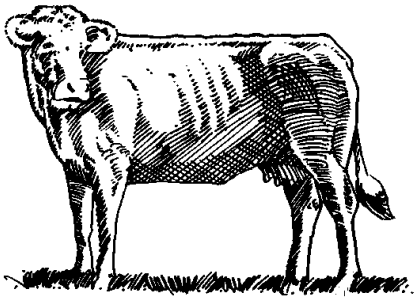

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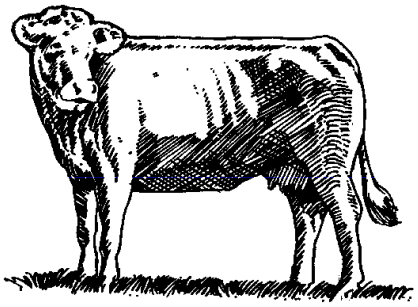

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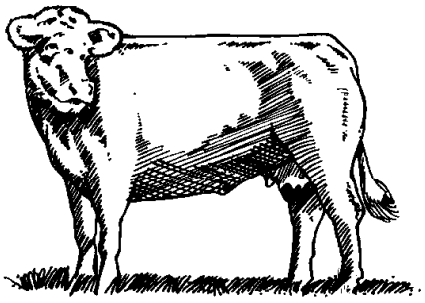

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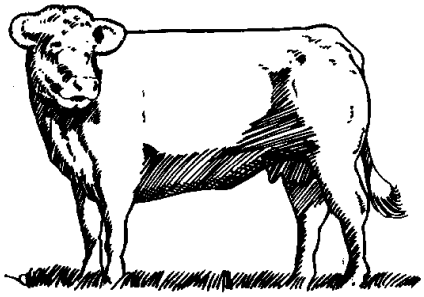


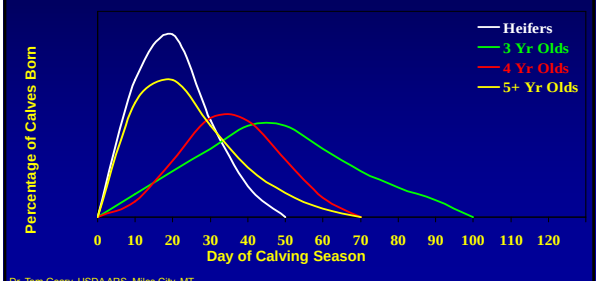
NO. 7

Nutrition and Reproduction

- Impacts rate of uterine involution
- Effects ovarian activity by impacting release of reproductive hormones - primarily Lutenizing Hormone from the anterior pituitary gland
- Negative energy balance which creates an unfavorable metabolic state can impact follicle development and egg quality

Measures of Fertility

Calving Distribution



Dr. Tom Geary, USDA ARS, Miles City, MT

Herd Health Impact

- Infectious diseases (Lepto, IBR, BVD, etc) - systematic vaccination program
- Parasites - internal/external parasite control program
- Toxins - nitrates, aflatoxin, etc.
- Dystocia - decreases PR by 16%
- C-section decreases PR by 27%

Basic Ruminant Nutrition

- The six basic classes of nutrients.
  - Water
  - Carbohydrates
  - Fats
  - Proteins
  - Vitamins
  - Minerals

The Importance of Water Quality

•Lack of, dirty or poor quality water affects feeding performance

•Cattle need to consume 3.5 – 5.0 lbs. of water per lb. of dry matter intake

•For every 3.5 – 5.0 lb. reduction in water intake, Dry matter intake drops 1.0 lb

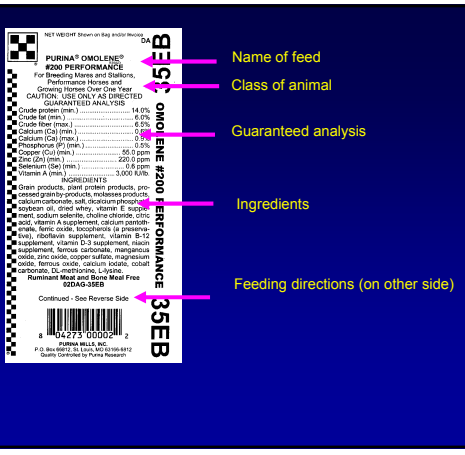
•A 1.0 lb. dry matter intake drop will reduce gain by 6.4 % and feed conversion by 2 – 3 %

Water Consumption

- Trough space… trough height, mud depth
- Location
- Cleanliness
- Chemical content… Sulfur, etc.
- Water temperature… shade, insulation

FEED TAGS

What they do (and don't) tell you!



Required Guarantees

- Crude Protein, % Minimum
- Crude Fat, % Minimum
- Crude Fiber, % Maximum
- Calcium, % Maximum and Minimum
- Phosphorus, % Minimum
- Copper, ppm Minimum
- Zinc, ppm Minimum
- Selenium, ppm Minimum
- Vitamin A, IU/lb. Minimum

Required Guarantees

- Energy?????
- Carbohydrates?
- Starch?
- Other vitamins and minerals?

Interpreting the Guarantees

- Protein – "Crude Protein"
  - Includes non-protein nitrogen
  - Digestibility?
  - Site of digestion?
  - Quality (amino acid profile)?

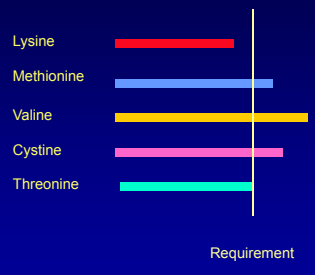
Protein Ingredients

- Soybean meal
- Extruded soybeans
- Milk proteins
- Cottonseed meal
- Sunflower meal
- Canola meal
- Peanut meal
- Linseed meal
- Meat meal
- Fish meal

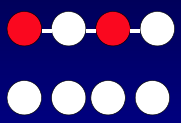
Protein

- Requirement is a function of the animal needs.
- Protein quality is the relationship between the amino acid needs of the animal and the concentration of amino acids in the diet and their availability / digestibility.

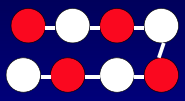
Limiting Amino Acids



Total Protein vs Amino Acid Requirements



Cotton Seed Meal



Soybean Meal

Interpreting the Guarantees

- Fiber – “Crude fiber”
  - An estimate of the poorly digestible portion of the feed (includes the indigestible portion)
  - Digestibility?
  - “Complete feeds” – adequate fiber?

Interpreting the Guarantees

- Fat – “Crude Fat”
  - The % of ether extractable fat in the feed
  - Digestibility?
  - Site of digestion?
  - Fatty acid profile?
  - Palatability?

