AN211

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Nutritional Management of Bulls[1]

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Introduction

Breeding bulls, purchased or home-raised, are large capital investments. However, the bull is often the nutritionally forgotten or most marginalized component of the beef cattle enterprise. This is unfortunate because proper bull management, particularly nutrition, is vital to ensure the long-term viability of the beef cattle enterprise. The bull contributes one-half of the genetics to each calf crop; without a functional bull the breeding season success and subsequent calf crop could be jeopardized. Therefore, proper and adequate nutritional management of herd bulls is paramount to the breeding season success and economic viability of the beef enterprise. Nutritional management of the herd bull necessitates planning to ensure success. In light of the tightening of feed supplies, adequate planning is both nutritionally and financially imperative.

Nutritional Management of Beef Bulls

There are a number of well defined nutritional periods during a bull's life.

1. Pre-pubertal – pre-weaning
2. Pre-pubertal – post-weaning to 30-60 days pre-breeding
3. Conditioning prior to the breeding season
4. Management during the breeding season
5. Management after the breeding season

Pre-weaning

During this period the bull is at the dam's side and nutrition during this period is generally adequate to ensure normal growth and development. Exceptions would be indicated when the dam's nutritional environment limits milk production. Creep feeding of potential herd sire bulls is utilized in some instances. Currently, there is little or no data that have evaluated the long-term effects of creep feeding on bull performance.

Post-weaning

This period of nutritional development should allow the bull to grow at nearly full genetic potential. The nutritional design of many growing programs or bull test station diets is a concentrate-based, low-roughage, high energy diet. The goal of this

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period is to grow the bulls rapidly, but avoid excessive fat development. The nutritional program should also be designed to avoid digestive upsets or affect soundness. The high-energy, high-plane of nutrition also stimulates the onset of puberty particularly in later maturing breeds. Adequate research indicates that either under- or over-nutrition during this period can have detrimental effects on bull development, attainment of puberty, and semen quality. Well-designed bull test diets or purebred bull breeders with sound development programs should allow bulls to express their growth potential without any deleterious effects on future performance. The basic nutrient requirements of growing bulls are listed in Table 1.

Conditioning prior to the breeding season

This period is the most important next to the development phase, but that could be debated. Not only do growing bulls need this conditioning period, but mature bulls also need to be conditioned before entering service during the breeding season. Growing bulls generally have just gone through the development phase which consisted of a high-energy concentrate-based diet. As such, these bulls need to be cycled down from that high plane of nutrition. That means there needs to be a transition from the test diet or development diet to a conditioning or maintenance diet that is often forage-based. The transition to a forage-based diet often occurs when the bulls are losing their teeth (at approximately three years of age), compounding the stress of the diet transition. The conditioning period should be around 60 days. This time frame should allow adequate time for the bulls to adjust to a new diet. For well-conditioned bulls this time frame will allow bulls to moderate their fat cover and “harden up”, likewise thin bulls will have adequate time to increase their body condition if required. Additionally, the 60-day time frame provides adequate time for the sperm population to turnover and quality sperm to develop prior to the bull entering breeding service. The bull should enter the breeding season with a body condition score of 5.5 to 6.5 (9 point scale). This body condition provides the bull adequate body reserves to draw upon during the defined breeding season.

Nutrition during the breeding season

The nutritional environment during this period is almost always the same as the cow herd. Therefore special nutritional attention for bulls is nearly impossible. As a result, the conditioning period prior to initiation of the breeding season becomes all the more important. During the breeding season, bulls can lose from 100-400 lbs of bodyweight which equates to a loss of 1 to 4 units of body condition score. The amount of bodyweight and body condition loss will be influenced by the age of the bull, prior body condition, length of the breeding season, level of activity experienced by the bull, and breed type of the bull. Young bulls and terminal sire type bulls in the Gulf Coast environment will generally lose more body weight and condition during the breeding season compared to older or maternal type bulls in the Gulf Coast environment.

Nutrition after the breeding season

After the breeding, season bulls generally will need some attention to restore their bodyweight and body condition. The amount of bodyweight and body condition that needs to be replaced can be considerable depending upon how much bodyweight and body condition the bull mobilized. A 2,000 lb bull that loses 200 lbs could require up to 1,200 lb of 65% TDN feed to fully regain all of the bodyweight that was lost. As mentioned previously, young bulls and terminal sire type bulls generally lose more bodyweight. The length of the breeding season and length of the resulting recovery period will dictate the intensity of feeding to recover the lost bodyweight. Maternal sire type bulls are likely to be expected to regain bodyweight on pasture alone or with minimal supplemental feed. Terminal sire type bulls may require supplemental feeds to regain lost bodyweight because pasture quality may not support the needed performance. Likewise the use of young bulls that still have growth requirements will generally result in greater feed input requirements after the breeding season. The nutrient requirements for gain of growing and mature bulls are listed in Table 1.

