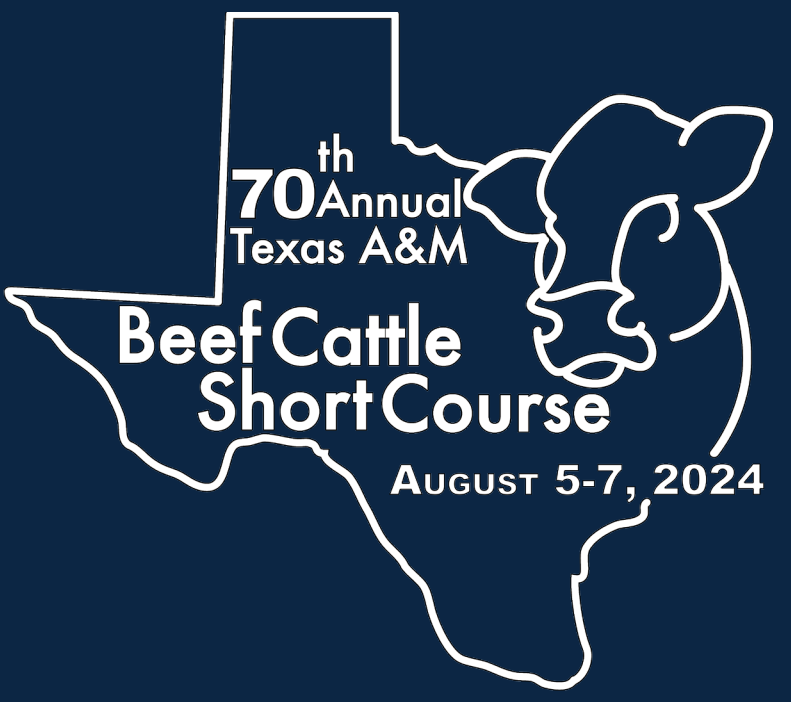
Nutrition Management: How Much Should I Feed My Cattle?
&
Minerals and Growing Cattle

Coordinators: Dr. Jason Banta
Dr. Karl Harborth



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Nutrition Management:
"How Much Should I Feed My Cattle"

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Cow-Calf Nutrition: Forage and Supplementation Considerations

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Listed values do not guarantee current company specifications.

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What is the most important part of a nutrition program?

3

4

Forage Systems

5

What is the goal of a forage plan/system?

maximize the number of grazing days

reduce/eliminate supplementation requirements

85% or better weaning rate

good weaning weights

6

Customized to Your Operation, Soil Type, and Resources

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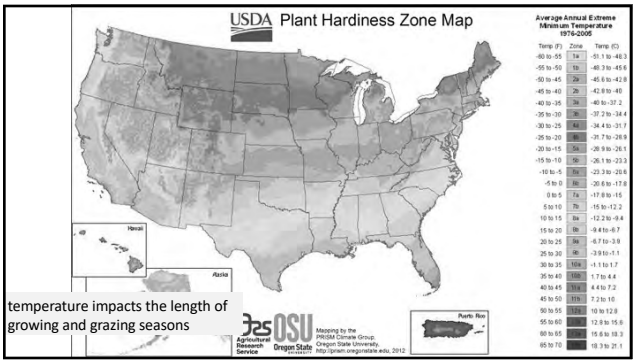
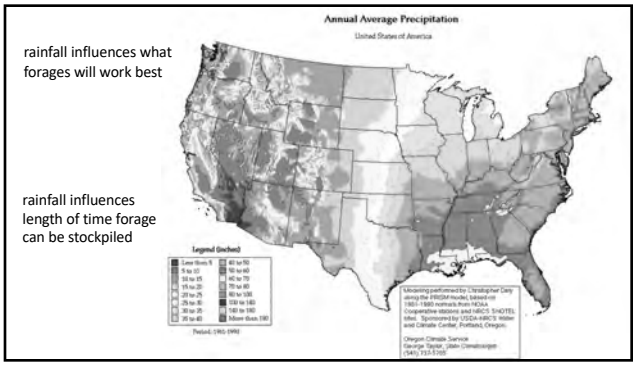


temperature impacts the length of growing and grazing seasons

8



rainfall influences what forages will work best

rainfall influences length of time forage can be stockpiled

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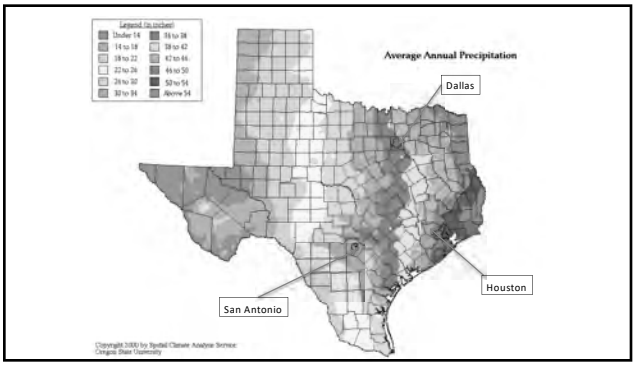

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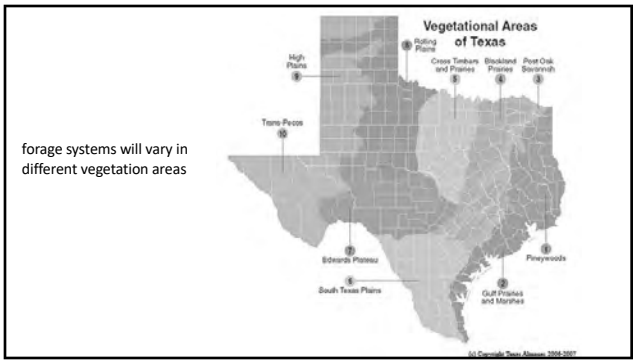

forage systems will vary in different vegetation areas

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Cow-Calf Systems are based on Perennial Forages

annual forages: annual ryegrass

short-lived perennial forages: alfalfa

long-lived perennial forages: bermudagrass

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Native Range Systems

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tall	eastern gammagrass switchgrass big bluestem indiangrass little bluestem	
mixed	little bluestem sand dropseed side oats gramma	
short	blue gramma buffalograss	

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Protein is often
first limiting when quality declines
in Native Warm-Season Perennial Forages

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Introduced Forage Systems

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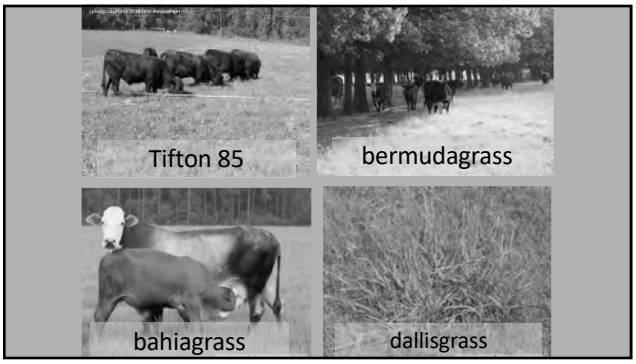

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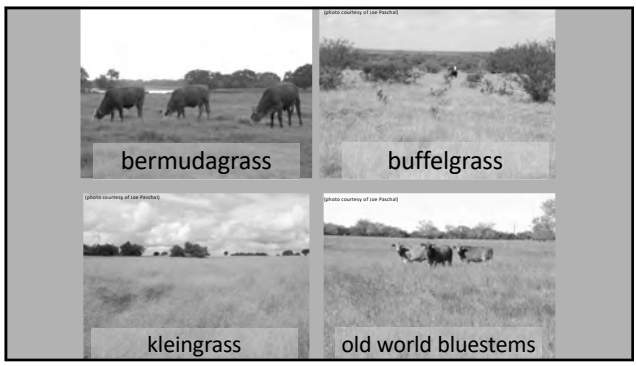

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Energy is often
first limiting when quality declines
in Introduced Warm-Season Perennial Forages

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Bahiagrass and
Bermudagrass Systems

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When does
bahiagrass and
bermudagrass grow?

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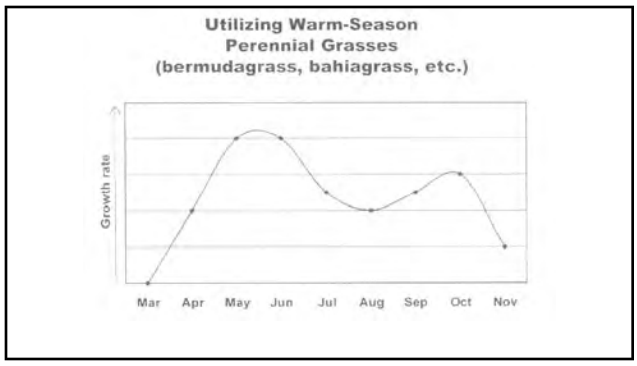

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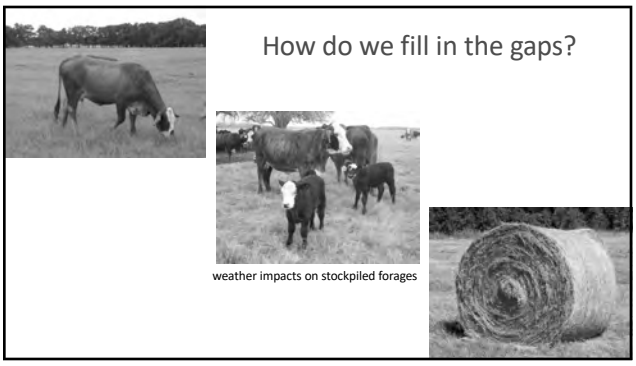

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What about
cool-season annuals?