Fat Ingredients

- Soybean oil
- Extruded soybeans
- Corn oil
- Rice bran
- Wheat germ oil
- Linseed oil
- Fish oil
- Animal fats
- Rancid fats
- Heated fats
- Mineral oil

Methods of Adding Fats

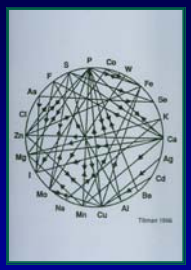
- Adding through molasses
- Adding to pellets
- Adding to extruded feeds
- Surface application to coarse feeds

Benefits of Added Fat

- Calorie source
- Source of “essential” fatty acids
- Improved performance
- Improved reproductive efficiency
- Manage metabolic diseases

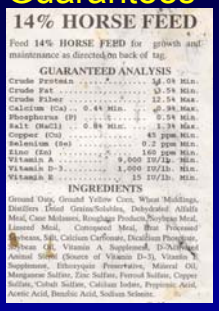
Interpreting the Guarantees

- Minerals
  - Calcium - cheap
  - Phosphorus – availability?
  - Selenium
  - Trace Minerals – oxides, carbonates, sulfates?
  - Amounts and ratios?



Interpreting the Guarantees

- Vitamins
  - More is not necessarily better!
  - Stability?



14% HORSE FEED

Feed 14% HORSE FEED for growth and maintenance as directed on back of tag.

GUARANTEED ANALYSIS

Crude Protein	14.0% Min.
Crude Fat	13.5% Min.
Crude Fiber	12.5% Max.
Calcium (Ca)	0.4% Min. 0.9% Max.
Phosphorus (P)	0.5% Min.
Salt (NaCl)	0.8% Min. 1.3% Max.
Copper (Cu)	45 ppm Min.
Selenium (Se)	0.2 ppm Min.
Zinc (Zn)	160 ppm Min.
Vitamin A	9,000 IU/lb. Min.
Vitamin D-3	1,000 IU/lb. Min.
Vitamin E	15 IU/lb. Min.

INGREDIENTS

Ground Oats, Ground Yellow Corn, Wheat Middlings, Distillers Dried Grains/Solubles, Dehydrated Alfalfa Meal, Cane Molasses, Roughage Products, Soybean Meal, Linseed Meal, Cottonseed Meal, Heat Processed Soybeans, Salt, Calcium Carbonate, Dicalcium Phosphate, Soybean Oil, Vitamin A Supplement, D-Activated Animal Sterol (Source of Vitamin D-3), Vitamin E Supplement, Ethoxyquin Preservative, Mineral Oil, Manganese Sulfate, Zinc Sulfate, Ferrous Sulfate, Copper Sulfate, Cobalt Sulfate, Calcium Iodate, Propionic Acid, Acetic Acid, Benzoic Acid, Sodium Selenite.

Ingredients

- Groupings
  - Grains
  - Grain products
  - Processed grain by-products
  - Forage products
  - Roughage products
  - Plant protein products

Ingredients

- Amounts
  - Tag tells nothing about the amount of each ingredient in the feed
  - The tag is not the formula, nor do we want it to be!

"Tag Dressing"

- Chelated minerals?
- Yeast culture?
- Biotin?
- Beet pulp?
- Yucca extract?

- Benefits?
- Amounts?

The Moral Is:

- Overall, tags tell very little
- Ask the customer (for example):
  - What do you like about this feed?
  - What results are you looking for?
  - What do you do with your horse?
- Then – "let us show you what our feed will do for your horse"

What's The Greatest Resource You Have On Your Ranch?

What Controls Forage Intake…?

- Rumen Fill
- Rate of Passage
- Groceries (Ammonia, Energy, and Minerals) We Supply The "Bugs" In The Rumen.

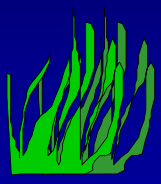
What Actually Digests Forage?

Does Forage Quality Affect Forage Intake?

Forage Stages

Vegetative - High quality pasture. Green, high moisture, containing all leaf material.

- 10-18% CP with 2.3-3.0% BW intake



Forage Stages

Transitional - Fair quality pasture or hay. Less leaf material with some development of stem and seedhead.

- 6-9% CP with 1.9-2.2% BW intake

Forage Stages

Mature - Poor quality pasture or hay. Seedhead is developed with more stem material and less leaf material.

- 5% or less CP and 1.3-1.8% BW intake

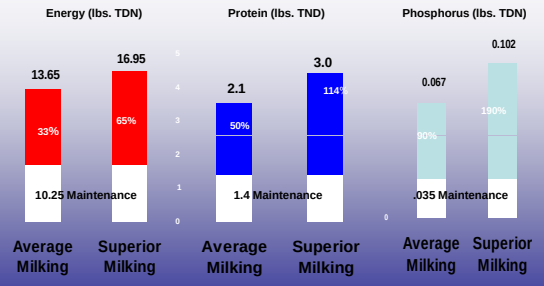
GRASS/HAY QUALITY AND INTAKE
Analysis on Dry Matter Basis

Stage of Growth	Quality Description	% DM	% CP	% TDN	% PHOS	Intake % BW
Vegetative *small grain pasture, early growth native and improved pasture	Good *mostly leaf material, no stem	30-55	10-18	54-65	0.15-0.25	2.3-3.0
Transitional *native and improved grass pasture/hay as it matures prior to seedhead formation	Fair *less leaf more stem development	55-80	6-9	44-53	0.09-0.14	1.9-2.2
Reproductive * reproductive green to dormant stage	Poor *seedhead fully develop. until next year's Spring green -up	80-90	≤5	≤43	≤.08	1.3-1.8

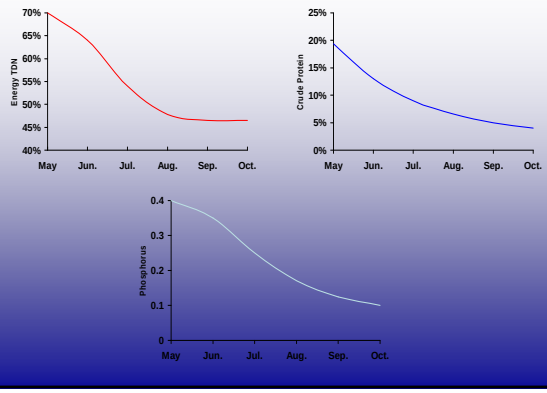
HOW CAN YOU INCREASE FORAGE UTILIZATION …?

