

Energy and Protein Supplementation for Cow-Calf Operations

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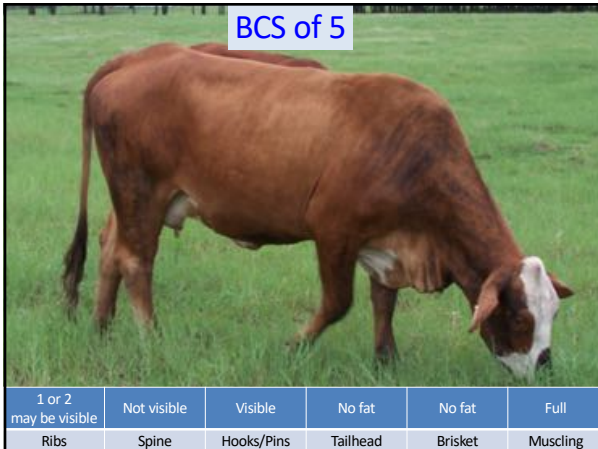
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What 3 primary things affect
 supplementation of
 energy & protein?

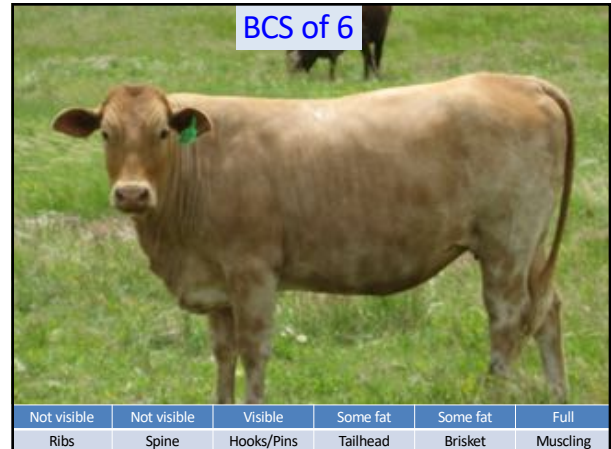
BCS

nutrient requirements
 forage & hay quality

2



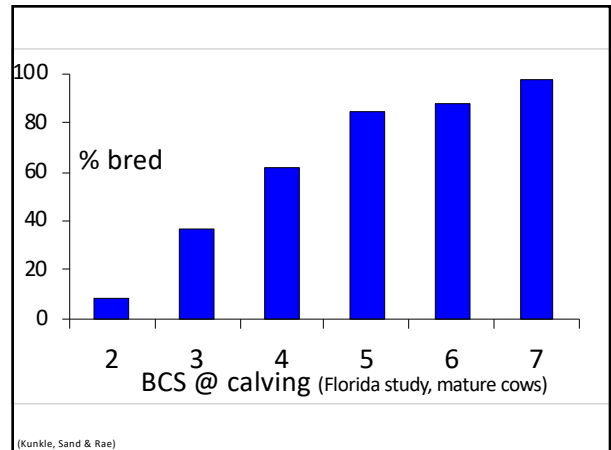
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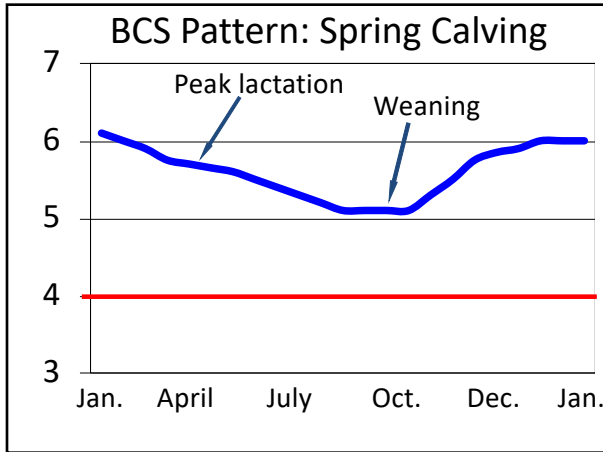
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Description	% CP	% TDN	% Ca	% P
2-yr-old lactating cow, peak lactation	11.5	60	0.28	0.18
3-yr-old lactating cow, peak lactation	12.5	61	0.30	0.19
mature lactating cow, peak lactation	12.5	61	0.30	0.19
coming 3-yr-old dry cow, 270 d pregnant	9.0	58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

8



9

but...what if the cows look like this?