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rye, oats, wheat

ryegrass

benefits to heifer development

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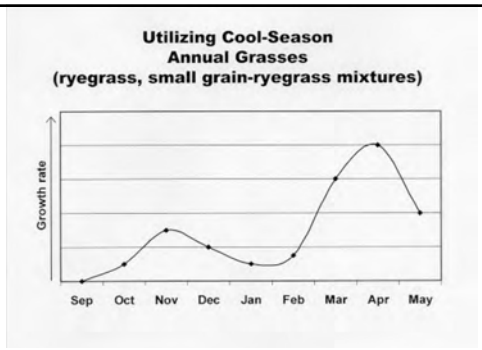

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just 2 forages

ryegrass slowing down
warm-season perennial?

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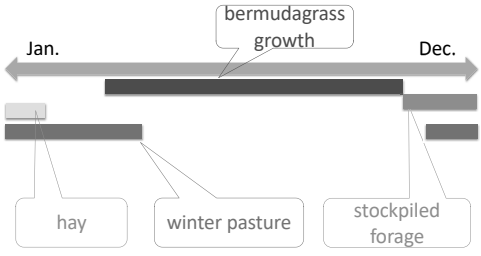

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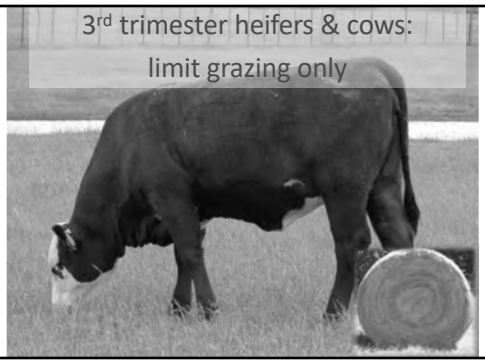
3rd trimester heifers & cows:
limit grazing only



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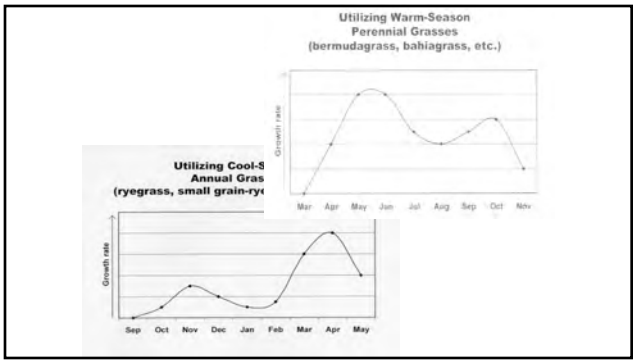

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Management Factors Affecting Forage Production

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Grazing Pressure and Stocking Rate

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pictures taken same day, 100’ apart

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Overton Stocking Rate Study: Winter Pasture

- 2 years: 1997-1998 and 1998-1999
- rye/ryegrass overseeded on bermudagrass
- 158 days of grazing: Dec. to May
- 267 lbs of N

initial weight of steer: 600 lbs

low: 1.6 hd/ac = 960 lbs
medium: 2.2 hd/ac = 1,320 lbs
high: 2.8 hd/ac = 1,680 lbs

(Rouquette et al., 2000; Steer performance affected by grazing method and stocking rate)

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Overton Stocking Rate Study

Grazing System (Continuous)	Stocking Rate, hd/ac	ADG, lbs	Gain/acre, lbs
Low	1.6	2.95	743
Medium	2.2	2.12	740
High	2.8	0.96	436

(Rouquette et al., 2000; Steer performance affected by grazing method and stocking rate)

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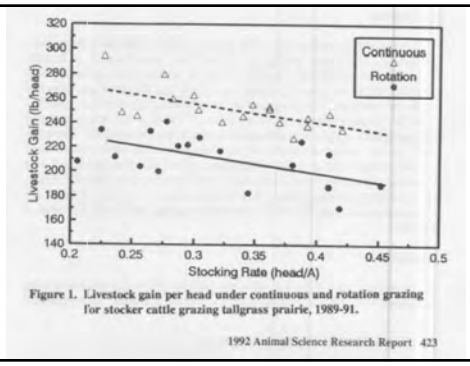

Figure 1. Livestock gain per head under continuous and rotation grazing for stocker cattle grazing tallgrass prairie, 1989-91.

1992 Animal Science Research Report 423

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some level of rotation/ability to rotate is beneficial in most situations

- cutting considerations and management of stored forages
- highly palatable forages
- planting of annuals forages

depending on stubble height targets it is very easy to reduce animal performance with rotation

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Stubble Height and Plant Health

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Stocking
Strategies and Factors

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How many acres do you need per cow-calf pair?

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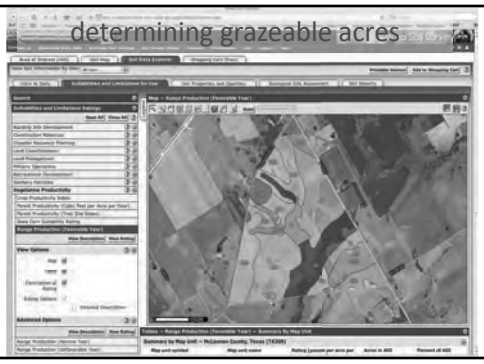
determining grazeable acres



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70% utilization

Cow Weight	1,000	1,200	1,400
Cow intake, (2.25% of BW)	8,213	9,855	11,498
Calf Intake	1,508	1,810	2,111
Pair Intake	9,721	11,665	13,609
Forage Allowance, let cow consume (70%)	13,887	16,664	19,441
Forage Production, lbs/ac	4,500	4,500	4,500
Stocking Rate, ac/pair	3.09	3.70	4.32

50

native forages: 25% utilization

Cow Weight	1,000	1,200	1,400
Cow intake, (2.25% of BW)	8,213	9,855	11,498
Calf Intake, lbs/year	1,508	1,810	2,111
Pair Intake, lbs/year	9,721	11,665	13,609
Forage Allowance, let cow consume (25%)	38,884	46,660	54,436
Forage Production, lbs/ac/yr	3,000	3,000	3,000
Stocking Rate, ac/pair	12.96	15.55	18.15

51

80%

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Protein and Energy Supplementation

53

When do we supplement?

for most beef cow-calf operations protein and/or energy supplementation is generally needed

- late summer when forage quality declines
- during the winter

54

What 3 primary things affect supplementation of protein and energy?

BCS
nutrient requirements
forage quality

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Factors Affecting
Protein and Energy Supplementation

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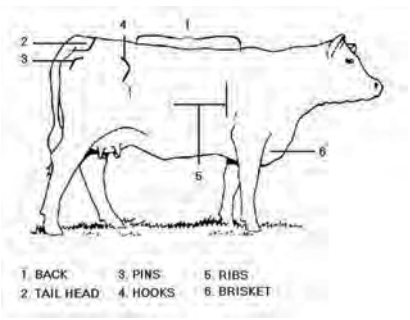

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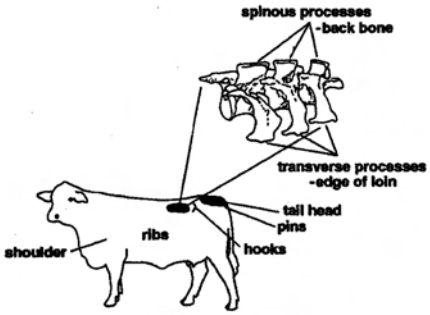

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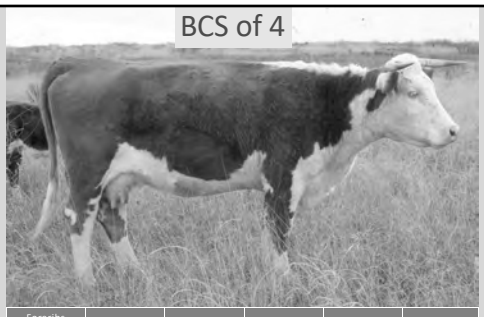
BCS of 4



Foreribs visible	Slightly visible	Visible	No fat	No fat	Some
Ribs	Spine	Hooks/Pins	Tailhead	Brisket	Muscling

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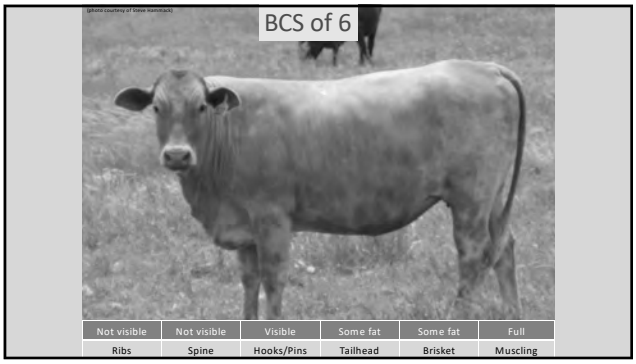
BCS of 5

1 or 2 may be visible	Not visible	Visible	No fat	No fat	Full
Ribs	Spine	Hooks/Pins	Tailhead	Brisket	Muscling

60



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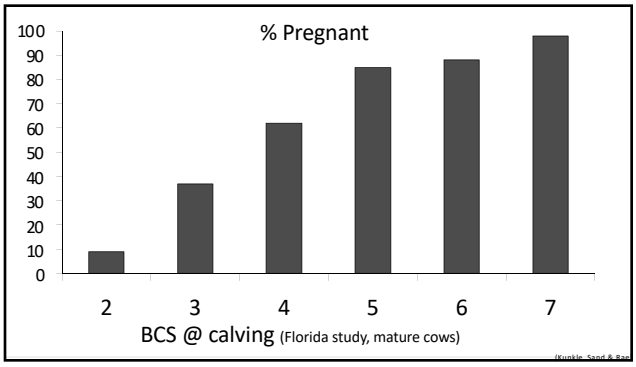

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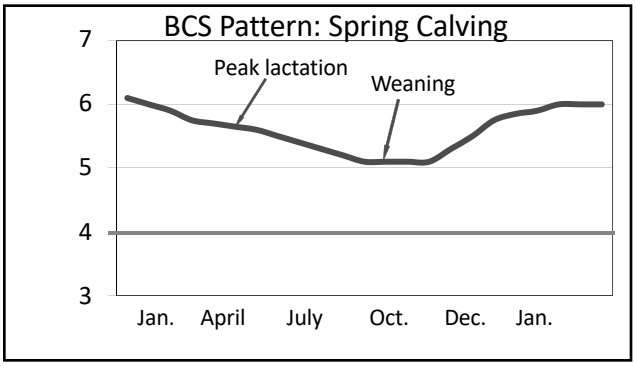

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Nutrient Requirements
Cows

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Description	% CP	% TDN	% Ca	% P
2-yr-old lactating cow, peak lactation	11.5	60	0.28	0.18
3-yr-old lactating cow, peak lactation	12.5	61	0.30	0.19
mature lactating cow, peak lactation	12.5	61	0.30	0.19
coming 3-yr-old dry cow, 270 d pregnant	9.0	58	0.26	0.17
mature dry cow, 270 d pregnant	8.5	55	0.26	0.17

*Estimated dietary requirements for high marbling cows with no weather stress. Assumes 1,300 lb mature weight and 25 lb milk potential at maturity (NRC, 2016)

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67

but….what if the cows look like this?

