



U.S. IPAS Extension
University of Florida

Small Farm Management Series: Animal Nutrient Requirements Bovine, Equine, and Caprine Livestock

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Nutrition Terminology

What is a nutrient?

Chemical substance that provide to an organism requirements to do their essential physiological functions

- Proper nutrition is essential for effective animal performance in all growth stages
- **Maintenance** of life and **production** (Key word).

Classifications of nutrients

Energy

- Fat and oils (9)
- Carbohydrates (sugars) (4)

Protein (4)

- AA

Minerals

- Macro Minerals – Ca, P, Mg, Na, Cl, K, S
- Micro Minerals – Co, Cu, F, Fe, I, Mn, Mo, Se, Zn – Occur in
- Cu above 11 ppm toxic to sheep

Vitamins

- Soluble in water
- Soluble in lipids

Water



Forage types (categories)

Categories

- Legumes
 - 14,000 species
- Grasses
 - 6,000 Species

Forages classification (practical method)

- Warm season
- Cool season

True classification is based on their physiology:

- C4 (mostly warm-season forages)
- C3 (mostly cool-season forages) species.

Dry Matter (DM)

Feeds vary in water content

- Dry matter concentration for:
 - hay should be approximately 85%–92%
 - haylage 40%–60%
 - silage 30%–40%
 - fresh pasture can be <20%

Dry Matter Intake (DMI)

- Refers to the portion of the forage after water is excluded
- Lbs or kg 1 lbs=2.2 kg



Total Digestible Nutrients (TDN)

A good way to estimate energy density of a feed (Sum of nutrients)

- Growing beef require between 65-75% TDN
- Most forages have at least 18% of Crude fiber
- Ask your feed dealer for this value (not on feed tag)

Good quality forages

Legume hay can have roughly

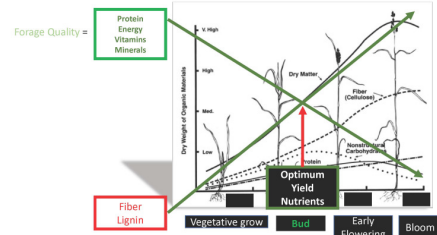
CP (18–22%)

Grass hay can have

CP (10–16%)



Total Digestible Nutrients Forage Quality



Total Digestible Nutrients Forage Quality

Table 1. Dry matter (DM), crude protein (CP), total digestible nutrients (TDN), acid detergent fiber (ADF), and neutral detergent fiber (NDF) of forage samples submitted to the Forage Extension Laboratory at the Range Cattle Research and Education Center – Ona, FL (October 2006 to December 2014).

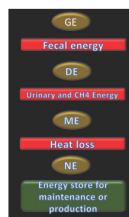
Forage Species	Number of Samples	CP	TDN	ADF	NDF
Bahagrass*	387	6.9 ± 3.0	51 ± 3	—	—
Bermudagrass	792	10.7 ± 3.1	52 ± 4	41 ± 3	74 ± 3
Stargrass	220	8.7 ± 3.8	51 ± 5	47 ± 9	70 ± 15
Limpograss	478	4.3 ± 3.0	54 ± 9	41 ± 4	70 ± 6
Corn Silage	87	8.0 ± 2.0	78 ± 8	30 ± 2	43 ± 8

*ADF and NDF analysis performed only on samples submitted by dairy producers. Bahagrass was not analyzed for these nutrient constituents.

Metabolizable Energy (mcal)

Measure of energy content of a feed.

- More precise way to evaluate energy density of feed, swine and beef cattle
- How much energy is available for the animal to use
- measure in Mcal/lbs



Crude protein and amino acids

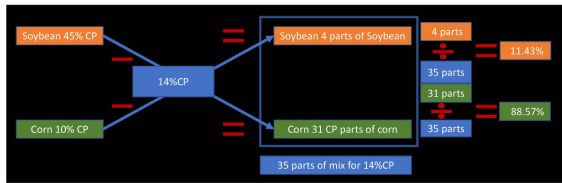
• Crude Protein

- Estimates how much protein in a feed, but doesn't tell how much can actually be used by the animal
 - Amounts different between species and stage of growth
 - Info on feed tag