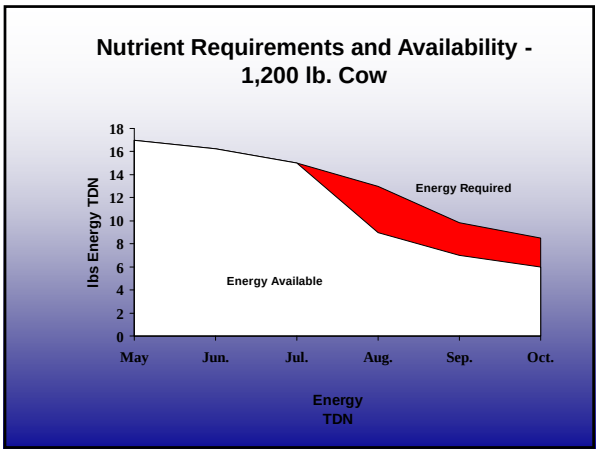
- Meet Bug Needs 24/7
- Insure Rumen pH is 6.2 or Higher
- Increase Grazing Time
- Increase Grazing Distribution

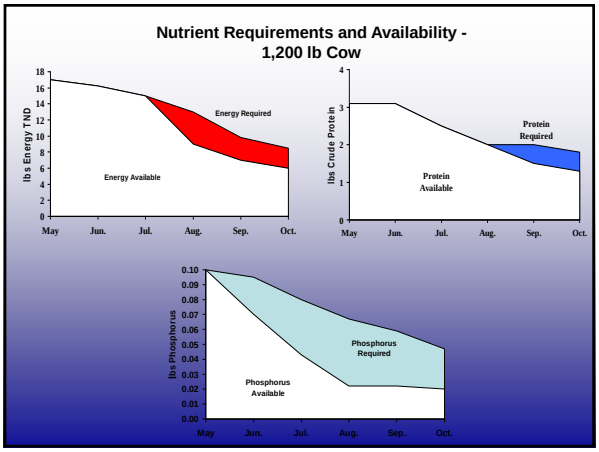
Increase In Nutrient Requirements for Lactation

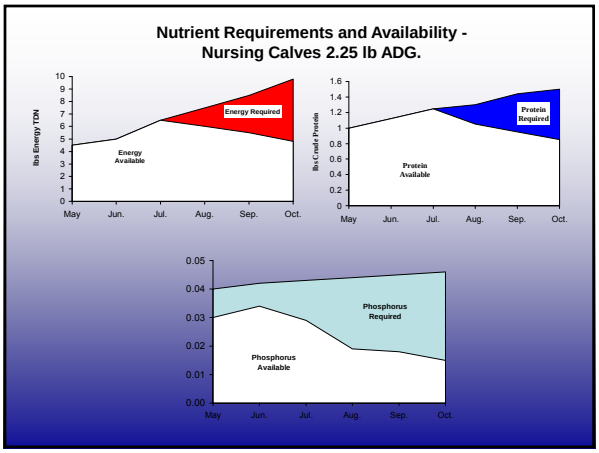


Nutrient Content of Forages




Nutrient Requirements and Availability - 1,200 lb. Cow
lbs Energy TDN
18
16
14
12
10
8
6
4
2
0
Energy Required
Energy Available
May
Jun.
Jul.
Aug.
Sep.
Oct.
Energy TDN


Nutrient Requirements and Availability - 1,200 lb Cow
lbs Energy TND
Energy Required
Energy Available
lbs Crude Protein
Protein Required
Protein Available
lbs Phosphorus
Phosphorus Required
Phosphorus Available
May
Jun.
Jul.
Aug.
Sep.
Oct.


Nutrient Requirements and Availability - Nursing Calves 2.25 lb ADG.
lbs Energy TDN
Energy Required
Energy Available
lbs Crude Protein
Protein Required
Protein Available
Phosphorus Required
Phosphorus Available
May
Jun.
Jul.
Aug.
Sep.
Oct.

Effects of Nutritional Shortages on Calf Weight Gains

Date	Gain (lbs/day) Deficient	Potential	Calf Weight (lbs) Deficient	Potential
March 1			75	75
Daily Gain	1.75	1.75		
April 1			128	128
Daily Gain	2.00	2.00		
May 1			188	188
Daily Gain	2.50	2.50		
June 1			263	263
Daily Gain	2.50	2.50		
July 1			338	338
Daily Gain	2.25	2.25		
August 1			406	406
Daily Gain	.75	2.25		
September 1			428	476
Daily Gain	.50	2.25		
October 1			443	542
Daily Gain	.50	2.25		
November 1			458	610

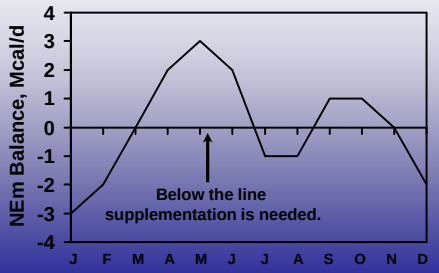
Need for Supplementing a Forage Depends On:

Nutrient Requirements

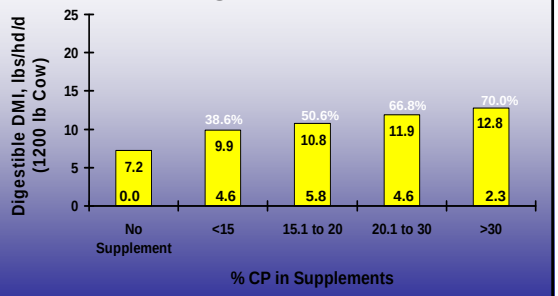
Forage Quality

When is Supplementation Needed?

Needed to bridge the gap between nutrient intake and nutrient requirement!



Effect of % CP in Supplements on Digestible DMI



(141 Mean Observations from 31 Trials) (Adapted from Heldt, 1998; KSU)

Rule of Thumb: usually when forage CP falls below 7-8% CP there is a great response to supplementation

- After a frost
- During a dry period

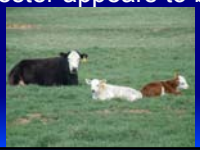
How do WE know when to provide supplemental nutrients?

Hard to know just "eye-balling" the forage situation?

- **In the Real World…**
  - **It is hard to know exactly when to provide supplemental nutrients?**
  - **It is hard to know exactly how much to supplement?**

Fetal Programming...application to cattle

- Refers to maternal events during development of the fetus…that have life-time effects on the calf after birth.
- Each trimester appears to be critical



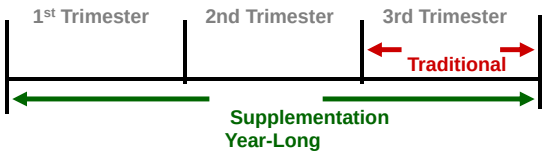
Fetal Programming in cows

- The brood cow is the only "managed livestock species" where the industry plans on her to lose weight during gestation.
- Do cows receive consistent nutrition in early, mid and late gestation?
  - Green-up…condition loss
  - Drought…condition loss
  - Winter…condition loss
- "Maternal Hunger" is the norm.

