

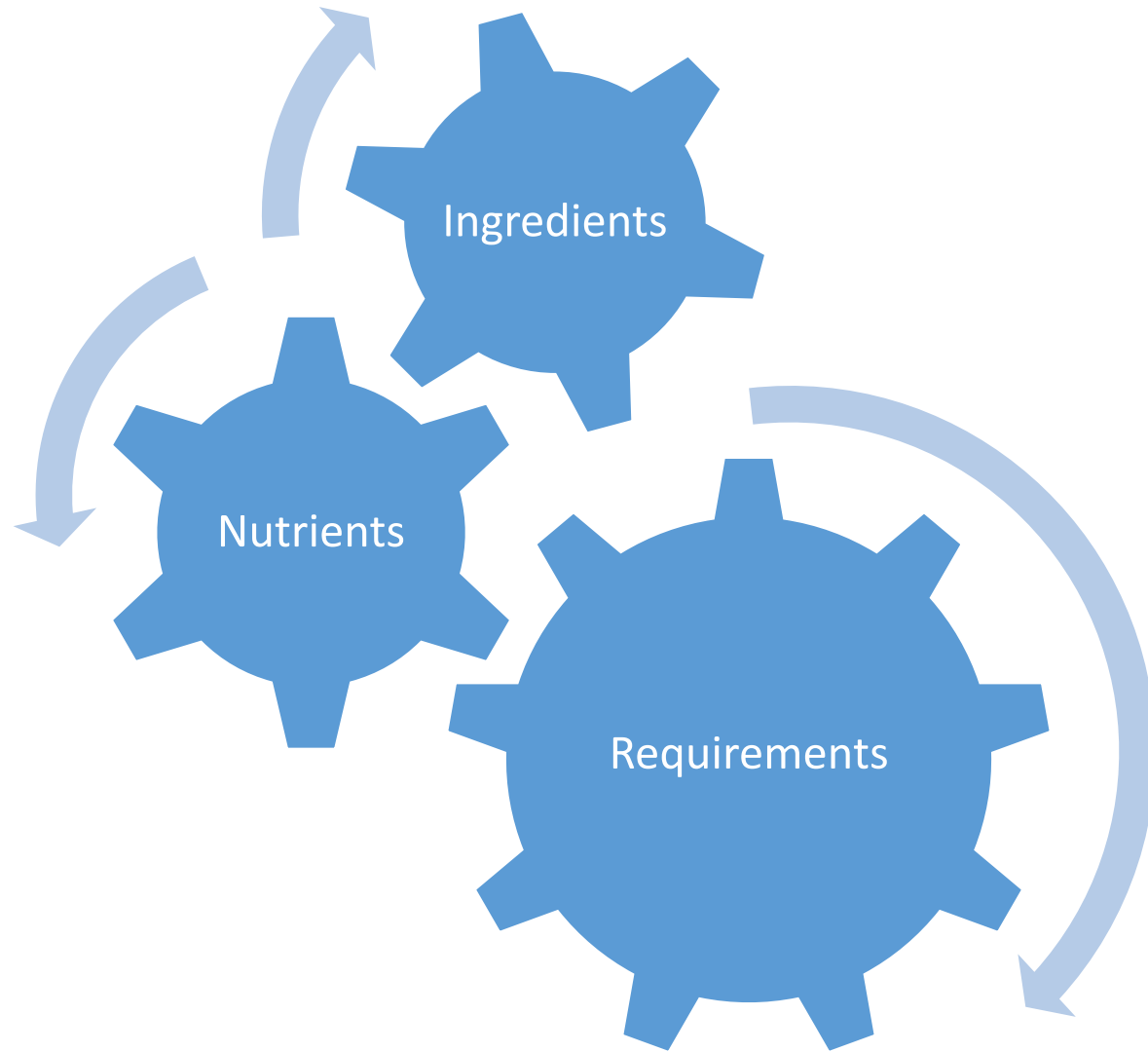
Nutrition – Building the Foundation



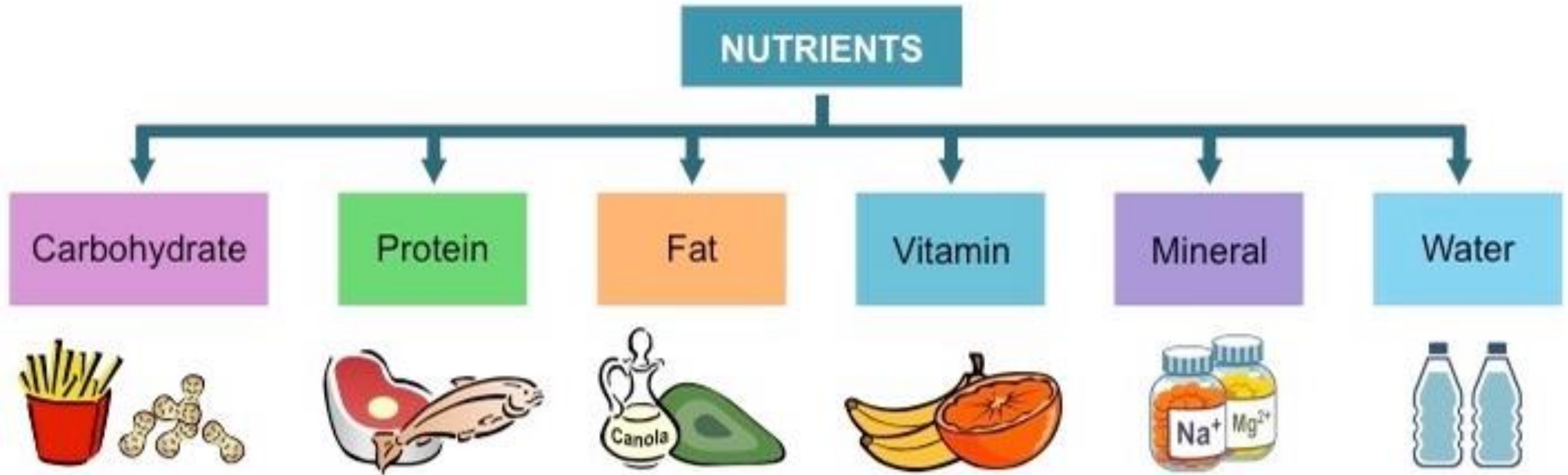
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NCHCA Annual Meeting
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FormAFeed



A **nutrient** is a substance used by an organism to survive, grow, and reproduce.



Nutrient Requirements

- What do cows need to live, grow and reproduce?
- Maintenance Requirements
 - First priority
 - Functions to keep her alive
 - organ function
 - cell regeneration
 - thermoregulation
 - immune system
 - Growth
 - Lactation
 - Reproduction



Figure 2. Prioritization of nutritional requirements for the beef cow.
Adapted from Short et al., 1990.
Journal of Animal Science

Nutrient Requirements of Beef Cows

Table 1

	Months Since Calving											
	1	2	3	4	5	6	7	8	9	10	11	12
NEM required (Mcal/day)												
Maintenance	10.25	10.25	10.25	10.25	10.25	10.25	8.54	8.54	8.54	8.54	8.54	8.54
Lactation	4.78	5.17	4.13	3.1	2.23	0	0	0	0	0	0	0
Pregnancy	0	0	0.01	0.03	0.07	0.16	0.32	0.64	1.18	2.08	3.44	5.37
Total	15.03	15.42	14.39	13.38	12.55	10.41	8.86	9.18	9.72	10.62	11.98	13.91