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Nutrient Requirements
Steers

71

comparison of steers
at different weights gaining 2.0 lb/d

weight	% CP	% TDN	% Ca	Ca, gm	DMI, lb
500	12.7	65	0.55	32	13.0
600	11.0	63	0.45	32	15.9
700	10.0	61	0.38	32	18.7
800	9.5	61	0.34	31	20.6

*Estimated dietary requirements for steers under typical production conditions (Beef Cattle NRC, 1996). These requirements will vary some based on various factors.

72

500 lb steer calf

ADG	% CP	% TDN	% Ca	Ca, gm	DMI, lb
1	10.0	56	0.36	20	12.5
1.5	11.5	60	0.44	26	12.8
2	12.7	65	0.55	32	13.0
2.5	14.0	70	0.65	38	13.0
3.0	15.3	75	0.75	44	13.0

*Estimated dietary requirements for steers under typical production conditions (Beef Cattle NRC, 1996). These requirements will vary some based on various factors.

73

600 lb steer calf

ADG	% CP	% TDN	% Ca	Ca, gm	DMI, lb
1.0	9	55	0.31	21	15
1.5	10	59	0.38	27	15.6
2.0	11	63	0.45	32	15.9
2.5	12	67	0.52	37	15.9
3.0	13.1	72	0.60	43	15.9

*Estimated dietary requirements for steers under typical production conditions (Beef Cattle NRC, 1996). These requirements will vary some based on various factors.

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700 lb yearling steer

ADG	% CP	% TDN	% Ca	Ca, gm	DMI, lb
1.0	8	53	0.26	21	18.1
1.5	9	57	0.32	27	18.5
2.0	10	61	0.38	32	18.7
2.5	11	65	0.43	36	18.7
3.0	12	70	0.50	42	18.7

*Estimated dietary requirements for steers under typical production conditions (Beef Cattle NRC, 1996). These requirements will vary some based on various factors.

75

800 lb yearling steer

ADG	% CP	% TDN	% Ca	Ca, gm	DMI, lb
1.0	7.8	53	0.25	22	20.0
1.5	8.6	57	0.30	27	20.5
2.0	9.5	61	0.34	31	20.6
2.5	10.3	65	0.39	36	20.6
3.0	11.1	70	0.44	41	20.6

*Estimated dietary requirements for steers under typical production conditions (Beef Cattle NRC, 1996). These requirements will vary some based on various factors.

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Nutrient Requirements Replacement Heifers

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open heifer: weaning – breeding

Target ADG: 1.55 lb mature weight: 1300 lb

Age, months	Weight	% CP	% TDN	% Ca	% P	DMI, lb
7.0	520	11	61	0.44	0.22	13.0
8.7	600	10	60	0.38	0.20	15.0
10.9	700	8.5	59	0.33	0.18	17.5
13.0	800	8	58	0.29	0.16	20.0
14.0	845	8	57	0.28	0.16	21.1

*Estimated dietary requirements for high marbling heifer with no weather stress. Assumes a 1,300 lb mature weight. (NRC, 2016)

78

bred heifer: breeding – calving calf birthweight: 70 lb

target ADG: 1.0 lb age at calving: 24 months mature wt: 1300 lb

Age, months	Days Preg.	Weight	% CP	% TDN	% Ca	% P	DMI, lb
16	45	915	8	56	0.26	0.16	19
18	105	975	8	57	0.26	0.16	20
20	165	1035	8	58	0.26	0.16	21
22	225	1095	9	61	0.34	0.19	22
23.5	270	1155	10.5	67	0.36	0.20	23

*Estimated dietary requirements for high marbling heifer with no weather stress. Assumes a 1,300 lb mature weight. (NRC, 2016)

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Forage Intake and Forage Quality

80

as forage quality declines forage intake decreases

- low quality forage = low intake
- high quality forage = higher intake

81

general intake guidelines (DM Basis)

- dry gestating cow: 1.8 to 2.0% of BW
- lactating cow: 2.3 to 2.5% of BW

	dry pregnant cow, % of BW	lactating cow, % of BW
DM basis	1.8 – 2.0%	2.3 to 2.5%
As-fed, assume 10% moisture hay	2.0 – 2.2%	2.5 – 2.8%
As-fed, assume 70% moisture silage	6.0 – 6.7%	7.7 – 8.3%

(intake guidelines from Lardy et al., 2004)

82

Hay: 45% TDN, 5.0% CP

Dry cow

goal: maintain BCS

8 lbs of 20% cubes

Wet Cow

goal: control weight loss

11 lbs of 20% cubes

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Factors Affecting Forage Quality

- species and cultivar
- maturity
- temperature
- nitrogen fertilizer
- rained on hay
- hay put up wet

84

Some generalizations:

cool-season > warm-season

annuals > perennials

arid environments > humid environments

85

shredding reduces animal performance

height of plant and varying quality

annuals and seed, ryegrass vs small grains

just because perennials are tall doesn't mean quality is low

86

warm-season perennials (native)

ADG: 1.0 to 2.25 lb

- big bluestem & indiangrass
- switchgrass
- eastern gamagrass
- little bluestem

part of advantage in ADG is due to grazing differences (25% vs 65+% utilization)

87

warm-season perennials (introduced)

ADG: 1.0 to 1.6 lb

- old world bluestems (could be higher under some conditions)
- Tifton 85 (bermudagrass x stargrass)
- johnsongrass (doesn't tolerate grazing well)

ADG: 0.7 to 1.3 lb

- bermudagrass
- kleingrass (doesn't tolerate close grazing for extended periods)
- bahiagrass
- dallisgrass

88

warm-season annuals (introduced)

ADG: 2.0 to 2.75 lb

- sorghum x sudangrass
- sudangrass

ADG: 1.25 to 2.0 lb

- crabgrass
- pearl millet

89

cool-season annuals (introduced)

ADG: 1.5 to 2.85 lb

- ryegrass
- small grains
  - rye, wheat, oats, barely, triticale

90

cool-season perennials (introduced)

ADG: 1.0 to 2.25 lb

- orchardgrass
- fescue
  - seed head suppression
  - novel endophyte
- perennial ryegrass

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Maturity

Interval between cuttings	% TDN	Yield, tons/acre
3 weeks	65.2	7.9
4 weeks	61.9	8.4
5 weeks	59.3	9.2
6 weeks	58.0	10.3
8 weeks	54.1	10.2
12 weeks	51.0	10.4

Coastal bermudagrass study in Georgia by Glen Burton

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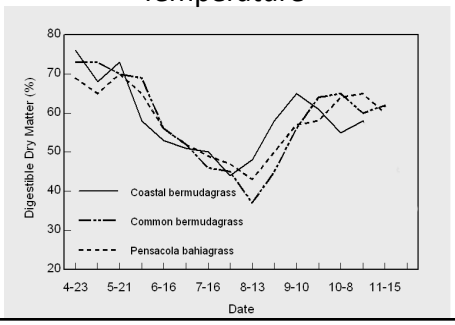
benefit of multiple fields that can be cut for hay or grazed

93

Temperature



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Determining Hay Quality

sample each cutting

TDN (i.e. energy)

- summative equations
- NDF
- NDF digestibility
- ash
- crude protein
- ADICP

Crude Protein

95

Components	As Fed	DM
% Moisture	9.1	
% Dry Matter	90.9	
% Crude Protein	6.2	6.8
% Adjusted Crude Protein	6.2	6.8
% Acid Detergent Fiber	45.3	49.8
% Neutral Detergent Fiber	56.1	61.8
% NFC	22.3	24.5
% TDN	52	57
NEL, Mcal/Lb	.46	.51
NEM, Mcal/Lb	.46	.51
NEG, Mcal/Lb	[illegible]	.26
IVTD 48hr, % of DM	[illegible]	69
NDFD 48hr, % of NDF	[illegible]	50

57% TDN

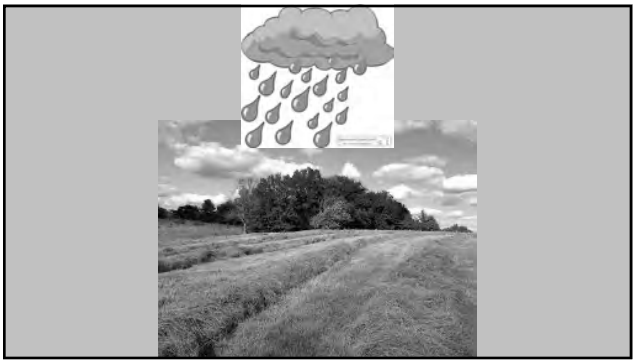
96

Components	As Fed	DM
% Moisture		
% Dry Matter		
% Crude Protein	6.2	6.8
% Adjusted Crude Protein	6.2	6.8
% Acid Detergent Fiber	45.3	49.8
% Neutral Detergent Fiber	56.1	61.8
% NFC	11.8	13.0
% Ash	16.55	18.21
% TDN	42	46
NEL, Mcal/Lb	.37	.41
NEM, Mcal/Lb	.31	.34
NEG, Mcal/Lb	.0	.09
IVTD 48hr, % of DM		69
NDFD 48hr, % of NDF		50

18.21% Ash

46% TDN

97



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Forage Testing Laboratories

not all labs are the same

talk to nutritionist

- analysis may change depending on forage species
- appropriate lab may change if HCN is needed

Dairy One Forage Lab
Ithaca, NY; 800-344-2697
http://www.dairyone.com

99

some Dairy One Forage NIR packages, prices as of 7/1/24

(325) Forage NIR $20: DM, CP, SP, RDP, ADICP, NDICP, est. lysine & methionine, ADF, aNDF, lignin, starch, WSC, ESC (simple sugars), NFC, fat, ash, RFV, TDN, NEl, NEm, NEg, ME, DE, Ca, P, Mg, K, S, Cl.

