Determining animal requirements

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Feed costs represent the greatest expense to most beef cattle operations. Therefore it is extremely important to closely match supplemented feed and forage to what an animal needs. This is extremely important for stocker producer, in situations where cattle are sold at a targeted weight at a future date. The recent feeder calf board sale is a good example to illustrate this. Calves sold on August 3 will be loaded from August 6 through December 1. Producers in this situation must be especially mindful of monitoring cattle gains to reach projected weights, and this may require adjusting any supplement as needed.

Supplementing to meet the requirements of your herd is a concept often overlooked, and may lead to added feed expense from over supplementing. It is important to consider that the same cow will have dramatically different requirements depending upon her stage of production. For example, when she is at the peak of lactation, her protein requirements will be almost double that of when she is dry in her middle third of pregnancy. It is very important, and will ultimately save money, to match her nutrient intake, from both forage and supplement, to her requirements.

In growing cattle, requirements are highly influenced by weight, gain, frame size, and sex. As expected, as cattle grow larger and faster their requirements will increase, and it is a good practice to supplement based on the average weight of growing cattle over a feeding period rather than targeted final weights, and to adjust diets and supplementation levels often. For cattle required to meet a target weight in a set number of days, it is important to collect weights frequently to determine if forage and supplement intake is adequate to meet targeted growth needs. A good practice would be to weigh cattle monthly over the growing period to ensure growth targets are being met. Complete nutrient requirement tables can be found: http://msucares.com/pubs/publications/p2528.pdf.

Beef cattle require nutrients to support body maintenance, reproduction, lactation, and growth. The nutritional needs of beef cattle vary by age, class, stage of production, performance level, and weight. Physiological and environmental stressors, such as sickness and weather, can also impact nutritional requirements. Beef cattle need water, protein, carbohydrates, fats, minerals, and vitamins. Of these nutrients, they require water in the greatest amounts daily. The second greatest need is energy, which is supplied by carbohydrates, fats, and protein. Protein is essential in beef cattle diets, and is typically the most expensive nutrient to supplement. Of the nutrients listed above, beef cattle need minerals and vitamins in the smallest quantities, but they are essential to health and productivity.

An example of a nutrient requirements table for growing steers and heifers is shown in table 1. Notice that to determine requirements you should know animal sex, anticipated weight at finishing, body weight, and targeted gain. The table provides an expected intake in lb/day as well as a percent of body weight basis. It then provides requirements for energy, protein, calcium, and phosphorus which are often major nutrients of concern in beef cattle diets. Ernegy is provided as total digestible nutrients (TDN), net energy for maintenance (NEm), and net energy for gain (NEg). It is preferred to formulate diets based on the net energy system for growing cattle as this better partitions energy into its functions for maintenance and growth. Remember that energy is utilized first to meet maintenance needs and then can be utilized for growth needs.

