

Tennessee



Master Beef Producer



UT | Extension

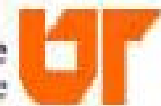
Tennessee Beef Cattle Improvement Initiative

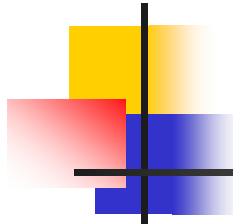
Master Beef Producer - Nutrition Section



*Tennessee Beef Cattle
Improvement Initiative*

Agricultural Extension Service
The University of Tennessee





Teaching Objectives

- **Provide nutritional training in order to obtain functional “comfort level”**
- **Cover the basics of ruminant nutrition with an emphasis on forage utilization**
- **Evaluate supplementation strategies that assure optimum efficiency**
- **Assess and cope with factors that influence herd nutritional status**
- **Review ration formulation methods**
- **Discuss practical use of common feedstuffs**

Guidelines for Cow /calf Feeding Management

- **Forage is the foundation**
 - **Successful cow /calf nutrition always based on forage**
 - **Pasture or hay must be of adequate quality and quantity**



Guidelines for Cow /calf Feeding Management

- **Improve pastures**
 - **Add clover in February**
 - **Consider rotational grazing**
 - **Soil test and fertilize according to recommendations**



Guidelines for Cow /calf Feeding Management

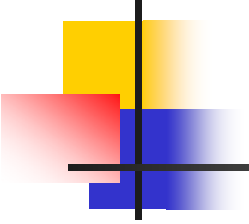
- **Manage for quality hay**
 - **Harvest at optimal stage of maturity**
 - **Forage test to assess quality**
 - **Store in barn or under cover**
 - **Minimize soil contact during storage**



Guidelines for Cow /calf Feeding Management

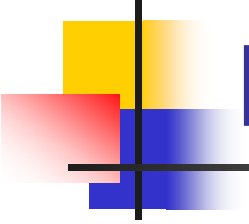
- **Manage hay feeding**
 - **Use hay rings to minimize wastage**
 - **Avoid feeding in muddy conditions**
 - **Unrolling may be advantageous**
 - **Cut strings**





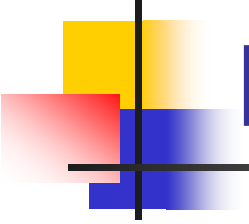
Guidelines for Cow /calf Feeding Management

- **If needed, supplement efficiently**
 - **Provide quality mineral supplement**
 - **Base supplements on forage tests**
 - **Heifers, first calf cows and thin cows may need additional supplementation**
 - **Low quality hay or forage may require supplemental protein**
 - **Avoid high levels of corn (>0.4 % BW)**



Ruminant Digestion

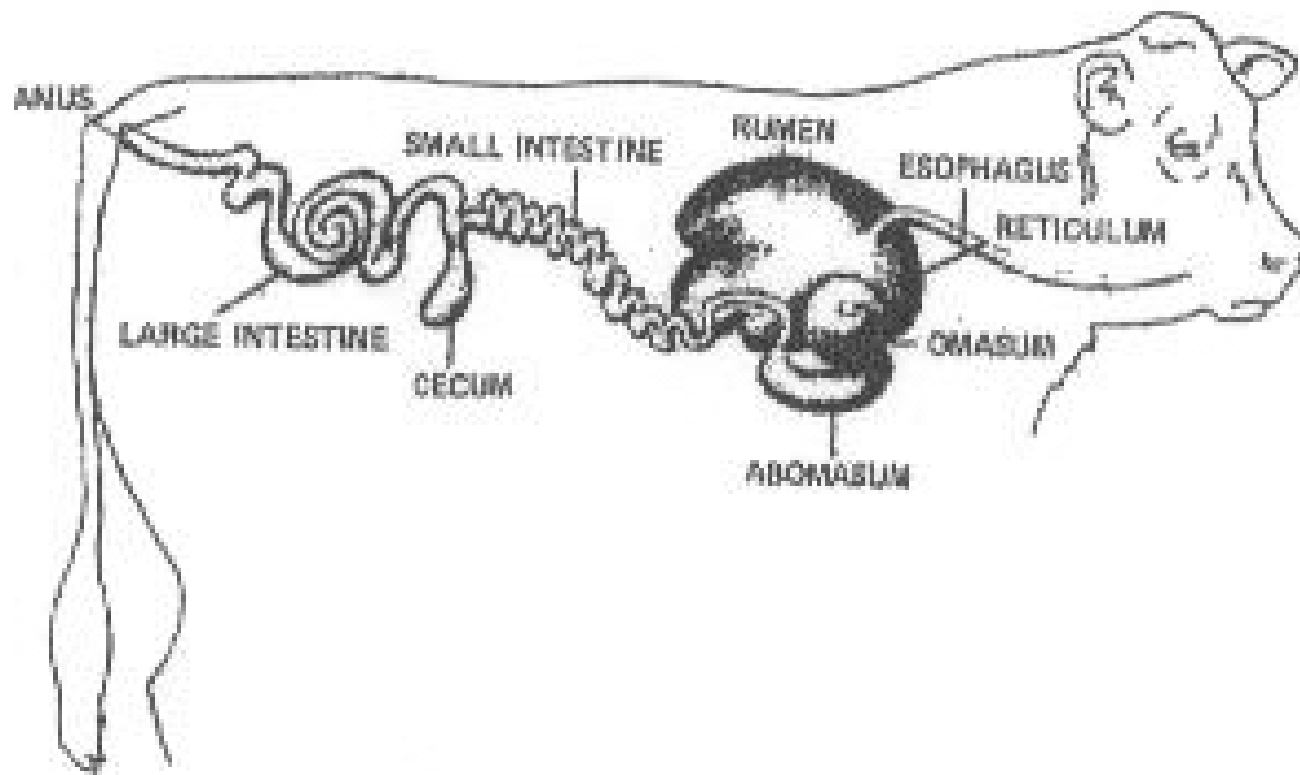
- **Cattle are able to use low-quality forages to produce a high-quality source of vitamins, minerals, energy & protein in the form of meat & milk**
- **This is because they are ruminants**
- **Microbes in their digestive system ferment cellulose which non-ruminants (humans, pigs) do not have**

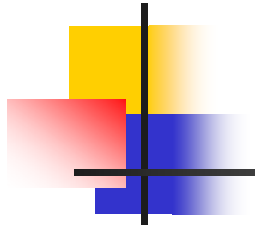


Ruminant Digestion

- **Main source of energy**
 - Humans - glucose
 - Cattle - volatile fatty acids (VFA)
- **The compartments of the ruminant digestive system are**
 - Rumen
 - Reticulum
 - Omasum
 - Abomasum

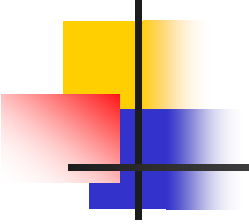
Ruminant Digestive Tract





The Nutrition Program

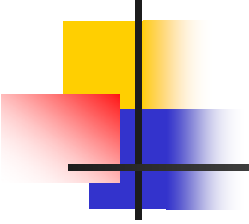
- **Should be as simple as possible and supply nutrients for the cow to:**
 - **Give birth to a strong health calf**
 - **Produce an adequate amount of milk to maintain calf growth**
 - **Rebreed within 80 to 85 days following calving**



Four Major Factors That Influence Profitability

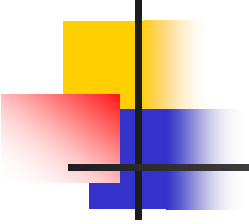
- Weaning weight
- Calf crop percentage weaned
- Market price for calves and cull cows
- Annual cow costs





Determining Profitability

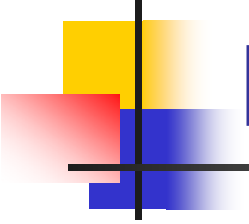
$$\left[\text{Weaning Weight} \times \text{Calf Crop Percentage Weaned} \times \text{Market Price} \right] - \text{Annual Cow Cost}$$



Principles of Nutritional Management

- Nutrient needs of the cow-calf unit vary throughout the production cycle
- Quantity and quality of the feed needed vary throughout the production cycle
- Forage availability and quality also vary throughout the year.

