Evaluating Forage Quality to Determine Supplementation Needs

McKenna M. Julian - Uinta County Extension

Golden Rule of Supplementation

Only use supplements if needed, and when they will enhance the nutritional value of the base forage.

Don’t waste your money supplementing when it isn’t needed.

Impact of winter weather on cattle

- Winter management affects the profitability of a beef herd, a cow's future performance, and the performance of her offspring.
- Might be tempting to let pregnant females "rough it" to save money.
  - Calves born from nutrient restricted dams during late gestation have been shown to have reduced immunity.
- When the temp. is ↓ an animal's lower critical temp., they must either receive more E from feed, or draw on E stores.
  - 7+ days of cold, windy, or wet weather ↑'s E req. 10-30%.

Body Condition Score

- Visual indicator of an animal's nutritional status.
  - Appraisal of fat condition.
- Prior to calving, prior to breeding, and at weaning.
- Use as a decision-making tool
  - Supplementing, breeding, and to predict animal performance.
- Winter conditions can make this difficult.
  - Gut fill of low-quality forage.
  - Winter hair coat can mask prominent ribs.
  - Cows can look shrunk after a storm.

Table 1. Body Condition Score (BCS) index for beef cattle.

Body Condition Score (BCS)	Description	Percent Carcass Fat
1	Emaciated	4
2	Very thin	
3	Thin	9
4	Moderately thin	
5	Moderate (ideal)	19
6	Moderately fleshy	
7	Fleshy	27
8	Very fleshy	
9	Obese	35

Body Condition Score

- 3 simple steps to evaluate body condition.
- Cattle can deposit fat differently, so you need to evaluate all locations when scoring your herd.

1. Look at the last 2 ribs.
   - If both are visible, < 5. If not, ≥ 5.
2. Look at the Spine. If vertebrae are visible, ≤ 3.
3. Look at the shape between the hooks and pins
   - Shallow U = 6, Strong U = 5, V Shaped = 4, Strong V = 3, and Very Strong V = 2

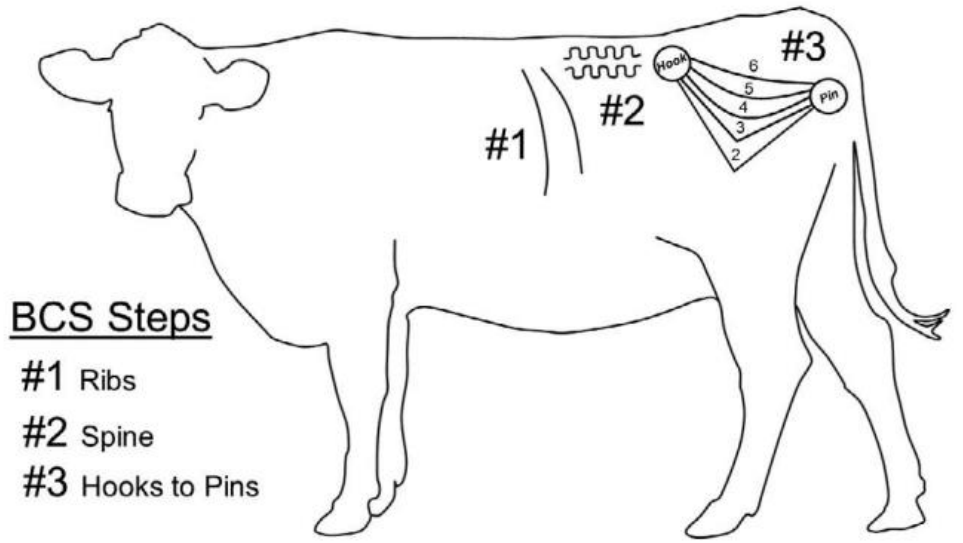
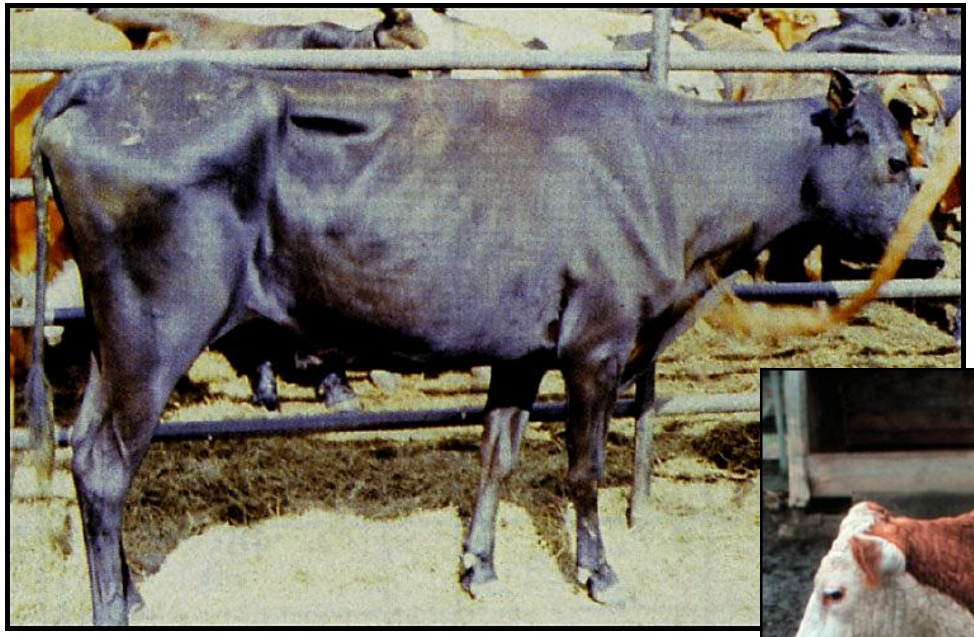


Figure 3. 3-Step Body Condition Score (BCS) guide for beef cattle. **Step 1** – Look at the last two ribs. If apparent, BCS < 5. If not apparent, BCS ≥ 5. **Step 2** – Look at spine. If visible, BCS ≤ 3. **Step 3** – Look at shape between hooks and pins. Shallow U - BCS = 6, Strong U - BCS = 5, V Shape - BCS = 4, Strong V - BCS = 3, Very Strong V - BCS = 2.