Sustained Nutrition

- What is it?
  - IM Technology Supplement
  - Available 24/7, 365 days
  - Intake depends on cow need
- What have ranchers seen?
  - Increased weaning weights
  - Increased conception rate

Traditional Supplementation vs. "Sustained Nutrition" through gestation



"The cow is nourishing the fetus in the womb"

Sustained Nutrition

- Why would there be better performance?
  - Consistent Fetal Nutrition
    - First trimester
    - Second trimester
    - Third trimester
  - Improved milk production
  - ↓Post-partum interval

Sustained Nutrition

- What does it cost?
  - Less than feeding supplement only in winter
  - Cows consume less supplement on a yearly basis
  - We are not crazy…we have data
  - There is a drive for energy intake
  - Sustained nutrition reduces the ravenous winter hunger-because she is not catching up

Fetal Programming Summary

In-utero nutrition effects subsequent generations:

1. Reproduction:
   - Conception rates
   - *First service conception rates
   - Calving difficulty
2. Growth traits:
   - Weaning weights
   - * Carcass weights
   - * Marbling
3. Health

Fetal Programming Conclusions

- The gestational nutrition of your herd this year, imprints the lifetime genetic potential and performance of subsequent generations.

- The performance of a calf is influenced not only by its nutrition before and after birth, but also by the prior fetal nutrition of both its dam and grand dam.

Best Solution Feeding System

- Forage
- Cow Appearance
- Stage of Cow Production
- Cow Nutrition Requirements
- Feeding Rates and Use

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- After a frost
- During a dry period

How do WE know when to provide supplemental nutrients?

Hard to know just "eye-balling" the forage situation?

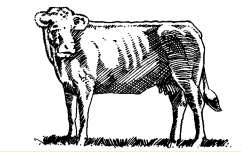
How does the cow tell us she's lacking nutrients?

LOSS OF BODY CONDITION!

SUMMARY OF THE VALUES OF BODY CONDITIO SCORING IMPACT

ECONOMIC FACTOR	IMPACT
Return to Estrus Days Postpartum Pregnancy Rate	----------Number of Calves Born
Days Postpartum Milk production Calf ADG	---------- Weaning Weight of Calf

KEY IMPACT	FACTOR	INCREASE
Number Calves Born 4.5	Pregnancy Rate (Improve BCS to 6.0)	+ 15%
Weaning Weight	Reduce Postpartum Interval 18 Days (1.5#/hd/day)	+ 27 lbs
Weaning Weight	ADG - Milk Production (.3 lbs/hd/day gain for 205 days)	+ 61 lbs



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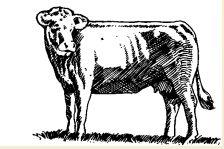

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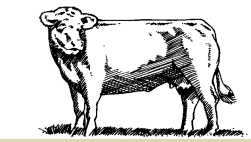


6

Body Condition Score Goals

- BCS of 6 at calving
- BCS of 5 at weaning

If ever above BCS 6 and consuming supplement… waste of money

Stage of Cow Production

Stage of Cow Production

Early Gestation/Maintenance

Last 1/3 Gestation

Lactation-average milk production

Critical Cow Life Stages

- Last 1/3 of Gestation
- 60-90 Days Before Calving
  - 65-75% of calf growth occurs
  - Protein, energy, and mineral need increase dramatically for calf bone and muscle development
- Lactation
- 90 Days After Calving
  - Milking and Rebreeding Needs
  - Protein and Phosphorus Requirements Almost Double
  - Energy Requirements Increases by 15%

Cow Nutritional Requirements

COW REQUIREMENTS

900# COW	CP (LBS)	TDN (LBS)	PHOS (LBS)
Gestation/Maint.	0.81	7.14	0.025
Last 1/3 Gestation	1.00	8.75	0.030
Lactation	1.80	10.30	0.055
1000# COW			
Gestation/Maint.	0.88	7.74	0.026
Last 1/3 Gestation	1.10	9.36	0.032
Lactation	1.90	10.75	0.05
1100# COW			
Gestatin/Maint.	0.93	8.25	0.029
Last 1/3 Gestation	1.12	9.85	0.034
Lactation	2.00	11.20	0.060
1200# COW			
Gestation/Maint.	1.00	8.75	0.030
Last 1/3 Gestation	1.17	10.30	0.036
Lactation	2.10	11.90	0.062

Cow Nutrient Requirements

Cow Size

1200 lb cow
TDN requirement = 1% of BW
TDN requirement = 12 lb daily
Must consume 24 lb of forage DM at 50% TDN

1500 lb cow
TDN requirement = 1% of BW
TDN requirement = 15 lb daily
Must consume 30 lb of forage DM at 50% TDN

Products and Programs

How do you feed your cows?

- Cubes
- Liquids
- Blocks/Tubs
- Accuration
- Salt Meal
- Commodity

Why do you feed these products?

- Price
- Performance
- Convenience
- Tradition
- Labor
- Do not know any better
- Location
- Availability

CUBES

Protein- 12, 14, 20, 32, 38
Quality of protein
Fat- 1-4%
Quality of fat- More is not necessarily better
TDN is what is important.
Fiber- The lower the higher the energy
Mineral package- Calcium, Phosphorus, Salt
Vitamins- Vitamin A

You can cheapen up a cube by
increasing fiber
increasing salt
increasing calcium
increasing inert materials like Magnesium Mica (binder)

Industry Block Technology

- Pressed blocks
- Dehydrated/Baked blocks
- Poured blocks
  - Purina Technology
  - West Coast Process

Pressed Blocks Technology

- Formed by applying pressure and heat to dry ingredients
- Small Thirty Three Pound Blocks
- Weather intolerant
- High level of salt (15-30%)
- Intake controlled by:
  - Salt
  - Hardness
  - Number of blocks
  - Location

Baked/Dehydrated Block Technology

- Liquid ingredients are "baked" to remove most of the moisture
- High energy--Low moisture product
- Intake controlled by:
  - Humidity
  - Temperature
  - Saliva
  - Number of blocks
  - Location

Baked/Dehydrated Block Technology

- Characteristics
  - Highest priced block
  - High energy
  - Consumption is normally less than half that of other processes- limited application

Baked/Dehydrated Block Technology

- Concerns
  - Low intakes will likely not allow improvements in BCS
  - Low intakes can result in loss in BCS on poor quality forage
  - Intake is not correlated with forage quality and quantity
  - Returnable tubs increase the chance of spreading disease

Purina Sup-R-Block Technology

- Purina combines their controlled intake systems and nutritional knowledge base to ensure cattle requirements are met
- Sup-R-Block contains only quality ingredients that have a high nutrient density
- Sup-R-Block is waterproof

The ultimate in poured block technology!