10



11



12

as forage quality declines forage intake decreases

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



13

Factors Affecting Forage or Hay Quality

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

14

Some generalizations:

cool-season > warm-season

annuals > perennials

arid environments > humid environments

15

warm-season perennials

ADG: 1.0 to 1.6 lb

- Tifton 85
- OWB

ADG: 0.75 to 1.25 lb

- hybrid bermudagrass
- bahiagrass

16

warm-season annuals

ADG: 2.0 to 2.75 lb

- sorghum x sudangrass
- sudangrass

ADG: 1.25 to 2.0 lb

- crabgrass
- pearl millet

17

cool-season annuals

ADG: 1.5 to 2.85 lb

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



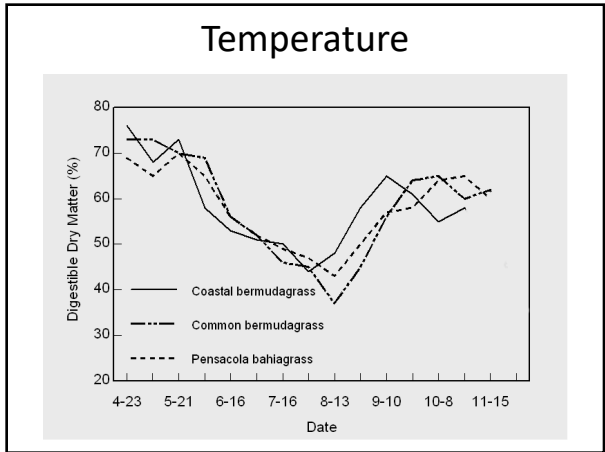
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Maturity

Interval between cuttings	% TDN	% CP	Season Yield, tons/acre
3 weeks	65.2	18.5	7.9
4 weeks	61.9	16.4	8.4
5 weeks	59.3	15.4	9.2
6 weeks	58.0	13.3	10.3
8 weeks	54.1	10.7	10.2
12 weeks	51.0	9.0	10.4

- Coastal bermudagrass study in Georgia
- Glen Burton

19



20

nitrogen fertilizer

- increase protein and yield
- no or minimal effect on TDN

Well-fertilized?

21



22

The Maillard Reaction

- aka non-enzymatic browning reaction
- heat
 - heat is produced from fermentation of wet hay
 - condensation of sugar residues with amino acids
 - proteins are rendered indigestible
 - ADICP
 - adjusted CP

(P. J. VanSoest, Nutritional Ecology of The Ruminant)

23



24



25

Determining Hay Quality

sample each cutting

TDN (i.e. energy)

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

Crude Protein

26

27



28

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
NFC, Mcal/lb	.7	.26
IVTD 48hr, % of DM		69
NDFD 48hr, % of NDF		50

29

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	22.3	24.5
% Ash	16.55	18.21
% TDN	42	46
NEL, Mcal/lb	.37	.41
NEM, Mcal/lb	.33	.34
NFC, Mcal/lb	.7	.09
IVTD 48hr, % of DM		69
NDFD 48hr, % of NDF		50

30

Forage Testing Laboratories

Dairy One Forage Lab

Ithaca, NY; 800-344-2697

<http://www.dairyone.com>

- talk to nutritionist who you may seek recommendations from

31

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

32

Determining Forage Quality

Pasture:

- forage species
- growing conditions
- fecal consistency



33

Supplementation Scenarios

~~cheap and easy~~

- easiest and least expensive
- hand fed supplements
- self-fed supplements

34

Easiest and
Least Expensive

35



36



37

Options if Cattle
Need Supplementation

38

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

39

What type of supplement is needed?

protein energy

a combination of energy and protein

40

Energy Sources

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

gradually increase levels in the diet

41

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

42

Protein Sources

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



43

Hand Feed Supplements

44

Considerations

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

45



Cottonseed Meal
A 41% plant protein source n
supplement to low quality h
AVAILABLE BAGS: 50 lb.