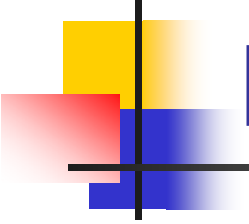
Understanding the above and planning and managing the nutrition program is key to success



Five Basic Classes of Nutrients

■ Water

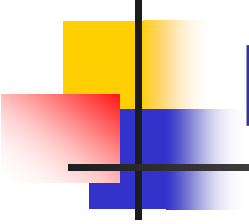
- Usually in excess of the need is provided
- Not necessary to balance rations for water
- Typically, balance rations as if they do not contain any water to avoid errors associated with mixing feeds of different water contents



Five Basic Classes of Nutrients

■ Energy

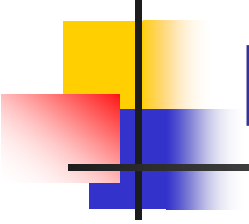
- Nutrient that is provided in largest quantity and is fuel for the body**
- Total Digestible Nutrients (TDN) is most often used as an energy measure**
- Additional terms to describe efficiency**
 - Digestible Energy (DE)**
 - Metabolizable Energy (ME)**
 - Net Energy (NE)**



Five Basic Classes of Nutrients

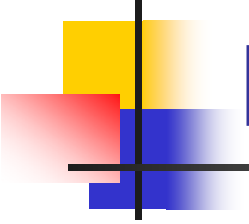
■ Protein

- The major component of muscle, hair, hooves, skin, internal organs and body chemicals
- Composed of smaller units, Amino Acids
- Beef rations balanced for protein rather than individual amino acids
- Rumen microbes digest most of protein and change it to microbial protein



Five Basic Classes of Nutrients

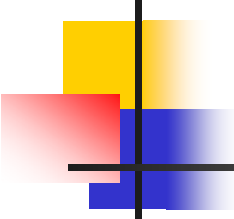
- **Protein (continued)**
 - Referred as Crude Protein (CP) - a reliable estimate of the protein content
 - Another method of expressing protein
 - Metabolizable Protein (MP) system
 - Degradable Intake Protein (DIP)
 - Undegradable Intake Protein (UIP)
 - The MP system takes into account how protein is used by both the animal and the microbes in the rumen



Five Basic Classes of Nutrients

■ Vitamins

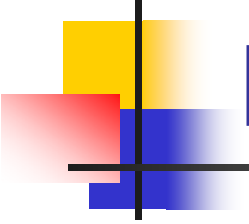
- There is usually very little problem with vitamin deficiencies in beef cattle**
- Only Vitamins A,D and E are not synthesized by the rumen microbes**
- They may need to be supplemented if green, leafy forage is not available for several months**



Five Basic Classes of Nutrients

■ Macro-Minerals

- **Sodium and Chlorine** are major components in body fluids that control functions, usually assumed adequate
- **Calcium** is most abundant mineral in body and functions in structure of bones and teeth
- **Phosphorus** is found with calcium in bones and teeth, is essential for reproduction, Ca:P should be app. 2:1
- **Magnesium** is used in enzymes and transmission of nerve impulses, deficiencies result in grass tetany
- **Potassium** is needed to maintain ion balance; excess makes Mg deficiency (Grass Tetany) more likely
- **Sulfur** is required nutrient, but usually in excess in TN, making copper and selenium more likely to be deficient



Five Basic Classes of Nutrients

■ Micro-Minerals

- **Copper** is component in enzymes, deficiency signs are rough hair coat and lower immunity and reproduction
- **Selenium** is component in muscle and essential for shedding afterbirth, also important in immune system
- **Zinc** is important in function of many enzymes, esp. in immune system
- **Iron** is necessary for oxygen transport, but too much can make copper less available
- **Iodine** is necessary for energy metabolism, but feed additive is associated with preventing hoof problems
- **Cobalt, Chromium, Nickel and Molybdenum** are needed, but not known if they are problems in TN

Recommended Minimum Levels in Mineral Supplements for Beef Cattle¹

Element	Level
Calcium	10-24 %
Phosphorus	5-12 %
Magnesium	2 % , 10-16 % ²
Sulfur ³	1 %
Manganese	2000 ppm
Copper	1750 ppm
Zinc	3000 ppm
Cobalt	20 ppm
Iodine ⁴	50 ppm
Selenium ⁴	50 ppm

¹Calculations are based on 2 to 4 ounces of mineral consumption.

²Increase magnesium in the mineral supplement during grass tetany season.

³Sulfur is commonly in excess in Tennessee and not required in the mineral supplement.

⁴Food and Drug Administration has legal limits on levels that can be in the mineral supplement.

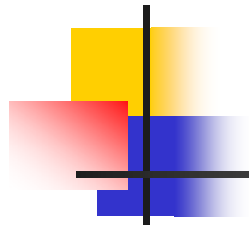
Forage Mineral Survey 2001 - 2003

- NAHMS (1999) indicated that 74% of tall fescue was deficient in copper
- Virginia Tech showed that the presence of endophyte decreases copper
- Feedlots often complain of calves that get sick and too many of them die!



<http://animalscience.ag.utk.edu/forageminerals/>

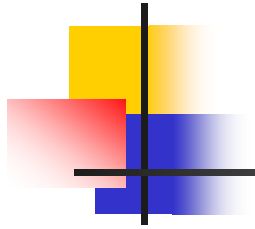
Mineral Levels by Year



Mineral	2001	2002	2003
Calcium, %	0.53 ^A	0.53 ^A	0.51 ^A
Phosphorus, %	0.36 ^A	0.42 ^A	0.35 ^A
Sodium, %	0.01 ^B	0.01 ^A	0.01 ^{AB}
Magnesium, %	0.26 ^A	0.27 ^A	0.26 ^A
Potassium, %	2.63 ^A	2.52 ^B	2.56 ^{AB}

^{A,B,C}Mineral estimates not sharing the same superscript are significantly different at $P < 0.05$.

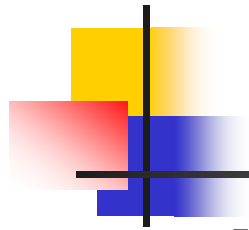
Mineral Levels by Year



Mineral	2001	2002	2003
Sulfur, %	0.28 ^{AB}	0.27 ^B	0.28 ^A
Manganese, ppm	106.24 ^B	110.41 _B	131.32 ^A
Copper, ppm	7.56 ^A	5.06 ^C	6.90 ^B
Zinc, ppm	24.92 ^B	21.47 ^C	28.05 ^A

^{A,B,C}Mineral estimates not sharing the same superscript are significantly different at $P < 0.05$.

Mineral Levels by Season

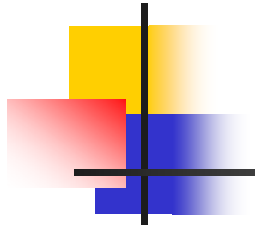


Mineral	Spring	Fall
Calcium, %	0.49 ^B	0.56 ^A
Phosphorus, %	0.35 ^A	0.41 ^A
Sodium, %	0.01 ^A	0.01 ^B
Magnesium, %	0.23 ^B	0.30 ^A
Potassium, %	2.67 ^A	2.46 ^B

^{A,B,C}Mineral estimates not sharing the same superscript are significantly different at $P < 0.05$.



Mineral Levels by Season

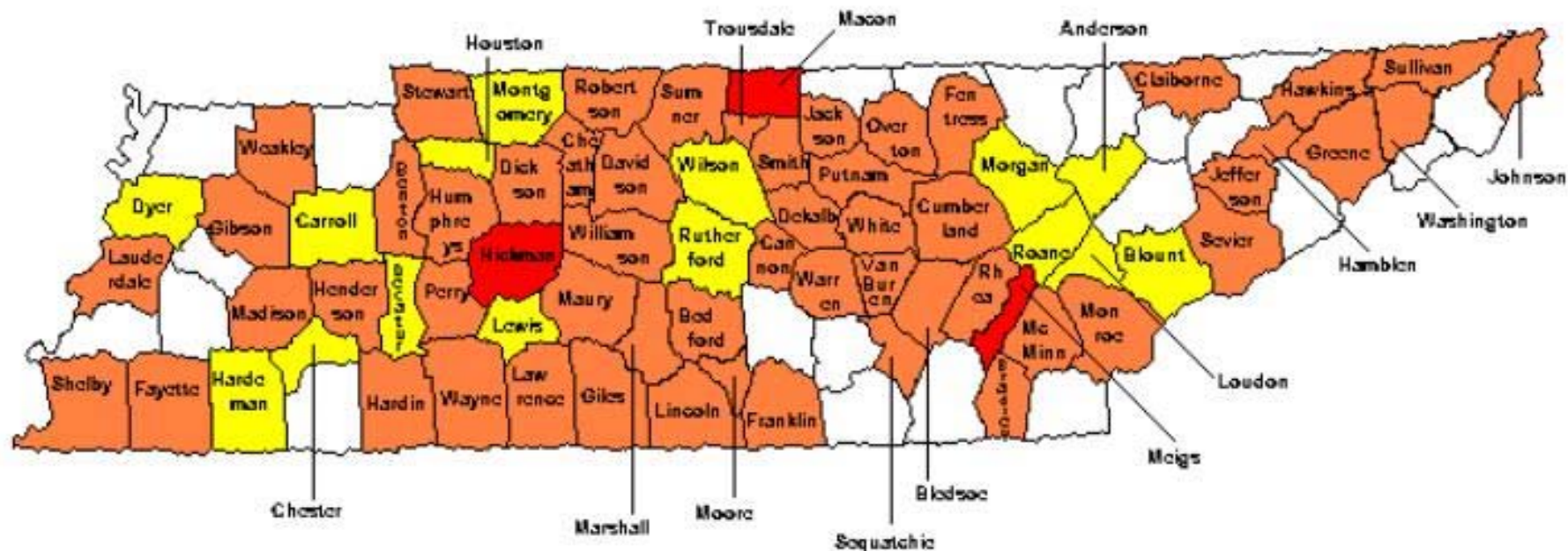


Mineral	Spring	Fall
Sulfur, %	0.26 ^B	0.30 ^A
Manganese, ppm	108.52 ^B	123.46 ^A
Copper, ppm	6.85 ^A	6.17 ^B
Zinc, ppm	22.43 ^B	27.20 ^A



A,B,C Mineral estimates not sharing the same superscript are significantly different at $P < 0.05$.

