Chapter 6

Beef Cattle Feeding

The greatest single cost in beef cattle production is feed. It represents from 65 to 75 percent of the total cost of keeping cows and represents an even greater cost item in finishing cattle.

It is very important that feeding practices be both adequate and economical. Feed has a tremendous effect on breeding efficiency and weaning weight of calves and, thus, influences both cow productivity and profit.

In feeding cattle there are two main goals: (1) determine the amount of each nutrient the animal needs (Table 6-2) and (2) determine how much and what kind of feed should be fed to cattle to supply their nutrient needs. For optimal performance, feeding a balanced ration which furnishes necessary nutrients in the amounts and proportions needed for proper nourishment is necessary.

Underfeeding and overfeeding are both costly problems for many Arkansas cattle producers. Underfeeding may result in lower calf crop percentage, lighter weaning weights, slower growth rates and increased parasite load depending upon the severity of undernourishment. Overfeeding is too expensive and cuts into profits.

Emphasis should be given to the amount and kind of feed needed each day. For example, thin-growing animals may consume up to 3 percent of their body weight as air-dry feed, while mature animals in fleshy condition may consume as little as 1.5 percent of their body weight.

The quality of the feedstuff has an effect on the amount an animal can consume as a percentage of its body weight. Physical fill and digestibility limit the intake of low-quality forage; whereas, metabolic control over satiety limits intake of high-quality feeds.

Feeding the Cow Herd

Most Arkansas cow-calf producers should strive to meet the nutritional needs of the cow herd with a year-round forage production program. During certain periods of the production year, supplementing the available forage with other feeds (Table 6-3) may be necessary, but the easiest and most economical feeding program for the cow herd is based on forages the cow harvests by grazing. The Arkansas climate is fairly well suited to grow cool-season grasses and small grains that enable year-round grazing for the cow herd with good pasture management.

The beef cow's nutritional requirements vary depending upon the (1) stage of production, (2) level of production, (3) age, (4) weight, (5) condition, (6) weather and (7) specific nutrient deficiencies in the area.

Stage of Production

The nutrient requirements of a beef cow change with her stage of production. The beef cow's production year begins at calving and ends with calving the next year. This period can be divided into four major stages of production: (1) the 82-day post-calving period, (2) a 123-day period during which the cow is lactating and attempting to breed or is in the early stages of pregnancy, (3) a 110-day mid-gestation period and (4) the 50 days just prior to calving.

TABLE 6-1. Calving

Period 1 (82 Days)	Period 2 (123 Days)	Period 3 (110 Days)	Period 4 (50 Days)
Early Lactation (1 to 3 months after calving)	Pregnant and Lactating (4 to 7 months after calving)	Mid-Gestation (8 to 10 months after calving)	Immediately Precalving (11 to 12 months after calving)

Period One – This 82-day period is the most critical of the cow year. During this time, the cow has just undergone the stress of giving birth, is lactating at a peak level and must gain strength and condition to start the reproductive cycle and rebreed. Most Arkansas cattle calve in the late winter or early spring; therefore, this period usually starts in February or March. The cow is often being fed hay or some other form of stored feeds at this time.

As spring pasture arrives, the green grass may appear to solve many nutritional requirements for the cow. Because of the high moisture content in spring grass, the average lactating cow may not be able to consume enough to provide necessary energy and dry matter requirements. Continued feeding of dry hay or even grain may be economically feasible during this time if the cows are not milking well or slow in rebreeding.

TABLE 6-2. Nutrient Requirements of Beef Cattle

Growing Steer and Heifer Calves – 1,100 Pounds @ Finishing or Maturity (Replacement Heifers)

Body Wt. (lb)	ADG (lb)	DMI (lb/day)	TDN (lb)	CP (lb)	Ca (lb)	P (lb)	Vitamin A (1,000s IU)
400	1.5	10.7	6.8	1.30	0.053	0.026	11
	2.0	10.7	7.4	1.51	0.066	0.031	11
500	1.5	12.6	8.1	1.41	0.054	0.027	13
	2.0	12.7	8.8	1.63	0.066	0.032	13
600	1.5	14.4	9.2	1.53	0.054	0.028	14
	2.0	14.6	10.1	1.74	0.065	0.033	15
700	1.5	16.2	10.4	1.64	0.054	0.030	16
	2.0	16.3	11.2	1.85	0.064	0.034	16