(321) Forage NIR Prime $27: DM, CP, SP, RDP, ADICP, NDICP, est. lysine & methionine, ADF, aNDF, lignin, starch, WSC, ESC (simple sugars), NFC, fat, TFA, RUFAL, ash, RFV, RFQ (with 48hr NDFD), MILK2006 values, TDN, NEl, NEm, NEg, ME, DE, Ca, P, Mg, K, S, Cl. **Select either NDFD 24hr, 30hr, or 48hr**, 30hr is default. Silages receive lactic acid, acetic acid, and ammonia CPE. Corn silages receive starch digestibility (7hr, 4mm grind).

(327) Forage NIR Pro $31: DM, CP, SP, RDP, ADICP, NDICP, est. lysine & methionine, ADF, aNDFom, lignin, starch, WSC, ESC (simple sugars), NFC, fat, TFA, C18:1, C18:2, C18:3, RUFAL, ash, TDN, NEl, NEm, NEg, ME, DE, Ca, P, Mg, K, S, Cl. Includes uNDFom and NDFDom values at 30, 120, 240hrs for use with CNCPS 6.5 biology. Silages receive lactic acid, acetic acid, and ammonia CPE. Corn silages receive starch digestibility (7hr, 4mm grind).

100

Components	As Fed	DM
% Moisture	8.0	
% Dry Matter	92.0	
% Crude Protein	11.3	12.2
% Adjusted Crude Protein	11.3	12.2
% Acid Detergent Fiber	37.3	40.6
% Neutral Detergent Fiber	64.8	70.5
% NFC	11.6	12.6
% TDN	50	54
NEL, Mcal/Lb	.38	.41
NEM, Mcal/Lb	.42	.46
NEG, Mcal/Lb	.19	.21

101

Determining Quality of Grazed Forages

forage species
growing conditions
fecal consistency

102

Supplementation and Hay Feeding Scenarios

- ~~cheap and easy~~
- easiest and least expensive
- frequent labor when needed, less expensive
- less consistent labor, more expensive

103

104

Easiest and Least Expensive

105

106

107

Options if Cattle Need Supplementation

108

When do we supplement?

for most beef cow-calf operations protein and (or) energy supplementation is generally needed

- late summer when forage quality declines
- during the winter

109

What type of supplement is needed?

protein energy

a combination of energy and protein

110

Energy Sources

- whole corn
- 11-14% cubes
- soybean hulls
- wheat midds
- rice bran

gradually increase levels in the diet

111

Energy and Protein Sources

- 20% cubes
- corn gluten feed
- distillers grains
- winter pasture
- whole cottonseed (max. 25% of diet)

gradually increase levels in the diet

112

Protein Sources

- soybean meal
- cottonseed meal
- 38 or 40% cubes
- canola meal
- sunflower meal
- alfalfa hay
- winter pasture
- urea (limited amount in right situation)

Feed	% TDN	% CP	% RDP
Soybean meal	88.5	52.6	67
Cottonseed meal	69.8	46.7	56
Canola meal	79.4	41.5	68
Sunflower meal, no hulls	67.9	38.9	84

(values on DM basis)

113

Hand-fed Supplements

114

115

Considerations

- easy to increase or decrease amount
- many options to choose from
- often cheaper per unit of nutrient especially TDN
- may require more labor

116

Cottonseed Meal

A 41% plant protein source m
supplement to low quality h
AVAILABLE BAGS: 50 lb

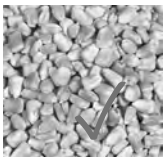
gradually increase levels in the diet

blend of
1/3 cottonseed meal and 2/3 corn

~20.8% CP; 84% TDN

(values on AF basis)

117



118

cubes are generally
3/4 or 7/8

pellets are generally
1/8, 1/4, or 3/8

same formulations and
ingredients can be used for both

sizes change based on feeding
situation and animal size

119

40% CUBES

38% CP, 68% TDN

generically referred to as a 40% cube,
tag may range from 38 to 41% protein

(values on AF basis)

120

20% CUBES

differences on feed tag
crude fiber & protein source
gradually increase levels in the diet

Cube A	Cube B – high fiber	Cube C
5 lbs; $1.46	6.4 lbs $1.61	not more than 6.6% CP from NPN
65% TDN, max CF 10%	51% TDN, max CF 15%	49.5% TDN, max CF 15%



(values on AF basis)

121

11-14% CUBES

differences on feed tag
crude fiber & protein source
gradually increase levels in the diet

Cube A – 12% CP High Energy	Cube B -14% CP	Cube C – 11% CP Hay Stretcher
75% TDN, max CF 7%	41% TDN, max CF 17%	max CF 23%



(values on AF basis)

122

DDG cubes

- variation among companies in CP, fat, and TDN content
- typical nutrient profile (AF basis)
  - 28 to 31% crude protein
  - 5 to 8% crude fat
  - 78 to 85% TDN

gradually increase levels in the diet

(values on AF basis)

123

extruded "whole" cottonseed meal cube (aka whole cottonseed cube)

- remains after mechanical press process
  - meal, hull, some fat
- example tag guarantee (AF basis):
  - minimum 26% crude protein
  - minimum 6.5% crude fat
  - max 28% crude fiber

*values consist of NRC, lab, and other estimates (values on DM basis)

	% TDN	% CP	% Fatty acids	% NDF
Whole cottonseed	65.6	23.3	15.5	48
Extruded whole cottonseed meal cube	55.4	26.5	8.5	54
Cottonseed meal, solvent	69.8	46.7	3.1	28.1
Cottonseed hulls	31.7	7.0	3.1	80.9

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More Cube Considerations

- forage extenders cubes are rarely a good option, to low in TDN
- rare for cubes to contain a good effective roughage source
- how is the Ca:P ratio
- is there any K added for dormant native forages

125

Self-fed Supplements

126

Considerations

- may be hard to change amount consumed
- may not be able to supply enough TDN to thin animals or animals consuming low quality forage
- less options to choose from
- may require less labor
- often best to feed all year long

127

molasses or DDG based

128

molasses based

distillers solubles based

Custom formulations for higher intake often requires 48,000 – 50,000 lb load

129

Liquid Feeds and Tubs

- DM intake is generally low
- not the best option for thin cattle
- work better in situations when cows only need a little bit of supplemental nutrition
- generally best to feed year round

130

- Our 4' model holds approximately 1300 to 1700 lbs of feed depending on the type of feed being dispensed.
- Our 8' model holds approximately 2600 to 3400 lbs of feed depending on the type of feed being dispensed.
- Our 16' model holds approximately 5200 to 6800 lbs of feed depending on the type of feed being dispensed.

131

132

Purina and Cargill both make limiters for sale

it is critical to visit with company nutritionist to get it done right

133

Starting Point

134

Hay: 45% TDN, 5.0% CP

Dry cow
- goal: maintain BCS
- 8 lbs of 20% cubes

Wet Cow
- goal: control weight loss
- 11 lbs of 20 % cubes

135

Hay: 50% TDN, 6.5% CP

Dry cow
- goal: maintain BCS
- 4 lbs of 20% cubes

Wet Cow
- goal: control weight loss
- 6 lbs of 40 % cubes

136

Hay: 55% TDN, 9.0% CP

Dry cow
- goal: maintain BCS
- hay only

Wet Cow
- goal: control weight loss
- 2 lbs of 40 % cubes

137

Monitor and adjust your supplementation program as performance dictates

138

Human Safety

139

things to be aware of

- cattle knocking someone over or into something to get to feed
- muddy conditions, when you can't move as well
- cattle fighting over feed
- make sure cattle respect your personal space
- feeding cattle cubes from your hand increases future risk

140

strategies to reduce risk

- carrying sacks or buckets
  - when feeding on the ground
    - spread feed out, piles are better than a line
      - 1 pile per animal is preferred
  - when using feed bunks
    - put feed in bunks while cattle are locked in adjacent pasture or trap
    - if cattle are in pasture, feed and move away
- cube feeders, trip hoppers, etc.
  - prevent accidental cattle contact
  - prevent tripping and falling in muddy or rough conditions

141

cube feeders, trip hoppers, etc.

- mounted to truck, ATV, tractor
- trailer type
- should have good resale value
- tractor mounted units may have advantages in higher rainfall areas

142

Supplementation Frequency

143

Frequency of Supplementation

protein supplements
(no NPN or antibiotics)

- everyday
- 3 times/wk
- 2 times/wk
- 1 time/wk ??