<p>Mature weight, 1,172 lb; calf birth weight, 88 lb; age at calving, 60 mo; peak milk, 17.6 lb;</p> <p>age of calf at weaning, 30 wk; breed code, Angus; milk protein, 3.4%; calving interval, 12 mo.</p> <p>Table adapted from Merck Manuals, Management and Nutrition, Nutrient Requirements of Beef Cows</p>												

What nutrients do we monitor in beef diets?

- DMI – dry matter intake
- CP – crude protein
- TDN - total digestible nutrients
- NE – net energy
 - Maintenance
 - Growth
 - Lactation
- Ca – calcium
- P - phosphorus



What Affects Nutrient Requirements?

- Age
- Size
- Exercise
- Stage of gestation/lactation
 - Calf size
 - Milk production
- Temperature



Nutritional Requirement Guidelines for Beef Cattle

Class	TDN%	CP%	Ca%	P%
Dry Cow, Early to Mid-gestation	48-52	7	0.26	0.16
Dry Cow, Late-gestation	58	9-10	0.27	0.17
Lactating Cow	60-65	11-12	0.31	0.21
Backgrounding 1.5 lb/d	63	13	0.49	0.24
Backgrounding 2.0 lb/d	68	13	0.50	0.24
Backgrounding 2.5 lb/d	74	13	0.50	0.24
Finishing	80	11	0.42	0.22

Nutritional requirements vary with body weight, frame size, predicted ADG & stage of production. All rations should be balanced for energy, protein, vitamins & minerals. 1200 lb cow, 500 lb growing animal & 800 lb finishing animal. Based on values from NRC Beef 1996