Pregnant Replacement Heifers – 1,100 Pounds Mature Weight

	Months Pregnant	DMI (lb/day)	TDN (lb)	CP (lb)	Ca (lb)	P (lb)	Vitamin A (1,000s IU)
	1	18.0	9.1	1.30	0.041	0.032	23
	2	18.5	9.3	1.33	0.041	0.032	23
	3	19.0	9.6	1.36	0.042	0.032	24
	4	19.5	9.9	1.41	0.043	0.033	25
	5	20.1	10.3	1.47	0.043	0.034	26
	6	20.8	10.9	1.57	0.044	0.035	26
	7	21.5	11.6	1.70	0.069	0.049	27
	8	22.3	12.6	1.92	0.069	0.049	28
	9	22.9	13.9	2.24	0.069	0.050	29

Two-Year-Old Heifers (20 Pounds Peak Milk) – 1,100 Pounds Mature Weight

	Months Since Calving	DMI (lb/day)	TDN (lb)	CP (lb)	Ca (lb)	P (lb)	Vitamin A (1,000s IU)
	2	22.5	13.9	2.45	0.072	0.045	40
	7	20.2	9.9	1.39	0.036	0.026	26
	11	21.4	11.9	1.79	0.060	0.036	27

Mature Beef Cows (20 Pounds Peak Milk) – 1,100 Pounds Mature Weight

	Months Since Calving	DMI (lb/day)	TDN (lb)	CP (lb)	Ca (lb)	P (lb)	Vitamin A (1,000s IU)
	1	25.4	15.0	2.62	0.075	0.051	45
	2	26.4	15.9	2.88	0.084	0.055	47
	3	26.9	15.6	2.73	0.077	0.051	48
	4	26.0	14.7	2.45	0.068	0.046	46
	5	25.0	13.8	2.17	0.060	0.042	44
	6	24.2	13.0	1.95	0.053	0.037	43
	7	20.9	9.8	1.36	0.033	0.026	27
	8	21.2	10.0	1.40	0.033	0.026	27
	9	21.8	10.4	1.45	0.033	0.026	28
	10	22.6	11.1	1.56	0.057	0.036	29
	11	22.5	11.7	1.73	0.057	0.036	29
	12	23.0	12.9	2.00	0.057	0.036	29

Yearling and Breeding Bulls – 2,000 Pounds Mature Weight[a,b]

Body Wt. (lb)	ADG (lb)	DMI (lb/day)	TDN (lb)	CP (lb)	Ca (lb)	P (lb)
1,000	1.73	25.2	15.1	1.89	0.062	0.036
	2.75	24.6	17.2	2.23	0.078	0.043
1,200	1.73	28.9	17.3	1.96	0.063	0.039
	2.75	28.2	19.7	2.22	0.075	0.044
1,400	0.49	30.7	15.4	1.74	0.051	0.036
	1.73	32.4	19.4	2.03	0.064	0.041
1,600	0.49	33.9	17.0	1.88	0.056	0.040
	1.73	35.8	21.5	2.09	0.066	0.044
1,800	0.49	37.0	18.5	2.02	0.061	0.044
	1.73	39.1	23.5	2.16	0.067	0.047
2,000	0.00	37.2	17.1	2.07	0.062	0.047
	0.49	40.1	20.1	2.15	0.065	0.049

[a]For bulls that are at least 12 months of age and weigh more than 50 percent of their mature weight.
[b]Vitamin A requirements per pound of dry feed are 1,000 IUs for growing bulls and 1,770 IUs for breeding bulls.

TABLE 6-3. Composition of Feeds

(All values except dry matter are shown on a dry-matter basis.)

