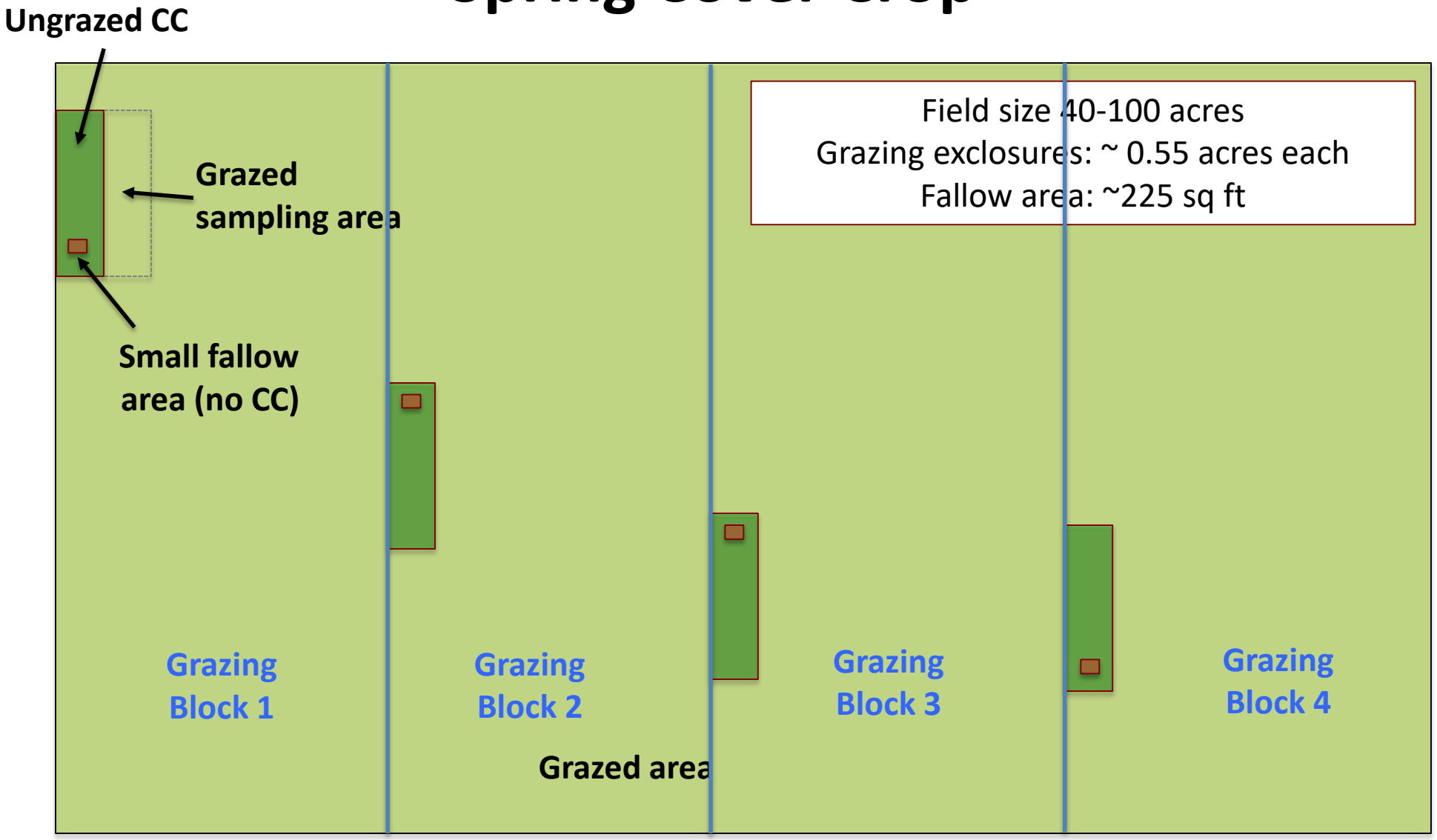
Total: 45 lbs/acre, ~$18/acre

2017 spring mix

10# forage barley
10# triticale
2# rapeseed
1# flax
1# safflower
1# sunflower
1# purple top turnip

Total: 41 lbs/acre, ~$18/acre

Spring Cover Crop



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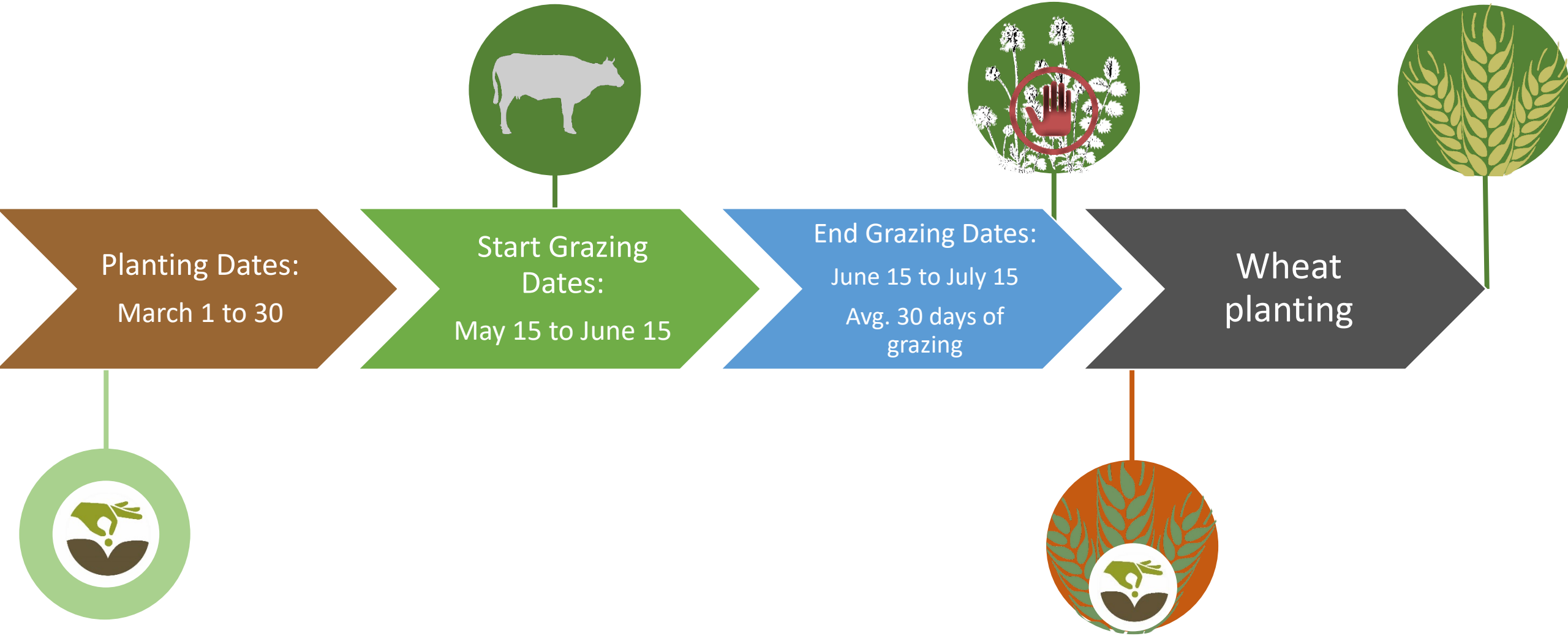
Spring Cover Crop



Post-Wheat Planted Mixtures

2017 Post-wheat mix

Total: 41 lbs/acre, ~$23/acre

20# triticale
6# Austrian winterpea
4# sorghum sudangrass
4# cowpea
3# sunflower
2# German millet
1# radish
0.5# rapeseed
0.2# phacelia

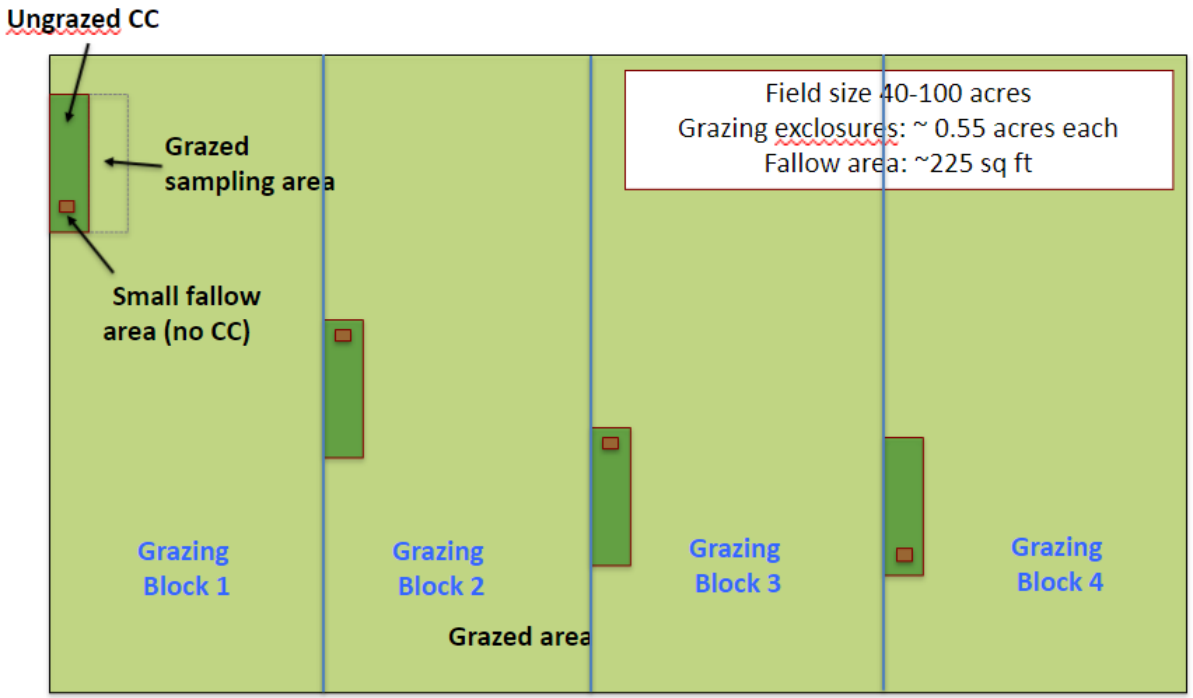
2018 Post-wheat mix

Total: 38.5 lbs/acre, ~$24/acre

20# triticale
5# cowpea
4# Austrian winterpea
4# sorghum sudangrass
2# German millet
1# sunflower
1# radish
0.75# sunn hemp
0.5# rapeseed
0.2# phacelia