46




gradually increase levels in the diet

47



48




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



49



1057 - Cotton-Seed Meal Cube


38% CP, 75% TDN

50

gradually increase levels in the diet

all 20% cubes
differences on feed tag
crude fiber & protein source

72% TDN, max CF 10% 57% TDN, max CF 15% not more than 8.6% CP from NPN, 56% TDN, max CF 15%



1043 - Range Star NP Cubes 1045 - Range Star Hi-Fi 20% NP Cubes 1048 - Range Star 20% EQ Cubes

51

DDG Cubes

- Diamond Nutrition Energy Cubes
 - 28% CP, 8% Fat
 - check for aflatoxins
 - corn and sorghum distillers grain and solubles
 - Levelland, TX

gradually increase levels in the diet

52

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

53

Self-fed Supplements

54

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

55



molasses or DDG based



56



molasses based
distillers solubles based

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

57

58

Custom formulations for higher intake
may be available in 48,000 – 50,000 lb load



59

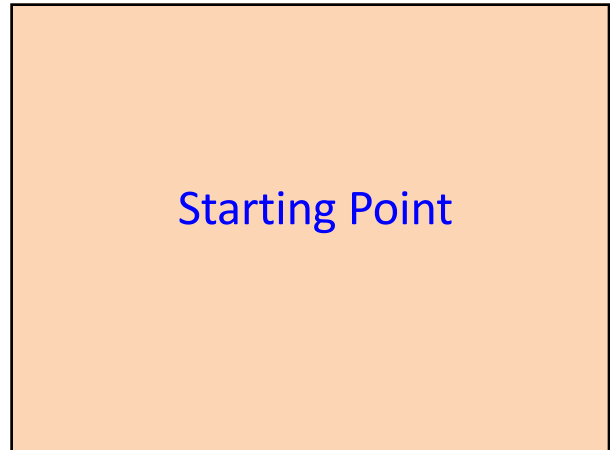


- Our 4' model holds approximately 1300 to 1700 lbs of feed depending on the type of feed being dispensed.
- Our 8' model holds approximately 2600 to 3400 lbs of feed depending on the type of feed being dispensed.
- Our 16' model holds approximately 5200 to 6800 lbs of feed depending on the type of feed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