Copper Levels in Tennessee



< 4 ppm - Deficient



> 9.9 ppm - Ideal



4 - 6.9 ppm - Marginally deficient

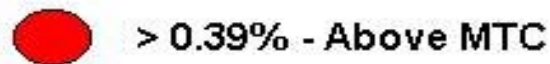
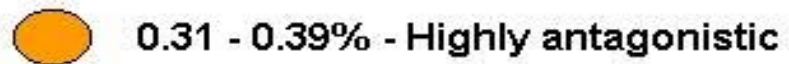
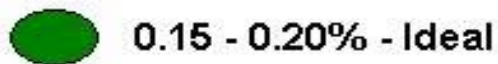
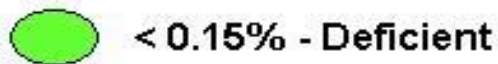


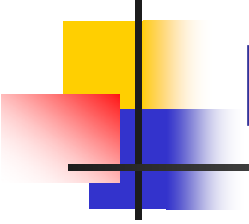
No tall fescue
samples submitted



7 - 9.9 ppm - Marginally deficient

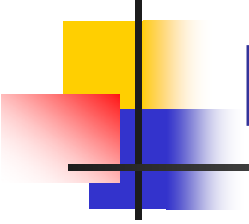
Sulfur Levels in Tennessee





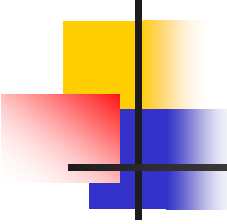
Keys to Improving Herd Mineral Status

- Monitor herd for symptoms
- Monitor mineral consumption
- Work with mineral dealers
- Test forages for minerals
- Higher producing cattle and some breeds may have higher requirements
- Imbalances can be corrected
- “If it ain’t broke, don’t fix it”



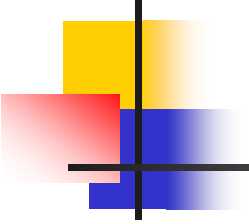
Mineral Toxicity and Nitrate Poisoning

- **Some minerals can be toxic, such as aluminum and fluorine**
- **Also, most minerals have a maximum tolerable (MTC) concentration**
 - **Copper - 100 ppm**
 - **Zinc - 500 ppm**
 - **Manganese - 1000 ppm**
 - **Selenium - 2ppm**
 - **Sulfur - 0.4 %**
 - **Potassium - 3 %**



Mineral Toxicity and Nitrate Poisoning

- **Nitrates are potentially deadly for cattle, sheep, goats and horses**
- **The vegetative portion of plants contain high levels of nitrates**
- **Nitrates are especially high in forages which are stressed by frost, drought, insufficient sunlight and herbicides**
- **Potential lethal level - 0.9 % (9000 ppm)**



Monitor Mineral Consumption

Mineral Consumption Record
(No. of Cows ____)

Date	Amt Fed	Calculations

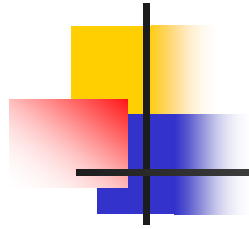
- Cattle must eat mineral for it to work
- Desired consumption is typically on the label
- Typical range between 2 to 6 oz per head each day
- Expect variation, but try to keep in acceptable range

Calculate daily consumption per head (in pounds) by adding consumption over a period, dividing by number of days in that period, then dividing by number of head. To convert to ounces, multiply the result by 16.

Steps in Balancing Rations

- Identify the animals to be fed
 - Classify the animals by
 - Weight
 - Age
 - Purpose
 - Backgrounding
 - Finishing
 - Lactating





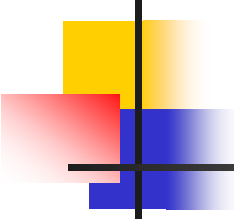
Nutrient Requirements Tables

[http://www.uaex.edu/Other_Areas/publications/
PDF/MP391.pdf](http://www.uaex.edu/Other_Areas/publications/PDF/MP391.pdf)

Steps in Balancing Rations

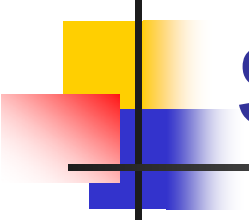
- **Select nutrient allowances to fit the animal's need**
 - **Nutrient requirements are in Table 2 on the text**





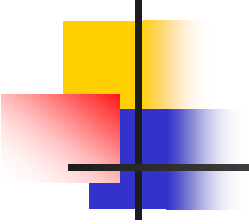
Steps in Balancing Rations

- **Select feeds and supplements to meet nutrient requirements**
 - **Pasture and hay are the least expensive base feeds in Tennessee (most of the time)**
 - **Supplemental ingredients should be selected for nutritional value, local availability, price, palatability and safety**



Steps in Balancing Rations

- **Determine the amounts of each ingredient to use**
 - **Begin by testing base forage**
 - **Estimate the amount of base forage, then calculate the nutrients that are lacking**
 - **A trial-and-error approach works for most common rations**



Trial and Error Method

- **Step 1**

- Identify animal - **Ex. 500 lb steer, 1.5 ADG**

- **Step 2**

- Select nutrient allowances - **Ex. Table 5.2 of text: 12.8 lb DMI; 8.1 lb TDN; 1.33 lb CP**

- **Step 3**

- Select feeds and supplements - **Ex. Table 5.3 of text: Fescue hay, Corn, Soybean Meal**

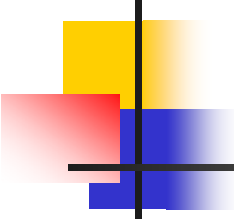
Trial and Error Method

■ Step 4

- Determine amounts of each feed

Example 1. Ration Balancing Sheet

Nutrient Requirements	Amount Fed	DMI 12.8 lb	TDN 8.1 lb	CP 1.33 lb
Fescue hay	9.0	8.3	4.0	0.78
Cracked Corn	5.0	4.4	3.96	0.44
Soybean Meal	0.5	0.45	0.38	0.22
Total	14.5	13.15	8.34	1.44
Deficiencies	0	0	0	0



Pearson Square Method

% CP in feed 1

Ex. 36 %

Feed 1 as % of Mixture

Ex. $3/27 = 11.1\%$

Target CP

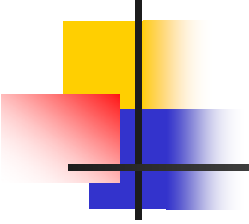
Ex. 12 %

% CP in feed 2

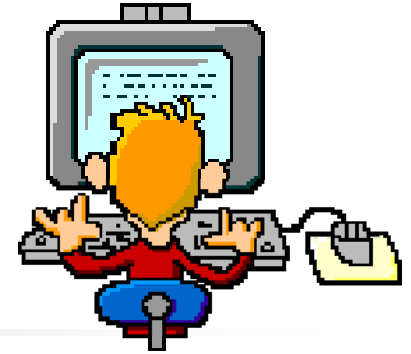
Ex. 9 %

Feed 2 as % of Mixture

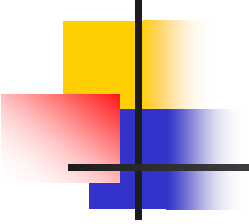
Ex. $24/27 = 88.9\%$



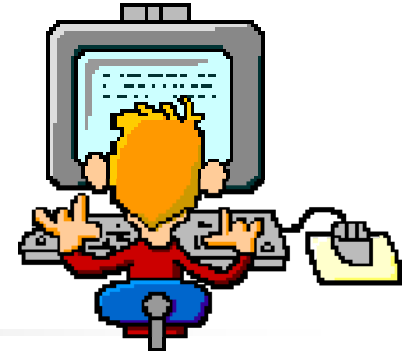
Computer Method



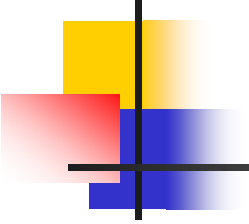
- Can be very useful for those who balance a large number of rations
- No ration balancing program or nutritionist is perfect
- Always observe, weigh and body condition score cattle and adjust ration accordingly



Computer Method

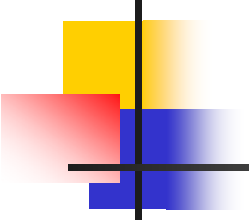


- **Important Facts to Keep in Mind**
 - **Diets are not magic, they are only as good as the information used in the program**
 - **Least-cost rations are most useful to large feeders with a variety of feeds to choose**
 - **Intake affects performance, if intake is below predicted values the ration will have to be adjusted**



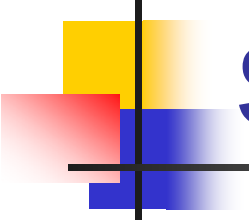
Using Salt to Limit Intake

- **This is not a perfect system, because different cattle can tolerate different levels of salt**
- **General Rule: Cattle will eat 0.1 lb of salt for every 100 lbs of body weight**
- **Always provide plenty of water to prevent salt poisoning**
- **Daily observation is still essential**