Transition Time-frame Considerations

As mentioned previously, the transition of a purchased bull from a high-growth diet to a normal production type diet is critical. An assessment of the bull's previous level of nutrition, and its characteristics on his current and future performance, needs to be made. Often bulls come off of test diets rather well-conditioned (i.e. fat, with a body condition score of 7+). While that conditioning may have been appealing in the sale ring, it is not an asset for breeding cows. How much fat needs to be shed and replaced by lean muscle is the issue. Excessive condition can be detrimental to semen quality because fat deposition decreases the effective cooling of the testes. Likewise excessive condition going into the breeding season can set the bull up for failure as the increased activity level and reduced feed intake cause him to “melt” as the breeding season progresses. Therefore, the goal of the transition period should be to “let down” the new bull from a high-energy concentrate diet to a low- to moderate-energy, roughage-based or grazing diet over time, continue the growth pattern as needed, and adapt the bull to an elevated activity level.

The transition between diets should occur over several weeks to provide adequate time for the bull to adapt to the new diet. In that regard, the bull will need to receive a diet similar to the test diet when he arrives at the ranch. A supply of similar concentrate feedstuffs will need to be on hand for the bull upon arrival. The transition at the ranch could begin with a diet that contains 60-70% of the previous concentrate intake and then be decreased gradually over a number of weeks until the final diet formulation is reached. Therefore, it is imperative that planning go into the purchase, nutrition, and overall management of a bull prior to his use during the breeding season. The concentrated portion of the ration can be replaced by bulky, fibrous feedstuffs (soybean hulls, citrus pulp) or with moderate quality hay or silage. Remember, young bulls still have a growth requirement and likely still need to gain 2.0 to 2.5 lbs/day of bodyweight during the transition. Therefore, depending upon the quality of the forage base utilized, complete removal of the concentrated portion of the diet may not be feasible. The concentrated portion of the ration generally supplies the energy and most of the protein to meet the bull's growth requirement. Some example rations are presented in Table 2.

Bull bodyweight gain during the transition period is dependent upon a number of factors that include previous bodyweight gain, current bodyweight, current body condition, and desired bodyweight at the initiation of the breeding season. Subsequent gain is then determined by dry matter intake and diet energy and protein density (Table 3). Bulls that are undersized for their desired breeding season bodyweight will need to be developed during the transition period at a greater rate of bodyweight gain compared to more fully developed bulls. In contrast, bulls that are overly conditioned but are not fully mature still require a positive plane of nutrition, albeit one that emphasizes lean bodyweight gain rather than fat deposition. To that end, desirable rations are high in roughage content or utilize quality pasture, moderate the readily available carbohydrate concentration, and provide adequate protein.

Another important consideration during the transition period is exercise. Bull test animals generally come out of confined spaces and are not acclimated to open space. Provide the bull with adequate space and let it become accustomed to getting exercise. Water, feed, and mineral can be spread aroundto encourage a level of activity prior to the breeding season, if the pasture size is adequate. An increased level of activity may also increase the bull's nutrient requirements by 5-10%, so appropriate consideration should be given to nutrition levels.

Conclusions

Several nutritional time frames exist in the lifespan of the bull in the beef herd. The appropriate nutritional management of growing bulls is a key component of the long-term reproductive success of the beef cow herd. As with most management of beef cattle, the transition periods are management situations that can have significant effects on the success of the bull management program. During these periods, the prior nutritional status, current body condition, and bodyweight growth goals of the bull all need to be considered when designing a nutrition management program. The take home

message is to know your bull. A correct assessment of the current and targeted bodyweight, body condition score along, and breed type are important factors to consider when designing nutritional programs to address any production scenario.

Literature Cited

NRC. 1986. Nutrient requirements of beef cattle. National Academy Press, Washington, DC.

NRC. 1996. Nutrient requirements of beef cattle. National Academy Press, Washington, DC.

Table 1. Nutrient requirements of growing bulls and maintenance of mature bulls[1,2]