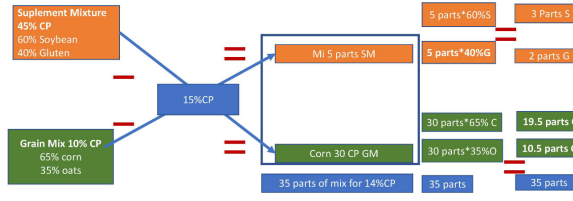
• Amino Acids

- Specific ones are supplemented for monogastric
 - Lysine (Pigs, horses, Cows)
 - Methionine (Lactating cow)

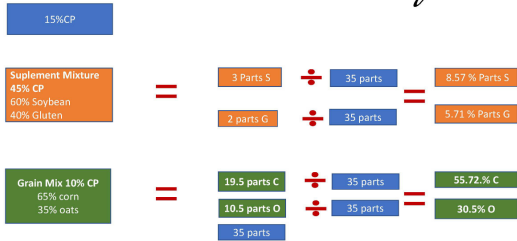
Formulation Ratio (Pearson Square)



Formulation Mix Ratio (Pearson Square)



Formulation Ratio (Pearson Square)



Formulation Ratio (Drought Feed)

Drought Feed Calculator
 Cattle 150kg/yr cull growth
 Live weight (kg) 40
 Feed type Feed 3
 Number of Animals (No) 100
 Daily feed amount in kg (kg/No/Day) 2.17
 Total feed amount for period in kg (kg/No) 217.00
 Total ration cost for period (\$) 1996

What information is missing(TDN)?


Seminole Wellness
WELLNESS DYNASPORT™
NESS DYNASPORT™
GUARANTEED ANALYSIS
INGREDIENTS

Assessment of Livestock


- Body Condition Score**
- Assessment of the fat cover
 - Best indicator of near-term nutritional needs
 - Thin 1-3
 - Moderate 4-6
 - Fat 7-9.




Body Condition Score



3

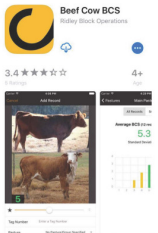


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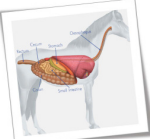
BCS (Mobile APP)




Types of Animal Digestive Systems

Monogastrics


- Hogs
- Cats
- Dogs
- Humans





Ruminants

- Cows
- Sheep
- Goats
- Alpacas




Pseudo-Ruminants

- Hogs
- Cats
- Dogs
- Humans

Digestive System (Monogastric)

Voluntary Intake

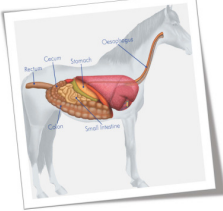
- Energy
 - Starch breakdown
 - Lipolysis
- Protein
 - AA



Pseudo-ruminants

Differences

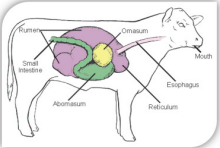
- Cecum
- Colom
- Microorganisms



Ruminants

Difference

- Stomach
 - Split 4 compartments
- CHOS (Sugar and Fats)
 - Bacteria's in the rumen:
 - Fats (galactolypids, TG, phospholipids)
 - Absorption Small intestine
- Sugars
 - Produce Volatile Fatty Acids
 - Propionic
 - Acetic
 - Butyric



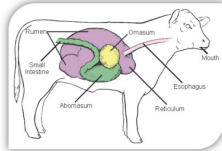
Ruminants

- Protein
 - Microbial protein
 - Ammonia and AA

Digestion produces energy loss

- Heat
- Gas

- Vitamins, minerals, wáter
 - Absorb in the small intestine



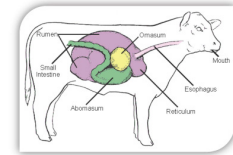
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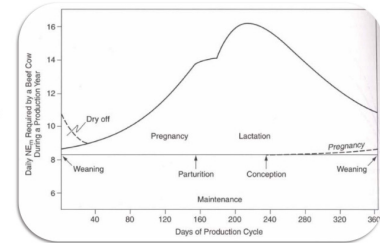
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Nutrient Requirements for animals by stage

Nutrient needs for animals by stages

- Start/Grow
- Maintenance
- Gestation
 - Hogs 114
 - Sheep and goats 150
 - Cow (283)
 - Horse (340)
- Lactation
- Finishing