Purina Sup-R-Block Technology

- High molasses content
- Most consistent quality
- Nutritionally fortified to meet cattle requirements
- High quality animal fat
- Consumption will vary depending on nutritional value of forage
- Products do not contain high levels of low cost ingredients intended to reduce cost and subsequently the nutritional

Competitive Poured Block Technology

- West Coast Process

  Typically use phosphoric acid in combination with:
  - Magnesium oxide & calcium sulfate
  - Magnesium oxide & calcium oxide
  - Magnesium sulfate & calcium oxide
  - Calcium oxide, magnesium oxide & magnesium sulfate

Competitive Poured Block Technology

- Ingredient and nutrient variations
  - Fiber guarantees up to 6% using rice or peanut hulls
  - Fat source is often vegetable oil
  - Magnesium guarantees up to 3%
  - Calcium guarantees up to 5%
  - Phosphorus levels as low as 0.08%
  - Salt levels as high as 5.25%
  - Weatherability is questionable

Competitive Poured Block Technology

- Energy level will be less than Sup-R-Block because of higher mineral & fiber levels
- Consumption will normally be lower due to negative effects of magnesium and calcium oxide
- Based on Purina research, intake within a herd will be more variable

Sup-R-Block

- Summary
  - Best source for protein and energy
  - Most cost effective block in the industry
  - Most consistent, predictable intake

Sup-R-Block Products

	Protein	NPN	Fat	Fiber	Phosphorus	Calcium	Magnesium
SRB 2	20.0	12.0	5.0	3.0	1.0	2.0	2.0
SRB 2N	20.0	0	4.0	1.0	1.0	2.0	2.0
SRB 2HL	24.0	16.0	5.0	3.0	1.0	2.0	2.0

Liquid is the most economical and performance enhancing way to feed cows IF you are feeding the right liquid!

Straight Molasses- No by products

- Low moisture
- High Quality Fat
- Must Control Intake

Liquid Byproducts

Liquid ingredients in competitive products

Ingredient	Moisture %	% Dry Matter	% TDN, as fed
Molasses	26-28	72-74	57
"Corn Steep Liquor" Condensed Fermented Corn Extractives	45-53	45	26-32
Condensed Corn Distillers Solubles	45-55	45-55	21-28
Condensed Whey	46-65	35-54	25-33
Condensed Extracted Glutamic Acid Fermentation Product - "Proteferm"	60	40	18
Hemicellulose Extract "Wood Molasses"	40-50	50-60	40-50
Condensed Separator Byproduct "Beet Filtrate"	35-45	55-65	27-40

Amount of Supplement Needed To Achieve
Same Performance as 2.50 lbs Accuration Range Liquid

Liquid Feed ID	Product Classification	Lbs Product Needed
Accuration Liquid	Best Value	2.50
A	Conventional	5.24
B	Commercial	7.10
C	Conventional	6.95
D	Commodity Blend	10.54
E	Commodity Blend	9.15
F	Commodity Blend	8.82
G	Commercial	6.31
H	Conventional	6.08
I	Conventional	5.43

Purina Liquids

	Protein	Fat	moisture	TDN
• Sup R Lix	16	5	29	65
• Sup R Lix	24	5	29	65
• Sup R Lix	32	5	29	65
• Forage Bal Hi-E	32	3	32	60
• Range Lix	32	5	32	60
• Range Lix	32	3	32	58
• Range Lix	32	1	32	55
• Compensator	32	0	32	50

Accuration Range Liquids

•	Protein	Fat	moisture	TDN
• Accuration 16-10	16	10	29	76
• Accuration 24-10	24	10	29	76
• Accuration 28-10	28	10	29	76
• Accuration 32-10	32	10	29	76

Accuration Range Liquid

Accuration Range Liquid is the best liquid supplementation for your cows to meet their nutritional needs in each life stage, including reproduction while providing you the best value and support for your bottom line potential.

*More Calves to Wean

*Heavier Calves

*Sustained Nutrition™

Benefits to Cattlemen

- 10% fat and higher energy levels help your cows meet their performance potential through every life stage, including reproduction
- Heavier calves and more calves to wean
- Value and Performance through Sustained Nutrition
  - Year-round supplementation may actually require LESS supplement per animal per year
- Cows get the nutrition and energy they need to help balance the deficiencies in range cattle diets

Sustained Nutrition

- What is it?
  - IM Technology Supplement
  - Available 24/7, 365 days
  - Intake depends on cow need
- What have ranchers seen?
  - Increased weaning weights
  - Increased conception rate

Sustained Nutrition

- What does it cost?
  - Less than feeding supplement only in winter
  - Cows consume less supplement on a yearly basis
  - We are not crazy…we have data
  - There is a drive for energy intake
  - Sustained nutrition reduces the ravenous winter hunger-because she is not catching up

YEAR ROUND PROGRAM

Stage of Growth	Quality Description	% DM	% CP	% TDN	Intake % BW	Suggested Product
Vegetative small grain pasture, early growth native and improved pasture	Good *mostly leaf material, no stem	30-55	10-18	65-75	2.3-3.0	W&R Mineral
Transitional native and improved grass pasture/hay as it matures prior to seedhead formation	Fair *less leaf more stem development	55-80	6-9	50-60	1.9-2.2	W&R Mineral Sup R Blocks Accuration 2HL Accuration Liquid Rangeland Tubs
Reproductive reproductive green to dormant stage and stored forages	Poor *seedhead fully develop. until next year's Spring green -up	80-90	≤5	40-50	1.3-1.8	W&R Mineral Sup R Blocks Accuration 2HL Accuration Liquid

Purina Beef Research

Controlled Intake Systems

- Available 24/7
- Intake Based on Forage Quality and Cattle Need

Purina Beef Research

Controlled Intake Systems

- Available 24/7
- Intake Based on Forage Quality and Cattle Need

•Creep Feeding
•Developing Bulls and Heifers
•Growing Stockers
•Conditioning Cows and Bulls

Mineral Basics

- **Cattle Need Mineral.**
- **Forages Are Deficient in Mineral.**
- **Purina Has a Full Line of Research Tested and Field Proven Cattle Minerals.**