Post-Wheat Cover Crop

- Minimum of 40 acres
- Planted a set post-wheat cover crop mix mid-July to early September
- Grazed if possible
- After termination in early spring, planted corn or milo



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Sampled:

- Forage Biomass
- Forage species composition
- Soil Moisture Samples
- Soil Bulk Density

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Sampled:

- Livestock gains
- Following cash crop yields

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Forage Production

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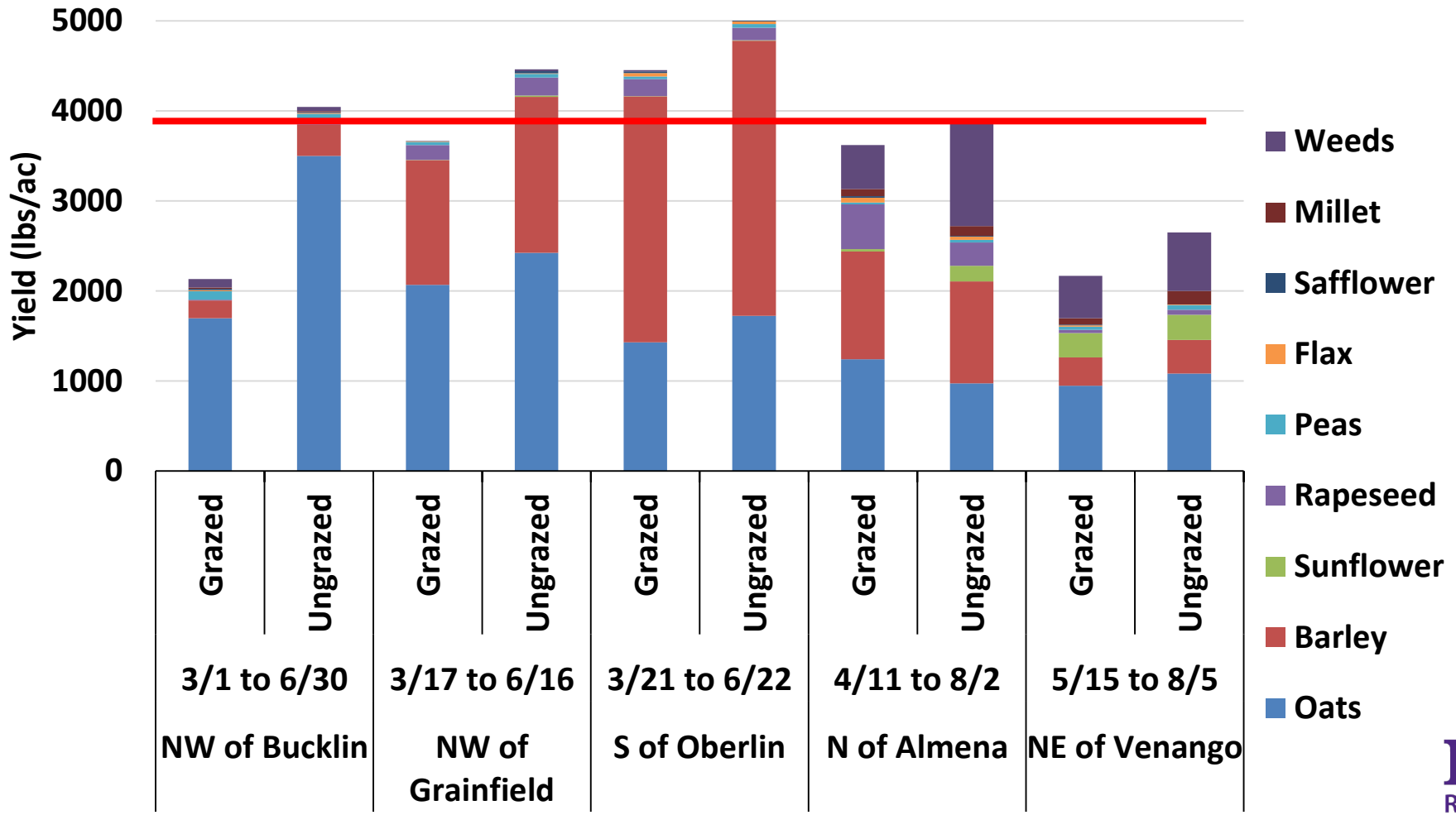
2016 Spring Planted Forage
Little reduction in cover after grazing due to regrowth



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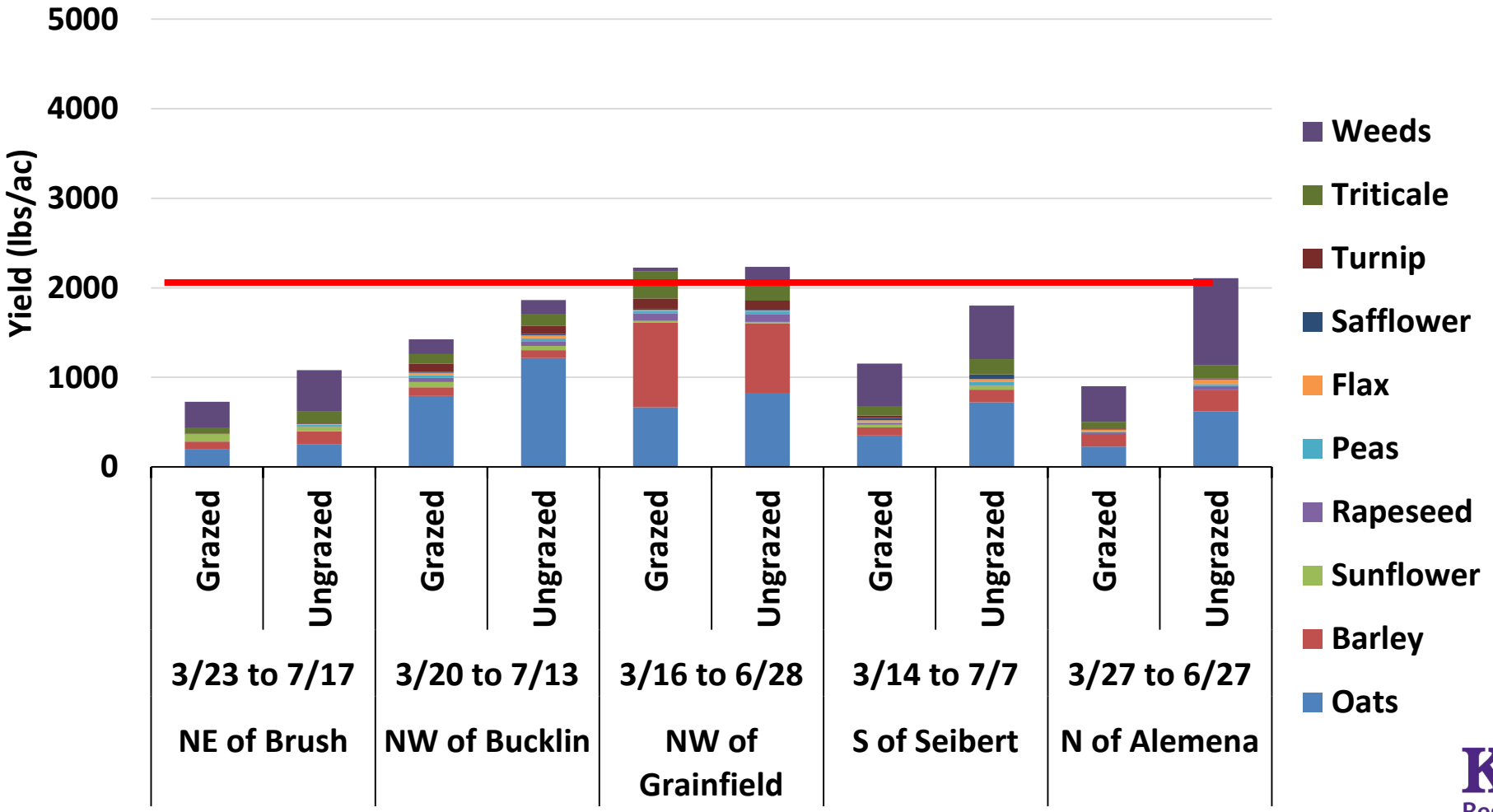
2017 Spring Planted Forage
Cooler conditions slowed growth & increased weed pressure