Factors Affecting Nutrient Requirements

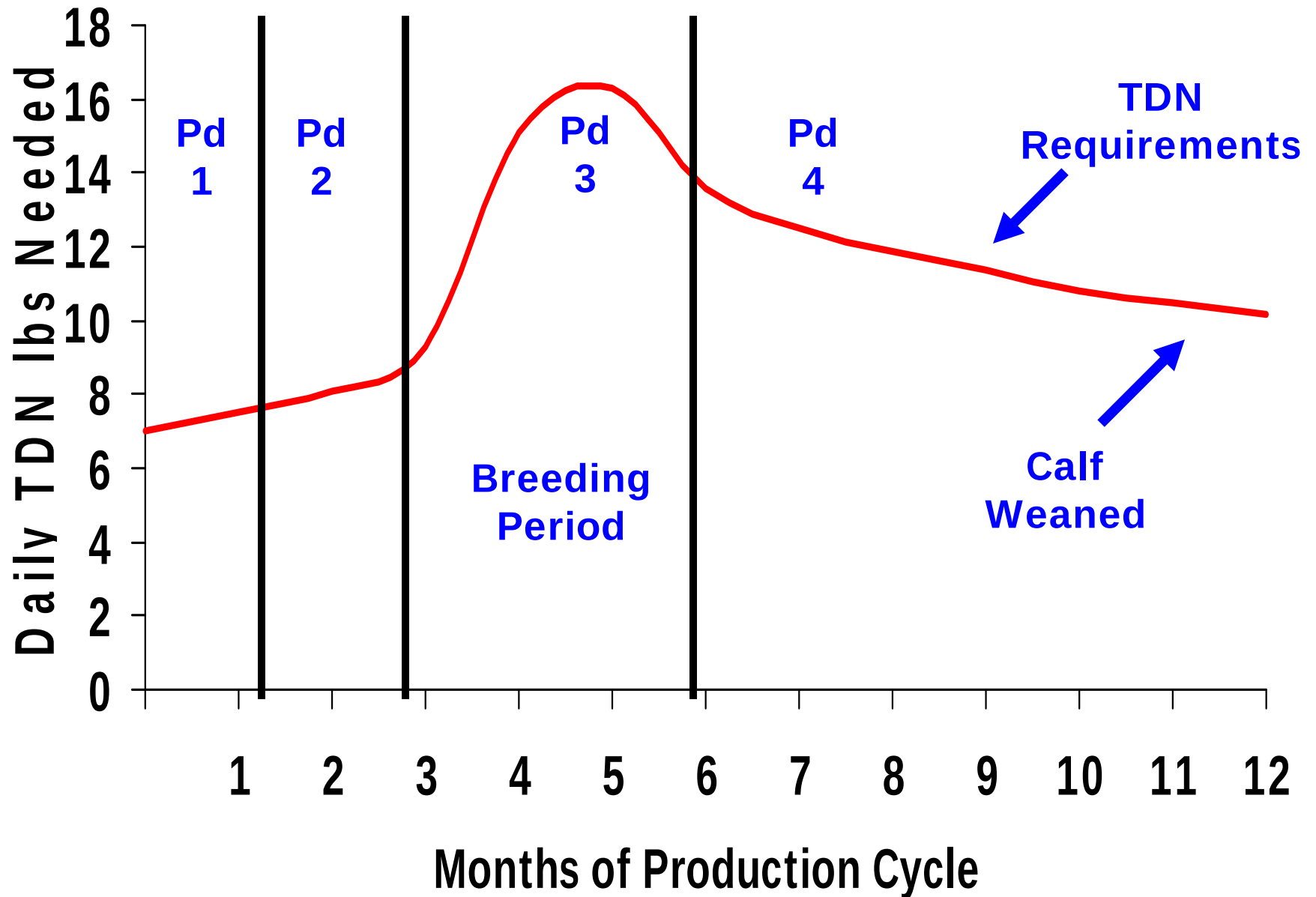
- 1. Stage of Production**
- 2. Age of Cow**
- 3. Cow size and condition**
- 4. Milk Production**
- 5. Weather**
- 6. Length of breeding season**
- 7. Breed**

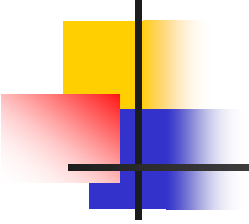


Stage of Production

- **One of the Major Criteria In Planning a Cow Herd Nutritional Program**
- **Consider the 365-day cow year**

Annual Relative Nutrient Requirement of 1000 lb Mature Beef Cow

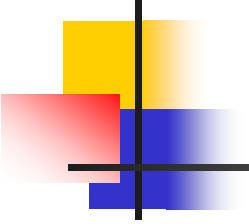




Stage of Production

■ Period 1

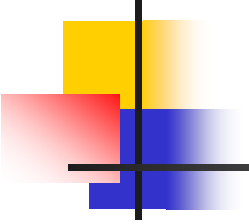
- This period from weaning to 50-d prior to calving has the lowest nutritional need
- In Fall, lower quality feeds (crop residues and dormant pasture) can be used
- Cows may need to increase condition if going into winter
- In case of insufficient energy, feeding a highly digestible fiber source will increase forage digestibility



Stage of Production

■ Period 2

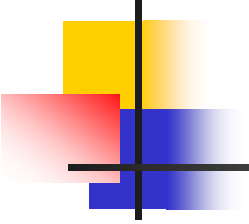
- This period can greatly affect subsequent calving percentages and cow longevity
- App. 50 to 60 pounds of fetal growth occur
- Insufficient nutrition and body condition at calving will influence calf birth weight, health, vigor, colostrum and survival
- It also will reduce milk production thus influencing calf weaning weights and calving interval



Stage of Production

■ Period 3

- Most critical period due to peak lactation
- Cow has app. 80-d from calving to rebreed and maintain a yearly calving interval
- First calf heifers will take app. 20-d longer to recycle and subsequently rebreed
- Nutrition during this period has major influence on conception rates, because even under ideal conditions, cows will still lose weight

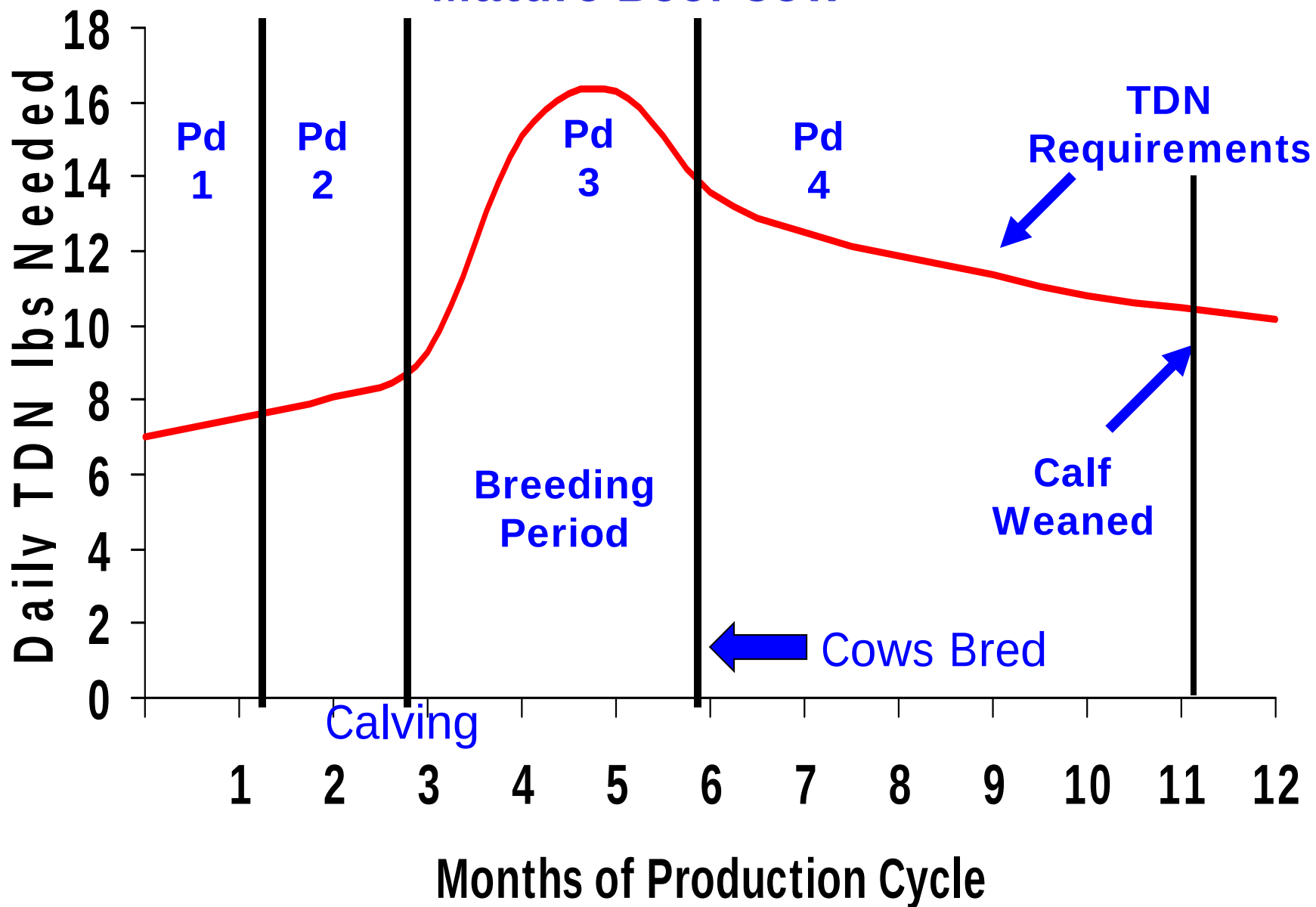


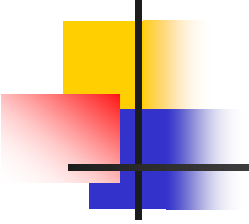
Stage of Production

■ Period 4

- Once a cow is pregnant, the nutritional need is to maintain lactation
- Often this is on spring or summer pasture
- Cows can regain body condition due to the increased availability of energy and protein