			Diet Nutrient Density						Daily Nutrient Requirements				
BW, lb	ADG, lb/d	DMI, lb	TDN, % DM	NE_M (Mcal/lb)	NE_G (Mcal/lb)	CP, % DM	Ca, %	P, %	TDN (lb)	NE_M (Mcal)	NE_G (Mcal)	CP, lb	Vit. A 1,000 IU
1,000	1.0	20.7	56.0	0.54	0.28	8.1	0.25	0.19	11.6	11.20	5.80	1.66	36
1,000	2.0	22.3	63.0	0.63	0.37	8.9	0.30	0.20	14.0	14.00	8.25	1.99	39
1,000	3.0	22.8	70.5	0.75	0.47	9.7	0.36	0.21	16.1	17.10	10.70	2.23	39
1,100	1.0	22.3	56.0	0.54	0.28	7.9	0.23	0.19	12.5	12.00	6.24	1.75	39
1,100	2.0	23.9	62.5	0.63	0.37	8.6	0.28	0.19	14.9	15.06	8.84	2.07	42
1,100	3.0	24.5	70.5	0.75	0.47	9.3	0.32	0.21	17.3	18.38	11.52	2.29	43
1,200	1.0	24.8	56.0	0.54	0.28	7.8	0.23	0.19	13.9	13.39	6.94	1.93	40
1,200	2.0	26.1	63.0	0.64	0.38	8.4	0.28	0.19	16.4	16.70	9.92	2.19	43
1,200	3.0	26.7	70.0	0.76	0.47	9.0	0.32	0.21	18.7	20.29	12.55	2.40	45
1,300	1.0	25.4	55.8	0.53	0.28	7.6	0.22	0.19	14.2	9.22	2.20	1.9	45
1,300	1.5	26.1	59.7	0.59	0.33	7.9	0.24	0.19	15.6	9.22	3.43	2.0	46
1,300	2.0	26.2	64.0	0.65	0.39	8.0	0.26	0.20	16.8	9.22	4.71	2.2	46
1,400	1.0	26.8	55.8	0.50	0.28	7.5	0.21	0.19	15.0	9.75	2.33	2.0	48
1,400	1.5	27.6	59.7	0.59	0.33	7.7	0.23	0.19	16.5	9.75	3.63	2.1	49
1,400	2.0	27.7	64.0	0.65	0.39	8.0	0.25	0.20	17.8	9.75	4.98	2.2	49
1,500	0.0	25.2	48.4	0.41	-	6.9	0.20	0.20	12.2	10.26	-	1.7	45
1,500	1.0	28.3	55.8	0.53	0.28	7.4	0.21	0.19	15.8	10.26	2.45	2.1	50
1,500	1.5	29.0	59.7	0.59	0.33	7.6	0.22	0.19	17.3	10.26	3.82	2.2	51
1,600	0.0	26.5	48.4	0.41	-	6.9	0.19	0.20	12.8	10.77	-	1.8	47
1,600	1.0	29.7	55.8	0.53	0.28	7.3	0.22	0.19	16.6	10.77	2.57	2.2	53
1,600	1.5	30.4	59.7	0.59	0.33	7.4	0.22	0.20	18.2	10.77	4.01	2.3	54
1,700	0.0	27.7	48.4	0.41	-	6.8	0.21	0.21	13.4	11.28	--	1.9	49
1,700	0.5	29.6	52.0	0.47	0.22	7.0	0.20	0.19	15.4	11.28	1.26	2.1	52
1,800	0.0	28.9	48.4	0.41	-	6.8	0.21	0.21	14.0	11.77	--	2.0	51
1,800	0.5	30.9	52.0	0.47	0.22	7.0	0.20	0.20	16.1	11.77	1.31	2.2	55
1,900	0.0	30.1	48.4	0.41	-	6.8	0.21	0.21	14.6	12.26	--	2.0	53
1,900	0.5	32.2	52.0	0.47	0.22	6.9	0.20	0.20	16.8	12.26	1.37	2.2	57
2,000	0.0	31.3	48.4	0.41	-	6.8	0.21	0.21	15.2	12.74	--	2.1	55
2,100	0.0	32.5	48.4	0.41	-	6.8	0.22	0.22	15.7	13.21	--	2.2	58

[1] For bulls that are at least 12 months of age and weigh more than 50% of their mature bodyweight (2,000 lb mature bodyweight).

[2] Adapted from the 1986 and 1996 Nutrient Requirements of Beef Cattle.

Table 2. of bull growing and transition diets

	Bull Bodyweight, lbs			
Feedstuff	1,000	1,100	1,200	1,300
	---------- %DM included in total diet ----------			
Bahiagrass hay	45	55	65	75
Shelled corn	30	20	10	0
Soybean hulls	20	20	20	20
Protein co-product[1]	5	5	5	5
Limestone	0.1	0.1	0.1	0.1
TDN, %	71	67	63	59
NE_M, Mcal/lb	0.72	0.66	0.61	0.55
NE_G, Mcal/lb	0.45	0.40	0.35	0.31
CP,%	13.3	13.5	13.6	14.0
DMI, lb	20	24	28	32
ADG, lb/d[2]	2.16	2.22	2.15	1.97

[1] Corn gluten feed, dried distillers grains, soybean meal, or cottonseed meal are all nearly equally effective in this role relative to ADG.

[2] Average daily gains will increase at each bodyweight for each diet with increasing dry matter intake.

Table 3. Effect of diet dry matter intake on bull bodyweight gain[1]

	Bull Bodyweight, lbs			
Estimated DMI, lb	1,000	1,100	1,200	1,300
		---------- Predicted ADG, lb/d ----------		
20	2.16			
22	2.58	1.87		
24	2.98	2.22		
26	3.39	2.57	1.86	
28	3.79	2.91	2.15	1.49
30	4.18	3.25	2.44	1.73
32		3.58	2.72	1.97
34		3.91	3.00	2.21
36			3.28	2.44
38				2.68

[1] Diets as formulated for each bodyweight in Table 2.