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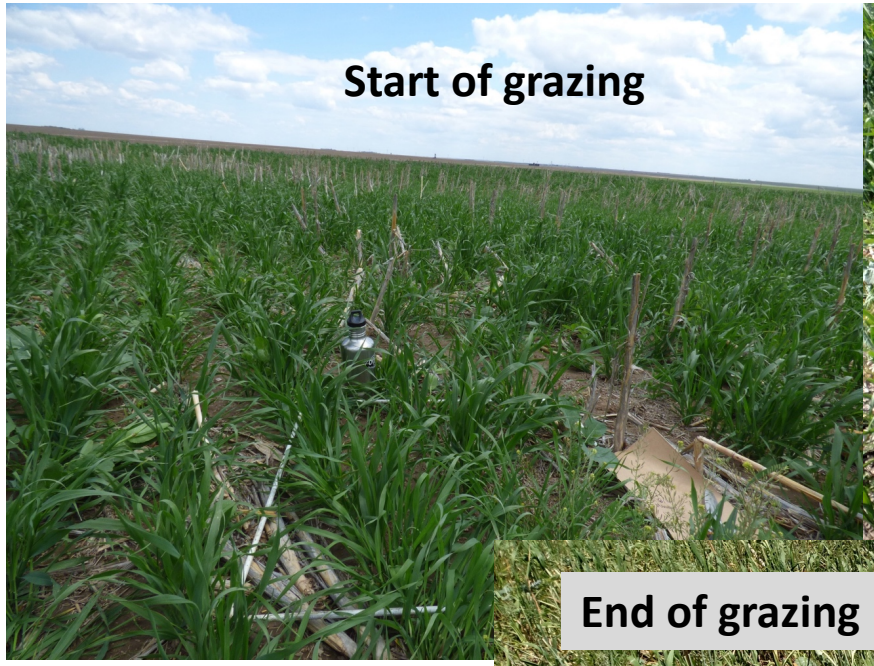

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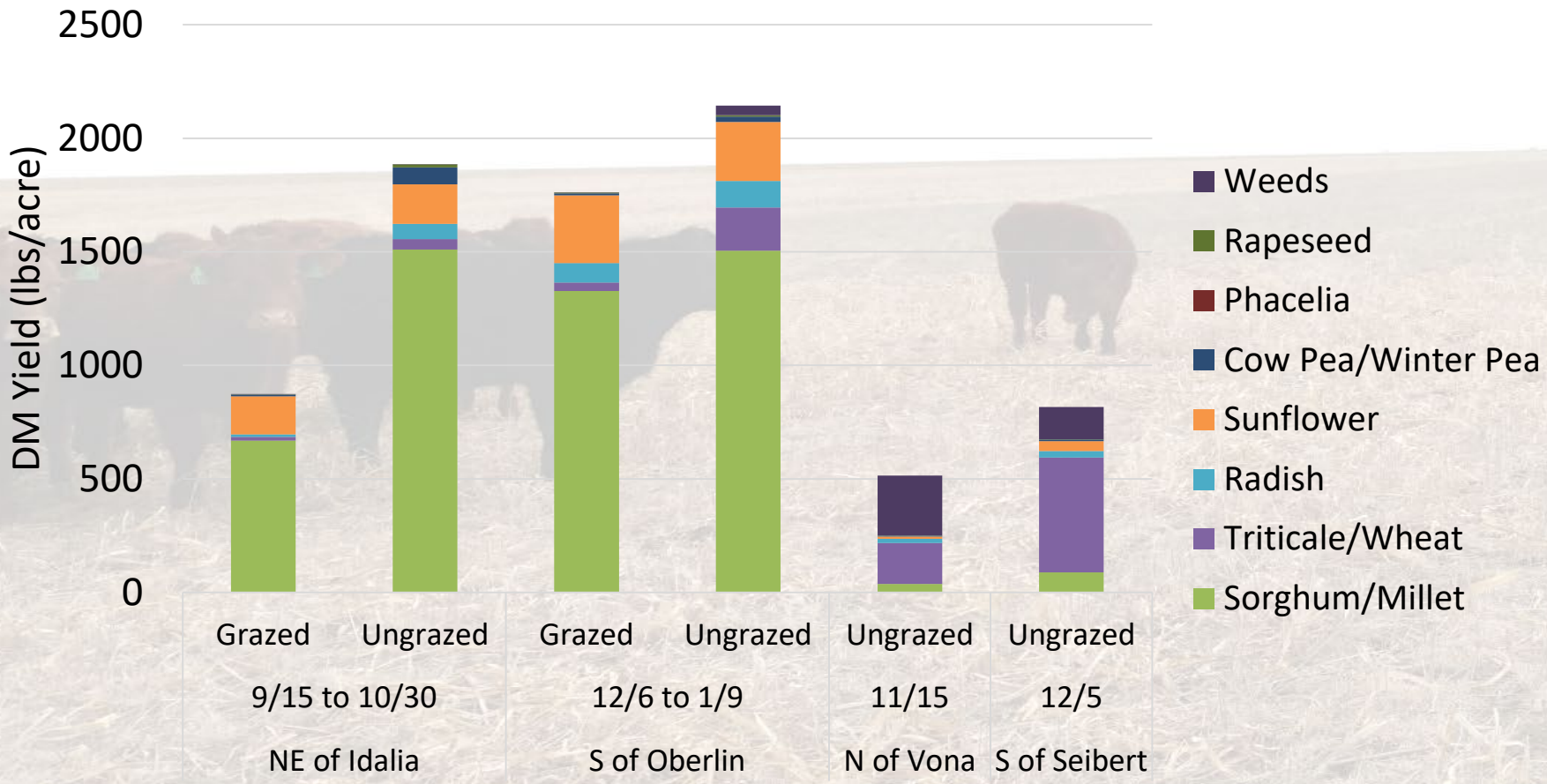
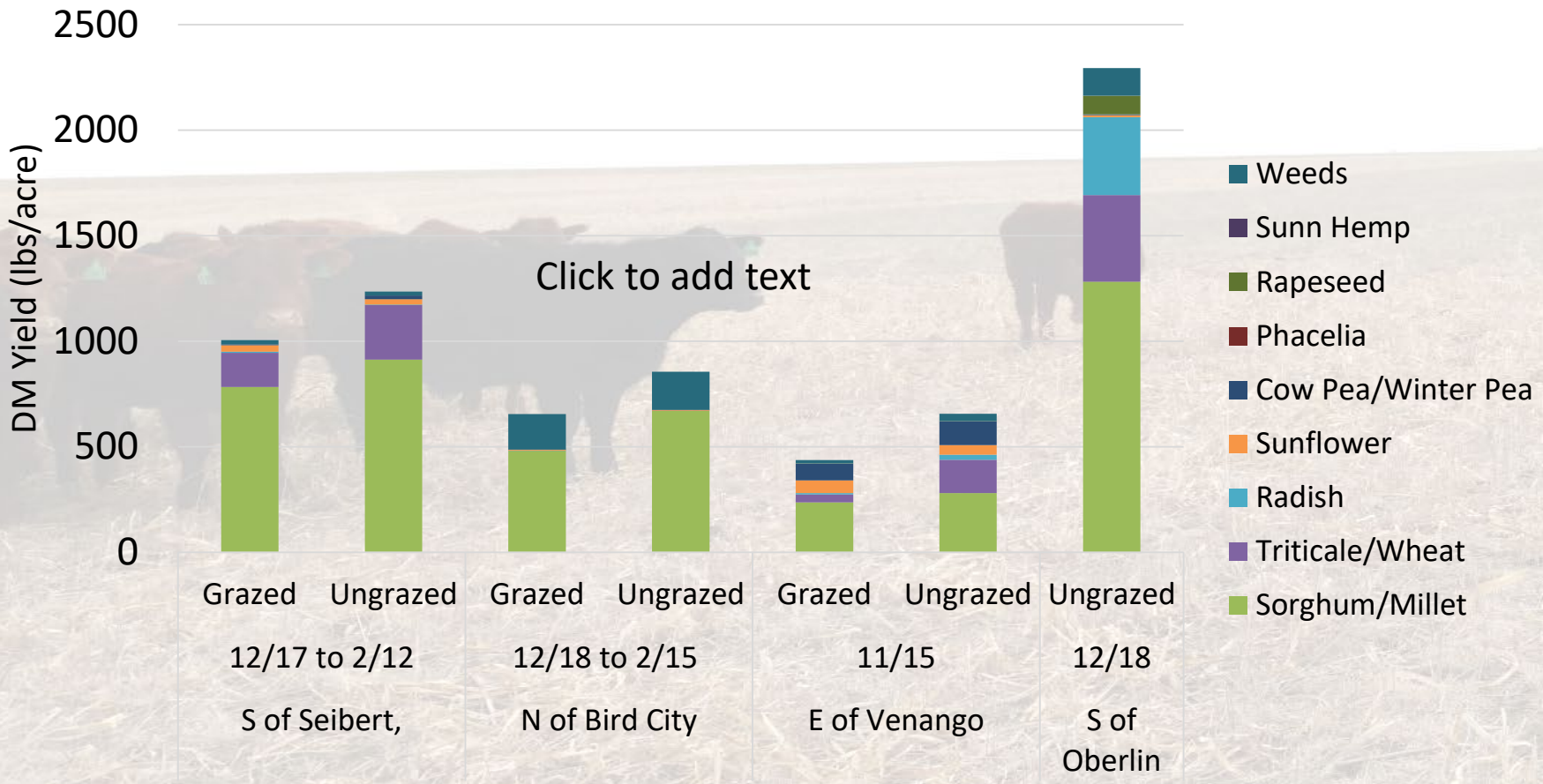
2017 Post-wheat cover crop composition