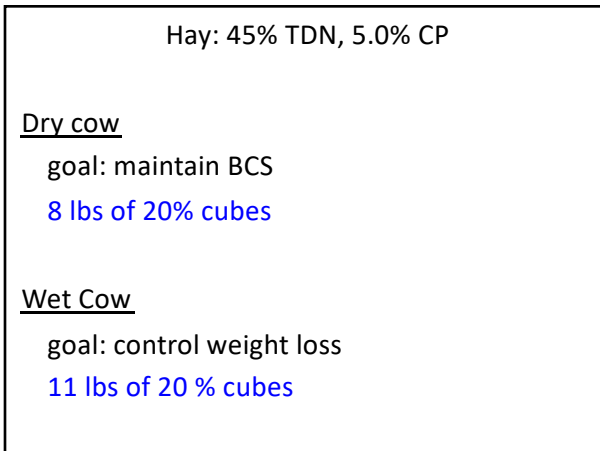
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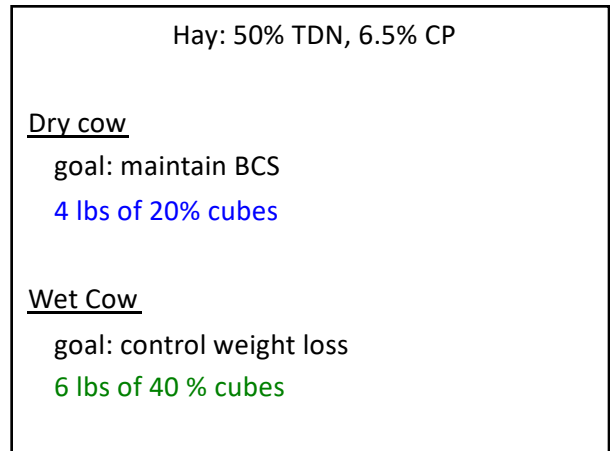
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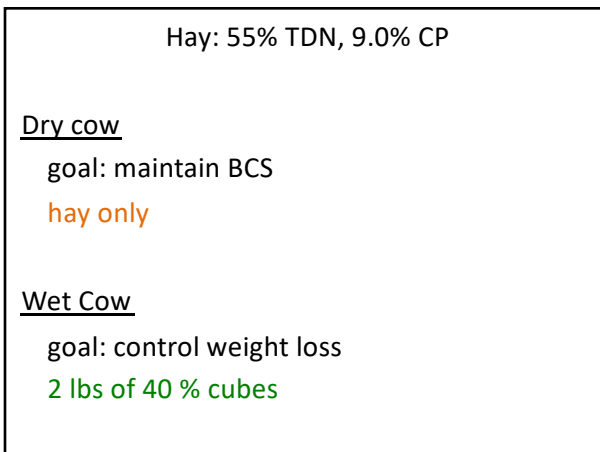
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Frequency of Supplementation

- protein supplements** (no NPN or antibiotics)
- everyday - 2 lbs
 - 3 times/wk - 4.7 lbs
 - 2 times/wk - 7 lbs
 - 1 time/wk ?? - 14 lbs

67

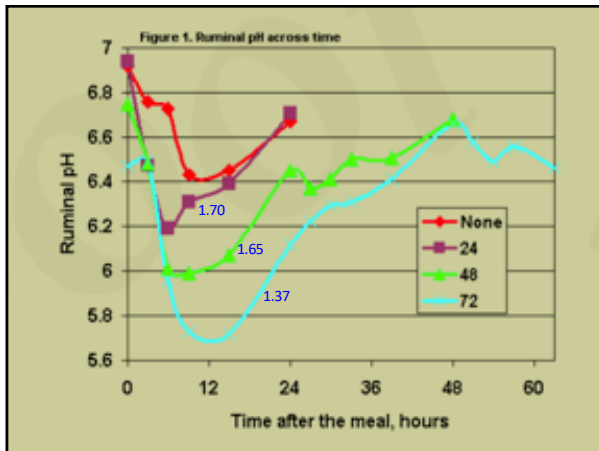
Frequency of Supplementation

- energy supplements**
- best to feed everyday
 - feeding at less frequent intervals 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

68



69

Factors to Consider when Selecting and Purchasing Supplements

70

- do we need protein
- do we need energy
- can the feed provide enough
- feeding conditions and resources
- labor considerations
- price per unit of protein or energy
- type of protein

71

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.

72

Mineral Supplementation for Beef Cow-Calf Operations

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1

Disclaimers

The information given herein is for educational purposes only.

Reference to trade name 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

mineral nutrition impacts

- growth
- reproduction
- milk production
- health



PROFITABILITY

3



4

Components of a Complete Mineral Supplement

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

5

Macro

% of diet

- calcium
- phosphorus
- potassium
- magnesium
- sodium
- sulfur

Trace (micro)

ppm or mg/kg

- copper
- zinc
- manganese
- iodine
- cobalt
- selenium
- iron
- others

6

Differences Between Companies

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

7

Targeted Intake

2 or 4 oz.