	Stage of production				
	Period 1:	Period 2:	Period 3:	Period: 4	Period 5:
	calving	breeding	early gestation	mid gestation	late gestation
Nutrient	(45 days)	(45 days)	(90 days)	(90 days)	(90 days)
Dry matter (lb)	20.6	21	19.5	18.1	19.6
Protein (lb/day)	2.5	2.6	2	1.3	1.6
TDN (lb)	13.8	14	11.5	8.8	10.5
Calcium (g/day)	36	38	25	15	23
Phosphorus (g/day)	25	27	20	15	18
Vitamin A (x 1,000 IU)	37	38	36	25	31

George, Melvin R., John Harper, Josh Davy, and Theresa Becchetti. "Livestock Production." *UC Rangelands Archive*. N.p., n.d. Web. 11 Feb. 2018.

Managing Animal Requirements

- Group animals with like requirements together
 - Gestating cows
 - Cow/calf pairs
 - Growing steers
 - Weaned calves



You can calculate requirements for your animals

- NRC tables

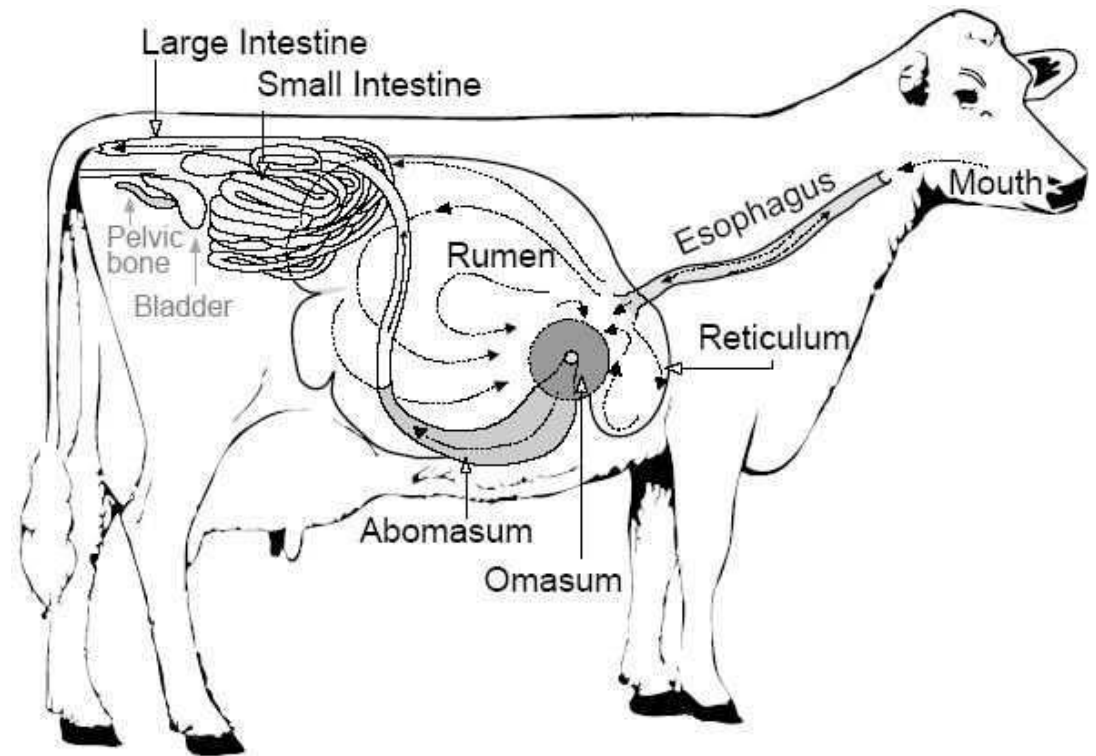


We Meet Her Requirements by Providing Nutrients



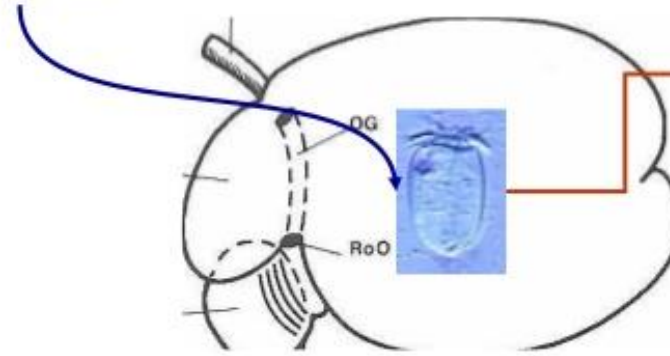
The Amazing Rumen

- Adaptation that enables the cow to extract nutrients from forages
- 4 chambered stomach
 - Rumen
 - Reticulum
 - Omasum
 - Abomasum
- Small intestine
- Large intestine