Cattle NEED Mineral

- **There are 14 Macro and Micro Minerals That Must Be Provided in Cattle Diets.**
- **Their Levels, Ratios, and Relationship to Other Minerals Drive the Development of a Sound Mineral Program.**

Forages Are Deficient

- **Forage Makes Up About 85% of a Brood Cow's Diet and Varies Greatly in Mineral Content, Due in Part to: Type and Variety of Forage, Soil Conditions, and Stage of Maturity**
- **Seldom Does Forage Alone Contain All Needed Minerals in Adequate Amounts and Ratios to Meet Cattle Requirements for Optimal Performance**

PURINA WIND & RAIN

Purina Has Mineral

- **Purina Conducts Research, Manufactures, and Markets a Full Line of Mineral for Beef Cattle**

Mineral Basics

- Cattle Need Mineral
  - What Happens If You Don't Feed a Quality Mineral?
    - Decreased Weaning Weights
    - Small or Weak Calves
    - Decreased Milk Production
    - Reduced/later conception
    - Poor Immunity - Increased Sickness

Mineral Basics

- Cattle Need Mineral
  - There are 14 Essential Macro and Micro Minerals
    - Macro Minerals are needed in larger quantities.
    - Micro Minerals are just as essential, they are simply needed in smaller amounts.

Mineral Basics

- Cattle Need Mineral
  - Macro Minerals
    - Phosphorus (P)
    - Potassium (K)
    - Calcium (Ca)
    - Sodium (Na)
    - Chlorine (Cl)
    - Sulfur (S)
    - Magnesium (Mg)

Cattle NEED Mineral

- Micro Minerals:
  - Iron (Fe)
  - Copper (Cu)
  - Zinc (Zn)
  - Iodine (I)
  - Selenium (Se)
  - Manganese (Mn)
  - Cobalt (Co)

Criteria Needed for Developing a Mineral Program

- Mineral requirements
  - dependent upon class of animal
  - dependent upon stage and level of production
- Forage mineral supply
  - Affected by various factors
- Bioavailable sources of minerals that are palatable.
  - Organic vs inorganic sources
  - Free choice vs dosed minerals

Mineral Requirements

Macro Minerals

Mineral	Growing Cattle	Cows/heifers Gestating	Cows/heifers Lactating
Calcium, %	.40 to .80	.16 to 27	.28 to .58
Phosphorus, %	.22 to .50	.17 to .22	.22 to .39
Magnesium, %	.10	.12	.20
Potassum, %	.60	.60	.60
Sodium, %	.06 to .08	.06 to .08	.06 to .08
Sulfur, %	.15	.15	.15

NRC, 1996

Mineral Requirements

Micro Minerals

Mineral	Growing Cattle	Cows/heifers Gestating	Cows/heifers Lactating
Cobalt, ppm	0.10	0.10	0.10
Copper, ppm	10.00	10.00	10.00
Iodine, ppm	0.50	0.50	0.50
Iron, ppm	50.00	50.00	50.00
Manganese, ppm	20.00	20.00	20.00
Selenium, ppm	0.10	0.10	0.10
Zinc, ppm	30.00	30.00	30.00

NRC, 1996

General Functions of Macro Minerals

- Constituent of bones and teeth
- Constituent of organic compounds
- Enzyme systems
  - Energy metabolism
  - Muscle function
- Function as soluble salts
  - Osmotic control
  - Acid base balance

General Functions of Micro Minerals

- Collagen formation
- Pigmentation
- Antioxidant
- Hormonal function
- Component of enzymes
- Enzyme metabolism
- Enzyme activity
- Wound healing

Pasture to Pasture Variation

Data from Montana	Pasture		
Mineral	A	B	C
Cu, ppm	7	10	7
Mo, ppm	.6	.2	4.1
Cu:Mo ratio	11	53	1.7
S, %	.26	.47	.46
Fe, ppm	457	385	179

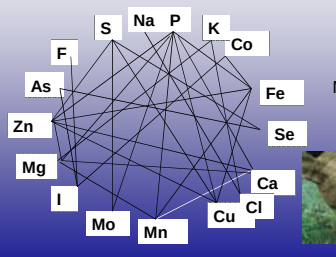
Sources of Minerals

- Feedstuffs
- Inorganic salts
- Organic salts
  - amino acid complexes
  - proteinates/chelates
  - polysaccharides
  - propionates

Bioavailability of Trace Minerals

	Sulfate	Oxide	Carbonate	Chloride	Organic
Co	100	31	100	-	85-140
Cu	100	0-10	-	100	130
Fe	100	0	0-75	-	150-320
Mn	100	30-65	28	-	121-174
Zn	100	44-61	60	40	108-206

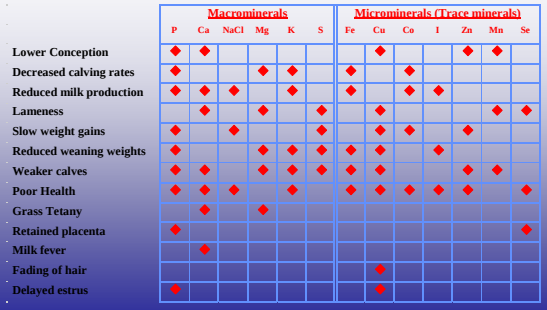
When Formulating Mineral Supplements Mineral Interactions Are Important



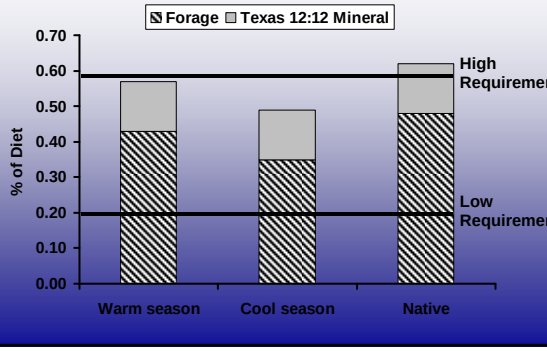
Key Interactions

Ca ⟷ P
K ⟷ Mg
Mo, S ⟷ Cu
Zn ⟷ Cu
Fe ⟷ Zn, Cu

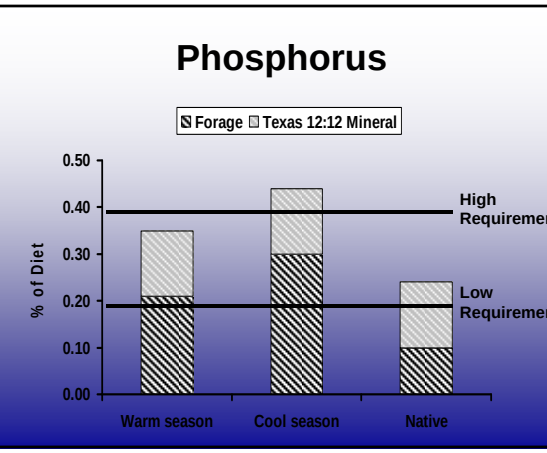
Relationship of minerals and production parameters