- most are 4 oz.

target of 4 oz.

- average intake of 3 – 4 oz. would be acceptable

Se level

- 4 oz: commonly 25 - 27 mg

8

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)**
 - \geq 5% Mg
 - higher Ca

9

	Example A	Example B	Example C
Calcium	15	16	15
Phosphorus	4	5	7.5
Salt	21	15.5	20
Magnesium	3	5	1
Potassium	-	0.1	1
Copper	1,200	2,500	1,200
Zinc	4,200	4,500	3,600
Manganese	3,600	4,000	3,600
Selenium	25	26	27
Iodine	100	200	60
Cobalt	150	20	12
Vitamin A	100,000	100,000	300,000
Vitamin D	2,500	-	30,000
Vitamin E	100	100	300

10

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

11

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

12

Macro Minerals: Geographic & Forage System Considerations

13

Phosphorus Levels

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

NRC requirements are too high for P

14

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

15

	AMPT-A	AMPT-P
Calcium	15	12
Phosphorus	4	9
Salt	21	17
Magnesium	3	2.5
Potassium	-	-
Copper	1,200	1,200
Zinc	4,200	4,200
Manganese	3,600	3,600
Selenium	25	25
Iodine	100	100
Cobalt	150	190
Vitamin A	100,000	400,000
Vitamin D	2,500	8,000
Vitamin E	100	400

16

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

17

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: 0.43%
- native forages average Ca: 0.48%

18

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

19

Winter Pasture

grass tetany concern for cows

- need consistent intake of Mg
 - 5% or greater Mg level
- 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

20

Poultry Litter

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

21

Trace Mineral Considerations

22

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

23

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

24

too much trace mineral can cause

- decreased ADG
- decreased pregnancy rates
- death

be cautious of using multiple products with added trace minerals

25

	Requirement, mg/kg of DMI	Maximum Tolerable, mg/kg of DMI	Ratio of Maximum Tolerable: Requirement (mg/kg of DMI)
Copper	10	40	4
Zinc	30	500	17
Manganese	40	1000	25
Iodine	0.50	50	100
Cobalt	0.15	25	167
Selenium	0.10	5	50

26

	Average Requirement, mg/hd/day (1,350 lb cow)	Maximum Tolerable, mg/hd/day (1,350 lb cow)
Copper	138	490
Zinc	413	6,122
Manganese	551	12,245
Iodine	6.9	612
Cobalt	2.1	306
Selenium	1.4	61

27

desirable ratios for Cu – Zn – Mn

- requirement: 10-30-40
- formulate mineral: 1-3-2 or 1-4-2

good targets for copper in most situations

- 1,200 to 1,500 ppm in 4 oz mineral
- many products have way more copper than needed
- **higher levels of copper have been reported to:**
 - reduce ADG
 - reduce feed intake
 - accumulate to toxic levels and cause death

28

Iodine

preferred forms

- EDDI (organic form)
- calcium iodate
- good target \geq 100 ppm in 4 oz mineral

don't want

- potassium or sodium iodide
- less stable

too much calcium iodate has been reported to reduce weight gain and feed intake

29

Selenium

requirement

- about 1.40 mg/d for 1,350 lb cow

legal limit

- 3 mg/d
- that is about 2.1 times requirement

toxicity could be a concern if getting added Se from multiple sources

30

Sources of Trace Minerals

31

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
- zinc hydroxychloride, basic copper chloride, manganese hydroxychloride

32

inorganic vs. organic vs. hydroxy

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

33

inorganic vs. organic vs. hydroxy

research is inconsistent on animal growth, reproduction, and health

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

34

Vitamins

35

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

36

vitamin A deficiency

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

- precursors to vitamin A are found in green growing forages

- drought concerns

37

Tubs

38

- most need separate source of salt

- most have a similar Ca:P ratio

- most have less Ca than loose supplements

39

	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.