Body Condition Score



BCS 2

BCS 3

BCS 4

Body Condition Score

BCS 5

BCS 6

BCS 7

Body Condition Score

What score would you call this angus female?

Body Condition Score

- Forage on rangelands in Wyoming tend to be very low quality during the winter months.
  - Low BCS during peak production stages will inhibit future animal performance.

- BCS at calving and breeding can directly impact a female's reproductive ability.
  - % of opens
  - Length of PPI
  - Calf Vigor at birth

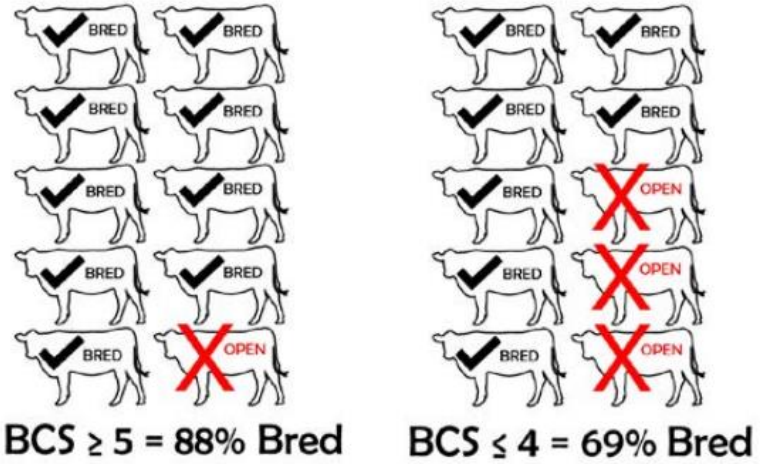
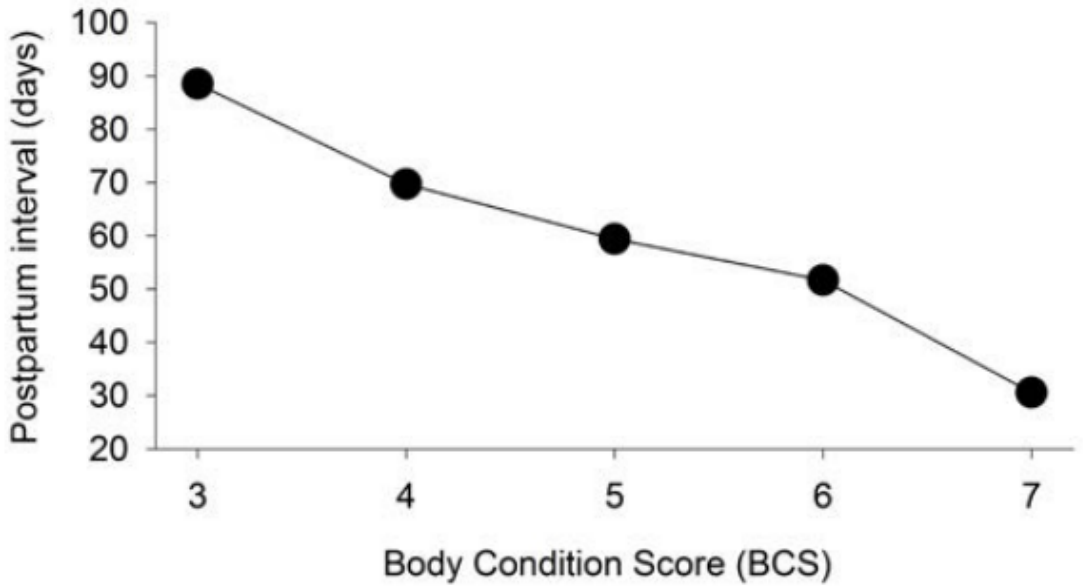


Figure 2. Effect of BCS on breeding success and pregnancy rates.



Body Condition Score

- BCS of 5 by breeding is ideal.
- Increasing BCS during early lactation is difficult.
- Recommended cows be in an acceptable condition at calving.

- Rule of thumb: 7-9-11
- Dry cow in early gestation – 7% CP
- Late gestation – 9% CP
- Early lactation – 11% CP
- ME requirements inc. by 80% from early gestation to peak lactation

Table 2. Weight and average daily gains required for a mature lactating cow to achieve a certain BCS if taken at calving (data from Wiltbank 1982).