Annual Relative Nutrient Requirement of 1000 lb Mature Beef Cow





Cow Size and Milk Production

- **10-pound increase in milk production per cow per day increases the TDN and CP requirements by 16-17 % and 30 % , respectively**
- **200-pound increase in body weight increases the TDN requirement by 10 %**

Relationship Between Cow Size and Milk Production

Cow Size	Milking Level	lb of milk / cow / day	lb TDN Needed	lb CP Needed
1000	Average	10	12.4	1.9
1000	Above Avg	20	14.8	2.6
1000	Superior	30	17.2	3.5
1200	Average	10	13.8	2.1
1200	Above Avg	20	16.2	2.8
1200	Superior	30	18.7	3.5
1400	Average	10	15.2	2.3
1400	Above Avg	20	17.6	3.0
1400	Superior	30	20.1	3.7

Source: Nutrient Requirements of Beef Cattle, 1984 & 1996.

Environmental Stress

- Plan for additional feed during cold weather stress
- Forages produce more heat of fermentation than concentrates



Understanding the Feed Label on Purchased Feeds

- **Feed Name**
 - May include the product name and brand name and must carefully conform to regulations about appropriateness

CO-OP 16% NATURAL CATTLE SUPPLEMENT- B

MEDICATED

For increased rate of weight gain in pasture cattle (slaughter, stocker, feeder cattle and dairy and beef replacement heifers).

ACTIVE DRUG INGREDIENT

Lasalocid 56.66 gm/ton

GUARANTEED ANALYSIS

Crude Protein (min.)	16.00%
Crude Fat (min.)	3.00%
Crude Fiber (max.)	8.00%
Calcium (min.) 1.00% (max.)	1.50%
Phosphorus (min.)	0.55%
Salt (min.) 0.80% (max.)	1.30%
Potassium (min.)	0.90%
Vitamin A (min.)	5,000 IU/lb.

INGREDIENTS

Processed Grain By-Products, Plant Protein Products, Calcium Carbonate, Cane Molasses, Lignin Sulfonate, Roughage Products, Salt, Potassium Sulfate, Magnesium Sulfate, Zinc Oxide, Manganous Oxide, Ferrous Sulfate, Magnesium Oxide, Copper Sulfate, Cobalt Carbonate, Ethylenediamine Dihydriodide, Calcium Iodate, Sodium Selenite, Vitamin A Acetate, Vitamin D-3 Supplement, Vitamin E Supplement, and Mineral Oil.

WARNING: A withdrawal period has not been established for this product in pre-ruminating cattle. Do not use in calves to be processed for veal.

CAUTION: The safety of Lasalocid in unapproved species has not been established.

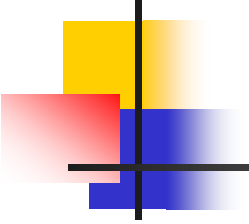
FEEDING DIRECTIONS: Feed continuously at rate of 2.2 to 4 lb. per head per day for the first 14 days. Following this adjustment period, cattle should continuously receive 2.2 to 7 lb. per head per day of Co-op 16% Natural Cattle Supplement-B while on good quality pasture. Provide fresh clean water at all times.

Manufactured By
TENNESSEE FARMERS COOPERATIVE
200 WALDRON ROAD
LAVERGNE, TENNESSEE 37086

ITEM NO. 454
TAG CODE NO. 093098-454

Seller warrants only that this feed conforms to the description on the label and is suitable for the purposes set forth when used in accordance with the directions for use on said label.

NET WEIGHT 50 lb. (22.68 kg.)/INVOICE



Understanding the Feed Label on Purchased Feeds

- **Medication**

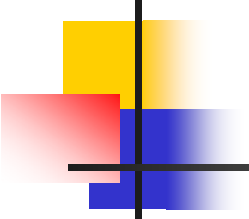
- If drugs or other non-nutritive, special-purpose additives are used, they must be on the label along with directions for use and precautions

- **Weight**

- Weight of the bag of feed must be present

- **Purpose**

- Kind of animals that the feed is intended



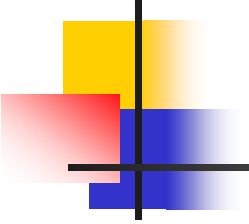
Understanding the Feed Label on Purchased Feeds

■ Guaranteed Analysis

- Minimum and/or maximum concentrations of nutrients such as Crude Protein, Crude Fat, Crude Fiber, Vitamins and Minerals

Guaranteed Analysis

Calcium (Ca) (min.)	12.00%	(max.)	14.00%
Phosphorus (P)		(min.)	6.00%
Salt (NaCl) (min.)	25.00%	(max.)	27.50%
Magnesium (Mg)		(min.)	2.00%
Sulfur (S)		(min.)	1.21%
Potassium (K)		(min.)	1.00%
Iodine (I)		(min.)	48 ppm
Copper (Cu)		(min.)	1200 ppm
Cobalt (Co)		(min.)	10 ppm
Selenium (Se)		(min.)	49 ppm
Zinc (Zn)		(min.)	3000 ppm
Manganese (Mn)		(min.)	2000 ppm
Vitamin A		(min.)	200,000 IU/lb.
Vitamin D		(min.)	39,900 IU/lb.
Vitamin E		(min.)	400 IU/lb.



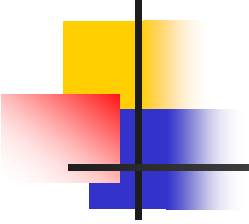
Understanding the Feed Label on Purchased Feeds

- **Ingredients**

- **Feedstuffs that are used to prepare the feed must be listed**
- **In some cases, ingredient classes may be used, such as “plant protein byproducts”**

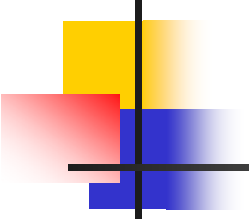
- **Company Name and Address**

- **This must be included on the label**



Understanding the Feed Label on Purchased Feeds

- **Feed labels must be carefully studied and followed**
- **Off-label use is illegal**
- **Problems may result from improper feeding or feeding to different species of animals than those listed on label**



Comparing the Value of Feeds

- Need to calculate price corrected for nutrient concentration differences

Ex. 48 % CP Soybean Meal @ \$245 per ton

$$0.48 \times 2000 = 960 \text{ lbs of CP}$$

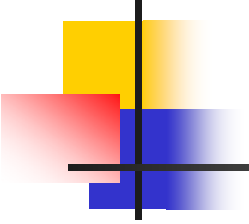
$$\$245 / 960 = 25.5\text{¢ per lb of CP}$$

20 % CP Corn Gluten Feed @ \$120 per ton

$$0.20 \times 2000 = 400 \text{ lbs of CP}$$

$$\$120 / 400 = 30\text{¢ per lb of CP}$$

- The more expensive feed is the more economical source of protein
- Need to consider energy, physical form

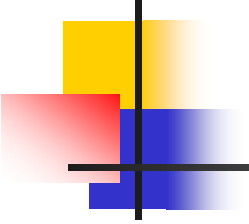


How Much Water is in The Feed?