- everyday
  - 2 lbs
- 3 times/wk
  - 4.7 lbs
- 2 times/wk
  - 7 lbs
- 1 time/wk ??
  - 14 lbs

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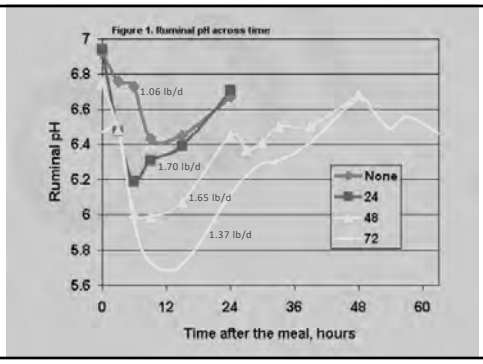
Frequency of Supplementation

energy supplements
- best to feed everyday
- feeding at less frequent intervals
  - reduces benefit of feed
  - in some cases can lead to big problems

feeding 3 times a week reduced ADG by 10% compared with daily feeding (Loy et al., 2008)
- 3 supplements, 2 supplementation levels

145



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Other Considerations

147

Off Site Landowners: that see cattle 1 time per week

tub or liquid free choice
and 5 lbs of 38-40% cubes once a week

likely won't be enough in many situations

call and we can discuss other options

148

Pricing Supplements

149

20% cubes

$10.60/50 lb sack
$424/ton

vs

20% tub

$98.95/225 lb tub
$880/ton

150

Need Protein

20% CP cube (no NPN)
- $10.30 per 50 lb sack
- 10 lb CP per sack (50 x 0.20 = 10 lb of CP)
- $1.03/lb of CP ($10.30 ÷ 10 = $1.03/lb)

38% CP cube
- $13.55 per 50 lb sack
- 19 lb CP per sack (50 x 0.38 = 19 lb of CP)
- $0.71/lb of CP ($13.55 ÷ 19 = $0.71/lb)

151

Need Energy

20% CP cube (high energy, 70% TDN, AFB)
- $10.30 per sack
- 35 lb of TDN per sack (50 x 0.70 = 35 lb)
- $0.29/lb of TDN ($10.30 ÷ 35 = $0.294/lb)

38% CP cube (67% TDN, AFB)
- $13.55 per 50 lb sack
- 33.5 lb TDN per sack (50 x 0.67 = 33.5 lb)
- $0.40/lb of TDN ($13.55 ÷ 33.5 = $0.404/lb)

152

153

Some feeds are designed to help meet the protein or energy needs of the animal.

Some feeds are designed to have something to sell or something that is cheap. They may have little value as protein or energy supplements.

154

http://beef.tamu.edu

jpbanta@ag.tamu.edu

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TEXAS A&M AGRILIFE EXTENSION

Mineral Supplementation for Cow-Calf and Stocker Operations

Jason Banta, Ph.D., PAS
Extension Beef Cattle Specialist
Overton, TX

1

Disclaimers

The information given herein is for educational purposes only.

Reference to trade names is made with the understanding that no discrimination is intended and no endorsement is implied by the Texas A&M AgriLife Extension Service.

Only a partial listing of available products and companies is included and no discrimination is intended by the omission of a product.

Listed values do not guarantee current company specifications.

2

Macro
% of diet
calcium
phosphorus
potassium
magnesium
sodium
sulfur

Trace (micro)
ppm or mg/kg
copper
zinc
manganese
iodine
cobalt
selenium
iron
others

3

4

mineral nutrition impacts

- growth
- milk production
- reproduction
- health

can increase or decrease PROFITABILITY

decrease can come from too much mineral or mineral imbalances

5

trace mineral supplementation is not a silver bullet

trace mineral supplementation will not overcome inadequate energy and protein intake

energy and protein intake are responsible for the big improvements or changes

trace minerals provide insurance and if deficiencies exist can help with improvements

6

Components of a Complete Mineral Supplement

- salt
- macro minerals
- trace minerals (aka micro minerals)
- vitamins A, D, and E

7

Differences Between Companies

- research programs
- targeted intake
- weatherization
- mineral type and source
- formulation
- reputation
- palatability enhancers

8

Targeted Intake

2 ounce, 4 ounce, 6 ounce, other

- 4 ounce is most common

if target is 4 ounces

- average intake of 3 – 4 ounce would be acceptable

Se level can be indicator of target

- 4 ounce: commonly 25 - 27 mg

9

Common Formulations

higher-calcium, lower phosphorus

- 15% Ca, 4% P
- 16% Ca, 5% P
- 15% Ca, 7.5% P

similar Ca & P levels or higher P

- 14% Ca, 12% P
- 12% Ca, 9% P
- 12.5% Ca, 8% P

winter pasture (moderate to higher Mg)

- ≥ 5% Mg
- higher Ca

with or without various additives

different sources of trace minerals

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	Example A	Example B	Example C
Calcium, %	15	15	16.5
Phosphorus, %	4	7.5	5
Potassium, %	-	1	0.1
Magnesium, %	3	1	5
Salt, %	21	20	16
Copper, ppm	1,200	1,200	2,500
Zinc, ppm	4,200	3,600	7,000
Manganese, ppm	3,600	3,600	4,000
Iodine, ppm	100	60	250
Cobalt, ppm	150	12	20
Selenium, ppm	25	27	26
Vitamin A, IU/lb	100,000	300,000	200,000
Vitamin D, IU/lb	2,500	30,000	20,000
Vitamin E, IU/lb	100	300	200

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Additives

researched

- IGR
- CTC (requires VFD)
- bovatec (not labeled for cows)
- rumensin

- product A
- product A with IGR
- product A with CTC
- product A with IGR and CTC

12

Additives

not well researched or limited/no benefits

- there is a long list of these
- be cautious of claims
- be aware of selectively reporting research
- many would not justify the added cost

13

All prices taken from the same Coop in Central Texas

	December 2022	June 2024
Purina Wind & Rain 7.5	$31.95	$28.95
Purina Wind & Rain 7.5 IGR	$38.65	$34.95
Purina Wind & Rain 7.5 ProCycle	$46.95	$46.95
Purina Wind & Rain 7.5 ProCycle IGR	$55.75	$52.95
Purina Wind & Rain 4 Hi Mag	$28.95	$25.95
Purina Wind & Rain 12	$38.60	$33.95

14

Macro Minerals: Geographic & Forage Base Considerations

15

Phosphorus Levels

once nutrient requirements are meet,
providing extra P will not improve reproduction

NRC requirements are too high for P

16

Native Range

dormant forages

- most mineral concentrations decrease with time especially P & K

protein and energy supplement can greatly impact the Ca:P ratio of the mineral needed

consider K level in protein and energy supplements

17

product	intake, lbs	% P	gm P supplied
15:4 mineral (A)	0.25	4	4.5
12:9 mineral (P)	0.25	9	10.2
12:9 mineral (P)	0.125	9	5.1
cottonseed meal	2	1.1	10.0
DDGS	2	0.7	6.4

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Native Range

Calcium content of the soil

- just because the soil is high in Ca or is sitting on a limestone base doesn't mean the plant will take up more Ca
- bermudagrass average Ca: 0.49% (10,794 samples)
- native forages average Ca: 0.49% (798 samples)

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Coastal Regions

mineral intake can be challenging

- try low salt formulations
- molasses based mineral tub
- some work from Florida would suggest we could put the mineral supplement in a cube and feed 1 time per week

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Winter Pasture

grass tetany concern for cows

- need consistent intake of Mg
  - 5% or greater Mg level
- sodium (salt) is important for absorption of Mg
- milk fever and grass tetany may both be involved in some cows
  - want higher Ca, lower P level

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Routine Poultry Litter Fertilization

- inverted Ca:P ratio in forage
- milk fever and grass tetany concerns
- may need P free mineral
- potential trace mineral issues especially Cu, Zn

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Trace Mineral Considerations

23

- copper
- zinc
- manganese
- iodine
- cobalt
- selenium

deficient	target	excess
some improvement possible by meeting requirements		reductions in DMI, ADG, reproduction
		death

24

mineral balance for 1,300 lb mature cow that is 270 d pregnant consuming bermudagrass hay only

ins required (except Ca & P), % of BW 2.00%
imins required (except Ca and P), lb/d 26.0

Daily dietary amounts, DM basis

Item	Supplied	Required	Balance	% of requirement
Calcium, gm	50	28	22	176
Phosphorus, gm	19	18	2	109
Potassium, gm	175	71	104	247
Magnesium, gm	21	14	7	151
Sulfur, gm	41	18	23	231
Sodium, gm	15	8	7	185
Chloride, gm	76	–	–	–
Copper, mg	100	118	-18	84
Zinc, mg	347	354	-7	98
Manganese, mg	602	472	130	128
Iron, mg	2,255	590	1,666	383
Iodine, mg	1.3	5.9	-4.6	23
Cobalt, mg	4.2	1.8	2.4	237
Selenium, mg	1.7	1.2	0.6	147
Molybdenum, mg	11.4	–	–	–
Vitamin A, IU	42,863	33,021	9,841	130
Vitamin D, IU	0	3,243	-3,243	0
Vitamin E, IU	394	413	-19	95

25

mineral balance for 1,300 lb mature cow that is 270 d pregnant consuming bermudagrass hay and 3.5 ounces of mineral

equired (except Ca & P), % of BW 2.00%
is required (except Ca and P), lb/d 26.0

Daily dietary amounts, DM basis

Item	Supplied	Required	Balance	% of requirement
Calcium, gm	65	28	36	227
Phosphorus, gm	23	18	5	131
Potassium, gm	175	71	104	247
Magnesium, gm	26	14	12	186
Sulfur, gm	41	18	24	234
Sodium, gm	23	8	15	279
Chloride, gm	87	–	–	–
Copper, mg	217	118	99	184
Zinc, mg	699	354	345	198
Manganese, mg	837	472	365	177
Iron, mg	2,255	590	1,666	383
Iodine, mg	9.2	5.9	3.3	155
Cobalt, mg	5.9	1.8	4.2	336
Selenium, mg	3.2	1.2	2.0	272
Molybdenum, mg	11.4	–	–	–
Vitamin A, IU	85,983	33,021	52,961	260
Vitamin D, IU	4,312	3,243	1,069	133
Vitamin E, IU	458	413	46	111

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3.5 ounces of mineral

Item	Conc.
Calcium, %	15
Phosphorus, %	4
Potassium, %	0
Magnesium, %	5
Salt, %	20
Copper, ppm	1,200
Zinc, ppm	3,600
Manganese, ppm	2,400
Iodine, ppm	80
Cobalt, ppm	18
Selenium, ppm	15
Vitamin A, IU/lb	200,000
Vitamin D, IU/lb	20,000
Vitamin E, IU/lb	300

