Using Cow Body Condition Score to Develop a Feeding Program
(Rush, 1991; Range Beef Cow Symposium XII)

We have a 1,300 lb cow that we scored as BCS 4 at weaning (Nov. 1st) and we want her to be at BCS 5 at calving (Feb. 1st). We are feeding her mature alfalfa hay (12% CP, 0.50 Mcal/lb NE_m, 0.12 Mcal/lb NE_g, 59% NDF) and 4 lbs of barley (13% CP, 0.92 Mcal/lb NE_m, 0.62 Mcal/lb NE_g). The following worksheet will help us to determine if our feeding program will allow her to gain the body condition we want her to by calving (1 BCS).

1. Determine weight gain needed by cow for BCS change. An average of 80 lb gain is needed for each condition score change. (An additional 100 lb gain of the fetus will occur)
(Number of BCS changes x 80 lb) = Weight gain needed to change BCS, lb
(Weight gain to change BCS, lb) + (100 lb) = Total weight gain needed, lb

1 BCS change x 80 lb = 80 lb gain needed to change BCS
80 lb + 100 lb = 180 lb total weight gain needed

2. Determine the average weight of the cow (not including fetal weight) during the feeding period (this will be used to determine the maintenance requirements).
[(Current wt, lb) + (Gain needed to change BCS, lb + Current wt, lb)] / 2 = Average cow wt, lb

[(1,300 lb) + (80 lb + 1,300 lb)] / 2 = 1,340 lb

3. Calculate ADG (not including fetal wt gain). (Wt gain needed, lb) / (Days to calving) = ADG

(80 lb) / (Nov. 1st to Feb. 1st; 92 days) = 0.87 lb

4. Determine the daily NE_m required (Mcal/day) for the cow (based on average body weight **not** including fetal weight; Table 1).

From question #2; Her average weight (without the fetus) will be 1,340 lb, so we'll use 1,350 lb in Table 1; her NE_m requirement is 9.48 Mcal/day

5. Locate daily NE_c required (Mcal/day) for fetal growth (used if during last trimester of gestation; Table 1).

Nov. 1st to Feb. 1st is the last trimester of gestation, so we need to identify the NE_c requirement from Table 1; 2.15 Mcal/day

6. Locate daily NE_l required (Mcal/day) for lactation (used if during lactation; Table 1).

She will not be lactating, so we will not use the NE_l requirement.

7. Determine total daily NE_m requirement (Mcal/day) for the cow by adding NE_m, NE_c & NE_l.

From questions #4 and #5; NE_m + NE_c = 9.48 Mcal/day + 2.15 Mcal/day = 11.63 Mcal/day

8. Determine the NE_g requirement per pound of weight gain needed (Table 2).
[(NE_g at original BCS, Mcal/lb) + (NE_g at target BCS, Mcal/lb)] / 2 = NE_g, Mcal/lb wt gain

Cows in lower body condition are more efficient at gaining weight, and therefore need less energy per lb of weight gain (See Table 2). As she increases in body condition, she becomes less efficient and the amount of energy needed to put on weight increases.

She is originally at a BCS 4 and her target BCS is a 5. From Table 2:
[(1.73 Mcal/lb) + (2.30 Mcal/lb)] / 2 = 2.02 Mcal/lb

9. Determine the daily NE_g requirement for the cow.
(ADG needed, lb) x (NE_g, Mcal/lb weight gain) = NE_g requirement, Mcal/day

From questions #3 and #8; 0.87 lb x 2.02 Mcal/lb = 1.76 Mcal/day needed to gain body condition