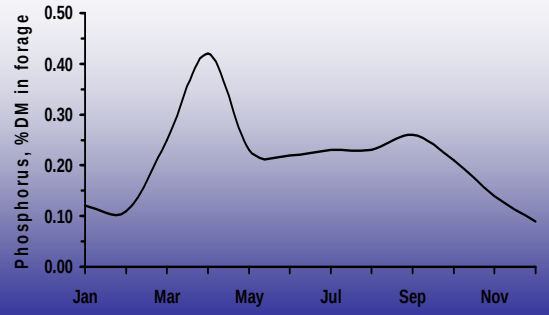
Calcium



Phosphorus

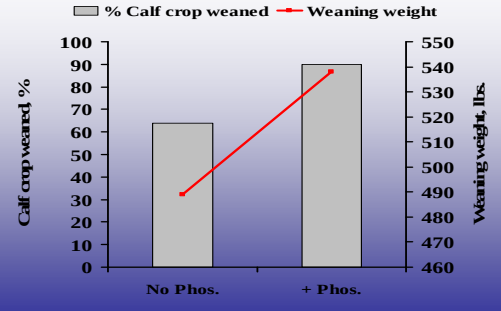


Forage Phosphorus Content



McCosker, 1968

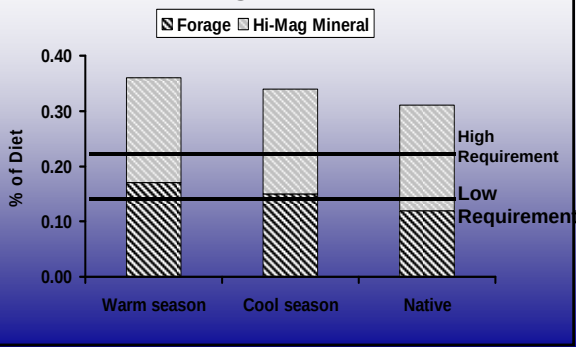
Need for Phosphorus



Average of four calf crops from the King Ranch in the 1940's
Average supplemental P consumed was 6 lbs. per year

Feed High Magnesium Mineral from one month precalving until the end of the calving period

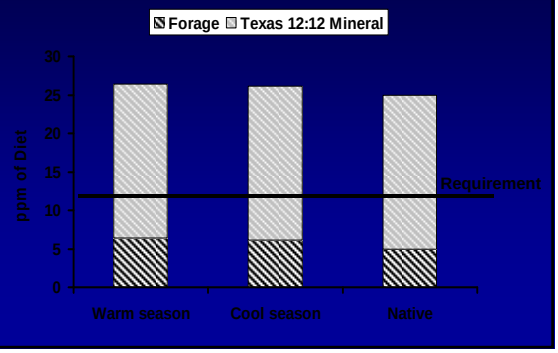
Magnesium



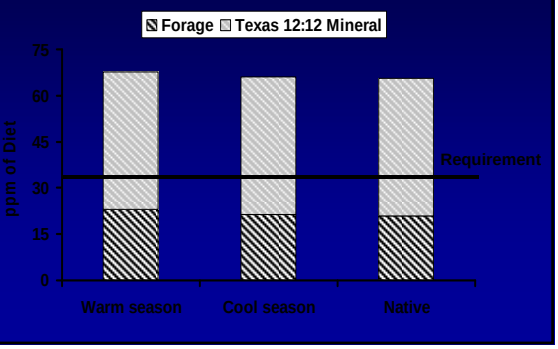
Magnesium deficiency

- Usually occurs in the spring when pastures are lush (magnesium low-potassium high)
- Tetany ratio:
  - \ Potassium / (Calcium + Magnesium)
  - \ Ratios greater than 2.2 are tetany prone

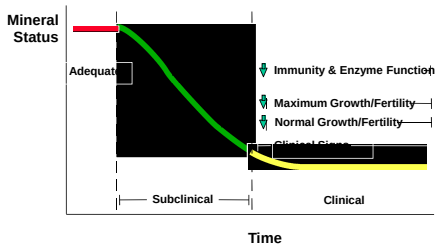
Copper



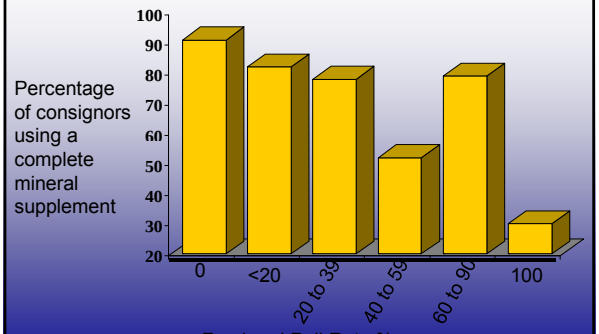
Zinc



Mineral deficiencies may not be detectable until production losses have occurred

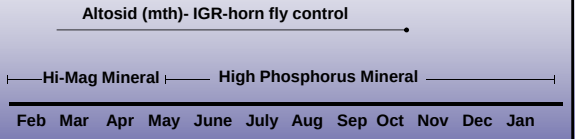


Incidence of Sickness Ranch to Rail Cattle in Texas '96



Gill et al., 1998

Mineral program for a Spring calving cow herd



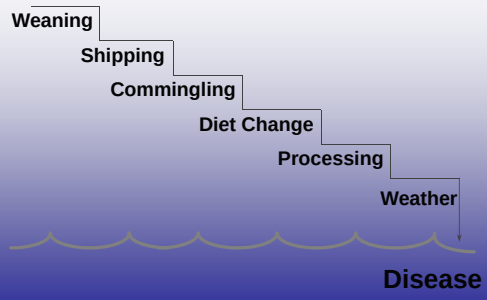
Primary Goal

Avoid Sick Cattle!

Primary Goal

Start Eating Quickly!

Stress Results in Reduced Disease Resistance



Morbidity and Performance

	Healthy	Sick
No. of calves	305	385
Daily gain, lbs.		
1- 7, d	-2.1	-5.7
1- 28, d	1.3	.02
1- 56, d	2.0	.02
Intake, % of BWT		
1- 7, d	1.55	0.90
1- 28, d	2.71	1.84
1- 56, d	3.03	2.68

Diet: Gr. Corn (44.3%), CSH (33.2%), CSM (16%), Mol (4%), VM (2.60%) (Texas A&M)

Texas A&M Ranch to Rail 1992-2001

Healthy Cattle are worth $91.88 per head more.

