# RESPONSIVENESS OF BEEF COW BODY CONDITION TO ENERGY SUPPLEMENTATION

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## Story in Brief

Seventy-two crossbred beef cows in mid gestation were randomly assigned to four levels of supplement to evaluate the effects of supplemental energy on cow body condition. Cows were held in drylot for the duration of the 70-day trial (March 26 to June 6) and allowed free choice access to round bales of native grass hay (4.9% protein). Supplements were formulated using soybean meal and soybean hulls to provide graded levels of energy (1.2, 2.3, 3.4, 4.4 lb total digestible nutrients/day) with constant protein intake (.70 lb protein/day). Cow weight (24 hour fast), body condition score (1-9 scale) and hay consumption on a pen basis were recorded. Cow weight was not significantly affected by increased supplemental energy. Body condition score (BCS), however, increased (.08, .24, .34, .37 units) as supplemental energy increased. Thin cows (<4.5 BCS) appeared to gain body condition more rapidly than fat cows (>4.5 BCS). It is important to note that feeding as much as 4.4 lb of supplemental energy per day increased body condition only slightly (.37 units) during the course of this 70-day trial. Thus, normal energy supplementation (2-4 lb total digestible nutrients/day) may not be adequate to return thin cows to optimal body condition between weaning and calving.

(Key Words: Beef Cattle, Body Condition, Energy, Supplementation, Native Grass.)

## Introduction

Spring calving beef cows grazing dormant native grass (<4% CP) require proper supplementation to maintain body condition through the winter. Cows entering the winter in poor body condition may need to be reconditioned to avoid rebreeding problems and reduced calf gains. Normal supplementation

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(1-2 lb 40% CP/day) may not be adequate to increase body condition of thin cows. Under these conditions, supplemental TDN is required.

High energy range supplements (20% CP) frequently contain large amounts of corn or other high starch cereal grains that may seriously inhibit forage utilization. With corn supplementation, forage intake and digestibility were decreased to the extent that the total energy intake of cows was not improved (Hibberd et. al., 1986). Digestible fiber feeds such as soybean hulls have been shown to have less detrimental effects on forage intake and digestibility than cereal grains (Martin and Hibberd, 1990). Thus, digestible fiber feeds may provide a useful alternative to cereal grains when range cows need supplemental energy.

A net energy system for beef cows is currently being developed (Buskirk et al., 1992) based on net energy for maintenance ($NE_m$) and net energy for weight change ($NE_\Delta$). This system will replace the TDN system currently used to formulate range supplements and is an improvement because it more accurately defines the energy requirements of cows in different body condition. This system should allow producers to formulate feeding programs that will allow cows to reach a target body condition. The objective of this trial was to determine the responsiveness of cow body condition to supplemental energy and to evaluate the accuracy of the $NE_\Delta$ system for beef cows fed low quality native grass hay.

## Materials and Methods

Calves were weaned from 72 fall-calving crossbred beef cows on March 19, one week before the start of this trial, in an attempt to mimic a post-weaning spring calving herd. Cows were randomly allotted to one of four supplements based on initial body condition score. Pelleted supplements were formulated from soybean meal and soybean hulls (Table 1). Protein concentration declined as feeding rate increased in an attempt to equalize supplemental CP intake at approximately .70 lb/day. Dicalcium phosphate, trace mineralized salt, and Vitamin A-30 were added to meet NRC (1984) requirements for calcium, phosphorus, and vitamin A. In addition, sodium sulfate was included to maintain a supplemental nitrogen:sulfur ratio of 12:1. Cows were individually fed their respective weekly allotment of supplement in five feedings (M, T, W, F, S).

The basal diet consisted of round bales of native grass hay fed free choice in round bale feeders. All bales were weighed and core sampled prior to feeding. Cumulative bale DM weight was regressed against time to estimate hay intake on a pen basis. Crude protein content of the hay was 4.9%.

Cows were fed soybean meal for 5 days prior and 5 days following the study to equalize fill. Initial and final weights (24-h fast) were used to

**Table 1. Feed composition, feeding rate and nutrient supply of supplements.**

| Item | Treatment 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Supplement composition (%, DM basis) | | | | |
| Soybean meal | 91.20 | 30.99 | 10.39 | |
| Soybean hulls | | 63.17 | 84.73 | 95.64 |
| Molasses | 3.00 | 2.99 | 3.01 | 3.00 |
| Dicalcium phosphate | 1.37 | .57 | .31 | .15 |
| TM salt[a] | 3.59 | 1.83 | 1.23 | .92 |
| Sodium sulfate | .72 | .40 | .29 | .25 |
| Vitamin A (30,000 IU/g) | .12 | .06 | .04 | .03 |
| Feeding rate | | | | |
| lb DM/day | 1.5 | 3.0 | 4.5 | 6.0 |
| Nutrient content (% DM basis) | | | | |
| CP[b] | 45.2 | 26.1 | 19.6 | 16.1 |
| TDN[c] | 78.8 | 75.6 | 74.4 | 73.9 |
| Nutrient supply (lb/day) | | | | |
| CP[b] | .68 | .77 | .86 | .97 |
| TDN[c] | 1.2 | 2.3 | 3.4 | 4.4 |

[a] Trace mineralized salt contained 92% NaCl, .25% Mn, .20% Fe, .033% Cu, .007% I, .005% Zn, and .0025% Co.
[b] Actual analysis.
[c] Estimated from NRC (1984).

evaluate treatment effects over the entire trial. Body condition score (1=emaciated, 9=obese) was evaluated by three independent observers.

Cow weight change and body condition change were analyzed by least squares procedures with treatment and initial cow body condition score (covariate) included in the model. Orthogonal polynomials were used to evaluate treatment responses.