2018 Post-Wheat Cover Crop Composition



RATORS RESOURCES BLOG CONTACT

Drylandag.org

Curt Sayles

DRYLAND FARMER

"We were diversified in our crop rotation, then we were diversified

Cole Mertens

DRYLAND FARMER

"Some of our land hasn't been worked for 20+ years, and now

https://bookstore.ksre.ksu.edu/pubs/**MF3523**.pdf

Post-wheat planted cover crops may offer a longer and more flexible grazing period than spring-planted cover crops within wheat-based dryland cropping systems. However, low available soil moisture and variable weather patterns this time of year can make cover crop establishment and productivity highly variable. Concerns about disrupting good wheat stubble, managing volunteer wheat to reduce disease transmission, and controlling weeds should be considered.

Species Selection

Determining what to plant can be difficult with all the varied species available for use as cover crops. Producers can use the *Midwest Cover Crops Council Cover Crops Decision Tool* to help select species based on specified goals. The decision tool currently includes recommendations for Kansas and Nebraska counties. When cover crops are grazed, producers should choose species that will not only benefit soil health but will also be palatable and safe as forage for livestock. Fortunately, many of the species recommended for use as cover crops are also good for forage production. Factors such as nutritive content and potential toxicities must be considered.

While some forages come with risks (i.e., nitrates, prussic acid, alkaloids), most can be managed. Planting immediately after wheat harvest comes with the risk of limited moisture in August and September, plant stress, and the accumulation of nitrates. Members of the sorghum family (sorghum-sudan, sudangrass, grain sorghum, and forage sorghum) as well as millets, oats, and brassicas are common nitrate accumulators. Environmental stress and excess nitrogen can result in increased nitrate levels in these plants. Anecdotal evidence suggests that the tolerance level of livestock may be different when grazing green growing forages than when feeding hay or silage. Animals consume green forage at a slower rate (graze) than when eating hay or silage at a bunk. In addition, animals will selectively graze heads and leaves, which are lower in nitrates, before moving on to stalks. Nitrate concentration is highest in the base of the stalk, thus careful observation and management might allow for grazing forages with elevated nitrate levels. Producers should use caution when grazing forages with high nitrate potential and test before grazing.

Although a hard freeze does not change nitrate content, prussic acid toxicity can occur when grazing sorghums, particularly young plants, and in the fall following a frost/freeze. Potential problems will be addressed in the grazing management section. For more information see *Nitrate Toxicity, MF3029* (K-State Research and Extension), or *Nitrate Poisoning, 1.610* (Colorado State University Extension). To learn more about prussic acid toxicities, see *Prussic Acid Poisoning, MF3040* (K-State) or *Prussic Acid Poisoning, 1.612* (CSU). For a more complete overview of forage crops with potential toxicities, see the K-State publication, *Grazing Management: Toxic Plants (MF3244)*.

COLORADO STATE UNIVERSITY EXTENSION

Managing Spring Planted Cover Crops for Livestock Grazing under Dryland Conditions in the High Plains Region

Fact Sheet No. 0.309 | Crop Series | Production

by Joe Brummer[1], Sandy Johnson[2], Augustine Obour[3], Kat Caswell[4], Angie Moore[5], John Holman[6], Meagan Schipanski[7], and Keith Harmoney[8]

https://www.bookstore.ksre.ksu.edu/pubs/MF3443.pdf

daunting task with all of the varied species available for use as cover crops. For Kansas and Nebraska producers, local Land Grant Universities and the Midwest Cover Crops Council have developed a **decision tool** to help select species based on specified goals. When cover crops are grazed, one needs to choose species that will not only benefit soil health but will also be palatable and safe as forage for livestock. Fortunately, many of the species currently recommended for use as cover crops are also good for forage production. Factors such as nutritive content and potential toxicities must be considered.

While a number of potential problems can occur with various forages, most can be managed. The most frequent problem is the accumulation of nitrates that is common with oats and brassicas but can occur in a variety of species under certain growing and management conditions. Most recommendations for feeding nitrate containing feeds come from dry forages. Anecdotal evidence would support the idea that the tolerance level may be different in green growing forages than in dried and baled hay. Rate of intake is less in green forage than baled feed, and selectively grazing leaves prior to stalks, which are lower in nitrates, helps reduce the potential toxicity issues associated with high nitrates. However, caution is still required when grazing high nitrate forages and testing before grazing is recommended. Prussic acid is another toxic-

[1]Joe Brummer, Associate Professor/Extension Forage Specialist, [2]Angie Moore, Research Associate, and [7]Meagan Schipanski, Assistant Professor, Colorado State University, Soil and Crop Sciences; [2]Sandy Johnson, Professor/Extension Beef Specialist (Colby), [3]Augustine Obour, Associate Professor (Hays), [6]John Holman, Professor (Garden City), and [8]Keith Harmoney, Range Scientist (Hays), Kansas State University; and [4]Kat Caswell, Extension Educator (McCook), University of Nebraska. (12/18)

to publications on nitrate (**CSU** or **KSU** fact sheets) and prussic acid (**CSU** or **KSU** fact sheets) toxicities for more information. For a more complete overview of forage crops with potential toxicities, please see the publication **Grazing Management: Toxic Plants**.

For spring planted cover crops, most, if not all, of the species planted should be classified as cool-season in order to be able to plant early and take advantage of winter and early spring moisture. Species that fall into this category include the small grains (e.g. wheat, barley, oats, triticale, and cereal rye), brassicas (e.g. turnip, rapeseed/canola, and radish), and legumes (e.g. field/winter peas, winter lentils, vetch, and sweetclover). In our experience, including warm-season species like millet, sorghum-sudangrass, and sunflower in spring planted mixes results in only minimal establishment and contribution of these species to yield and forage quality. By the time warm-season species germinate, the cool-season species have already established and have a competitive advantage. Therefore, instead of investing in complex mixes that include both cool- and warm-season species, your options are to cut back on the total seeding rate by eliminating warm-season species from the mix, increase the seeding rate of cool-season species in the mix, or add other cool-seasons to the mix. Depending on your crop rotation, a targeted planting of warm-season cover crops for summer forage grazing can be a good option.

Complex mixtures of 6 or more species, often referred to as "cocktails," are commonly recommended. The benefits of cocktails relative to single species or simple mixtures of 2 to 4 species depend on your specific management goals. Competitive cool-season grass species tend to be the highest biomass producers, which can optimize weed control

Quick Facts

- growth and take advantage of winter and early spring moisture.
- Cool-season grasses tend to dominate, often to the detriment of other species, when planting cover crop mixtures in the spring.
- Yield variability is high when growing cover crops under dryland conditions in the High Plains Region ranging from under 1,000 lbs/ac in dry years to almost 5,000 lb/ac in wet years.
- Stocking rates must be flexible because of the large year-to-year variability in cover crop productivity.
- Spring planted cover crops can provide an average of 30 to 45 days of grazing.
- Start grazing spring planted cover crops when they reach 6 to 8 inches of growth to take advantage of their high nutrient content and palatability.

extension.colostate.edu

Summary of spring grazing

	Start graze	Days grazing	DM yield	ADG	Stocking rate lbs/ac
NW of Bucklin, KS ‘16	5/25	36	4040	pairs	640
NW of Bucklin, KS ’17	6/13	31	1860	pairs	270
NW of Grainfield ’16	5/18	29	4460	3.37	890
NW of Grainfield ’17	5/30	28	2235	2.27	610
S of Seibert, CO ’17	6/15	22	1800	3.91	650
S of Oberlin, KS ’16	5/25	29	5020	2.48	370
N of Almena, KS ’16	7/6	28	3880	2.34	460
N of Almena, KS ’17	6/6	27	2110	1.3	320
NE of Brush, CO ’17	6/22	25	1080	0.69	440
E of Venango, CO ‘16	7/7	28	2650	1.39	940