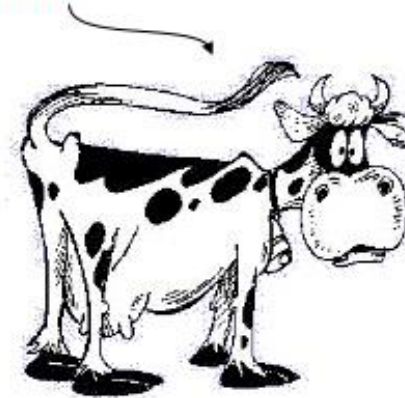


Feed the Microbes, Let the Microbes Feed the Ruminant!

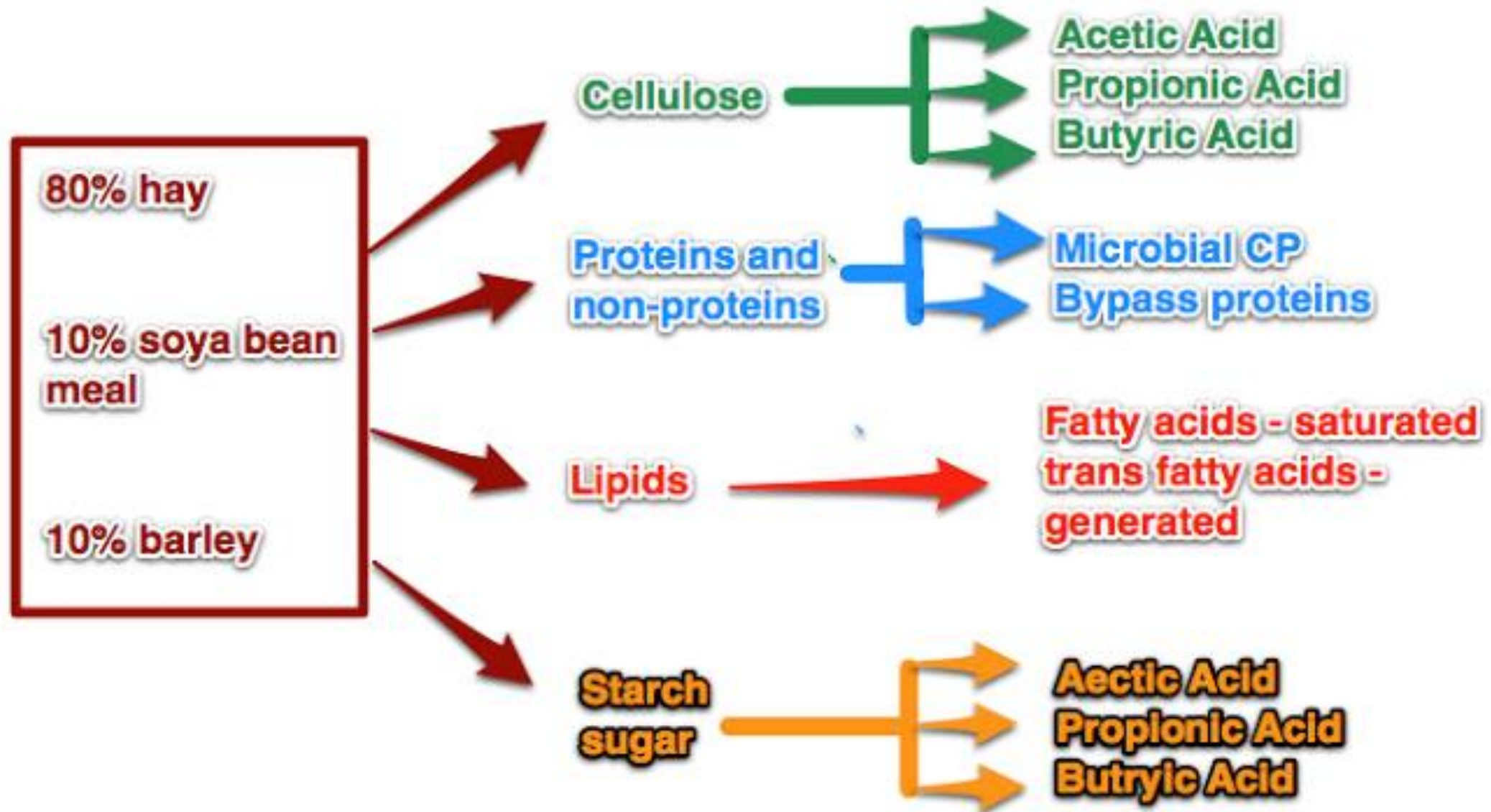
Feed In



VFA
Microbial Protein
Vitamins



The nutrients presented to the animal after ruminal fermentation are very different than those entering the rumen as feed