Why are healthy cattle more profitable?
Primarily because they grow!

Why do healthy cattle grow?
Primarily because they eat!

Common Misconceptions

- **The "creep ration" is not the starting ration**
- **Roughage and fiber are not always the same thing**

Creep Ration Not Starting Ration

What is the big difference?

Roughage level!

Traditional Creep…..15-20%
Traditional Starter….40-45%

Roughage vs. Fiber

	By-Product			
Item	**Gluten Feed**	**SB Hull**	**Oat Hull**	**CSH**
Total Dietary Fiber	61.7	79.6	72.2	73.7
NDF	65.1	69.2	69.4	73.5
pH	5.85	5.36	6.25	6.46
Rate of Disapp.	6.3%/h	7.7%/h	0.8%/h	0.8%/
Extent of DMD 12h	48.9	64.6	56.5	35.1

University of Illinois

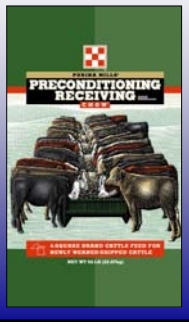
ttonseed Hulls and Hay are best roughage

BOTTOMLINE…..

Creep doesn't have enough
ROUGHAGE
to prevent bloat and acidosis.

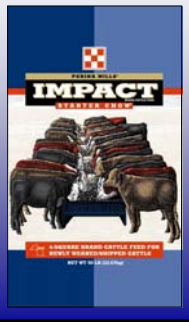
What does Purina have to offer?

2-3 weeks



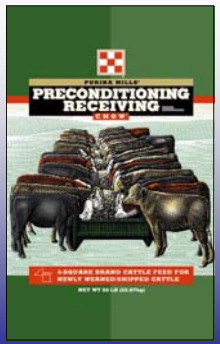
or

2-4 weeks



Tag Guarantees ISC vs. PCRC

	ISC	PCRC
Protein,%	13.8	12
NPN, %	2.3	2.0
Fiber, %	20	26
Fat, %	3.4	1.0
Calcium, %	.80	.5-.7
Phosphorus, %	.45	.40
Roughage, %	27	45



What is the best thing about "Precon"?

THE CATTLE EAT IT!!!

Summary of PCRC Trials – 1986 to 2000

Number of Head	125,901
Average Starting Weight, lbs.	482.9
Average Ending Weight, lbs.	546.5
Days on Feed	22
Average Daily Gain, lbs.	3.0
Feed Conversion	5.33

Proper Management of Preconditioning/Receiving Chow

- DAY 1 – Provide hay regardless of feeding method….provide at appox. 2% of BW
- Self feeding
  - Adjust feeders properly (2 fingers width)
  - Clean fines many times/week
  - Bunk space 12”/hd
  - Day 2, can remove hay completely…use common sense

Proper Management of Preconditioning Receiving Chow

- Hand feeding
  - Leave out hay free-choice to avoid appetite build up…needs to be quality hay
  - Bunk space 12”/hd
- Closely monitor intake
  - 3.0 to 3.5% intake…time to move up
- Do not Limit Feed
  - Bloats occur because hungry calves eat rapidly
  - Limit feeding reduces gain

Proper Management of Preconditioning Receiving Chow

- **Pen Space and Arrangement**
  - **Ideally, cattle should have 500 sq. ft. per head of pen space.**
  - **Locate feeders and waterers on the outside of the pen where calves that tend to "walk the fence" will find them. Ideally feeders would be placed perpendicular to the fence so that calves must run into them as they circle the pen.**

What is the worst thing About "Precon"?

The cattle eat it…alot?

If cattle need to be kept on a starting program for an extended period of time….consider IMPACT.

IMPACT Starter Theory

Why Modify Starting intake?

- **Excessive intakes by yearlings, creep fed calves, or genetically superior "big eaters" during step-up often lead to subsequent "yo-yo" effect.**
- **How can over consumption be prevented, without limit feeding, and still maintain gain?**

IMPACT Starter Complete

- Unique, Innovative Program from Purina Mills Beef Research
- Reduced roughage in the starter phase
- More energy in the starter phase
- Controlled intake with patented Intake Modifiers
- Eases the transition onto IMPACT Grower program

IMPACT Starter Complete

- Coarse form
  - More resistant to moisture
  - More durable for handling
  - Attractive appearance
- Reduced concern with bloat
- Improved performance in prolonged feeding
- Can be used in 30-45 day back-grounding program with commercial feeder calves

Proper Management of Impact Starter Complete

- DAY 1 – Provide hay, regardless of feeding method…use quality hay at approx. 2% of BW
- Self feeding
  - Adjust feeders properly *(3 fingers width)*
  - Clean fines many times/week
  - Bunk space 12”/hd
  - Remove hay completely

Proper Management of Impact Starter Complete

- Avoid hand feeding
- Self-fed Intakes
  - 10-15% less than PCRC week 1
  - 7-10 % less than PCRC overall
- Do not Limit Feed or Run Empty Bunks
  - Bloats *may occur* because hungry calves eat rapidly
  - Limit feeding reduces gain

Proper Management of Impact Starter Complete

- Pen Space and Arrangement
  - Ideally, cattle should have at least 500 sq. ft. per head of pen space.
  - Locate feeders and waterers on the outside of the pen where calves that tend to "walk the fence" will find them. Ideally feeders would be placed perpendicular to the fence so that calves must run into them as they circle the pen.

Other Helpful Mgmt. Tools

1) Angus cattle usually eat more

2) *Bos Indicus* cattle eat less

3) The smaller the starting pen, the higher the intake

Purina Preconditioning Programs

Preconditioning/Receiving Chow & Accuration/Cattle Limiters
1) 2-3 weeks on Preconditioning/Receiving Chow
2) Remainder of preconditioning period on Accuration and Forage
3) 45 days or longer….

IMPACT Program #1 (Complete Feeds Programs)
1) 2-3 weeks on IMPACT Starter
2) 1 week on Accuration Cattle Limiter LW and Hay
3) Remainder of preconditioning period on IMPACT Grower
4) 45 days or longer….

IMPACT Program #2 (Grind and Mix Programs)
1) 2-3 weeks on IMPACT Starter
2) 3 weeks on IMPACT Starter/Grower Transitions
3) Remainder of preconditioning period on IMPACT Grower
4) 45 days or longer

"An Ounce of Prevention is Worth a Pound of Cure."

Benjamin Franklin