Wheat Yields following Spring Cover Crop

Treatment	Yield (bu/ac)
Fallow	52.2 a
Grazed	42.5 b
Ungrazed	41.3 b

Fallow plots had ~10 bu/ac greater yield

2016: 1 out of 4 fields with yield reduction

2017: 1 out of 3 fields with yield reduction

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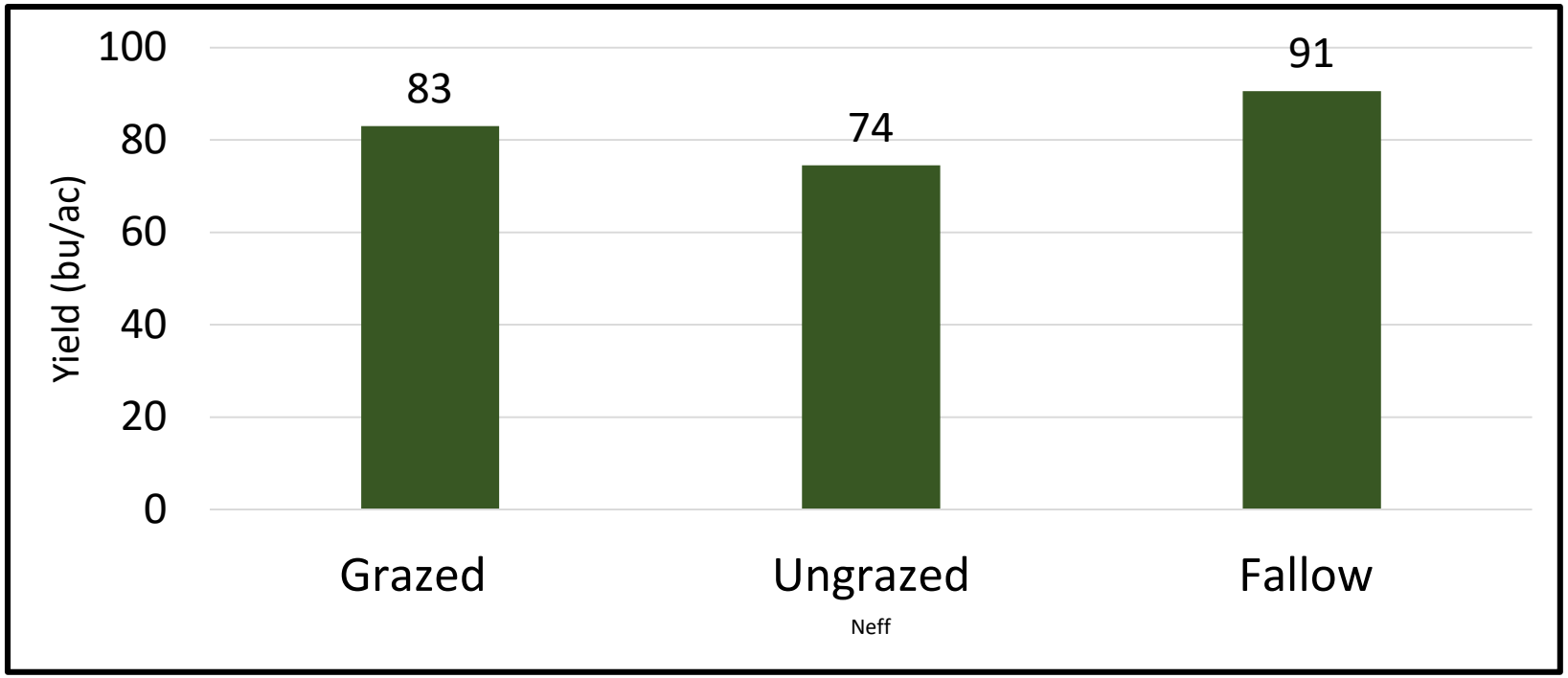
Performance of yearlings grazing post-wheat planted forage

Location - Year	Planting Date	Start graze	Days grazing	Calculated grazing days	DM Yield	ADG	Stocking rate lbs/acre
2017							
NE of Idalia, CO	July 8	9/15	33	**38**	1886	0.63	534
S of Oberlin, KS	July 10	12/8	33	**35**	2143	0.97	711
N of Vona, CO	July 18	Not grazed			514		
S of Seibert, CO	Sept 11	Not grazed			816		
2018							
N of Bird City, KS	July 7	1/14	32	**44**	856	0.41	453
S of Seibert, CO	July 9	12/17	57	**74**	1236	2.03	254
S of Oberlin, KS	July 20	Too wet to graze			2294		
E of Venango, NE	1st wk Aug	10/1	4		657		

Corn Yields Post-Wheat 2017



The graph above shows the corn yield for the only field we were able to get corn yield data from due to hail and severe weather.

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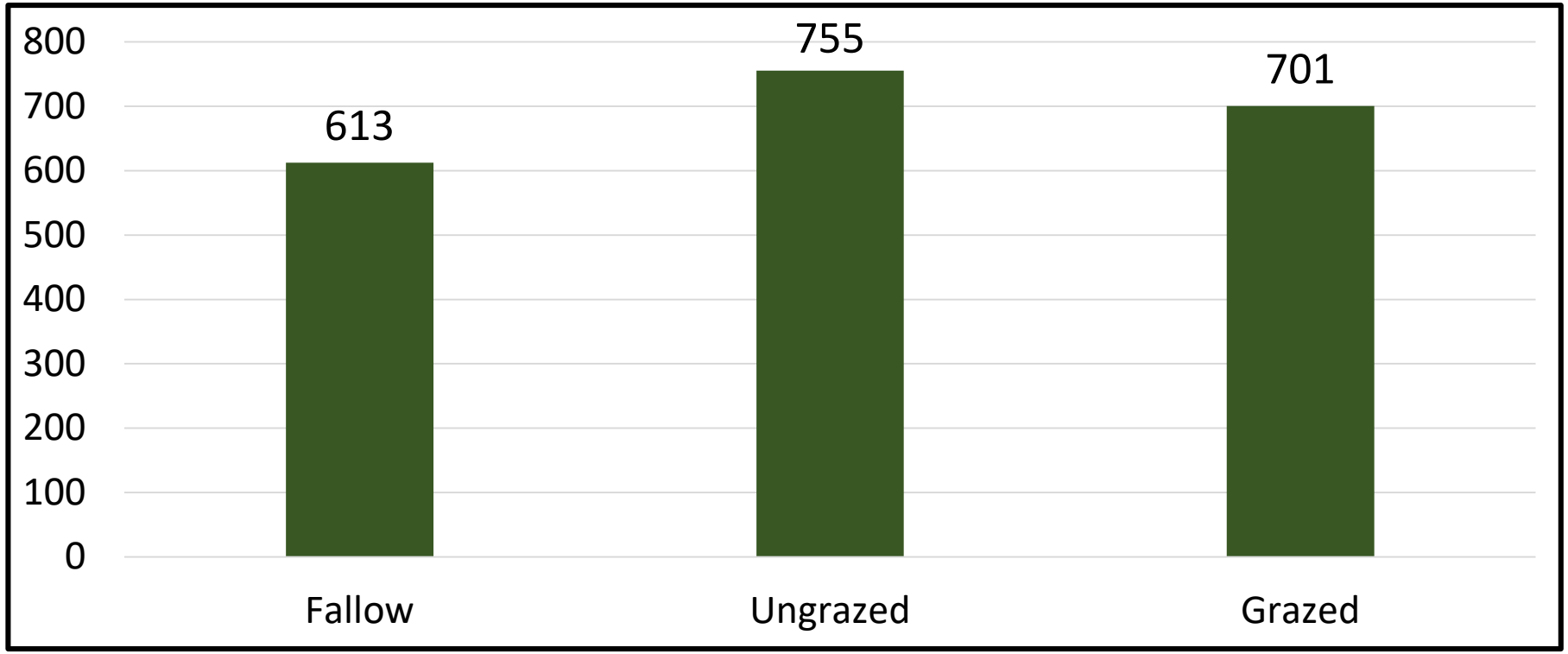
Sunflower yield post-wheat, post hailed corn 2017



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General wheat pasture stocking rates

- Fall – 250 to 600 lbs of bovine per acre or 1 to 2 acres/stocker
- Spring – 500 – 1200 lbs of bovine per acre or 0.75 to 1.3 acres/stocker

https://www.drylandag.org/resources.html

Carrying Capacity Calculator
Number of animals for fixed grazing days

	Inputs	Number of animals
Acres	100	
Estimated yield per acre, dry matter basis	1700 lbs	
% utilization	30	
Animal weight	800	
Length of grazing	45	
Dry matter Intake	2.5 %	
		57

100 x 1700 x (30/100) /((800 x (2.5/100))* 45)

$$\frac{\text{Lbs produced (DM)}}{\text{Intake per day x days}} = \frac{51{,}000}{20 \times 45} = \mathbf{57} \text{ head}$$

https://www.drylandag.org/resources.html

Carrying Capacity Calculator
Days of grazing for fixed number of animals

	Inputs	Days of grazing
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Number of animals	57	
Dry matter Intake	2.5 %	
		45