Daily dietary amounts, DM basis

Item	Supplied	Required	Balance	% of requirement
Calcium, gm	65	28	36	227
Phosphorus, gm	23	18	5	131
Potassium, gm	175	71	104	247
Magnesium, gm	26	14	12	186
Sulfur, gm	41	18	24	234
Sodium, gm	23	8	15	279
Chloride, gm	87	–	–	–
Copper, mg	217	118	99	184
Zinc, mg	699	354	345	198
Manganese, mg	837	472	365	177
Iron, mg	2,255	590	1,666	383
Iodine, mg	9.2	5.9	3.3	155
Cobalt, mg	5.9	1.8	4.2	336
Selenium, mg	3.2	1.2	2.0	272
Molybdenum, mg	11.4	–	–	–
Vitamin A, IU	85,983	33,021	52,961	260
Vitamin D, IU	4,312	3,243	1,069	133
Vitamin E, IU	458	413	46	111
Added copper, mg	117	118	-1	100
Added zinc, mg	352	354	-2	100
Added manganese, mg	235	472	-237	50
Added iron, mg	0	590	-590	0
Added iodine, mg	8	5.9	1.9	133
Added cobalt, mg	2	1.8	0.0	100
Added selenium, mg	1	1.2	0.3	124
Added molybdenum, mg	0	–	–	–
Added vitamin A, IU	43,120	33,021	10,099	131
Added vitamin D, IU	4,312	3,243	1,069	133
Added vitamin E, IU	65	413	-348	16

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be cautious of using multiple products with added trace minerals

too much trace mineral can cause

- decreased ADG
- decreased WW
- decreased feed intake
- decreased pregnancy rates
- cause death

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excess free

- copper
- zinc
- and likely iodine

can reduce NDF digestibility in the rumen

digestible NDF provides the greatest energy source in most forage-based diets

29

desirable ratios for Cu – Zn – Mn

- requirement: 10-30-40
- most cases formulate mineral: 1-3-2

good targets for 4 oz mineral in most situations

- copper: 1,200 ppm
- zinc: 3,600 ppm
- manganese: 2,400 ppm

additional comments

- many products have way more copper than needed
- higher levels of copper have been reported to:
  - reduce feed intake and ADG
  - accumulate to toxic levels and cause death

30

Iodine

about 80 ppm is good target for 4 ounce mineral
- that level will meet requirement with 3 to 4 ounces of intake

foot rot - no benefit beyond meeting requirement

preferred forms
- EDDI (organic form)
- calcium iodate

don't want
- potassium or sodium iodide they are less stable

to much iodine has been reported to reduce weight gain and feed intake

31

Selenium

most 4 ounce minerals contain 25 – 27 ppm
- that will provide about double the requirement

15 ppm is probably plenty for 4 ounce mineral

legal limit
- 3 mg/d

toxicity could be a concern under certain situations
- oversupply from diet, injections, drenches
- plants that accumulate Se in some areas of US

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Cases and Considerations

- poultry litter fertilization: Cu and Zn
  - hay testing considerations
  - wet chemistry add on: Cu, Zn, Mn, Mo
- copper toxicity
  - potential breed differences
- injectable and drenches
- force feeding

33

Cases and Considerations

- changes in coal burning power plants
- hair coat considerations
  - genetics vs mineral

34

Cases and Considerations

- companies won't let data be published
- cherry picking of data in advertisements
  - products may not be the same

35

Types of Trace Minerals

36

inorganic
- ionic bond
- copper sulfate, zinc oxide, sodium selenite, etc.

organic
- covalent bond to carbon-containing ligand
- mineral bonded to: amino acid, protein, or CHO
- zinc methionine, copper amino acid complex, cobalt glucoheptonate, etc.

hydroxy
- covalent bond to a hydroxy (OH) group
- basic copper chloride, zinc hydroxychloride, manganese hydroxychloride

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inorganic vs. organic vs. hydroxy

all cattle consume some organic trace minerals from forage and other feedstuffs

research is inconsistent on animal growth, reproduction, and health
- cattle on consistent mineral program
- short-term feeding of high-risk stockers with unknown history

organic and hydroxy sources may be safer for vitamins added to mineral supplements

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Vitamins

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Vitamins

water soluble vitamins
- "B" vitamins
- produced by rumen microbes

fat soluble vitamins
- vitamin A
- vitamin D
- vitamin E
- vitamin K
  - produced by rumen microbes

40

Vitamin A

precursors to vitamin A are found in forages
- high levels in green growing forages
- low levels in hay and dormant forages; decrease with time

stored in liver for later use

vitamin A deficiency
- birth of dead or weak calves
- frequent occurrence of retained placentas
- reduced conception
- impaired spermatogenesis

drought concerns

41

Table 1. Daily vitamin A requirement for beef cows and heifers

Cow weight, lb	Dry pregnant cows or heifers, IU	Lactating Cows, IU
1,000	27,200	38,100
1,100	29,920	41,910
1,200	32,640	45,720
1,300	35,360	49,530
1,400	38,080	53,340
1,500	40,800	57,150
1,600	43,520	60,960

Table 2. The effect of vitamin A concentration in the mineral on vitamin A consumption

IU of vitamin A per lb of mineral supplement	Daily intake of mineral supplement, lb	IU of vitamin A consumed per cow each day
100,000	0.25	25,000
150,000	0.25	37,500
200,000	0.25	50,000
300,000	0.25	75,000

42

Vitamin D

sunlight

generally not a concern in Texas

supplementation may be important for show cattle kept inside during the day

43

Vitamin E

high levels in green growing forages

levels in hay usually about 50% less, but will decrease with extended storage

levels often drop right around calving

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Tubs

45

- most need separate source of salt
- most have a similar Ca:P ratio
- most have less Ca then loose supplements

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	Mineral-lyx	IGR Max
Calcium	3.5 - 4.5	5 - 6
Phosphorus	4	5
Salt	none	none
Magnesium	3.0	5.0
Potassium	1.7	1.5
Copper	500	1,000
Zinc	1,500	3,000
Manganese	2,000	4,000
Selenium	8.8	13.2
Iodine	25	50
Cobalt	5	10

recommended intake
mineral-lyx: 4.8 to 12 oz.
IGR max: 4 oz.

47

	AS 4 CP add Zn & Cu	MAG Mineral Tub
Calcium	4.5	5.5
Phosphorus	4	4
Salt	10	0
Magnesium	1	5
Potassium	1	2
Copper	1,250	650
Zinc	3,750	2,375
Manganese	1,250	1,250
Selenium	10	10
Iodine	68	68
Cobalt	30	30

recommended intake
4 to 8 oz.

need to put salt out with the "MAG" tub

48

Blocks

49

50

	Big 6	Se-90	Iodized	Sulfur
Calcium				
Phosphorus				
Salt	96 - 99	95 – 98.5	97 – 99.7	95 - 97
Magnesium				
Potassium				
Sulfur				3
Copper	260 - 380	280 - 420		
Zinc	320	3,500		
Manganese	2,400	1,800		
Selenium		90		
Iodine	70	100	100	
Cobalt	40	60		
Vitamin A				
Vitamin D				
Vitamin E				

51

American Stockman Big 6® Trace Mineralized Salt is the most popular in the eastern half of the United States. With the six core micro-minerals required for animal health - zinc, manganese, cobalt, copper, iodine and iron - it's the first choice for weight gain, feeding efficiencies and overall herd performance. For all classes of beef and dairy cattle, pigs and horses.

Ingredients:

Salt, Manganous Oxide, Ferrous Carbonate, Magnesium Oxide, Copper Oxide, Zinc Oxide, Calcium Iodate, Cobalt Carbonate, Red Iron Oxide for Color.

Guaranteed Analysis:

Salt (min.) 96.0%, Salt (max.) 99.0%, Manganese (min.) 2,400 ppm, Iron (min.) 2,400 ppm, Copper (min.) 260 ppm, Copper (max.) 380 ppm, Zinc (min.) 320 ppm, Iodine (min.) 70 ppm, Cobalt (min.) 40 ppm.

Feeding instructions:

Allow livestock free access to this feed salt.

52

Ingredients:
Salt, Sulfur, FD&C Yellow #5 Dye for Color.

Guaranteed Analysis:
Salt (min.) 95.0%, Salt (max.) 97.0%, Sulfur (min.) 3.0%.