Human

- Uses glucose for energy
- Digests starches, sugars and fats for energy
- Needs high quality proteins
- Limited ability to digest fiber

Cow

- Uses rumen to turn fiber into energy
- Uses fermentation endproducts for energy
- Meets >50% of protein needs from protein made in the rumen
- Can digest proteins, fats and carbohydrates post ruminally

Ingredients – the way we get nutrients into cattle

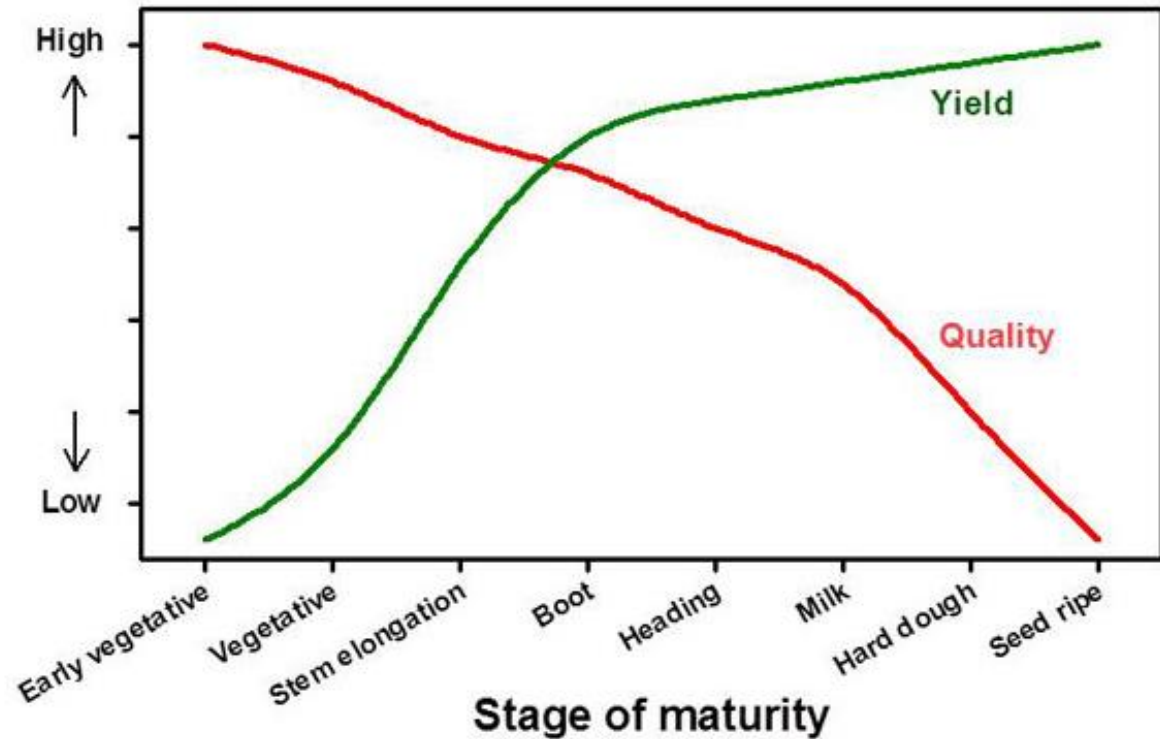
- Feedstuffs
 - Forages – high fiber, low energy
 - Grasses
 - Legumes
 - Dry vs silage
 - Concentrate – high energy, low fiber
 - Grains
 - Byproducts – medium protein, digestible fiber, etc
 - Vitamin/Mineral/Water

Our job is to select ingredients that provide the right nutrients to meet her requirements

What affects nutrients in forages

- Legumes/grasses
- Growing conditions
- Varieties
- Harvest date
- Storage conditions

Generalized relationship between forage yield and forage quality as affected by stage of maturity