Body Condition			Weight and Gains Needed by Breeding (lbs)		
BCS at Calving	to	BCS Needed at Breeding	Days to Breeding	Body Weight Change (total lbs)	Average Daily Gain (ADG, lbs per day)
5		5	60	0	0.0
4		5	60	80	1.3
3		5	80	160	2.0
3		5	60	160	2.7
3		5	40	160	4.0

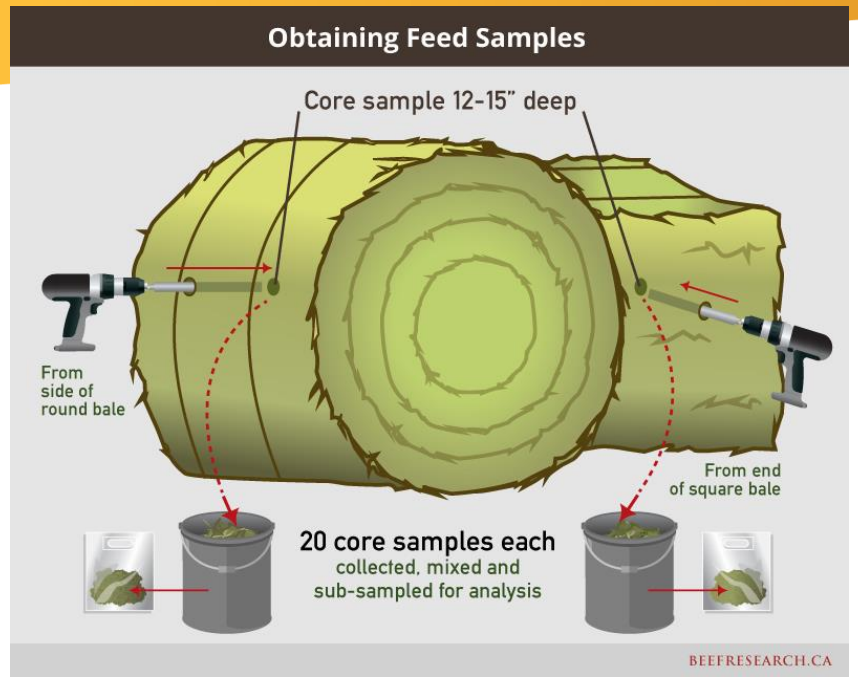
Know what your forage is

- The only way to truly know what you have is to have it tested.
- Nutrient concentration can vary drastically.
  - Grass Hay: 4-18% CP DM
  - Alfalfa: 10-25% CP DM
- Maturity: Fiber ↑ (Digestibility ↓), & CP ↓.

- Set aside higher quality hay for young growing animals, and those in peak production stages.
- Utilize poorer quality hay for early gestation, weaning, and animals that need more fiber

Know what your forage is

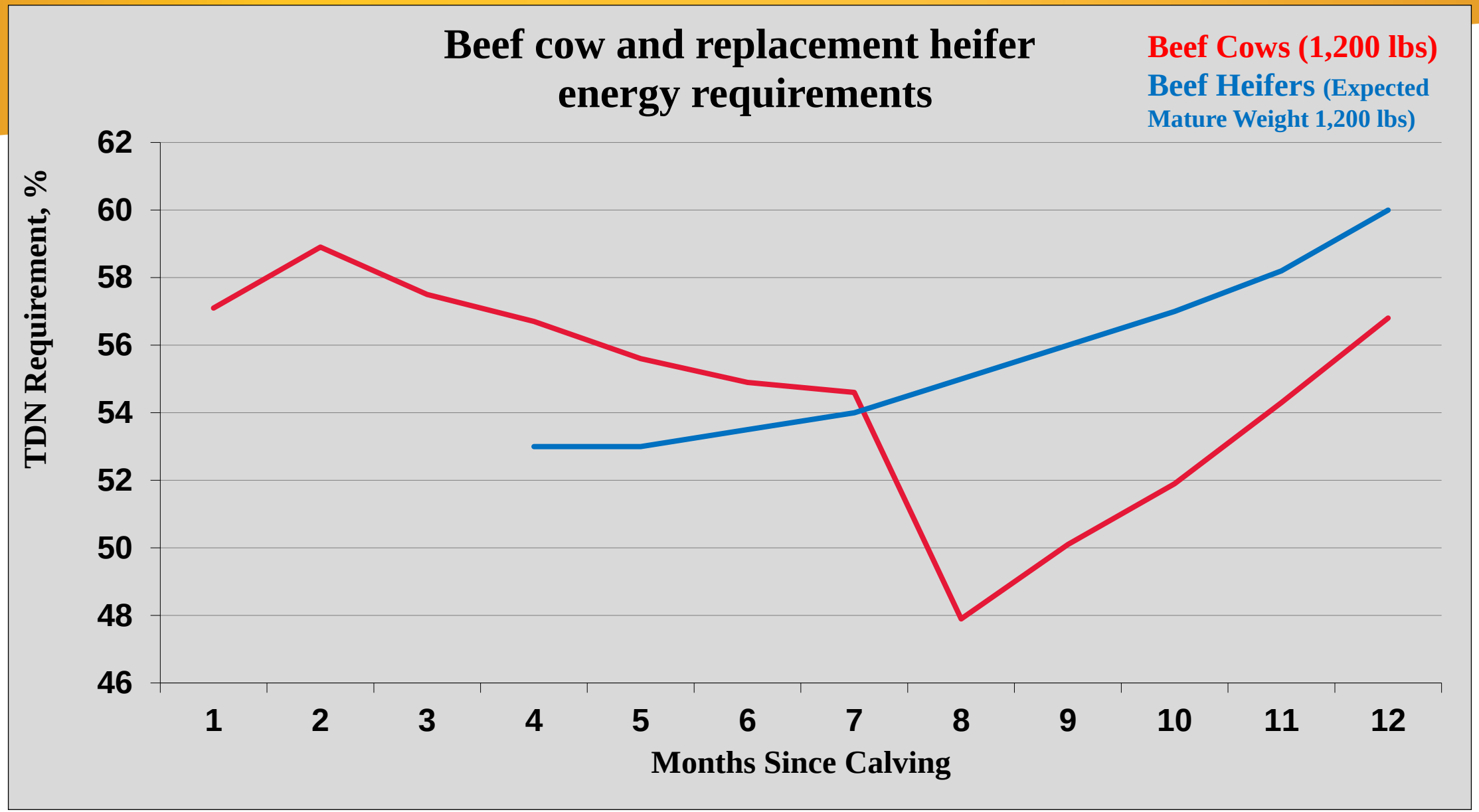
- Sample baled hay once cured for 17-21d.
  - Hay probe, not "grab samples."
- Sample in "lots" based on cutting, field, type of grass mix, rained on, etc.
  - 15 bales if lot is 30-40 bales.
- Place samples in large bucket, mix, then fill a zip-lock bag.
  - Label bag with your name, address, lot ID, and type of material in the bag.
- Moisture (DM), CP, Fiber, TDN.
  - Many basic tests include macrominerals (Ca).
  - Fairly inexpensive. $18.