53

54

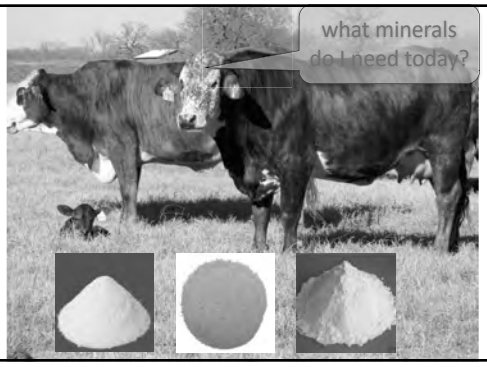
Mineral Feeders

55

56

Mineral Intake

57



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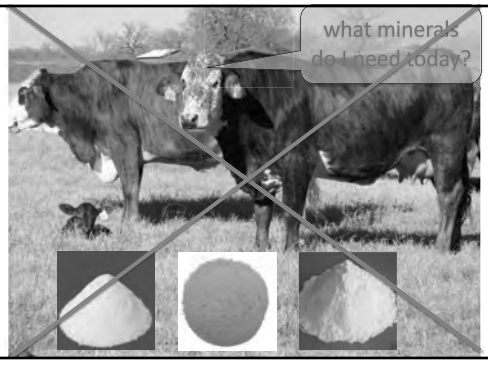
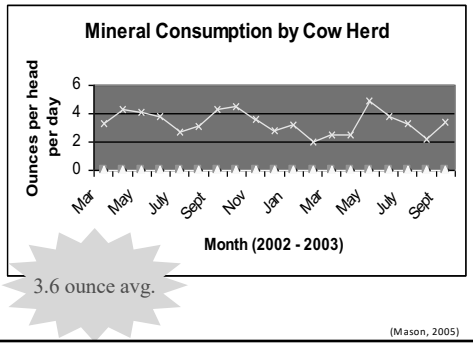


59

- focus on average consumption over several weeks
- intake varies over time
- lactation may increase intake, 2 to 2.5x

60



61

if intake is too high
- provide free choice salt
- check location of mineral feeder
- reduce amount of mineral fed

if intake is low
- determine if cattle are receiving salt from another source
- check location of mineral feeder

62

salt
- initially encourages intake
- as salt consumption increases mineral intake is reduce

phosphorus
- generally decreases intake

magnesium
- generally decreases intake

63

additives that stimulate intake
- molasses, yeast, other flavoring agents
- mineral oil and weatherization products

64

Calculating Mineral Intake

- 35 cows
- put 50 lbs of mineral in an empty feeder
- mineral lasts for 6 days
- 50 lbs ÷ 6 days = 8.33 lbs per day for the herd
- 8.33 lbs per day ÷ 35 hd = 0.24 lbs/hd/d
- 16 oz. x 0.24 lbs = 3.8 oz./hd/d

65

How Many Bags Do I Need Per Month

- 40 cows
- 40 cows x 4 oz/cow/day = 160 oz per day (10 lbs)
- 10 lbs per day x 30 days = 300 lbs per month
- 300 lbs ÷ 50 lbs per bag = 6 bags per month

- if same 40 cows only ate 3 oz per day, then they would consume 4.5 bags per month (this would be alright in most situations)

66

When and What
Do I Feed

67

Reputable Company with a
Nutritionist on Staff

68

Consider Flexibility

69

Cow-Calf

70

When should I feed a cow-calf mineral?

- year round is best
- last 3, first 3
- provide salt when not feeding a mineral

71

introduced pasture and hay

- higher Ca, lower P

Emerald

AS 5 complete
AS 7.5 complete

AMPT-A

72

growing native range
- higher Ca, lower P

dormant native range (with protein/energy supplement that has some P)
- higher Ca, lower P
- if possible get protein/energy supplement with added K

Emerald

AS 5 complete
AS 7.5 complete

AMPT-A

73

dormant native range (no protein/energy supplement)
- similar Ca & P levels
- make sure intake is adequate

Bronze

AS 12 complete

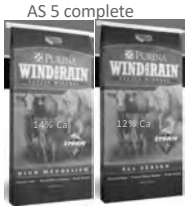
AMPT-P

74

winter pasture
- higher Ca, lower P
- 5% or more Mg, make sure intake is good

Emerald

Hi-mag complete
AS 5 complete



AMPT-M

75

Growing Animals:
Weaned Calves, Stockers, Replacement Heifers

76

77

mineral supplementation is basically the same as the cow herd with a few exceptions

Ca needs increase as ADG increases

when grazing cool-season annuals:
- want at least 10 gm/d of added Ca intake
- Mg level is not really a concern, don't want it too high

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Nutrient Requirements

500 lb steer calf

ADG	% TDN	% CP	% Ca	Ca, gm	DMI, lb
1	56	10.0	0.36	20.0	12.5
1.5	60	11.5	0.44	25.6	12.8
2	65	12.7	0.55	32.2	13.0
2.5	70	14.0	0.65	38.1	13.0
3.0	75	15.3	0.75	43.8	13.0

*Estimated dietary requirements for Brangus type steer under typical production conditions (Beef Cattle NRC, 1996). These requirements will vary depending on numerous factors including body condition, health, breed, environmental factors, use of growth promotants, and others.

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Nutrient Requirements

800 lb yearling steer

ADG	% TDN	% CP	% Ca	Ca, gm	DMI, lb
1.0	53	7.8	0.25	22.0	20.0
1.5	57	8.6	0.30	26.9	20.5
2.0	61	9.5	0.34	31.4	20.6
2.5	65	10.3	0.39	35.6	20.6
3.0	70	11.1	0.44	40.6	20.6

*Estimated dietary requirements for Brangus type steer under typical production conditions (Beef Cattle NRC, 1996). These requirements will vary depending on numerous factors including body condition, health, breed, environmental factors, use of growth promotants, and others.

80

Oklahoma Winter Wheat

4 year average:

no mineral: 1.57 lb/d

with mineral: 1.81 lb/d

0.24 lb/d increase due to mineral

(Fieser et al., 2007; Effects of energy, mineral supplementation, or both, in combination with monensin on performance of steers grazing winter wheat pasture); page 9 under steer performance section

81

Ca Intake

mineral with 12% Ca
if intake is 0.15 lbs = 8.1 gm of Ca

mineral with 16% Ca
if intake is 0.15 lbs = 10.9 gm of Ca

mineral with 20% Ca
if intake is 0.15 lbs = 13.6 gm of Ca

82

http://beef.tamu.edu

jpbanta@ag.tamu.edu

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TEXAS A&M AGRILIFE EXTENSION

How much can you afford to feed weaned calves and stocker cattle?

Jason Banta, Ph.D., PAS
Extension Beef Cattle Specialist
Overton, TX

1

feeding to increase weight gain

feeding to meet nutrient requirements and keep cattle healthy

2

feeding to increase weight gain

What is the value of added weight gain?

What does feed cost?

DDG $452/ton $0.226/lb

What is the supplement conversion?

Impacts of fleshy calves on sale price

3

Value of Gain

522 lb steer @ $3.04

522 x 3.04 = $1587

625 lb steer @ $2.68

625 x 2.68 = $1675

625 – 522 = 103 lb

$1675 - $1587 = $88

$88 ÷ 103 = $0.85

4

NETBIO sale results 5/20/24

# of Head	Comment	Avg Weight, lbs	Price, $/cwt	$/hd
3	#1 CHAR X STS	394	$370	$1,458
5	#1 CHAR X STS	451	$340	$1,533
16	#1 CHAR X STS	519	$308	$1,599
20	#1 CHAR X STS	575	$307	$1,765
26	#1 CHAR X STS	625	$291	$1,819
17	#1 CHAR X STS	669	$273	$1,826
8	#1 BLK & BLK BALDY STS	395	$373	$1,471
30	#1 BLK & BLK BALDY STS	453	$352	$1,595
33	#1 BLK & BLK BALDY STS	515	$316	$1,627
15	#1 BLK & BLK BALDY STS	558	$315	$1,758
28	#1 BLK & BLK BALDY STS	571	$310	$1,770
17	#1 BLK & BLK BALDY STS	621	$291	$1,807
27	#1 BLK & BLK BALDY STS	674	$267	$1,800

5

NETBIO sale results 3/15/24

# of Head	Comment	Avg Weight, lbs	Price, $/cwt	$/hd
34	#1 CHAR X STS	458	$345	$1,580
28	#1 CHAR X STS	520	$329	$1,711
22	#1 CHAR X STS	581	$307	$1,784
29	#1 CHAR X STS	627	$281	$1,762
35	#1 CHAR X STS	673	$273	$1,834
47	#1 BLK & BLK BALDY STS	457	$341	$1,558
45	#1 BLK & BLK BALDY STS	513	$331	$1,698
27	#1 BLK & BLK BALDY STS	568	$326	$1,852
23	#1 BLK & BLK BALDY STS	577	$313	$1,806
37	#1 BLK & BLK BALDY STS	628	$283	$1,777
39	#1 BLK & BLK BALDY STS	675	$275	$1,853

6

Supplement Conversion

7

DDGS

8

Arkansas
Gadberry et al., 2010

The Professional Animal Scientist 26 (2010):347–355
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Effect of Dried Distillers Grains Supplementation on Calves Grazing Bermudagrass Pasture or Fed Low-Quality Hay

M. S. Gadberry,* PAS, P. A. Beck,†[1] PAS, M. Morgan,‡ D. Hubbell III,§ J. Butterbaugh,|| PAS, and B. Rudolph,|| PAS

*Cooperative Extension Service, University of Arkansas, Little Rock 72203; †Southwest Research and Extension Center, University of Arkansas, Hope 71801; ‡Department of Animal Science, University of Arkansas, Fayetteville 72701; §Livestock and Forestry Research Station, University of Arkansas, Batesville 72501; and ||Furst-McNess Company, Freeport, IL 61032

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Exp. 2: low-quality fescue hay fed for 82 days during winter

485 lb steers

DDGS fed at 4 levels

*assumed feed cost of $0.226/lb

Feeding Rate, % of BW	ADG, lbs	Additional feed, lb feed/lb of gain (DM basis)	Additional feed, lb feed/lb of gain (AF basis using 90% DM)	Cost of feed to add 1 lb of gain
0%	0.11	-	-	-
0.30%	0.99	1.49	1.66	$0.38
0.60%	1.30	2.27	2.52	$0.57
1.20%	1.81	3.13	3.48	$0.85

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Exp. 1: steers grazed bermudagrass during summer for 84 days

576 lb steers

DDGS fed at 3 levels

*assumed feed cost of $0.226/lb

Feeding Rate, % of BW	ADG, lbs	Additional feed, lb feed/lb of gain (DM basis)	Additional feed, lb feed/lb of gain (AF basis using 90% DM)	Cost of feed to add 1 lb of gain
0%	1.74	-	-	-
0.30%	2.21	3.70	4.11	$0.93
0.59%	2.32	5.88	6.53	$1.48

*performance of steers is higher than what would typically be expected on bermudagrass

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Arkansas
Beck et al., 2014

4 studies

- no supplement
- DDGS fed at 2.5 lbs/d (AF basis)
  - averages about 0.40% of BW
- next slide only has data for control and daily DDGS without rumensin

The Professional Animal Scientist 30 (2014):515–526; http://dx.doi.org/10.15232/pas.2014-01318
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Effect of daily or alternate-day distillers grains supplementation with or without monensin on performance of grazing calves[1]