## Results and Discussion

Hay intake increased with added supplemental TDN and peaked with 3.4 lb TDN (Figure 1). Hay intake was decreased with 4.4 lb of supplemental

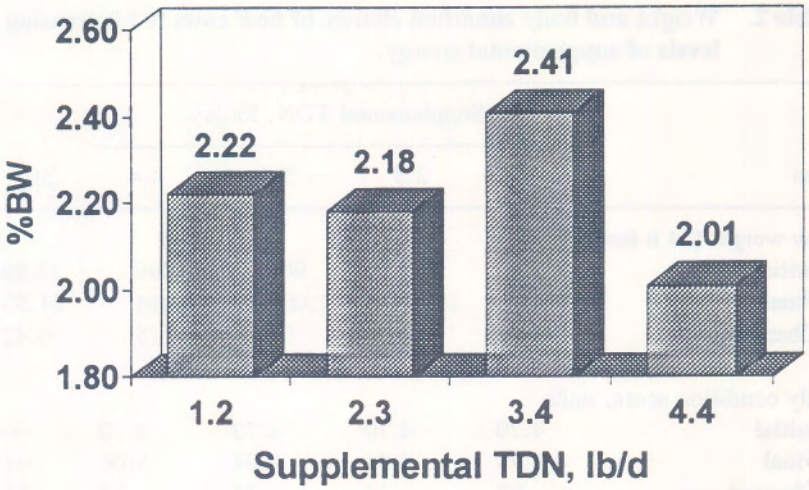


**Figure 1. Effect of supplemental energy on hay intake (% BW) by gestating beef cows.**

TDN indicating substitution of supplement for hay. These results agree with Martin and Hibberd (1990) in that soybean hulls do not reduce forage intake until the feeding rate exceeds 6 lb/day.

Cow weight change was not affected by level of supplemental TDN (Table 2). Cow body condition, however, was increased (linear, P=.0002) as supplemental energy increased. It is not clear why body condition increased while body weight did not. It is important to note that the largest increase in body condition was only .37 units during the course of this 70-day trial. Thus, substantial quantities of energy (4.4 lb TDN/day) produced marginal improvements in body condition. When cows were sorted by initial body condition score it was noted that thin cows (BCS $<4.5$) appeared to gain body condition more rapidly than fatter cows (BCS $>4.5$, Figure 2).

A program that computerized the $NE_{\Delta}$ system was developed at Kansas State University. This program was utilized to calculate predicted body condition change based on the level of supplemental TDN that was fed (Table 3). Although the general trends were similar, predicted changes in body condition score slightly overestimated the actual changes that were observed.

These results suggest that it may be very difficult to substantially increase body condition of beef cows, in a restricted time period using normal supplementation rates (2-4 lb of supplemental TDN/day). Since thin cows (BCS $<4.5$) showed a greater response to supplemental energy, sorting cows by body condition into feeding groups may prove to be beneficial and economical.

**Table 2. Weight and body condition change of beef cows fed increasing levels of supplemental energy.**

| Item | Supplemental TDN, lb/day | | | | SE |
|---|---|---|---|---|---|
| | 1.2 | 2.3 | 3.4 | 4.4 | |
| Cow weight (24 h fast), lb | | | | | |
| Initial | 908 | 913 | 904 | 899 | 19.39 |
| Final | 1,011 | 1,027 | 1,002 | 1,014 | 21.50 |
| Change | 103 | 114 | 98 | 115 | 6.42 |
| Body condition score, units | | | | | |
| Initial | 4.70 | 4.70 | 4.70 | 4.70 | .00 |
| Final | 4.78 | 4.94 | 5.04 | 5.06 | .05 |
| Change[a] | .08 | .24 | .34 | .37 | .05 |

[a] Linear response to level of supplemental TDN (P=.0002).

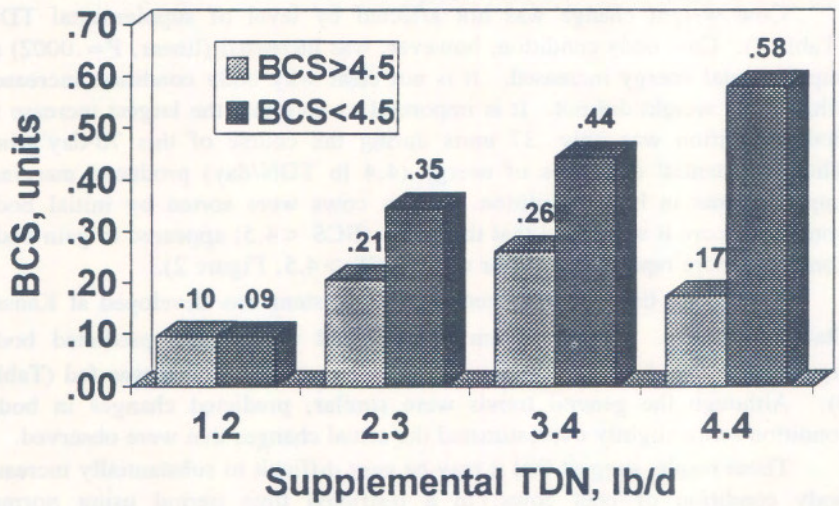


**Figure 2. Responsiveness of fat (>4.5 BCS) and thin (<4.5 BCS) cows to graded levels of supplemental energy.**

**Table 3. Comparison of predicted[a] vs actual body condition change (BCS units) due to level of supplemental energy.**

| TDN lb/day | Predicted[a] | Actual |
|---|---|---|
| 1.2 | .19 | .08 |
| 2.3 | .30 | .24 |
| 3.4 | .69 | .34 |
| 4.4 | .52 | .37 |

[a] Predicted using the $NE_{\Delta}$ system.

## Literature Cited


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