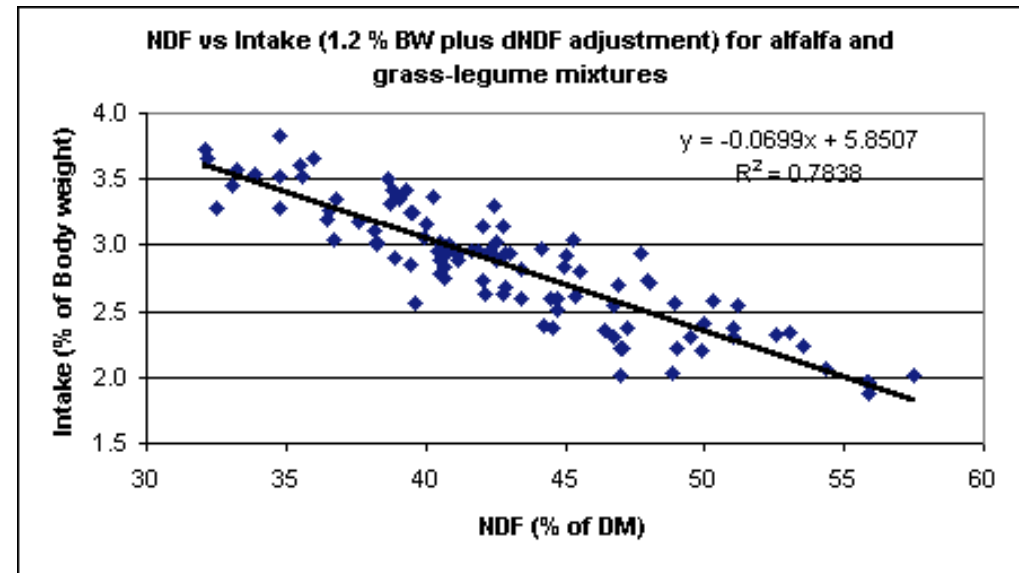


Relationship Between Quality and Intake

Table 1. Estimating hay intake of beef cows.

Forage Quality	Protein, %	TDN, %	Intake, % of body weight	
			Dry Cow	Lactating
Excellent	14	62	2.7	3.0
Good	13	58	2.5	2.7
Medium	8	51	2.0	2.5
Poor	4	38	1.5	2.0

Source: Patterson, J. Interpreting a forage analysis summary.



Brown, Sara. "Do You Have Enough Hay to Feed Your Cows This Winter?" *Drovers*. N.p., 9 Nov. 2017. Web. 11 Feb. 2018.

Undersander, Dan, and John E. Moore. "Relative Forage Quality (RFQ) – Indexing Legumes and Grasses for Forage Quality." *Team Forage – University of Wisconsin Extension*. N.p., 2001. Web. 11 Feb. 2018.

Forage Testing

- Take the sample
 - Core
 - Multiple bales
- Send to lab
 - CP
 - ADF/NDF
 - Ca
 - P
 - TDN/energy



Moisture	15.69%
Dry Matter	84.31%

Moisture	18.52%
Dry Matter	81.48%

	DRY BASIS:	AS IS:
Crude Protein	7.41%	6.25%
A D F	41.96%	35.38%
aN D F	64.11% (w/ Na2SO3)	54.05%
Lignin (Sulfuric Acid)	6.70%	5.65%
Lignin % of NDF	10.46%	10.46%
AD-ICP % of CP	14.04%	14.04%
ND-ICP % of CP	44.00% (w/o Na2SO3)	44.00%
Protein Sol. % of CP	26.99%	26.99%
Fat (EE)	2.35%	1.98%
Total Fatty Acid (TFA)	1.14%	0.96%
Ash	6.12%	5.16%
Calcium	0.44% 2.00 g/lb	0.37%
Phosphorus	0.19% 0.86 g/lb	0.16%
Magnesium	0.16% 0.73 g/lb	0.13%
Potassium	1.51% 6.85 g/lb	1.27%
Sulfur	0.11%	0.09%
Sugar (ESC)	7.80%	6.58%
T.D.N. - OARDC	56.04%	47.25%

	DRY BASIS:	AS IS:
Crude Protein	12.99%	10.58%
A D F	32.88%	26.79%
aN D F	46.66% (w/ Na2SO3)	38.02%
Lignin (Sulfuric Acid)	6.72%	5.48%
Lignin % of NDF	14.41%	14.41%
AD-ICP % of CP	11.40%	11.40%
ND-ICP % of CP	38.42% (w/o Na2SO3)	38.42%
Protein Sol. % of CP	27.94%	27.94%
Fat (EE)	2.92%	2.38%
Total Fatty Acid (TFA)	1.66%	1.35%
Ash	7.92%	6.45%
Calcium	1.17% 5.31 g/lb	0.95%
Phosphorus	0.19% 0.86 g/lb	0.15%
Magnesium	0.32% 1.45 g/lb	0.26%
Potassium	1.01% 4.58 g/lb	0.82%
Sulfur	0.15%	0.12%
Sugar (ESC)	11.21%	9.13%
T.D.N. - OARDC	59.06%	48.12%