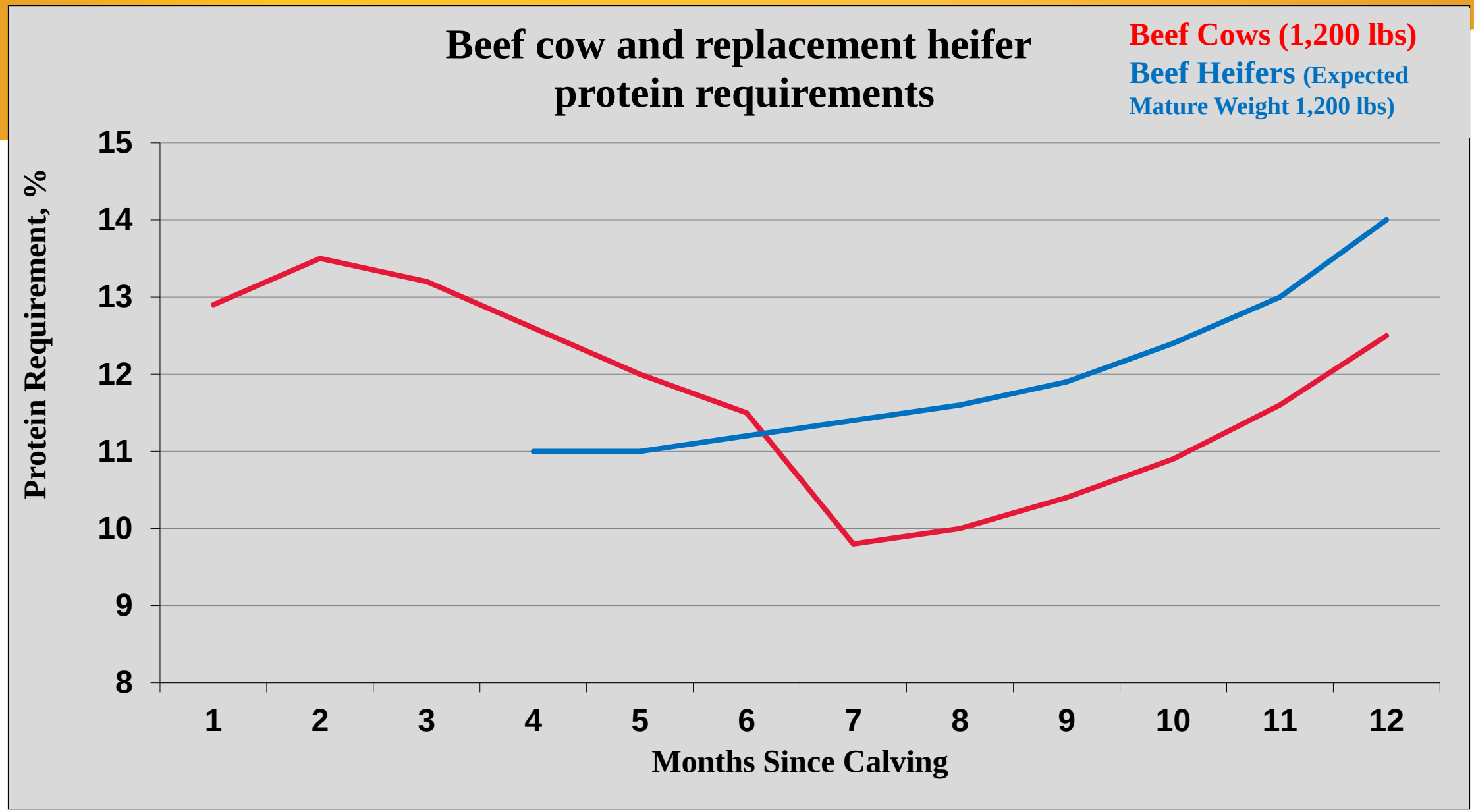
Forage Quality

Forage Quality	Crude Protein (%)	Total Digestible Nutrients (%)	Relative Feed Value (RFV)
High	>14	>55	110+
Moderate	10-14	51-55	81-110
Low	<10	<50	<80