40

	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

41

Blocks

42

Loose Mineral Products for Comparison	Company A	Company B	Company C
Calcium	16	15	15
Phosphorus	5	7.5	4
Salt	15 - 16	20	21
Magnesium	5	1	3
Potassium	0.1	1	-
Copper	2,500	1200	1,200
Zinc	4,500	3600	4,200
Manganese	4,000	3600	3,600
Selenium	26	27	25
Iodine	200	60	100
Cobalt	20	12	150
Vitamin A	100,000	300,000	100,000
Vitamin D	-	30,000	2,500
Vitamin E	100	300	100

43



44

	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				

45

American Stockman Big 68 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, Manganese 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.

46

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

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

47



48

Things That Don't Make Sense To Me

49

- having more P than Ca in the mineral
- not having any Ca in the mineral
- putting sodium bicarbonate in a mineral
- adding sulfur to the mineral

50



51

Mineral Feeders

52



53



54



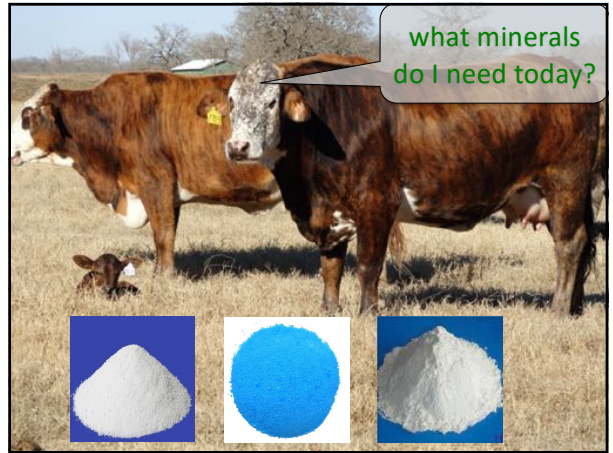
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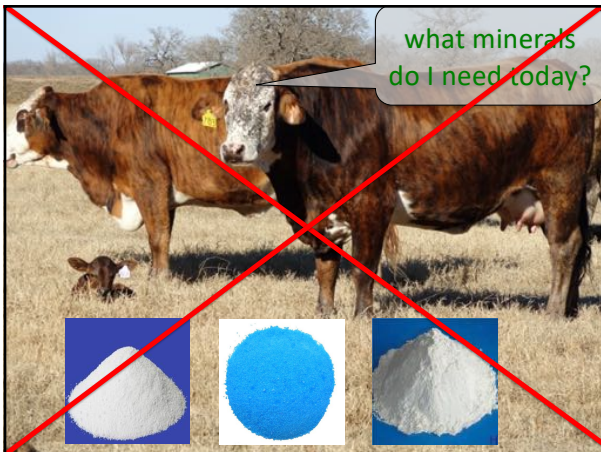
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Mineral Intake

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58



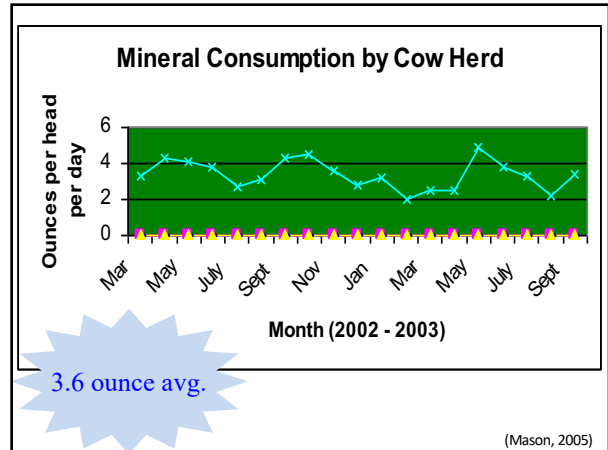
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- focus on average consumption over several weeks
- intake varies over time
- lactation may increase intake, 2 to 2.5x