Moisture	8.97%
Dry Matter	91.03%

	DRY BASIS:	AS IS:
Crude Protein	6.52%	5.93%
A D F	36.59%	33.31%
aN D F	57.23% (w/ Na2SO3)	52.09%
Lignin (Sulfuric Acid)	5.78%	5.26%
Lignin % of NDF	10.10%	10.10%
AD-ICP % of CP	14.73%	14.73%
ND-ICP % of CP	58.29% (w/o Na2SO3)	58.29%
Protein Sol. % of CP	20.09%	20.09%
Fat (EE)	2.69%	2.45%
Total Fatty Acid (TFA)	1.51%	1.37%
Ash	7.37%	6.71%
Calcium	0.48% 2.18 g/lb	0.44%
Phosphorus	0.17% 0.77 g/lb	0.15%
Magnesium	0.18% 0.82 g/lb	0.16%
Potassium	1.17% 5.31 g/lb	1.07%
Sulfur	0.11%	0.10%
Sugar (ESC)	10.24%	9.32%
T.D.N. - OARDC	57.92%	52.72%

Moisture	12.05%
Dry Matter	87.95%

	DRY BASIS:	AS IS:
Crude Protein	16.30%	14.34%
A D F	28.93%	25.44%
aN D F	38.40% (w/ Na2SO3)	33.77%
Lignin (Sulfuric Acid)	5.94%	5.22%
Lignin % of NDF	15.47%	15.47%
NDFD 30 (1mm)	38.46%	38.46%
IVTDM 30	76.37%	76.37%
AD-ICP % of CP	7.12%	7.12%
ND-ICP % of CP	12.89% (w/o Na2SO3)	12.89%
Protein Sol. % of CP	33.13%	33.13%
Fat (EE)	2.54%	2.23%
Total Fatty Acid (TFA)	1.93%	1.70%
Ash	9.05%	7.96%
Calcium	1.38% 6.26 g/lb	1.21%
Phosphorus	0.27% 1.22 g/lb	0.24%
Magnesium	0.29% 1.32 g/lb	0.26%
Potassium	2.46% 11.16 g/lb	2.16%
Sulfur	0.23%	0.20%
Sugar (ESC)	10.19%	8.96%
T.D.N. - OARDC	62.85%	55.28%

Match Quality to Requirements

- Best quality
 - Growing steers
 - Lactating cows
 - Cold stress
- Moderate quality
 - Growing heifers
 - Gestating cows
 - Bulls
 - Milder winter
- Mixed Groups
 - Feed for animals with highest nutrient requirements
 - Reduce competition
 - Plenty of feed space
 - Don't limit feed

What if it doesn't test well enough?

- Cow needs nutrients to meet requirements
- Ingredients are only a source of nutrients
- If protein is too low
 - Provide supplemental protein directly
 - Soybean meal, canola meal, distillers grains, brewers grains
 - Provide protein indirectly
 - Feed rumen microbes – sugar, urea
- If energy is too low
 - Provide energy for rumen microbes
 - Corn, barley, sugar
 - Provide energy for cow directly
 - Rumen bypass fats



