



**Vol 1. #8.** Good afternoon. With fall rapidly approaching, ranchers often have questions on supplementation strategies. The following is a brief review of the literature summarizing animal performance, behavior and consumption of various forms of self fed supplements. Have a good week. JP

### Self-fed Supplements for Range Cattle

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#### Background

During the late summer and early fall months, range grasses are deficient in both crude protein and energy for cows in lactation. Because of limited forage quantity and (or) quality, supplemental feeding of protein-energy, minerals and vitamins is practiced by the producer. Nationally, the USDA estimated that ninety four percent of cattle producers utilized pasture or crop residues, while 83% fed hay from November to March and, 49% provided supplements.

The overarching goal of supplementing beef cattle is to provide nutrients that are lacking in the basal diet and to increase the intake and digestibility of lower quality forages and crop residues. It is evident that reproduction is impacted the most by nutrient deficiencies. Table 1 partially summarizes the consequences of inadequate intake of energy, protein, vitamins and minerals by beef cattle and lays the foundation as to why supplementation is often necessary.

Table 1. Influence of Inadequate Dietary Nutrient Intake on Reproduction in Beef Cattle (Bearden And Fuquay, 1992)

Nutrient Consumption	Reproductive Consequence
Inadequate Energy Intake	Delayed puberty, suppressed estrus and ovulation, suppressed libido and spermatozoa production
Inadequate protein intake	Suppressed estrus, low conception, fetal resorption, premature parturition, weak offspring
Vitamin A deficiency	Impaired spermatogenesis, anestrus, low conception, abortion, weak offspring, retained placenta
Phosphorus deficiency	Anestrus, irregular estrus
Selenium deficiency	Retained placenta
Copper deficiency	Depressed reproduction, impaired immune system, impaired ovarian function
Zinc deficiency	Reduced spermatogenesis

Commercially available self-fed products are nutritionally balanced to provide not only supplemental protein but also vitamins, and macro- and trace-minerals. Self-fed supplements can be provided in several different forms such as liquid, pressed blocks, chemical blocks and low moisture blocks. Although the supplements would be purchased in order to provide additional dietary crude protein, these supplements also provide macro- and trace-minerals and vitamins. Depending on the ranchers' specific requirement, supplements can also be formulated to provide additional ingredients such as fats, ionophores, coccidiostats, complexed minerals, and antibiotics.

Sawyer and Mathis from New Mexico State University attempted to further determine which supplemental protein delivery system would be selected by a rancher based upon (A) formulation cost, (B) labor and delivery costs or (C) flexibility in feeding location (Table 2). The authors ranked a dry supplement delivery supplement number one when considering cost

of formulation and flexibility in feeding location but liquid feeds were ranked number one when labor and delivery costs were a major concern by the producer.

Table 2. Ranking (1=Best) of Different Forms of Supplement Delivery Systems Based on Three Criteria (Sawyer And Mathis, 2000 )

A. Flexibility of least cost formulation	B. Labor and delivery costs	C. Flexibility in feeding location
1.Cubes or meals	1.Liquid feeds, dealer filling feeders	1. cubes
2.Pressed blocks	2.Hardened molasses blocks	2. Small package meals
3.Hardened molasses Blocks	3.Small package meals (e.g. minerals)	3. Blocks (any type)
4. Liquid feeds	4.Pressed blocks	4. Liquids
	5.Hand-fed cubes	5. Large package meals (protein or energy)

Results of a survey conducted by King and others from Montana showed that approximately 76% of ranchers balanced their cattle rations using either published or analyzed values and 91% provided a supplement. Ranked from most purchased to least purchased were: 1) dry supplement; 2) tub supplement; 3) alfalfa or grass hay; 4) grain only; 5) liquid supplement and 6) a coproduct feedstuff. When these ranchers were asked who assisted them in making nutritional decisions, they ranked in order the: 1) extension agent or specialist; 2) feed salesperson or retailer; 3) producer magazines, books or newsletters; 4) veterinarian; 5) private nutritionist or 6) other producers .

A summary derived from numerous experiments at Kansas State University showed that supplements containing between 25 and 35% crude protein were most effective for stimulating forage consumption (Table 3).

Table 3. Average forage intake response to supplements containing various concentrations of crude protein (McCollum, 1997)

Supplement crude protein content, %	Intake response, %
Less than 15	+9
15 to 20	+23
25 to 35	+60
Greater than 35	+36
Overall average	+33

Kansas State workers compared two levels of CP (14.4 vs. 27.5%) in a cooked molasses block and found that gains were better when heifers consumed the 27.5% protein block compared to the 14.4% protein block or no block on a prairie grass hay based diet (Table 4). Similarly, forage intake was highest for heifers supplemented with the high protein block.