P. Beck,*[2] B. Stewart,* S. Gadberry,† J. Tucker,‡ D. Hubbell,‡ J. Butterbaugh,§ T. Hess,‡ K. Coffey,# and B. Rudolph§

*Division of Agriculture, Southwest Research and Extension Center. University of Arkansas, Hope 71801; †Division of Agriculture, Cooperative Extension Service. University of Arkansas, Little Rock 72204; ‡Division of Agriculture, Livestock and Forestry Research Center, University of Arkansas, Batesville 772701; §Furst-McNess Co, Freeport, IL 61032; and #Division of Agriculture, Department of Animal Science, University of Arkansas, Fayetteville 72701

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Exp 1: 2010, heifers grazing bermudagrass and crabgrass pastures near Hope, AR
Exp 2: 2011, heifers grazing bermudagrass and crabgrass pastures near Hope, AR
Exp 3: 2011, steers and heifers grazing bermudagrass near Batesville, AR
Exp 4: 2012 steers and heifers grazing nontoxic endophyte infected fescue near Batesville, AR during winter and spring

*assumed feed cost of $0.226/lb

Experiment	No supplement ADG, lbs	2.5 lbs of DDGS, ADG, lbs	Additional feed, lb feed/lb of gain (AF basis using 90% DM)	Cost of feed to add 1 lb of gain
1	0.64	1.06	5.85	$1.32
2	1.39	1.79	6.17	$1.40
3	0.99	1.63	3.97	$0.90
4	1.98	2.43	5.56	$1.26

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Overton
Smith et al., 2020


ARPAS
Evaluation of growth performance and carcass characteristics of beef stocker cattle grazing Tifton 85 bermudagrass supplemented with dried distillers grains with solubles then finished in the feedlot

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steers grazed Tifton 85 during summers of 2014 and 2015
836 lb steers
DDGS fed at 4 levels

*assumed feed cost of $0.226/lb

Feeding Rate, % of BW	ADG, lbs	Additional feed, lb feed/lb of gain (DM basis)	Additional feed, lb feed/lb of gain (AF basis using 90% DM)	Cost of feed to add 1 lb of gain
0%	1.35	-	-	-
0.25%	1.96	4.1	4.56	$1.03
0.50%	2.12	6.2	6.89	$1.56
1.00%	2.43	9.2	10.2	$2.31

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Other Feedstuffs

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Overton
Rouquette et al., 2010

Tifton 85
corn gluten, corn, soybean meal


CORN GLUTEN, CORN, AND SOYBEAN MEAL USED AS A SUPPLEMENT FOR FALL-BORN CALVES STOCKED ON TIFTON 85 BERMUDAGRASS

F.M. Rouquette, J.L. Kerby, G.H. Nitze, and K.D. Norman
Texas A&M AgriLife Research and Extension Center, Overton, Texas

Summary

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Exp 1: steers and heifers grazed Tifton 85 during summer of 2005
corn gluten or corn fed at 2 levels

Feeding Rate, % of BW	ADG, lbs	Additional feed, lb feed/lb of gain (AF basis using 90% DM)
Pasture only	0.78	-
Corn gluten 0.40%	1.45	5.1
Corn gluten 0.80%	1.89	6.1
Corn 0.40%	1.71	3.6
Corn 0.80%	2.14	5.0

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Exp 1: steers and heifers grazed Tifton 85 during summers of 2006 and 2007
corn gluten supplement

Feeding Rate, % of BW	ADG, lbs	Additional feed, lb feed/lb of gain (AF basis using 90% DM)
2006 Pasture only	0.82	-
2006 corn gluten 0.80%	1.67	7.3
2007 pasture only	0.90	-
2007 corn gluten 0.40%	1.21	10.8
2007 corn gluten 0.80%	1.32	15.8

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Compensatory Gain

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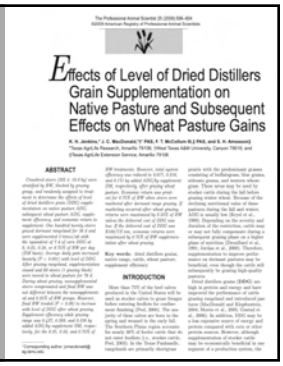
Amarillo
Jenkins et al., 2009

2 part study
native range with DDGS
followed by
wheat pasture no supplement



Effects of Level of Dried Distillers Grain Supplementation on Native Pasture and Subsequent Effects on Wheat Pasture Gains

ABSTRACT

INTRODUCTION

23

steers grazed dormant rangeland for 56 days
496 lb steers, DDGS fed at 4 levels
cattle fed 3 times per week, amounts increased on feeding days

*assumed feed cost of $0.226/lb

Feeding Rate, % of BW	ADG, lbs	Additional feed, lb feed/lb of gain (DM basis)	Additional feed, lb feed/lb of gain (AF basis using 90% DM)	Cost of feed to add 1 lb of gain
0%	0.59	-	-	-
0.25%	1.07	2.34	2.60	$0.59
0.50%	1.42	2.71	3.01	$0.68
0.75%	1.73	2.96	3.29	$0.73

24

steers grazed dormant rangeland for 56 days, then grazed wheat for 76 days
496 lb steers, DDGS fed at 4 levels
no supplementation while on wheat

549 – 483 = 66 lbs 657 – 626 = 31 lbs

Feeding Rate, % of BW	ADG on native range, lbs	Final BW on native range, lbs	ADG on wheat pasture ,lbs	Final BW on wheat pasture, lbs
0%	0.59	483	1.99	626
0.25%	1.07	512	1.60	626
0.50%	1.42	531	1.74	655
0.75%	1.73	549	1.62	657

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Forage Considerations
and
Animal Performance

26

Forage Species

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warm-season perennials (native)

ADG: 1.0 to 2.25 lb

- big bluestem & indiangrass
- switchgrass
- eastern gamagrass
- little bluestem

part of advantage in ADG is due to grazing differences (25% vs 65+% utilization)

28

warm-season perennials (introduced)

ADG: 1.0 to 1.6 lb

- old world bluestems (could be higher under some conditions)
- Tifton 85 (bermudagrass x stargrass)
- johnsongrass (doesn't tolerate grazing well)

ADG: 0.7 to 1.3 lb

- bermudagrass
- kleingrass (doesn't tolerate close grazing for extended periods)
- bahiagrass
- dallisgrass

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warm-season annuals (introduced)

ADG: 2.0 to 2.75 lb

- sorghum x sudangrass
- sudangrass

ADG: 1.25 to 2.0 lb

- crabgrass
- pearl millet

30

cool-season annuals (introduced)

ADG: 1.5 to 2.85 lb

- ryegrass
- small grains
  - rye, wheat, oats, barely, triticale

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Ryegrass Cost Estimates: Varying Yield

	Ryegrass	Ryegrass	Ryegrass
Seed, $/bag	45.00	45.00	45.00
Seed, $/ac (25 lbs)	22.50	22.50	22.50
Fertilizer, $/ac 200 lbs of N	90 - 180	90 - 180	90 - 180
Forage Yield	4,000	6,000	8,000
$/ton of DM	56.25 - 101.25	37.50 - 67.50	28.13 – 50.63

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Stocking Rate

stocking rate typically has a bigger impact than supplementation

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Overton Stocking Rate Study: Winter Pasture

- 2 years: 1997-1998 and 1998-1999
- rye/ryegrass overseeded on bermudagrass
- 158 days of grazing: Dec. to May
- 267 lbs of N

initial weight of steer: 600 lbs

low: 1.6 hd/ac = 960 lbs
medium: 2.2 hd/ac = 1,320 lbs
high: 2.8 hd/ac = 1,680 lbs

(Rouquette et al., 2000; Steer performance affected by grazing method and stocking rate)

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Overton Stocking Rate Study

Grazing System (Continuous)	Stocking Rate, hd/ac	ADG, lbs	Gain/acre, lbs
Low	1.6	2.95	743
Medium	2.2	2.12	740
High	2.8	0.96	436

(Rouquette et al., 2000; Steer performance affected by grazing method and stocking rate)

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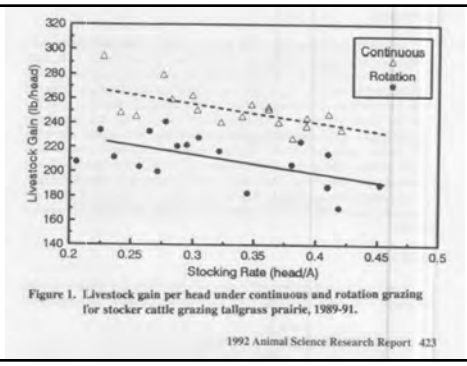

Figure 1. Livestock gain per head under continuous and rotation grazing for stocker cattle grazing tallgrass prairie, 1989-91.

1992 Animal Science Research Report 423

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Feeding to Meet Nutrient Requirements or Limited Gain

37

Goals During Weaning Period

keep calves growing at a moderate rate
- 0.5 – 1.5 lbs per day

keep costs down

keep rumen healthy

optimize immune function

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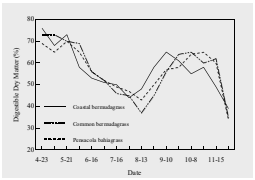
provide a properly formulated complete mineral

39

- plan the grazing program so that high-quality pasture is available at the weaning location/facility
- make sure the pasture is not too large
- good stockpiled forage is fine



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high-quality pasture

- only feed to teach cattle to eat
- feed 1 to 1.5 lbs of an energy supplement

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"they're too loose"

42

medium or low-quality pasture

- feed to increase intake and digestibility of forage
- feed 1 to 1.5 lbs of a high-protein supplement

43

high-quality hay

- only supplement grain to improve gains or teach cattle to eat
- feed 1 to 3 lbs of an energy supplement

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Like Starting Cattle on a High-Protein Supplement
(Safer if Some Overconsume)

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http://beef.tamu.edu

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