- High-moisture feed is expensive to transport, likely to spoil and difficult to store
- Determine the true value of nutrients
 - Add up all costs associated with a feed
 - Convert to a dry matter (DM) basis
 - Nutritional evaluations should always be made on a dry matter basis

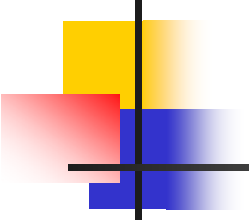
Ex. As-Fed CP % $\div$ DM % = CP on DM basis

$$8\% \div 40\% \times 100 = 20\%$$



Common By-product Feeds in Tennessee

- Also called Commodity Feeds, these are feeds that result from the processing or manufacturing of other products
- Are available in many forms
 - Bagged
 - As part of complete feeds
 - Bulk, by the truckload (most economical)



Typical Commodity Feeds

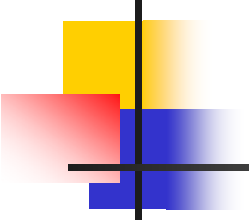
- **Oilseeds:** Cottonseed and soybeans
- **Energy feeds:** Hominy, Bakery waste
- **Energy/Fiber:** Soyhulls, Beet pulp, Citrus pulp, Rice bran, Wheat midds
- **Medium protein:** Brewer's grains, Corn gluten feed, Distiller's grains
- **High protein:** Cottonseed meal, Feather meal, Peanut meal
- **Forage extenders:** Cottonseed hulls, Peanut hulls, Rice hulls

Corn Gluten Feed

■ Description

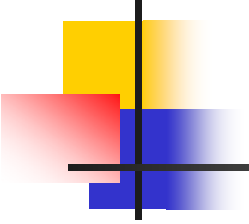
- Wet (45 % moisture) or Dry form
- Dry form available as meal or pellets
- Nutrient composition is variable
 - 16 to 25 % CP; 80 to 83 % TDN; 44 to 47 % NDF; 10 to 12 % ADF
- Ca is low (0.02 %);
P is 1.2 %
- High in Sulfur
- Palatability is good





Corn Gluten Feed

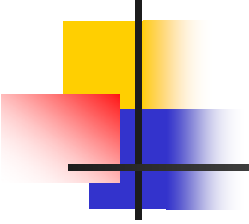
- **Storage and Feeding**
 - Wet product requires bunker, bag or pit
 - Dry requires grain bin
 - Palatable to cattle
- **Limitations**
 - Wet form can and will spoil
 - Typically limited to 20-40 % of ration
 - Pricing sometimes dictates limited usage
 - High in sulfur, which can bind copper



Soybean Hulls

■ Description

- Seed coat removed during oil extraction
- Typically pelleted
- High in digestible fiber (>60 % **NDF**) – Referred to as “Forage Friendly Fiber”
- 80 % TDN; 12 to 14 % CP; 14 % starch
- Lower starch reduces acidosis; improves performance on forage based diets
- Demand and prices usually lower in summer



Soybean Hulls

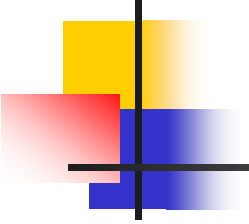
- **Storage and Feeding**
 - **Light and bulky (20 lb./cubic foot)**
 - **Very palatable**
 - **Protein, calcium and phosphorus are adequate and nearly balanced**
 - **Can be fed without mixing with other feeds**
 - **Improves forage utilization and cattle gains**

Soybean Hulls

- **Limitations**

- **Storing and handling can limit their use in some situations**
- **Dust?**

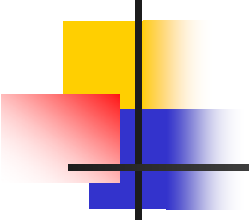




Wheat Middlings

■ Description

- Byproduct of milling wheat for flour
- 82 % TDN; 18 % CP; 10 % ADF;
1 % Phosphorus
- Routinely used in commercial feeds
- Price is often attractive when higher protein content is needed in ration



Wheat Middlings

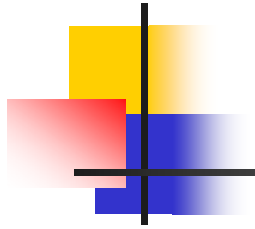
- **Storage and Feeding**
 - **Light and bulky (20 lb / cubic foot)**
 - **Moderately palatable**
 - **Pelleting improves palatability**
 - **Excellent supplement to grazing cattle due to high energy, protein and phosphorus levels and moderate levels of starch**

Wheat Middlings

- **Limitations**

- **Palatability may limit use in some situations**
- **Limit to 50 % of the total dry matter intake**
- **High levels of phosphorus need to be balanced by adding calcium**

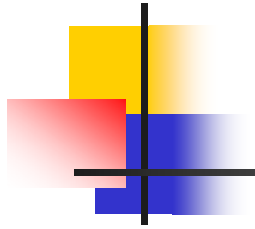




Molasses

■ Description

- Black strap molasses is a byproduct of the sugar industries
- 22 % Moisture; 60 % TDN; 7 % CP
- Marketed up to 32 % CP by adding urea and other N sources
- Other ingredients added (including fat and minerals)
- Can be in liquid or dry form



Molasses

- **Storage and Feeding**
 - **Stable liquid**
 - **Cattle limit their consumption (limiters sometimes added)**
 - **Can be fed 3 days per week and cattle allowed to run out between feedings**
 - **Less bunk space is required**
 - **Often fortified with fats, minerals and protein to improve nutritive value**

Molasses

■ Limitations

- Relative high cost of protein and energy
- Requires specialized storage and feeding equipment
- Typically high in sulfur, which can bind copper

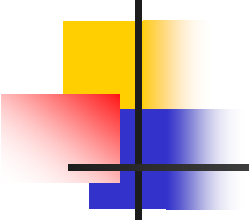


Whole Cottonseed

- **Description**

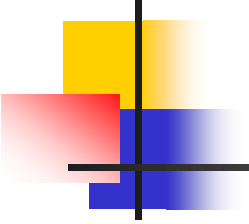
- **Byproduct of cotton production**
- **Can be fed to ruminants or processed for the oil content**
- **94 % TDN and 23 % CP**
- **Supplies are seasonal and tend to be lower in the fall**





Whole Cottonseed

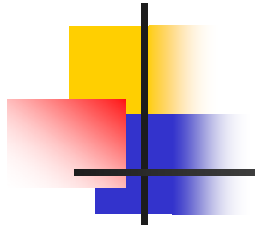
- **Storage and Feeding**
 - **Light (20 to 25 lb./cubic foot)**
 - **Must be dry or will mold during storage**
 - **Does not need to be processed and can be fed in feed bunks or on clean sod**
 - **Cattle will eat after adapted**



Whole Cottonseed

■ Limitations

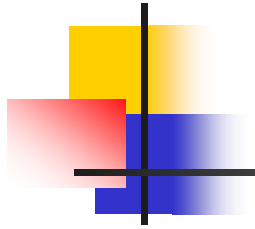
- High fat content (18 %) and gossypol limit level that can be fed
- Should be limited to 25 % of the total intake of beef cattle
 - 3 lb/day for a stocker calf
 - 5 lb/day for a beef cow
- Can reduce reproductive development, primarily in the bull
- Likely to bridge in bins or self-feeders



Hominy

■ Description

- Hominy is a byproduct of corn processing
- Higher in energy, protein, fat and fiber than corn grain
- Fat can range from 5 to 12% which will alter TDN concentration and the maximum levels that can be fed
- Often used as a replacement for corn



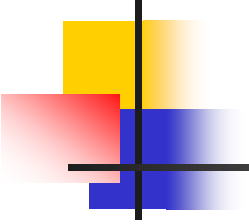
Hominy

- **Storage and Feeding**

- Can be stored, handled and fed similar to ground corn
- Should feed supplies in 1 month to avoid stale smell

- **Limitations**

- Lower starch level than corn but can be used with the same limitations as corn



Cotton Gin Trash

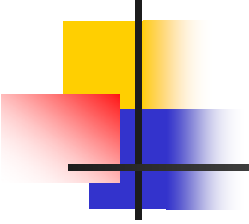
■ Description

- Waste product at cotton gins
- Mostly cotton lint with some stems, immature seeds and other plant parts
- Nutrient content is variable depending on the amount of foreign matter
- Energy and protein typically 10 % or higher
- Best suited to feed to mature dry cows
- Supply is seasonal with cotton harvest and processing

Cotton Gin Trash

- **Storage and Feeding**
 - Bulky and light, large truck may only contain 10 to 12 tons
 - Baling may be feasible to facilitate handling and transporting
 - Smells good and is very palatable

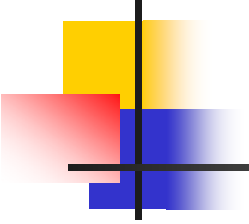




Cotton Gin Trash

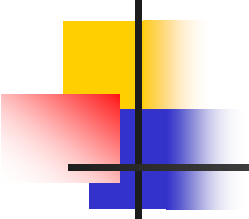
■ Limitations

- Limited in energy
- Pesticides used in cotton production are not labeled for beef cattle
- If residues exist, producers who use this product are at risk of liability
- Need to monitor pesticides and be aware of risks
- Weed seeds are also common contaminate



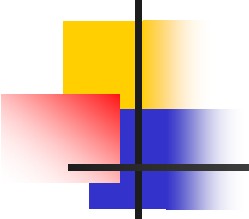
Feed Additives

- **Many are available to improve performance, prevent disease or improve feed or forage efficiency**
- **Lists and guidelines are constantly changing, work with feed dealers**
- **Follow manufacturers and Beef Quality Assurance guidelines**



Matching Available Feed to Animal Needs

- Forage is the basis for TN beef cattle production but are highly variable and may require supplementation
- Should provide supplement nutrients with minimal feed inputs
- Primary objective is to efficiently use available forage
- Need to know how supplement affects daily forage intake