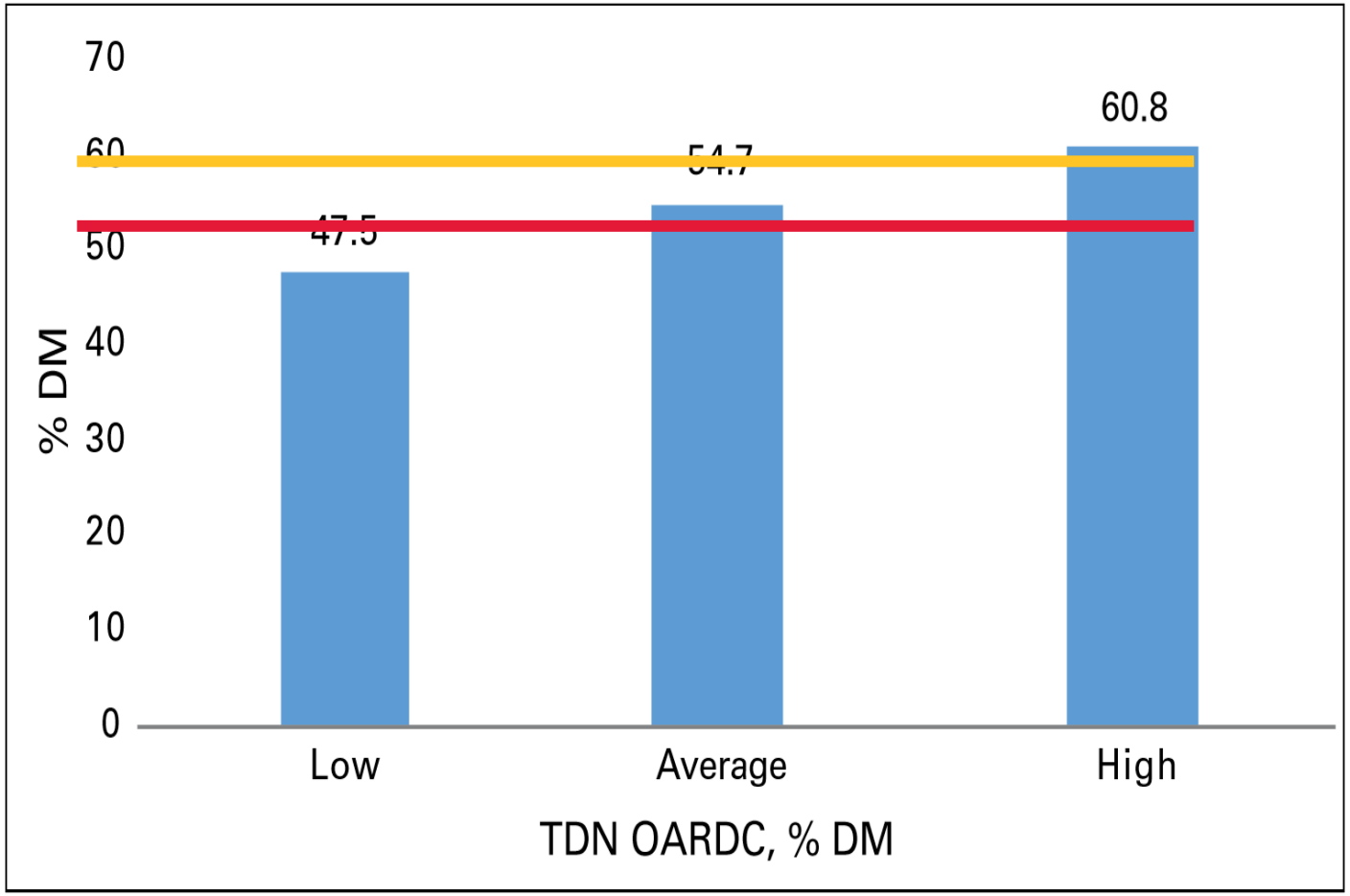
Beef cow and replacement heifer energy requirements



Beef cow and replacement heifer protein requirements



Hay Quality (84 Samples)