61



62

- 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

63

- salt
 - initially encourages intake
 - as salt consumption increases mineral intake is reduced
- phosphorus
 - generally decreases intake
- magnesium
 - generally decreases intake

64

additives that stimulate intake

- molasses, yeast, other flavoring agents
- mineral oil and weatherization products



65

Calculating Mineral Intake

- 35 cows
- put 50 lbs of mineral in an empty feeder
- mineral lasts for 6 days
- $50 \text{ lbs} \div 6 \text{ days} = 8.33 \text{ lbs per day for the herd}$
- $8.33 \text{ lbs per day} \div 35 \text{ hd} = 0.24 \text{ lbs/hd/d}$
- $16 \text{ oz.} \times 0.24 \text{ lbs} = 3.8 \text{ oz./hd/d}$

66

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)

67

When and What Do I Feed

68

Reputable Company with a Nutritionist on Staff

69

Consider Flexibility

70

Cow-Calf

71

When should I feed a cow-calf mineral?

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

72

introduced pasture and hay

- higher Ca, lower P



73

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



74

dormant native range (no protein/energy supplement)

- similar Ca & P levels
- make sure intake is adequate



75

winter pasture

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



76

Growing Animals: Weaned Calves, Stockers, Replacement Heifers

77



78



79

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 to high

80

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.

81

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.

82

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)

83

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

84

For Reference Only

85



86

	Emerald	Bronze	Gold
Calcium	16	12.5	12.5
Phosphorus	5	8	2
Salt	15 - 16	15 - 17	13 - 15
Magnesium	5	3	13
Potassium	0.1	2	0.2
Copper	2,500	2,500	1,500
Zinc	4,500	6,000	4,500
Manganese	4,000	4,000	4,000
Selenium	26	26	26
Iodine	200	200	200
Cobalt	20	20	20
Vitamin A	100,000	100,000	100,000
Vitamin D	-	10,000	-
Vitamin E	100	110	100

87

5 basic formulas,
common in Texas



- All Season 7.5 Complete
- Hi-Magnesium Complete
- Texas All Season 12 Complete
- Texas All Season 7.5 Complete
- Texas All Season 5 Complete

88

	Texas All Season 12 Complete	Texas All Season 7.5 Complete	Texas All Season 5 Complete	All Season 7.5 Complete	Hi-Magnesium Complete
Calcium	14	15	12	15	14
Phosphorus	12	7.5	5	7.5	4
Salt	24	20	20	20	18
Magnesium	1	1	5	1	10
Potassium	1	1	0.1	1	0.1
Copper	2500	2500	2500	1200	1200
Zinc	7500	7500	7500	3600	3600
Manganese	4000	4000	4000	3600	3600
Selenium	27	27	27	27	27
Iodine	60	60	60	60	60
Cobalt	12	12	12	12	12
Vitamin A	150,000	150,000	75,000	300,000	75,000
Vitamin D	15,000	15,000	7,500	30,000	7,500
Vitamin E	150	150	75	300	75

89



90

	AMPT-A	AMPT-M	AMPT-P	AMPT-T	(Low Salt) AMPT-T
Calcium	15	9	12	12	12
Phosphorus	4	4	9	7	7
Salt	21	20	17	20	4
Magnesium	3	10	2.5	3	3
Potassium	-	-	-	-	-
Copper	1,200	1,200	1,200	1,200	1,200
Zinc	4,200	4,200	4,200	4,200	4,200
Manganese	3,600	3,600	3,600	3,600	3,600
Selenium	25	25	25	25	25
Iodine	100	100	100	100	100
Cobalt	150	150	190	200	200
Vitamin A	100,000	100,000	400,000	250,00	250,00
Vitamin D	2,500	2,500	8,000	5,000	5,000
Vitamin E	100	100	400	250	250

91

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92