Table 4. Effects of supplementation with a cooked molasses block containing either 14.4 or 27.5% CP on intake and performance of growing heifers fed prairie hay ad libitum (Titgemeyer et al. 2004)

Item	No supplement	14.4% CP block	27.5% CP block
Heifer daily gain,lb	.11 <sup>a</sup>	.24 <sup>a</sup>	.46 <sup>b</sup>
Forage intake, lb/d	15.22 <sup>ab</sup>	14.72 <sup>b</sup>	16.08 <sup>a</sup>
Block intake, lb/d	-	.81 <sup>a</sup>	.92 <sup>b</sup>
Total intake, lb/d	15.22 <sup>b</sup>	15.53 <sup>b</sup>	17.00 <sup>a</sup>

<sup>a,b</sup> Means without a common superscript differ (P< 0.05)

Recent research from Oregon State University showed that supplements containing urea or biuret as the primary source of supplemental N could be effectively used by cows consuming low-quality forage, even when provided every other day (Table 5). Supplemented animals gained more weight prior to calving than nonsupplemented animals. There were no effects of supplementation or source of supplemental NPN on calf birth weights.

Table 5. Effects of nonprotein nitrogen (NPN) source and supplementation frequency on cow performance and calf birth weight (Currier et al., 2004)

Item	Control	Urea-daily	Urea-every other day	Biuret-daily	Biuret-every other day	Significance
Wt. change, lb						Supplemented animals gained more weight (pre) or lost less weight (post) than controls
Pregalving	22	68	73	77	73	
Postgalving	-88	-29	-42	-13	-31	No effect due to supplementation, NPN source or frequency
Calf birth weight, lb	81	84	86	81	84	

### Self-Fed Supplements and Grazing Distribution

Bailey and others (2003) showed that low moisture blocks could be used to improve the uniformity of grazing on rangeland compared to hand-feeding of range cake. Consumption of the low moisture block was approximately one half that of the hand fed supplement (.70 vs. 1.69 lb/day), yet daily gains and body condition scores were similar at the end of the experiment which began in October and ended in January (Table 6). It was reported for this study that the range cake cost \$187/ton compared to \$578/ton for the low moisture block. Rancher travel was 50 miles per feeding (3X/week for range cake vs. every two weeks for low moisture block).

Results of this study showed that cows spent more time near the low moisture blocks and grazed higher terrain compared to cows which were handfed the range cake. Although the cost of the range cake was significantly lower than the low moisture block, travel and labor costs were much higher for the range cake. The total costs of supplementation favored the block (\$.09/day) compared to the range cake (\$.24/day).

Table 6. Daily gain, body condition score change and cost of supplementing either low moisture block or handfed range cake from October to January for cows in Northern MT (Bailey, 2003)

Trait	Low moisture block	Handfed range cube	P-value
Initial wt., lbs	1346	1364	0.80
Daly gain	.91	.86	0.70
Initial BCS	5.8	5.8	0.60
Change in BCS	0.40	0.50	0.60
Costs of supplementation/day,\$			
Supplement	.20	.16	
Travel	.03	.10	
Labor	.06	.14	
TOTAL	\$.29	\$.40	

When Bailey was at Montana State Universities Northern Ag Research Station near Havre, he also showed that self-fed molasses-based supplements could be used to lure animals to graze areas that typically receive little use. In another study reported by Bailey (2004), he showed that terrain use by dry cows fed low-moisture blocks or liquid supplement in lick-wheel tanks were similar. Supplement consumption was higher for the liquid, but weight gains were similar between treatments. Cows spent similar amounts of time within 600 yards of both supplement types and the number of visits to the supplements were likewise similar (Table 7).

Table 7. Consumption and Performance of Dry Cows Supplemented with Either Low Moisture Blocks or Liquid Supplement in Northern MT (Bailey, 2004)

Item	Low Moisture Block	Liquid Supplement
Supplement consumption, lb/day (DM Basis)	.61 <sup>a</sup>	1.77 <sup>b</sup>
Weight change, lb (Oct-Dec)	-12	-35
Visits/day to supplement	1.82	2.18
Percent of days supplement was visited	56.0	77.1
Total time within 600 yards of supplement, min/day	710	876

<sup>a,b</sup> P<0.05

### Summary

- The constant challenge for the cow calf producer is to match forage nutrients with animal requirements. Often, because there is not synchrony between these two as well as conditions of drought, supplemental feedstuffs are required to maintain productivity (lactation, body condition, growth of the calf). It has been shown that diets low in protein have resulted in weak calves at parturition. A forage and water analysis is critical in determining how well the forage resource meets the nutrient requirements of the gestating cow and replacement heifer.
- Producers often provide self-fed supplements to prevent a decline in reproduction caused by inadequate forage quantity and/or quality.
- Self-fed supplements are provided in a variety of forms. Usage depends upon issues such a flexibility of formulation, labor and delivery cost and placement limitations in a pasture or on range.
- When travel and labor costs are included in the total cost of a supplementation program, self-fed supplements can be less expensive than hand-fed supplements.
- Higher protein supplements (~30%) consistently increase intake and digestibility of lower quality forage.

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