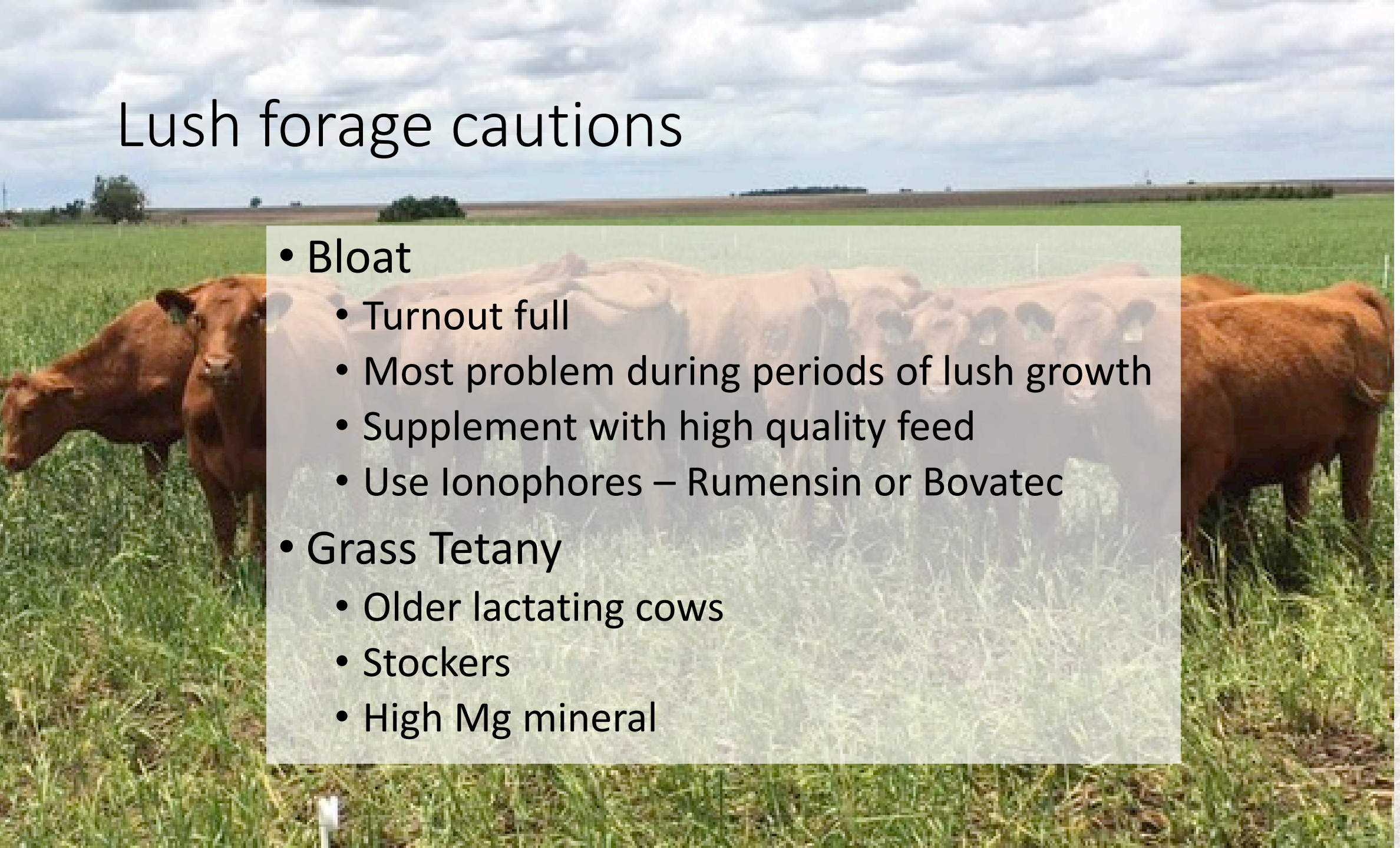
100 x 1700 x (30/100) /((800 x (2.5/100))* 57)

$$\frac{\text{Lbs produced (DM)}}{\text{Intake per day x no. of hd}} = \frac{51{,}000}{20 \times 57} = 45 \text{ days}$$

Grazing Management

- Continuous vs strip vs paddock
- Water

Lush forage cautions



- Bloat
  - Turnout full
  - Most problem during periods of lush growth
  - Supplement with high quality feed
  - Use Ionophores – Rumensin or Bovatec
- Grass Tetany
  - Older lactating cows
  - Stockers
  - High Mg mineral

Cautions

- Nitrates and prussic acid potential
- Potentially invasive rangeland weeds
  - Sunn Hemp
  - Sweetclover
- Is Hairy vetch poisonous
- Other issues
- https://www.bookstore.ksre.ksu.edu/pubs/MF3244.pdf

Economics – Range in Additional Costs

	Per AUM	Per Acre
Additional costs		
Fence materials	$3 - 7	$1 - 7
Fence labor	$2 - 5	$1 - 2
Livestock labor	$3.74-3.76	$1.59-1.72
Seed	$11 -25	$10 - 18.00
Fertilizer	$7 - 16	$7 - 9
Herbicide	$5 - 12	$5 - 9
Machinery Cost	$12 - 13	$5 - 23
Other (water)	$1 - 19	$1 - 8
Total Costs	$52 - 92	$39 - 72

Range in Partial Budget Values

	Per AUM	Per Acre
Increased Returns	$32 - 81	$44 - 74
Reduced Returns		$8 - 40
Additional Costs	$52 - 92	$39 - 72
Reduced Costs		$15 - 49
Herbicides		$15
Feed		$11
Pasture leases		$20
Net Change Income		$17 to $79

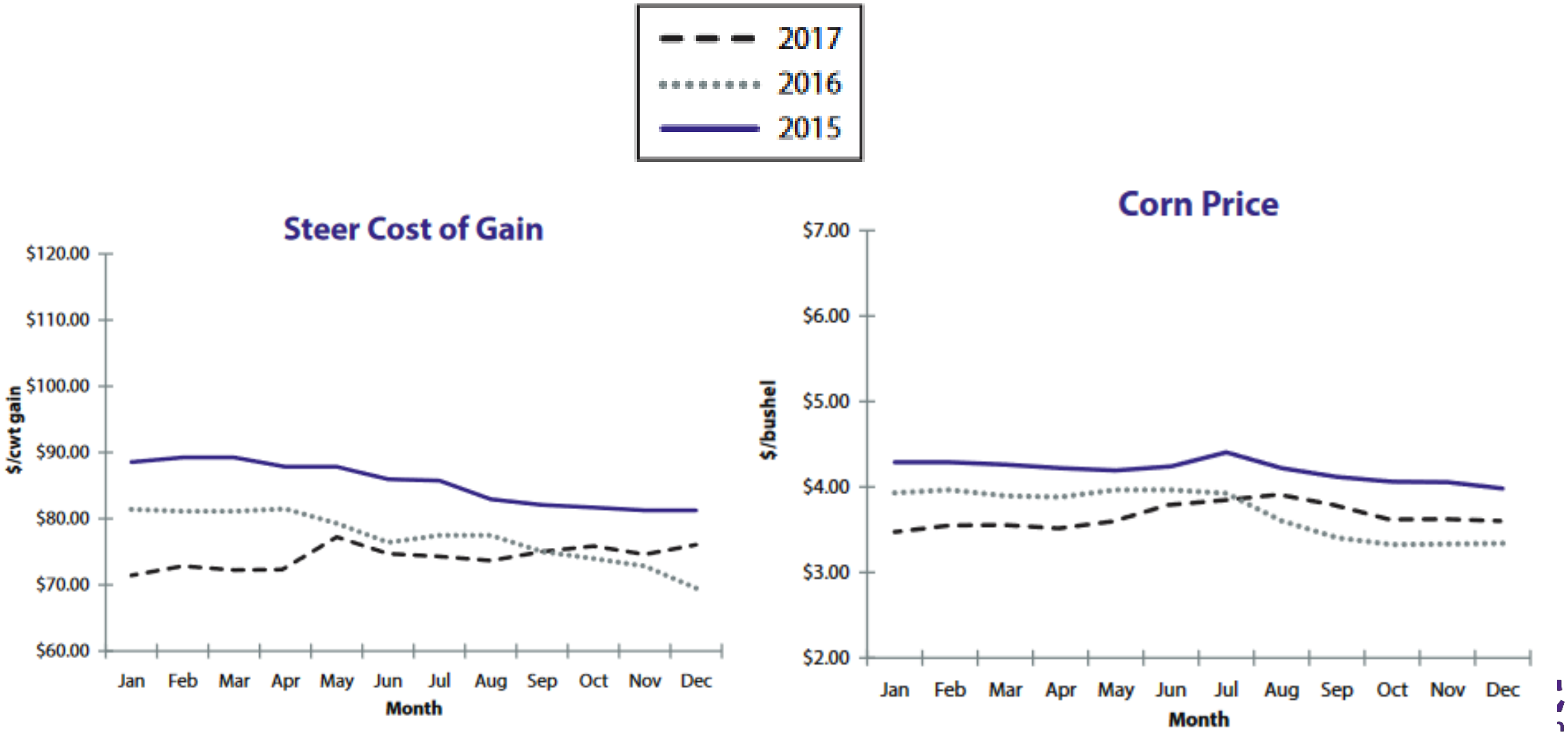
What is the cost of the alternative?