Table 1. Nutrient Requirements of Growing Steer and Heifer Calves[1,2]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG, lb	DMI, lb/day	DMI, % of BW	TDN, % DM	NE$_m$, Mcal/lb	NE$_g$, Mcal/lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NE$_m$, Mcal	NE$_g$, Mcal	CP, lb	Ca, lb	P, lb
1,100 lb at finishing															
	0.5	7.9	2.6	54	.50	.24	9.2	.30	.16	4.3	3.1	.4	.73	.024	.013
	1.0	8.4	2.8	59	.57	.31	11.4	.46	.23	5.0	3.1	.9	.95	.039	.019
300	1.5	8.6	2.9	64	.64	.37	13.6	.62	.29	5.5	3.1	1.4	1.17	.053	.025
	2.0	8.6	2.9	69	.72	.44	16.2	.79	.36	5.9	3.1	1.9	1.39	.068	.031
	2.5	8.5	2.8	75	.81	.52	18.9	.96	.40	6.4	3.1	2.5	1.61	.082	.034
	3.0	8.2	2.7	83	.92	.62	22.2	1.17	.51	6.8	3.1	3.0	1.83	.096	.042
	0.5	9.8	2.5	54	.50	.24	8.7	.27	.15	5.3	3.8	.5	.85	.026	.015
	1.0	10.4	2.6	59	.57	.31	10.4	.39	.20	6.1	3.8	1.1	1.08	.040	.021
400	1.5	10.7	2.7	64	.64	.37	12.1	.50	.24	6.8	3.8	1.7	1.30	.053	.026
	2.0	10.7	2.7	69	.72	.44	14.1	.62	.29	7.4	3.8	2.4	1.51	.066	.031
	2.5	10.6	2.7	75	.81	.52	16.3	.75	.34	8.0	3.8	3.1	1.72	.079	.036
	3.0	10.2	2.6	83	.92	.62	19.0	.90	.41	8.5	3.8	3.7	1.94	.092	.042
	0.5	11.6	2.3	54	.50	.24	8.4	.25	.15	6.3	4.5	.6	.97	.029	.017
	1.0	12.2	2.4	59	.57	.31	9.8	.34	.18	7.2	4.5	1.3	1.19	.041	.022
500	1.5	12.6	2.5	64	.64	.37	11.2	.42	.22	8.1	4.5	2.1	1.41	.054	.027
	2.0	12.7	2.5	69	.72	.44	12.8	.52	.25	8.8	4.5	2.8	1.63	.066	.032
	2.5	12.5	2.5	75	.81	.52	14.7	.62	.30	9.4	4.5	3.6	1.84	.077	.037
	3.0	12.1	2.4	83	.92	.62	16.9	.74	.35	10.0	4.5	4.4	2.05	.089	.042
	0.5	13.2	2.2	54	.50	.24	8.2	.23	.14	7.1	5.2	.7	1.08	.031	.019
	1.0	14.0	2.3	59	.57	.31	9.4	.30	.17	8.3	5.2	1.5	1.31	.043	.024
600	1.5	14.4	2.4	64	.64	.37	10.6	.38	.20	9.2	5.2	2.4	1.53	.054	.028
	2.0	14.6	2.4	69	.72	.44	11.9	.44	.22	10.1	5.2	3.2	1.74	.065	.033
	2.5	14.4	2.4	75	.81	.52	13.6	.52	.26	10.8	5.2	4.1	1.95	.075	.037
	3.0	13.8	2.3	83	.92	.62	15.7	.62	.30	11.5	5.2	5.0	2.17	.086	.041
	0.5	14.9	2.1	54	.50	.24	8.0	.22	.14	8.0	5.8	.8	1.19	.033	.021
	1.0	15.8	2.3	59	.57	.31	9.0	.28	.16	9.3	5.8	1.7	1.42	.044	.026
700	1.5	16.2	2.3	64	.64	.37	10.1	.33	.19	10.4	5.8	2.7	1.64	.054	.030
	2.0	16.3	2.3	69	.72	.44	11.4	.39	.21	11.2	5.8	3.6	1.85	.064	.034
	2.5	16.1	2.3	75	.81	.52	12.8	.46	.24	12.1	5.8	4.6	2.06	.074	.038
	3.0	15.5	2.2	83	.92	.62	14.6	.54	.27	12.9	5.8	5.7	2.27	.084	.042

[1] 1,100 or 1,200 lb at finishing (28 percent body fat) or maturity (replacement heifers)

[2] BW = total body weight = shrunk body weight or 96% full body weight, ADG = average daily gain, TDN = total digestible nutrients, NE$_m$ = net energy for maintenance, NE$_g$ = net energy for gain, CP = crude protein, Ca = calcium, P = phosphorus

Source: NRC, 2000. Adapted from NRC Nutrient Requirements of Beef Cattle, 7th revised edition.

One concept that is often overlooked when considering animal requirements is that an animal requires a certain amount (pounds) of protein or energy per day. Requirement tables often provide both a diet nutrient density (% required) as well as a daily nutrients required (lbs/day). It is important to focus on the daily nutrients required value when considering animal requirements. The diet nutrient density value is calculated based on an animal's predicted intake. For example, for a 500 lb steer to gain 1.5 lbs/d, he would require 1.4 lbs of protein. That protein can be provided in several ways. He could be fed 10 lbs of a 14% protein feed or 3.5 lbs of a 40% protein feed. This is the reason that diets containing a higher percentage of protein are often more expensive, but may end of cheaper in the long term.

When considering a supplementation program, it is important to first consider what the animal requires. After this the supplement should be chosen to meet any deficits left from the forage base. These considerations, and understanding what an animal needs are critical to developing an efficient feeding program. Don't forget to do your homework beforehand!

For more information about beef cattle production, contact an office of the Mississippi State University Extension Service.