Early lactation requirement

Late gestation requirement

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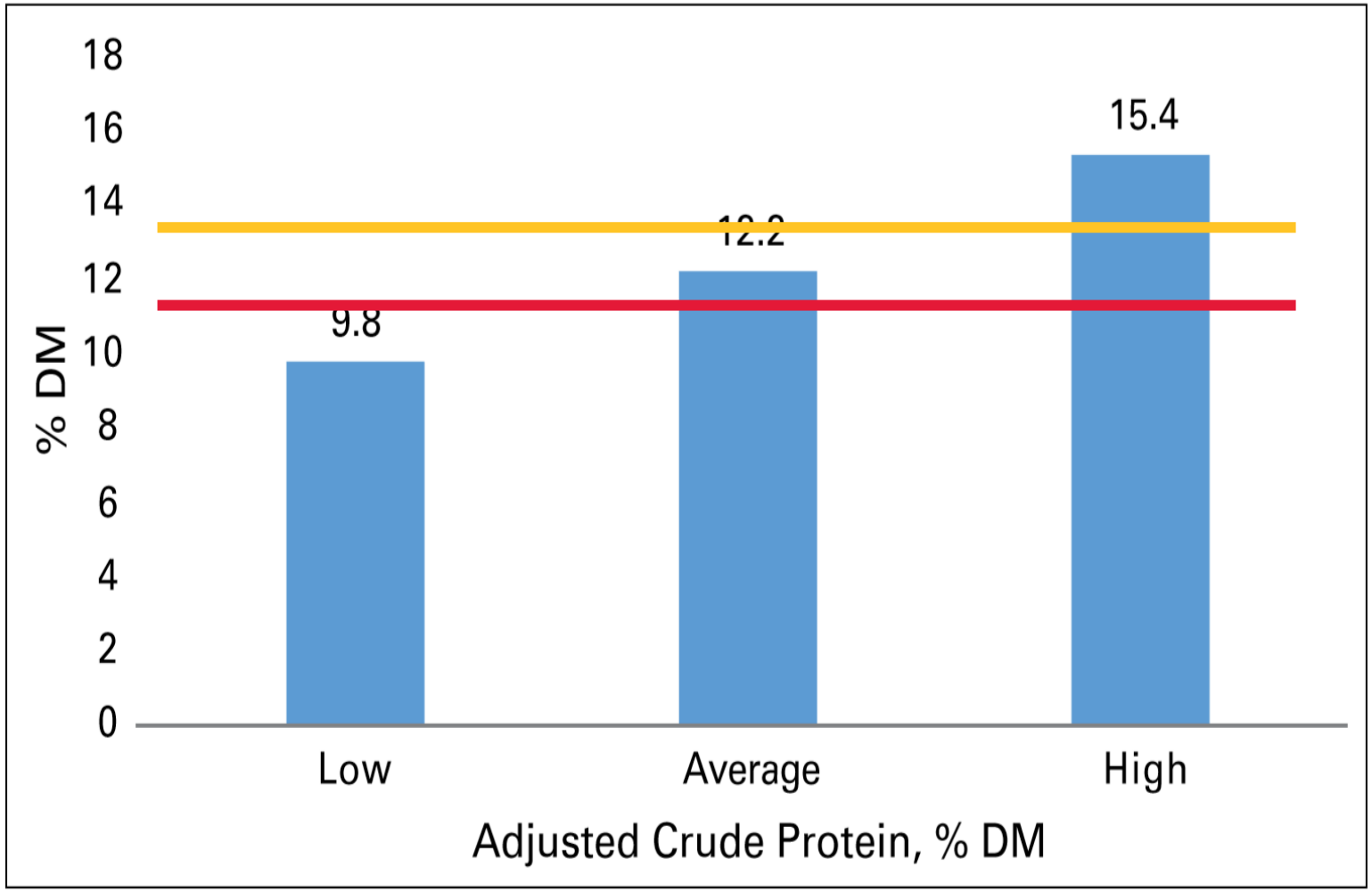

Early lactation requirement

Late gestation requirement

Estimated DMI as determined by forage quality % BW

Item	No Supplement	Supplemented with Protein	Supplemented with Energy
Dry, Gestating Cow			
Low Quality Forage	1.5	1.8*	1.5
Average Quality Forage	2.0	2.2*	2.0
High Quality Forage	2.5	2.5*	2.5
Lactating Cow			
Low Quality Forage	2.0	2.2*	2.0
Average Quality Forage	2.3	2.5*	2.3
High Quality Forage	2.7	2.7*	2.7

* These are good "Thumb Rules" when we don't have a forage analysis

Estimating DMI

- Hay analysis: 60% NDF, 12% CP, 52% TDN

These are constants

- 120 /NDF (60%)= 2.0% BW DMI (average and high-quality hay)
- 110 /NDF for low quality forages (CRP, stalks, straw)

- Example:
  - 1400 lb x .02 = 28.0 lb of hay
  - 28.0 lb x .12 = 3.36 lb of CP/d
  - 28.0 lb x .52 = 14.56 lb of TDN/d

Table 1.2. Nutrients requirements of breeding beef cattle (nutrient concentration in diet dry matter).[a]

Weight (lb)	Daily gain (lb/day)	DM intake (lb)	Protein (%)	Protein (lb)	TDN (%)	TDN (lb)	Ca (%)	P (%)
Dry pregnant mature cows—middle third of pregnancy								
800	0.0	15.3	7.1	1.1	48.8	7.5	0.17	0.17
900	0.0	16.7	7.0	1.2	48.8	8.2	0.18	0.18
1,000	0.0	18.1	7.0	1.3	48.8	8.8	0.18	0.18
1,100	0.0	19.5	7.0	1.4	48.8	9.5	0.19	0.19
1,200	0.0	20.8	6.9	1.4	48.8	10.1	0.19	0.19
1,300	0.0	22.0	6.9	1.5	48.8	10.8	0.20	0.20
1,400	0.0	23.3	6.9	1.6	48.8	11.4	0.20	0.20
Dry pregnant mature cows—last third of pregnancy								
800	0.9	16.8	8.2	1.4	54.5	9.2	0.26	0.20
900	0.9	18.2	8.0	1.5	54.0	9.8	0.27	0.21
1,000	0.9	19.6	7.9	1.6	53.6	10.5	0.26	0.20
1,100	0.9	21.0	7.8	1.6	53.2	11.2	0.26	0.21
1,200	0.9	22.3	7.8	1.7	52.9	11.8	0.26	0.21
1,300	0.9	23.6	7.7	1.8	52.7	12.5	0.26	0.21
1,400	0.9	24.9	7.6	1.9	52.5	13.1	0.26	0.21