- Dry lot yearlings
  - $1.32 hd /d
  - $1.90 hd/d
- Lease
  - $0.90 / hd/ d

KFMA annual feed & pasture cost 2016 -2020

- $1.21 to $1.57 per hd per day

Focus on Feedlots



Corn price and cost of gain*

- Steer cost of gain ($/cwt) = $22.32 + ($14.09 x corn price)
- Heifer cost of gain ($/cwt)=$21.16 + ($15.21 x corn price)

Corn Price	Steer COG	Heifer COG
$3.50	71.64	74.40
$3.75	75.16	78.20
$4.00	78.68	82.00
$4.25	82.20	85.80
$4.50	85.73	89.61

* Focus on Feedlots Kansas Feedlot Performance and Feed Cost Summary 2017 Annual Review

Wheat pasture cost of gain

- Corn – 1.0 Mcal NE_m/lb
- Wheat – 0.73 Mcal NE_m/lb

Corn Price	Steer COG	Wheat Pasture COG
$3.50	71.64	52.29
$3.75	75.16	54.86
$4.00	78.68	57.44
$4.25	82.20	60.01
$4.50	85.73	62.58

Grazing annual forages

PROS

- Many cover crop species produce excellent quality forage
- Grazing a cover crop may offset management costs
- May allow for longer rest periods on pastures
- Portable fencing can improve utilization

CONS

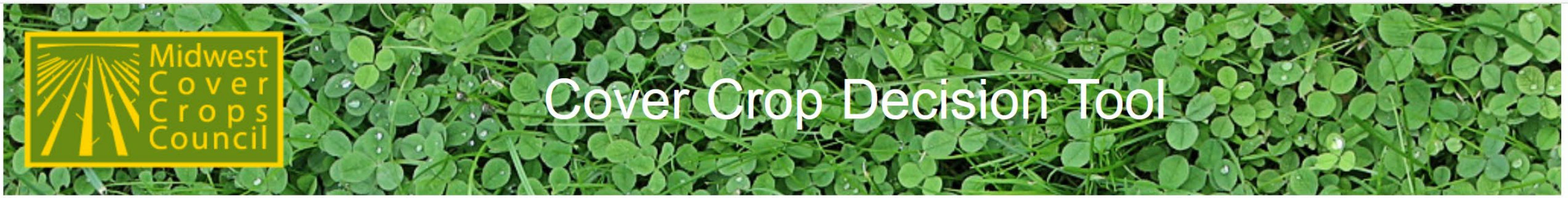
- Harder to predict forage availability in lower rainfall areas
- Always need a backup plan for livestock
- Economical system to provide water is critical
- Fencing may be needed

If you don't want to own cattle, someone else might

Wise producers have said:

- If you think you need to move soon, do it now, not tomorrow
- Seed won’t grow if it isn’t in the ground
- Work towards a balance, not maximizing livestock or crop side of equation

https://mccc.msu.edu/covercroptool/



Start with where is your farm?

Select a state or province

Select a county

Tell us your goals

Select a goal

Add Goal +

Show current cash crop options

Show drainage options

Start with where is your farm?

Kansas | Norton

Tell us your goals

#1 goal: Good Grazing

#2 goal: Lasting Residue

Add Goal +

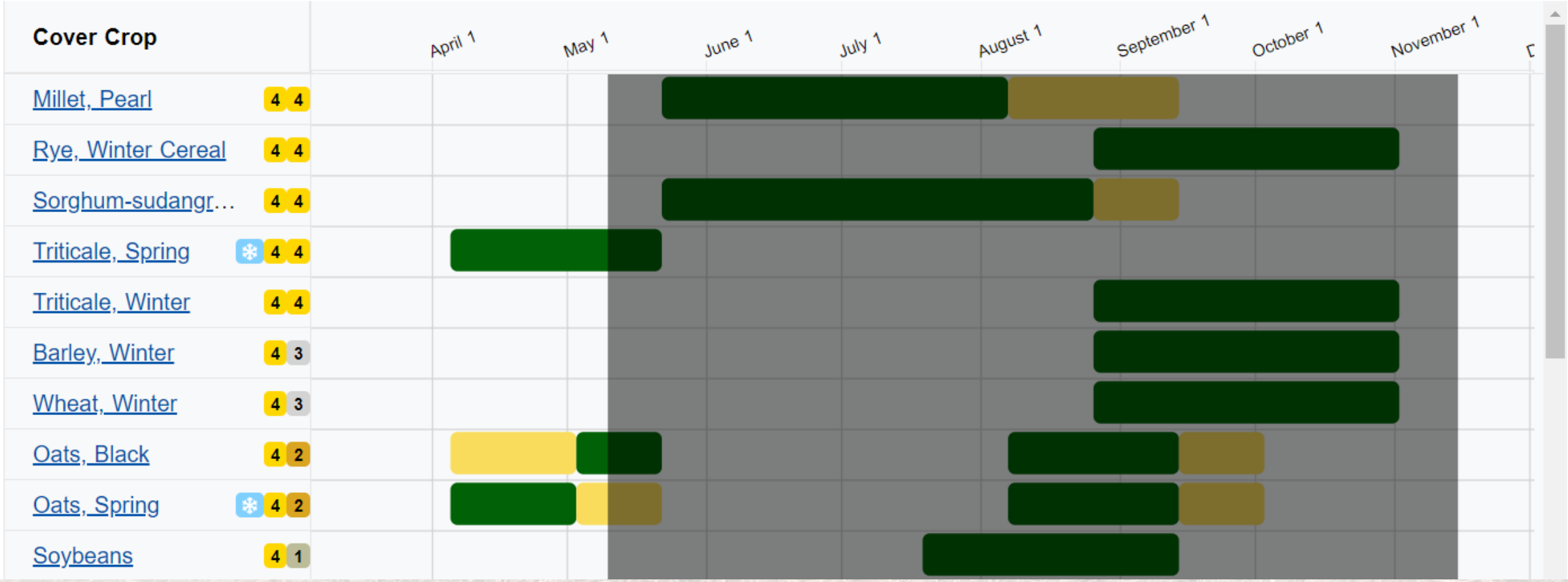
Hide current cash crop options

Current cash crop	Planting date	Harvest date
Corn - Seed	10 May 2021	15 Nov 2021

Available Cover Crops

Planting periods: Reliable Establishment | Freeze/Moisture Risk to Establishment | Current cash crop growing period

Goal fulfillment: 4 =Excellent, 3 =Very good, 2 =Good, 1 =Fair, 0 =Poor

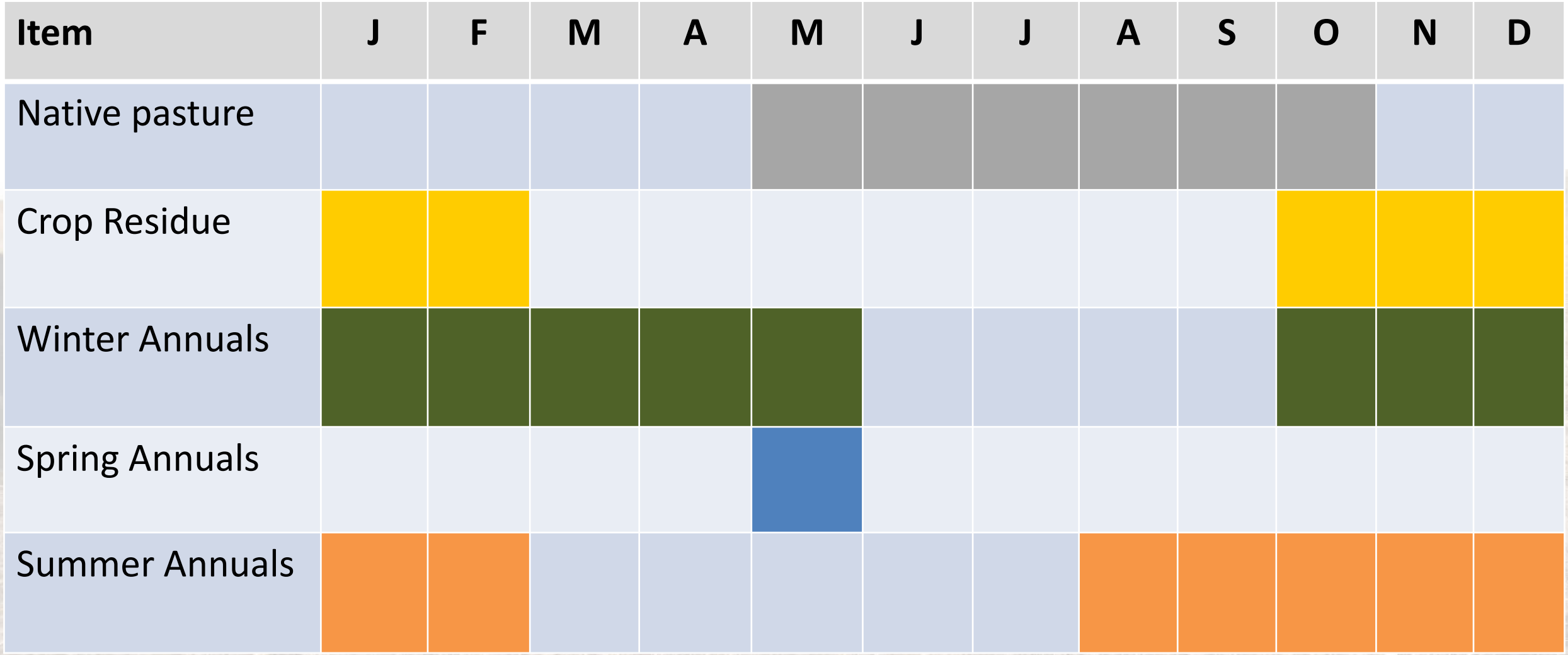



See links at:
twincreeks.ksu.edu/livestock

COW FACTS

- Herd animals
- They ruminate
- They seek place with most desirable temperature
- They need water
- They leave about half of nutrients they eat on site