Monitor Body Condition

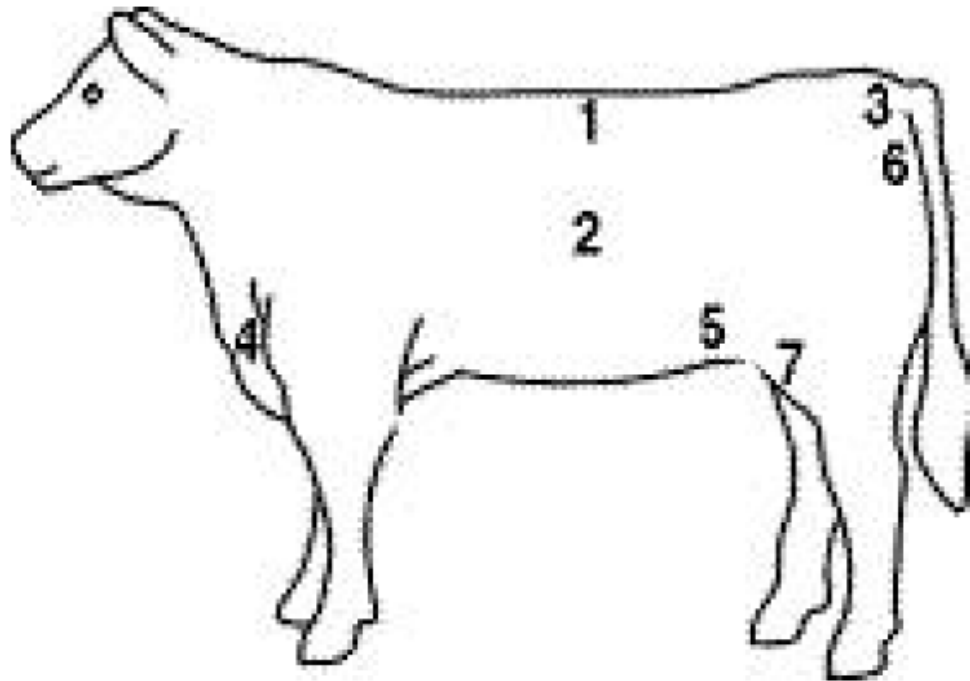


Figure 3. Fat deposition sites in the cow.

<https://www.ag.ndsu.edu/pubs/ansci/beef/as1026.pdf>

Score 1

A deep dip in the left flank. The skin under the lumbar vertebrae curves inward. The skin fold from the back base goes vertically downwards. The rumen fossa behind the last rib is more than one hand width deep. Viewed from the side, this part of the flank has a rectangular appearance. This cow has eaten little or nothing, which could be due to saddle illness, or insufficient or unpalatable feed.

Score 2

The skin under the lumbar vertebrae curves inward. The skin fold from the back base runs diagonally forward towards the last rib. The rumen fossa behind the last rib is one hand width deep. Viewed from the side, this part of the flank has a triangular appearance. This score is often seen in the first week after calving. Later in lactation, this is a signal of insufficient feed intake or a rate of passage that is too high.

Score 3

The skin under the lumbar vertebrae curves vertically down for one hand width and then curves outward. The skin fold from the back base is not visible. The rumen fossa behind the last rib is still just visible. This is the desired score for milking cows who have sufficient intake and the feed speeds the correct amount of time in the rumen.

Score 4

The skin under the lumbar vertebrae curves outward. Behind the last rib, there is no rumen fossa visible. This is the correct score for cows nearing the end of lactation and dry cows.

Score 5

The lumbar vertebrae are not visible as the rumen is filled. The skin over the whole belly is quite tight. There is no visible transition between the flank and the ribs. This is the correct score for dry cows.

Scoring Guide

Score all animals during your daily inspections and whenever you need to. A rumen score is just a snapshot. So always do the scoring at different times of the day to get a good impression of the situation.

Over the day the rumen score should be 6.5 points below or above the optimum rumen score. The optimum rumen score for rations with a low rate of passage (slow ration) is higher than with a high rate of passage (fast ration). There is therefore a difference between the ideal rumen score for dry cows and lactating cows:

- lactating cows 3.0
- dry cows 4.0

The heavily pregnant uterus alone should lead to a higher score for dry cows.

Interpreting the results:

- Some animals' scores are too low; attend to them
- A lot of variation within a group; eliminate the causes
- The score is too low or too high; monitor the feed intake and the ration

<http://www.rennut.com/nutrition/Ren%20Tips/RenTip91%20Cow%20Signals%20Cow%20Fill%20Score%20Card.pdf>

Body Condition Scores

	<i>Severely Emaciated</i>	<i>Extremely Thin</i>	<i>Very Thin</i>	<i>Borderline Thin</i>	<i>Moderate</i>	<i>Slightly Fleshy</i>	<i>Fleshy</i>	<i>Obese</i>	<i>Very Obese</i>
9-point scale:	1	2	3	4	5	6	7	8	9
Physically weak	yes	no	no	no	no	no	no	no	no
Muscle atrophy	yes	yes	slight	no	no	no	no	no	no
Outline of spine visible	yes	yes	yes	slight	no	no	no	no	no
Outline of ribs visible	all	all	all	3-5	1-2	0	0	0	0
Outline of hip & pin bones visible	yes	yes	yes	yes	yes	yes	slight	no	no
Fat in brisket and flanks	no	no	no	no	no	some	full	full	extreme
Fat udder & patchy fat around tail head	no	no	no	no	no	no	slight	yes	extreme
5-point scale:	1	1.5	2	2.5	3	3.5	4	4.5	5

(Modified from Pruitt, 1994)

Thank You