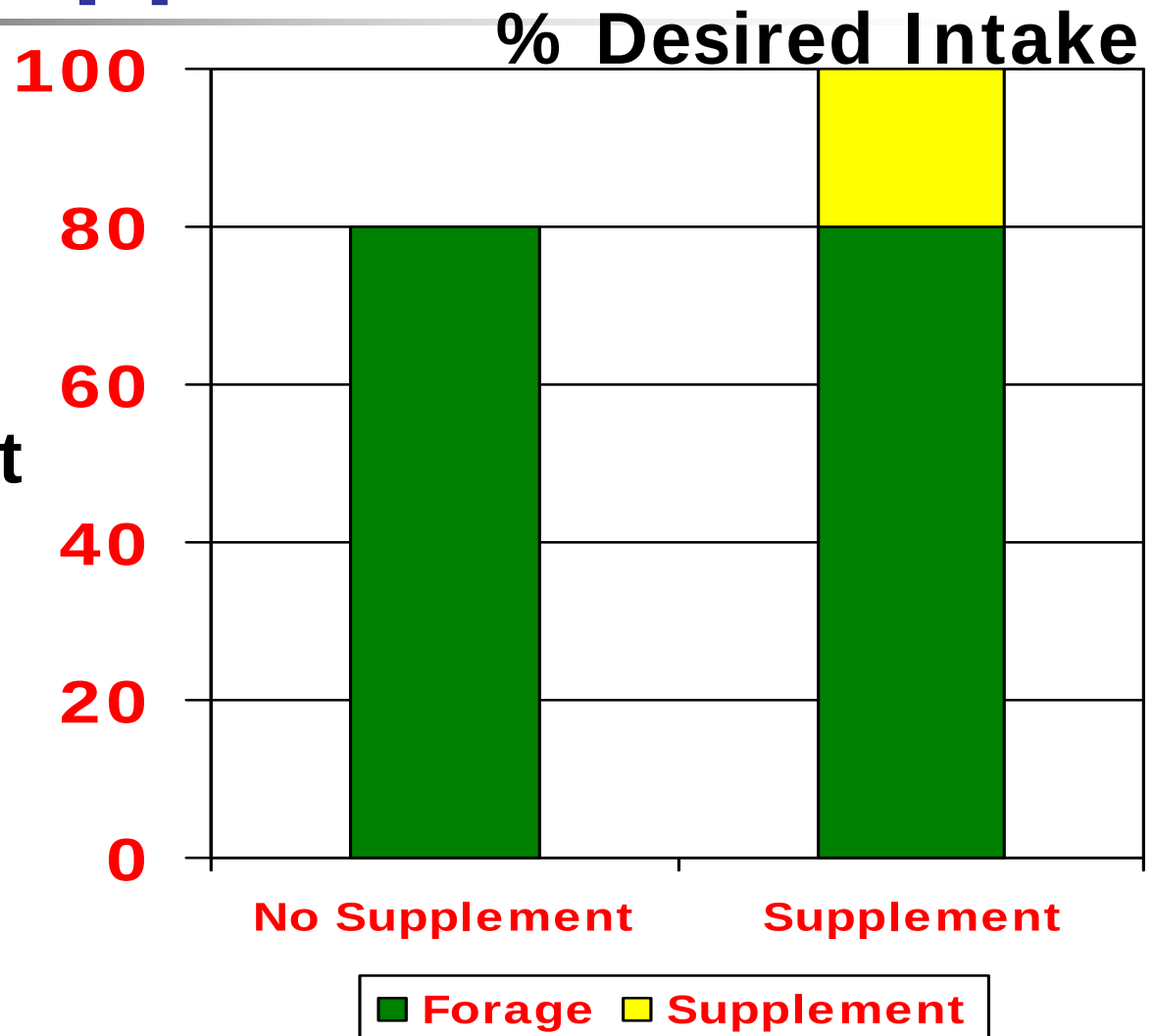


Matching Available Feed to Animal Needs

- **Three common situations when supplementation should be considered**
 - **Performance goals not met by forage alone**
 - **Supplement feed that will sustain forage intake and digestion but provide additional nutrients**
 - **Forage quality and digestion are limited**
 - **Supplement feed that will stimulate forage intake and digestion**
 - **Forage supplies are limited**
 - **Supplement feed that will reduce forage intake but maintain total energy intake**

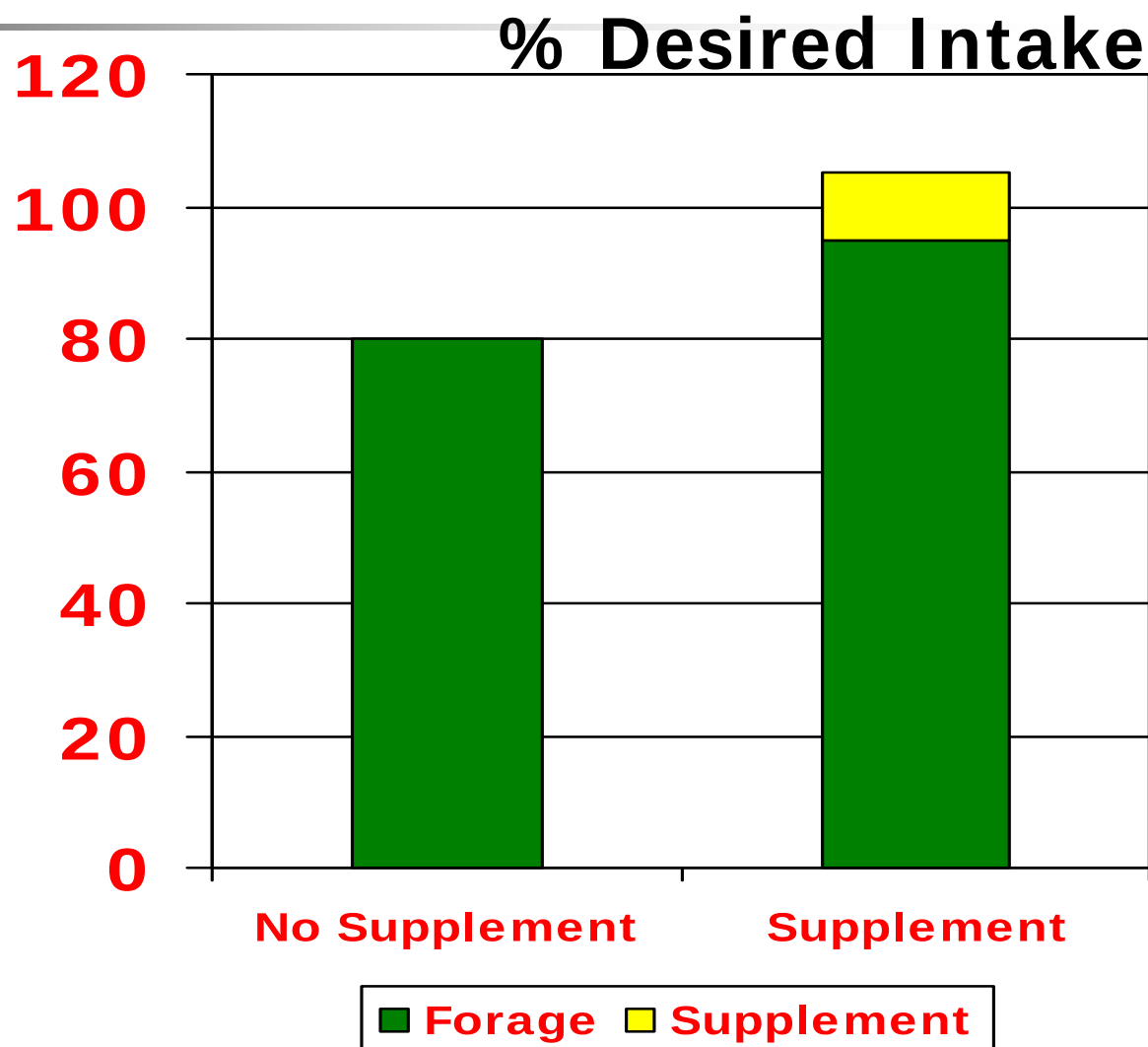
Supplementing Forage - Classic Approach

- Forage alone will not meet nutrient requirement
- Add supplement to “fill the gap” between what is provided by forage and what is needed by animal