10. Calculate the NE_m and NE_g values (Mcal/lb) of the ration to be fed.

Given in the introduction; Mature alfalfa hay (0.50 Mcal/lb NE_m, 0.12 Mcal/lb NE_g, 59%NDF), 4 lbs of barley (13% CP, 0.92 Mcal/lb NEm, 0.62 Mcal/lb NEg)
Use hay NDF to estimate DM forage intake: 120/59 = 2.03% of BW(use her average total BW with the fetus to determine intake).
[(1,300 lb) + (1,300 lb + 80 lb + 100 lb)] / 2 = 1,390 lb
1,390 lb x 0.0203 = 28.2 lb forage DM
Total intake = 28.2 lb forage + 4 lb barley = 32.2 lb
(28.2 lb forage / 32.2 lb total) x 100 = 87.58% forage
100 – 87.58% = 12.42% supplement
(0.8758 x 0.50 Mcal/lb NE_m) + (0.1242 x 0.92 Mcal/lb NE_m) = 0.55 Mcal/lb NE_m
(0.8758 x 0.12 Mcal/lb NE_g) + (0.1242 x 0.62 Mcal/lb NE_g) = 0.18 Mcal/lb NE_g

11. Calculate the amount of ration needed per day to meet maintenance requirements.
(Total daily NE_m requirement, Mcal) / (NE_m in ration, Mcal/lb) = lb ration for maintenance

From questions #7 and #10; (11.63 Mcal) / (0.55 Mcal/lb) = 21.1 lb/day for maintenance

12. Calculate the amount of ration needed per day to meet the gain requirements.
(Total daily NE_g requirement, Mcal) / (NE_g in ration, Mcal/lb) = lb ration for gain

From questions #9 and #10; (1.76 Mcal) / (0.18 Mcal/lb) = 9.8 lb/day for gain

13. Calculate total amount of ration needed per day.
(lb ration for maintenance) + (lb ration for gain) = total amount of ration per day, lb

From questions #11 and #12; (21.1 lb) + (9.8 lb) = 30.9 lb total diet needed

14. Evaluate if this is within the cow's intake limit by calculating predicted possible intake using Intake, %BW = (120 / %NDF) and her average body weight including the fetus.

From introduction; (120 / 59) = 2.03% BW is predicted hay intake
From question #10, total intake = 32.2 lb
From question #13, 30.9 lb total diet needed is within her predicted intake of 32.2 lb

15. Based on her predicted intake, her performance can be predicted. Calculate the amount of ration left over for gain (after maintenance requirements are met). (DM intake, lb/day) - (lb ration for maintenance) = lb ration left for gain

From questions #14 and #11; (32.2 lb predicted intake – 21.1 lb for maintenance) = 11.1 lb left for gain

16. Calculate NE_g available for gain per day.
(lb ration left for gain) x (NE_g in ration, Mcal/lb) = NE_g available for gain, Mcal/day

From question #15 and #10; (11.1 lb x 0.18 Mcal/lb) = 2.0 Mcal/day NEg available for gain

17. Calculate the predicted gain. (Use NE_g, Mcal/lb wt gain found in #8)
(NE_g available for gain, Mcal) / (NE_g, Mcal/lb wt gain) = predicted gain, lb/day

From questions #16 and #8; (2.0 Mcal) / (2.02 Mcal/lb) = 1.0 lb/day predicted gain

18. Estimate condition score change.
(Predicted ADG, lb/day) x (days until calving) = gain, lb (not including fetal wt)
(Gain, lb) / 80 = condition score change

From questions #17 and #3; (1.0 lb/day) x (92) = 92.0 lb gain
(92.0 lb gain) / (80 lb/BCS) = 1.15 BCS
Based on our calculations, she will gain a little more than 1 BCS.

Table 1. Net energy requirements of mature beef cows.

Cow wt, lb	1000	1050	1100	1150	1200	1250	1300	1350	1400
NE_m, Mcal/day	7.57	7.86	8.13	8.41	8.68	8.95	9.22	9.48	9.75
NE_c, Mcal/day for fetal growth[a]	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15
NE_l, Mcal/day average milk[b]	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
NE_l, Mcal/day superior milk[b]	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80

[a] Energy required for the fetus during the last trimester of gestation, a weight gain of 0.9 lb/day.
[b] Energy required to support lactation. Average milk is 10 lb of milk/day; superior milk is 20 lb/day. Calculated as lb of milk x 0.34 Mcal/lb. This is added to NE_m during lactation.

Table 2. Net energy for gain (NE_g) in cows of varying body condition.

Body condition score	NE_g Mcal/lb of weight gain
2	1.17
3	1.73
4	1.73
5	2.30
6	2.87
7	2.87
8	3.44