CP: 3.36 lb/d
TDN: 14.56 lb/d

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Weight (lb)	Daily gain (lb/day)	DM intake (lb)	Protein (%)	Protein (lb)	TDN (%)	TDN (lb)	Ca (%)	P (%)
Cows nursing calves—average milking ability—first 3 to 4 months postpartum—10 lb milk/day								
800	0.0	17.3	10.2	1.8	58.2	10.1	0.30	0.22
900	0.0	18.8	9.9	1.9	57.3	10.8	0.28	0.22
1,000	0.0	20.2	9.6	2.0	56.6	11.5	0.28	0.22
1,100	0.0	21.6	9.4	2.0	56.0	12.1	0.27	0.22
1,200	0.0	23.0	9.3	2.1	55.5	12.8	0.27	0.22
1,300	0.0	24.3	9.1	2.2	55.1	13.4	0.27	0.22
1,400	0.0	25.6	9.0	2.3	54.7	14.0	0.27	0.22
Cows nursing calves—superior milking ability—first 3 to 4 months postpartum—20 lb milk/day								
800	0.0	15.7	14.2	2.2	77.3	12.1	0.48	0.31
900	0.0	18.7	12.9	2.4	69.8	13.1	0.41	0.28
1,000	0.0	20.6	12.3	2.5	67.0	13.8	0.39	0.27
1,100	0.0	22.3	11.9	2.6	65.2	14.5	0.38	0.27
1,200	0.0	23.8	11.5	2.7	63.7	15.2	0.36	0.26
1,300	0.0	25.3	11.2	2.8	62.6	15.9	0.36	0.26
1,400	0.0	26.7	11.0	2.9	61.7	16.5	0.35	0.26

CP: 3.36 lb/d
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Crude Protein Differences

- Scenario: You have 2 lots of hay tested. 1,400 lb Spring calving cows, in the 2nd trimester.
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$$\frac{\text{1.6 lb CP required}}{\text{.07 lb CP/lb of hay}} = \boxed{\text{22.9 lb}}\ \text{Hay DM Intake}$$

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- If you have 100 hd.
  - 5.6 lb AF * 100 hd = 560 lb of 7% hay per day increase to meet CP

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- If you have 100 hd.
  - 5.6 lb AF * 100 hd = 560 lb of 7% hay per day increase to meet CP
- If you have 300 hd.
  - 5.6 lb AF * 300 hd = 1,680 lb of 7% hay per day increase to meet CP

Crude Protein Differences

- What if our hay was even worse…. 5% CP DM Basis

Lot 3: 5% CP DM basis

$$\frac{\text{1.6 lb CP required}}{\text{.05 lb CP/lb of hay}} = \boxed{\text{32.0 lb}}\ \text{Hay DM Intake}$$

Crude Protein Differences

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Lot 3: 5% CP DM basis

$$\frac{\text{1.6 lb CP required}}{\text{.05 lb CP/lb of hay}} = \boxed{\text{32.0 lb}}\ \text{Hay DM Intake}$$

- 32 lb DM Basis / 0.9 DM = 36.0 lb AF
- (36 lb AF Intake / 1,400 lb BW) * 100 = 2.57% of BW she would have to consume just to meet her CP Requirement.
    - That 5% CP hay is very low quality and not very digestible.
    - She likely cannot consume enough to meet her requirements.
    - Thus, supplementation would be critical.

Corn vs. Protein Supplementation

- Thin cows grazing low quality forages…
  - Some producers want to ↑ E intake by supplementing corn.
  - Supp. corn on a forage-based diet can ↓ forage intake & digestibility.
    - ↑ starch alters the microbe population of the rumen.
- Dietary protein determines how this corn affects performance.
    - If protein req. is not met, supp. corn may ↑ BW loss compared to corn+protein, or protein alone.
- Supplementing protein improves nutrient flow from the rumen, forage digestibility, and forage intake.

Table 1. Late gestation body weight change of cows supplemented with corn only, corn and a protein supplement, or a protein supplement only

Item	Ear corn	Ear corn + protein	Protein
Initial BW, lb	1,155	1,151	1,155
Winter BW change, lb	-119	-40	13

Adapted from Sanson et al. (1990)