Nutrient needs for animals by stages

Nutrient Ranges

	Intake	Energy	Protein	Fat	Fiber
Fowl	50-1600 g/week	6200-7300 kcal/lb ME	12-26% CP	--	--
Cow	1.5-3.0% BW	45-90% TDN	6-18% CP	< 4% total diet	> 8% NDF in diet
Goat	1.3-4.2% BW	53-68% TDN	5.5-20% CP	< 4% total diet	> 8% NDF in diet
Horse	1.5-3.0% BW	0.9-1.40 mcal/lb DE	8-14.5% CP		
Pig	3 lbs to 5% BW	7200 kcal/lb ME	12-26% CP	3.5-6.5%	--
Sheep	1.5-5.2% BW	55-80% TDN	9-26% CP	< 4% total diet	> 8% NDF in diet

Nutrient Requirements for Cow's

Livestock Class	Water daily Requirements (gpd)
Dry cow and heifers	6-15
Lactating cow	11-18
Bulls	7-19
Growing cattle	
400lbs	3.5-10
600lbs	5-15
800lbs	6-18
Finishing cattle	
1,000 lbs	8-21
1,200 lbs	9-23
Dairy cattle	10-25
Horses	8-15
Sheep and goats (for every 100 lbs)	1-4

Dietary Protein and Energy Requirements of Goats

Class of Goat	Ave. feed intake/day, lb	% Crude Protein	% TDN
Growing doe/ling, 45 lb	2.4	8.8	56
Growing male kid, 66 lb	2.9	9	57
Yearling doe, 90 lbs	4.6	10	56
3 years old doe, 110 lb	5.0	11.3	69
Mature buck, 220 lb	5.3	9	55
Dairy doe, 150 lb	7.5	11.6	71

Practical Feeding Recommendations for feeding Goats

	% Protein	% TDN
Growing Kids, dry does, and bucks	9-10	54-58
Pregnant goats	10-11	56-60
Lactating goats	12-13	62-68

Practical Feeding Recommendations for feeding Beef Cows

Parameters	Early Lactation / Calving to Breeding	Mid Pregnancy	Late Pregnancy
Non-lactating, 2200 lbs			
Protein (%)	9.5 - 10.8	8.0	8.5 - 9.0
TDN (%)	63 - 65	48 - 52	52 - 58
Calcium (%)	0.34	0.20	0.20 - 23
Phosphorus (%)	0.24	0.20	0.20 - 23
Lactating, 2200 lbs			
Protein (%)	9.6	7.0	7.8
TDN (%)	56 - 58	48 - 49	50 - 54
Calcium (%)	0.28	0.18	0.26
Phosphorus (%)	0.22	0.16	0.21

Practical Feeding Recommendations for feeding Horses

Table 1. Comparisons of Daily Energy, Protein and Mineral Requirements for Sedentary, Mature Horses of Different Body Weight.

Size of Horse	Digestible Energy (Mcal/day)	Crude Protein (pounds)	Calcium (grams)	Phosphorus (grams)
Maintenance (1,000 pounds)	15	1.2	18	13
Maintenance (1,100 pounds)	16.5	1.4	20	14
Maintenance (1,200 pounds)	18	1.5	22	15

Nutrient requirements are estimated from the National Research Council's Recommendations for Nutrient Requirements of Horses (2007). Meal is megacalories (1,000 Calories), a unit of energy potential.

Summary

Things to consider in cattle feeding:

- Nutrient requirements for growth stage
 - Total Digestible Nutrient
 - CP
 - ME
- Livestock species
- Forage availability
- Animal stocking rate
- Season

Reference:

- Pastures and Forage Crops for Horses. <http://edis.ifas.ufl.edu/pdffiles/AA/AA21600.pdf>
- Basic Nutritional Guidelines for Equine Management. <http://edis.ifas.ufl.edu/pdffiles/AN/AN23500.pdf>
- How to Feed a Horse: Understanding Basic Principles of Horse Nutrition. <https://edis.ifas.ufl.edu/pdffiles/AN/AN23600.pdf>
- The Digestive Tract of the Pig. <http://edis.ifas.ufl.edu/pdffiles/AN/AN01200.pdf>
- <http://edis.ifas.ufl.edu/pdffiles/AG/AG36200.pdf>
- Nutritive Value Parameters: <http://edis.ifas.ufl.edu/pdffiles/AA/AA19200.pdf>