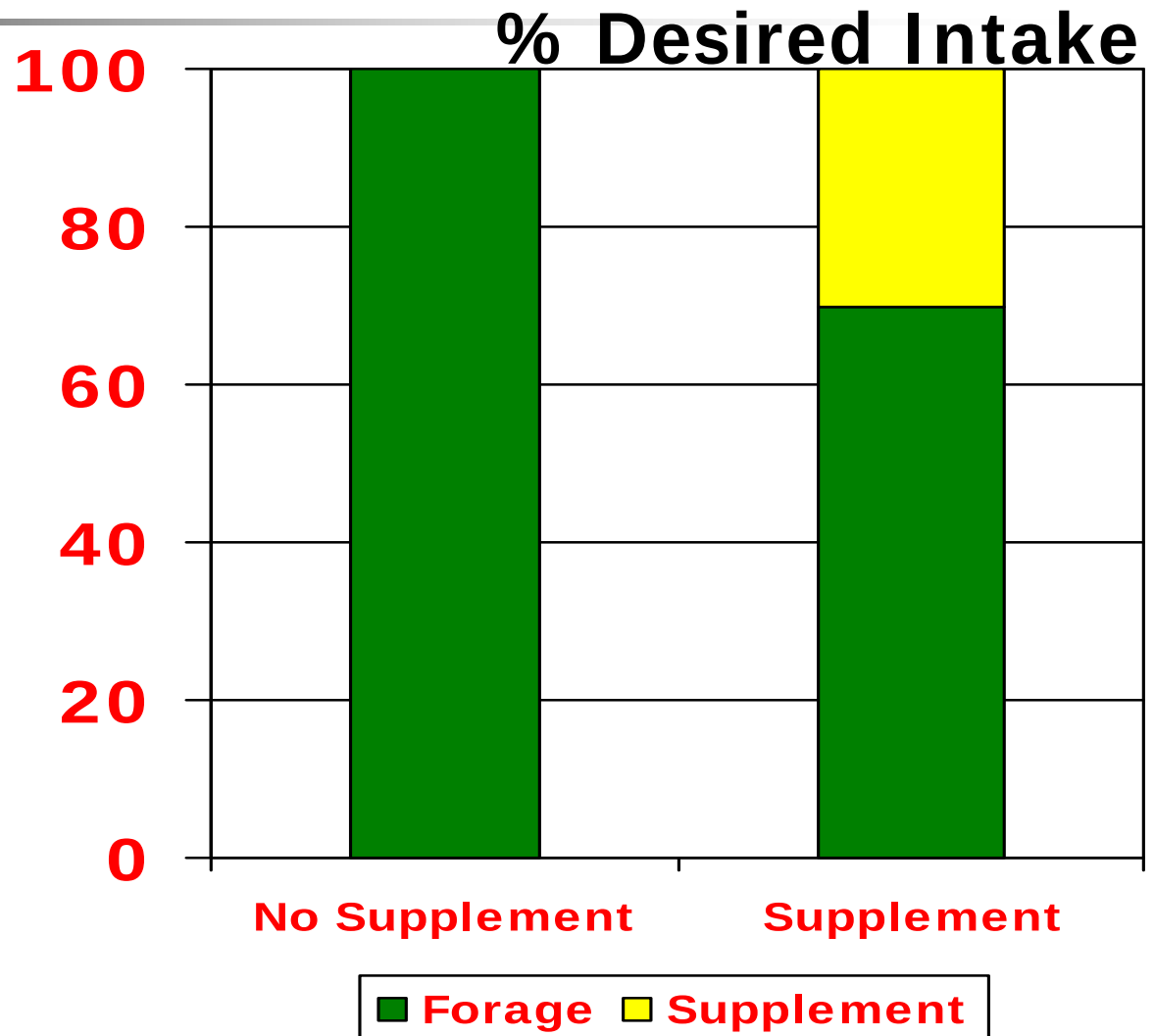
Supplement to Improve Forage Utilization

- Right kind of protein & “forage friendly fiber” make rumen “bugs” more efficient forage users & result in better forage digestion & consumption
- Soyhulls, corn gluten feed and corn gluten are good examples



Stretching Forage

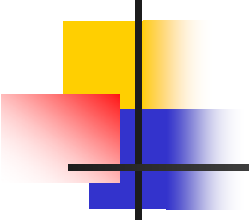
- Most often when forage is limited and/or expensive
- Drought years best example
- Also, when winter hay is low (good to base on early inventory)



Evaluation of Nutritional Status of the Cow Herd

- Reproductive success and optimum health are linked to nutritional status
- Nutritional Status Evaluation
 - Body Condition Score
 - Hair Coat Score
 - Forage Analysis
 - Blood Analysis
 - Fecal Egg Count
 - Water Analysis





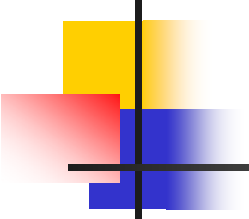
Evaluation of Nutritional Status of the Cow Herd

- **Body Condition Scoring (BCS)**
 - Visual appearance of cows for fleshiness
 - Will fluctuate throughout the year
 - Should be scored mid-summer, weaning, 60-d post weaning, calving and breeding
 - Target at calving is 5 (cows) and 6 (heifers)
 - See Reproduction section for in-depth explanation of BCS scale

Gain Needed to Maintain Desired BCS

Score	Desired BCS	Amount of Body Weight Gain
1	5	> 350 lbs*
2	5	300-350 lbs*
3	5	200-300 lbs
4	5	150-200 lbs
5	5-7	100 lbs (fetus weight)
6	5-7	100 lbs (fetus weight)
7	5-7	None needed
8	5-7	Lose 50-150 lbs
9	5-7	Lose 100-200 lbs

***Economics Questionable**



Evaluation of Nutritional Status of the Cow Herd

Hair Coat Score

Score	Description
1	No detectable problem; healthy coat appearance; appropriate to season
2	Slight indications, but not clear; could be genetically off-color
3	Some off-color; slightly slow to shed
4	Enough dead hair to cover significant percent of body; slow shedding
5	Hair clearly dead in appearance; brittle; cattle not slicking off normally

Evaluation of Nutritional Status of the Cow Herd

- **Forage Analysis (Hay or Pasture)**
 - Includes moisture, TDN, CP, ADF, NDF and mineral profile
 - Pasture samples are generally for minerals
 - Separate tall fescue pasture samples can be taken for endophyte fungus analysis

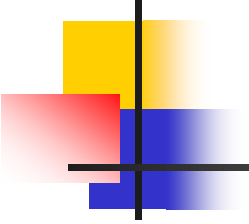


Evaluation of Nutritional Status of the Cow Herd

■ Blood Analysis

- To assess copper and selenium status
- Possibly disease titer
- Blood analysis is not definitive and should be taken only in context with a review of symptoms as part of a complete nutritional evaluation





Evaluation of Nutritional Status of the Cow Herd

■ Fecal Egg Count

- Presence of significant levels of internal parasites may indicate nutritional or physiological status and may be part of the cause of the problem
- The animals sampled must be identified, condition scored and be reflective of the nutritional condition of the entire herd

Evaluation of Nutritional Status of the Cow Herd

■ Water Analysis

- Usually only done when there is evidence of a problem with sulfur, iron or other water contaminants



Evaluation of Nutritional Status of the Cow Herd

■ Soil Analysis

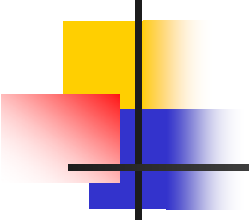
- Measure of soil fertility
- Typically phosphorus and potassium as well as pH
- Other soil components can be analyzed if there is a need



Beef Cowherd Nutritional Analysis

Evaluation Practice	What is Evaluated	Number of Samples
Body Condition Score	Energy Status	100 %
Hair Score	Nutritional Status	100 %
Hay Analysis	Quality, Minerals	2
Pasture Analysis	Minerals	2, twice
Blood Analysis	Copper, Selenium	10 % , min 5
Fecal Egg count	Internal Parasites	10 % , min 5
Water Analysis	Contaminants	1
Soil Analysis	Fertility, pH	2

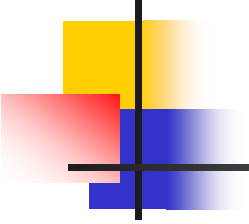
Nutritional evaluation should occur 60-90 prior to calving.



Developing Heifers for Optimum Reproduction

■ Preweaning

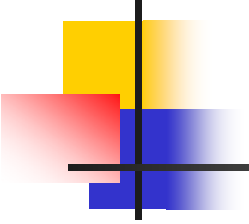
- Select early born heifers at weaning (450-600 pounds) depending on breed and frame size
- Weight needs to be true muscle growth without a substantial amount of fat
- High-energy creep feed can cause British heifers to become too fat and will hinder future milk production



Developing Heifers for Optimum Reproduction

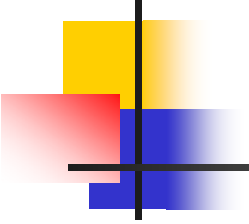
■ Weaning to Breeding

- Heifer needs to be grown and developed to 65 % of mature weight at breeding
- Most British breeds reach puberty at 1 year while Continental breeds and some lines of British will be older
 - Nutritional development is more critical for these Continental breeds and lines of British
- Typically need to gain 1-1.5 pounds/day
- Must initiate cycling prior to breeding since first behavioral estrus is sub-fertile



Developing Heifers for Optimum Reproduction

- **Breeding until Calving**
 - **Need to assure adequate growth to 85 % of mature weight at calving**
 - **Should gain 0.75-1 pound per day**
 - **Adequate protein and energy is essential for optimum fetal growth and preparation of the heifer for calving and lactation**



Developing Heifers for Optimum Reproduction

- **Calving to Rebreeding**
 - Calving is critical time for 2-year old heifers
 - Separate and monitor for difficulties
 - Give app. 2 hours, then provide assistance
 - The nutrient needs greatly increase due to lactation, growth and rebreeding
 - Inadequate nutrition prolongs postpartum intervals and can greatly affect the future productivity of the heifer

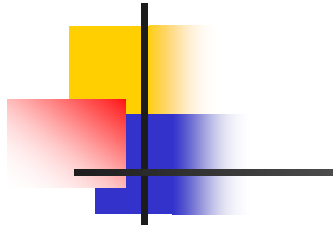
The End



<http://animalscience.ag.utk.edu>

<http://www.agriculture.utk.edu>

<http://www.tnbeefcattleinitiative.org>



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