Corn vs. Protein Supplementation

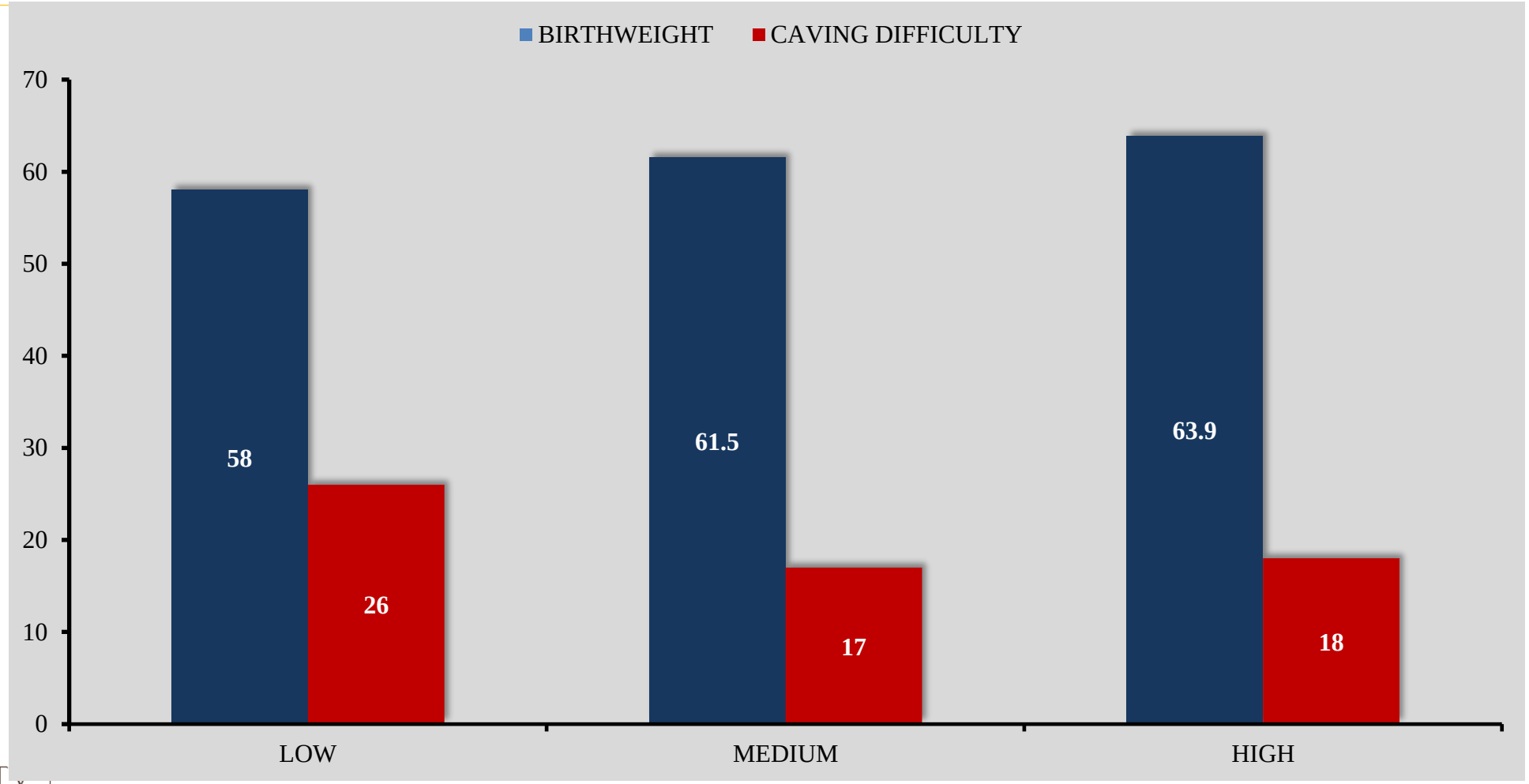
- Both protein and energy supplementation are needed if cows are thin.
    - Increase BCS
- Cows in an acceptable BCS, on low-quality forages can maintain or slightly increase BCS with just protein supplementation.
- Consider sorting off thin (≤ 4 BCS) and young cows.
    - Supplement separately and decrease overall feed costs.
    - Provide adequate protein and energy (Starch or Fiber).

- Corn is cheaper than protein supplements; however, the difference in $ can cause detrimental effects to your cow herd if protein requirements aren't met.

Dystocia caused by higher energy

"But I don't supplement my cows during late gestation because it increases birth weights and dystocia"

Impact of pre-calving energy level on calving difficulty and birth weight



Adapted from Laster, 1974

Pricing Supplements

- Break down the price of the whole supplement to determine the cost of the actual nutrient.
  - EX: Range Cubes – You want to know how much the protein in each supplement costs

20% CP Cubes	32% CP Cubes
90% Dry Matter	90% Dry Matter
$380/ton	$480/ton

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90% Dry Matter	90% Dry Matter
$380/ton	$480/ton

(2,000 lbs * 0.90 DM * 0.20 CP) = 360 lbs CP

($380 / 360 lbs CP) = $1.06/lb of CP

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20% CP Cubes 90% Dry Matter $380/ton	32% CP Cubes 90% Dry Matter $480/ton
(2,000 lbs * 0.90 DM * 0.20 CP) = 360 lbs CP ($380 / 360 lbs CP) = $1.06/lb of CP	(2,000 lbs * 0.90 DM * 0.32 CP) = 576 lbs CP ($480 / 576 lbs CP) = $0.83/lb of CP

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- While the price of the 32% is a bit of a sticker shock it is a better value ($/lb of CP)
  - You don't have to feed as much to meet your deficiency

Do I have to supplement everyday?

- Supplementing protein or E more frequently ↓ the potential for negative impacts on forage intake.
- NMSU:
  - Infrequent delivery of high protein cake resulted in no significant reductions to heifer performance.
    - 1 d/wk vs. 3 d/wk.
    - Transportation and labor costs ↓ by 60%.
  - E supplementation needs to be provided daily.
    - Infrequent supp. →decreased weight gain and conception rates.

Table 4. Comparison of supplementing the same amount of cottonseed cake (41% CP*) to yearling heifers once weekly versus three times weekly during the winter-spring dormant season of two consecutive years.

Component	Year 1		Year 2	
Time fed/week	1	3	1	3
Amount fed/feeding, lb/hd**	6.9	2.3	10.5	3.5
Protein fed/feeding, lb/hd	2.8	0.95	4.3	1.43
Number of heifers/treatment	43	40	27	18
Average initial weight, lb	495	495	502	491
Average daily gain, lb	0.50	0.47	0.34	0.37
Conception rate, %	93	90	89	89

*CP=crude protein

**hd=head

Adapted from Wallace and Parker 1992

Table 5. Comparison of grain cubes for energy supplementing yearling heifers either daily or twice weeklyfor 156 days during the winter-spring dormant season.

Component	Grain Cube (9.4% CP*)	
Time fed/week	2	7
Supplement fed, lb/hd**	6.4	1.8
TDN fed/feeding, lb/hd	5.34	1.52
ADG, lb/d	-.03	.14
Conception Rate, %	68	94
Supplement Cost, $/hd	$23	$23

*CP=crude protein

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Adapted from Wallace and Parker 1992

Take home message

- Know the condition of your herd.
    - Where they are going and what they need.
- Testing your hay is the only way to know what you have.
    - Use your resources strategically.
- Meeting requirements during peak performance stages is critical.
- Determine what nutrients your cows need!
    - Don't supplement something you don't need to… waste your $.
- Don't let cows get behind.
- Calculate supplement costs.

Thank You!

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