Grazing Options in Western Kansas



- MF3244

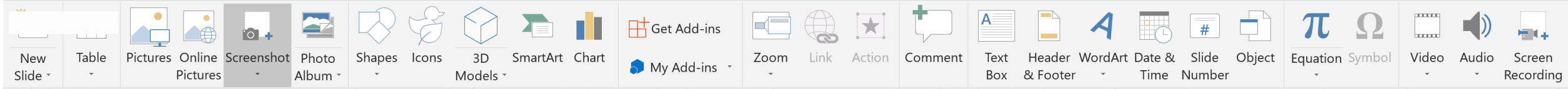
FORAGE CROPS

GRAZING MANAGEMENT: TOXIC PLANTS

Forage Crop Characteristics and Toxicities

Plant	C[1]	G[2]	W[3]	S[4]	TDN[5]	CP[6]	Toxicities	Livestock affected
Amaranth	B	A	L	W	68	13-18	Some species OK, some poisonous	
Beet (bulb)	B	B	H	C	75-79	7-11	Choking	All livestock species
Beet (tops)	B	B	H	C	58-61	15-17		
Brassica hybrid	B			C	67-70	15-16	Nitrate, polioencephalomalacia, anemia, emphysema	All cattle
Buckwheat[7]	B	A	M	W	62-75	3-25	Photosensitive dermatitis	Horses
Canola	B	A/B	M	C	62-65	13-16	Nitrate toxicity, bloat, polioencephalomalacia	All cattle
Carrot (root)	B	A/B	H	C	83	10	Scouring	Cattle
Carrot (top)	B	A/B	H	C	73	13	Nitrate	
Chicory leaves	B	P		W	67	8		
Chicory roots	B	P		W	89	4		
Flax[8]	B	A	M	C			Prussic acid (green flax), seeds SAFE	All cattle
Kale	B	A	M	C	69	22	Nitrate,polioencephalomalacia, anemia, emphysema	All cattle
Mustard[9]	B	A/P	H	C	53	10	Glucosinolate toxicity	All livestock species
Phacelia	B	A	L	C	56	15		
Radish	B	A	H	C	66	20	Nitrate, polioencephalomalacia, anemia, emphysema	All cattle
Rapeseed	B	A/B		C	70	17	Nitrate, polioencephalomalacia, anemia, emphysema	All cattle
Safflower	B	A	H	W	55-58	10-13		
Spinach[10]	B	A	M	C	51	31		
Squash[10]	B	A		W	54	26		
Sunflower[11]	B	A	H	W	55	10-12	Nitrate	All cattle
							, polioencephalomalacia, anemia, emphysema	All cattle
							etany, bloat	All cattle, lactating cows
							etany, bloat	All cattle, lactating cows
							, acidosis, founder	All cattle
							, prussic acid	All cattle and sheep
							, prussic acid	
							, prussic acid	All cattle and sheep
							etany, bloat	All cattle, lactating cows
							, prussic acid	
							etany	All cattle, lactating cows

continued



Corn Stalk Inputs

					Calculated Values
FEED AVAILABILITY	Corn yield		240.00	bu/ac	3,369 lbs DM per acre
	Stalk harvest efficiency (50% Recommended)		50.0%		1,684 Available DM
	Total number of animals		70	head	
	Average animal weight		1,100		
	Days on corn stalks		120	days	308 AUMs needed
	Acres rented		130	acres	128 Acres needed
	Cost per acre	$	10	per acre	
NUTRITION	Percent dry matter		90.0%		
	Percent crude protein (on a DM basis)		8.0%		
	Percent TDN (on a DM basis)		56.0%		
TRANSPORTATION	Cattle transportation distance (ranch to corn field)		75	miles	
	Transportation cost per loaded mile	$	5.00	per mile	$375 Cost per trip
	Animals per load		35		
CARE & SUPERVISION	How far to check cattle (one way)		60	miles	
	Transportation cost per mile to check cattle	$	0.45	per mile	
	Other charges (labor) per visit		30		$84.00 Cost per trip
	Number of supervisory visits		5		

Cost per Pound of Purchased Nutrient

$ 0.0371 per pound of **Crude Protein**

$ 0.0053 per pound of **TDN**

$ 0.0030 per pound of **DM**

Cost per Pound of Available Nutrient

$ 0.0742 per pound of **Crude Protein**

$ 0.0106 per pound of **TDN**

$ 0.0059 per pound of **DM**

Cost per Pound With Cattle Hauling

$ 0.1598 per pound of **Crude Protein**

$ 0.0228 per pound of **TDN**

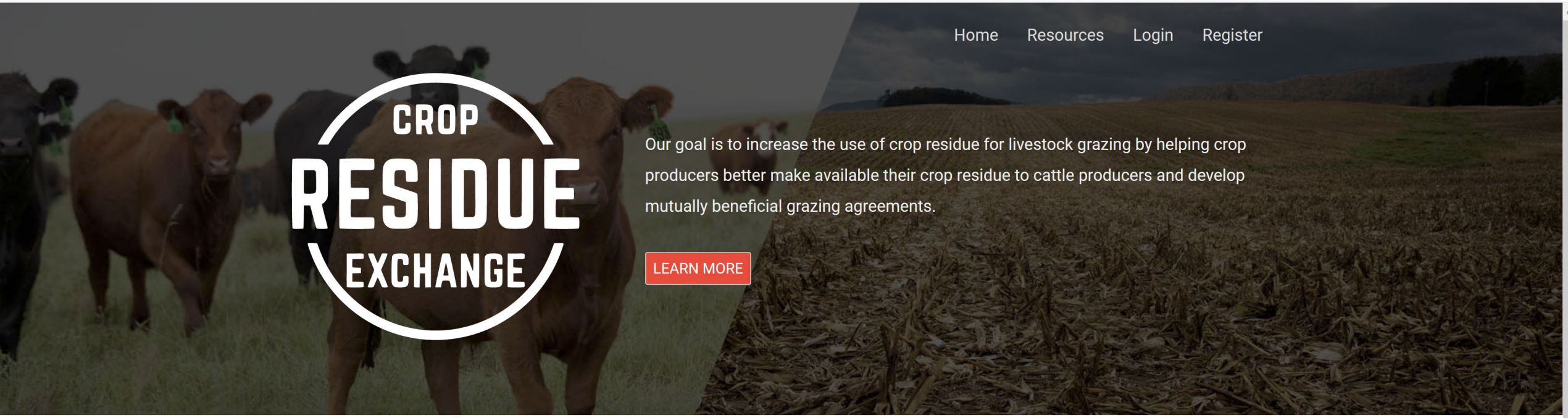
$ 0.0128 per pound of **DM**

Cost per Pound of Nutrient Consumed

$ 0.1841 per pound of **Crude Protein**

$ 0.0263 per pound of **TDN**

$ 0.0147 per pound of **DM**



Crop Producers

List crop residue available for potential grazing arrangements.

LIST CROP RESIDUE & FORAGE

Livestock Producers

Search crop residue listings available for potential grazing arrangements.

FIND FORAGE

114
miles
SHERMAN COUNTY, NE

Available: 11/14/2020 - 3/31/2021
Corn, 135.0 acres, Partially Fenced, Water Onsite, No Care Provided, $0.4 per head per day
285 AUMs Available

164
miles
POLK COUNTY, NE

Available: 11/18/2020 - 2/15/2021
Corn, 237.3 acres, Unfenced, Water Onsite, Care Provided, $0.85 per head per day
580 AUMs Available

165
miles
BOONE COUNTY, NE

Available: 10/17/2020 - 2/28/2021
Corn, 282.1 acres, Unfenced, Water Onsite, Care Provided, $15 / acre
737 AUMs Available

165
miles
BOONE COUNTY, NE

Available: 10/17/2020 - 2/28/2021
Corn, 130.5 acres, Unfenced, Water Onsite, Care Provided, $15 / acre
341 AUMs Available

165
miles
BOONE COUNTY, NE

Available: 10/15/2020 - 2/28/2021
Corn, 158.0 acres, Unfenced, Water Onsite, Care Provided, $15 / acre
413 AUMs Available

Lactipro: Convenient and Easy t

https://www.msbiotec.com/lactipro#lactipronxt

Lactipro® harnesses the power of *Mega e*™, a superior lactic acid utilizer, to enable beef and dairy producers to support healthy rumen pH and improve profitability.

In 2020 MS Biotec is launching two new Lactipro product lines with stability of months instead of days – LactiproFLX® and LactiproNXT®.

Livestock PFT Signature Program

- Forage sampling and analysis

- https://www.asi.k-state.edu/research-and-extension/beef/agent-resources/programmingmaterials.html

Animal Sciences and Industry

KSUBeef.org Home

Beef Stocker Field Day

Cattlemen's Day

Ranching Summit

Winter Ranch Management

Beef Team Webinars

YouTube Channel

Feed & Water

Health

Reproduction & Genetics

Cost of Production & Marketing

Employee Management

Legal/Regulatory

Proceedings and Research Reports

Sunflower Supreme Replacement Heifer Program

Programming Materials

>> Back to Professional Development Materials

Forage Sampling and Feed Analysis

Forage Sampling

Forage Sampling Action Plan

Understanding Feed Analysis

Forage Sampling Analysis Evaluation

Forage Sampling and Feed Follow-up Evaluation

How to Sample Forages for Nutrient Analysis video

Understanding Forage Analysis video

Prussic Acid

Prussic Acid Demo Talk

Understanding Nitrate Toxicity for Cattle and Management Practices presentation

Nitrates Example video