	Feedstuffs	Dry Matter %	Crude Protein %	TDN %	Calcium %	Phosphorus %
	Dry Forages					
1.	Alfalfa hay, early bloom	90	18.0	60	1.41	0.22
2.	Alfalfa hay, mid bloom	90	17.0	58	1.41	0.24
3.	Bermudagrass hay	87	12.3	59	0.51	0.27
4.	Bromegrass hay	88	11.0	56	0.63	0.10
5.	Corncobs	90	2.8	50	0.12	0.04
6.	Corn stover	85	6.6	50	0.57	0.10
7.	Cottonseed hulls	90	4.2	42	0.15	0.09
8.	Fescue hay	87	11.2	54	0.50	0.31
9.	Grass-clover hay, 65%-35%	88	12.2	55	0.83	0.27
10.	Ladino clover hay	89	22.4	60	1.45	0.33
11.	Lespedeza hay, mid bloom	93	14.5	50	1.04	0.23
12.	Oat hay	91	9.5	53	0.32	0.25
13.	Orchardgrass hay, early bloom	89	12.8	65	0.27	0.34
14.	Red clover hay	89	15.0	55	1.38	0.24
15.	Rice straw	91	4.3	41	0.21	0.08
16.	Sorghum stover	88	5.2	54	0.52	0.13
17.	Soybean hay, mid bloom	94	17.8	53	1.26	0.27
18.	Wheat straw	91	3.5	40	0.17	0.05
	Silages					
19.	Alfalfa, wilted, early bloom	35	17.0	60	1.00	0.22
20.	Corn, well eared	35	8.7	72	0.25	0.22
21.	Grass-legume	28	12.1	57	0.86	0.29
22.	Sorghum	33	10.1	56	1.03	0.40
23.	Sorghum-sudangrass	30	9.0	62	0.49	0.28
	Concentrates					
24.	Barley	88	13.2	84	0.05	0.35
25.	Brewers grains, dehydrated	90	29.2	66	0.29	0.70
26.	Brewers grains, wet	21	26.0	70	0.29	0.70
27.	Corn, dent, grade 2	90	9.8	90	0.03	0.32
28.	Corn gluten feed	90	23.8	80	0.07	0.95
29.	Cows milk	12	25.8	130	0.92	0.67
30.	Cottonseed meal, 41%	90	46.1	75	0.20	1.16
31.	Cottonseed, whole	89	24.4	95	0.17	0.62
32.	Dehydrated alfalfa, 17%	92	18.9	61	1.51	0.25
33.	Ground ear corn	87	9.0	82	0.07	0.27
34.	Molasses, sugarcane, dehydrated	94	10.3	70	1.10	0.15
35.	Molasses, sugarcane (black strap)	74	5.8	72	1.00	0.10
36.	Oats	89	13.6	77	0.01	0.41
37.	Rice, rough	89	8.9	79	0.07	0.32
38.	Sorghum grain	90	11.6	82	0.04	0.34
39.	Soybean hulls	90	12.2	77	0.53	0.18
40.	Soybean meal, 44%	89	49.9	84	0.40	0.71
41.	Soybeans, whole	90	40.3	94	0.27	0.65
42.	Wheat	90	14.2	88	0.05	0.44
43.	Wheat middlings	89	18.4	83	0.15	1.00
	Mineral Sources					
44.	Dicalcium phosphate	97	---	---	22.0	19.3
45.	Deflorinated phosphate	100	---	---	32.0	18.0
46.	Limestone, calcium carbonate	100	---	---	34.0	---
47.	Magnesium oxide (55% magnesium)	98	---	---	3.1	---
48.	Sodium tripolyphosphate	96	---	---	---	25.0
49.	Steamed bone meal	97	13.2	---	27.0	12.7

Period Two – For the next 123 days, the cow is in the early stages of pregnancy and is also nursing a calf. Milk production declines during this period, and the calf increases its grass consumption to meet its own needs. Drought and the accompanying shortage of total feed supply are often the main concern during this time. Short grass growth usually results in decreased milk production and lighter calf weights but should not affect the reproductive capability of the cow during this period as long as she stays healthy. Supplemental feeding of the cow for greater milk production is rarely economical. Creep feeding the calf 30 to 45 days prior to weaning will usually improve weight gain and reduce weaning stress; however, the economic return to creep feeding is affected by the quality and quantity of pasture forage as well as the cost of the creep feed supplement.

Period Three – This mid-gestation period of around 110 days is the time when the cow's needs are at her lowest level. If the cow is on stored forage, the worst hay in the barn should usually be fed.

Period Four – This 50-day period is the second most important in the cow's year. This is in midwinter for most Arkansas cattle operations. During this time, 70 to 80 percent of fetal growth occurs. At the time of calving, the cow should be in a moderate body condition (body condition score of 5 on a 1 to 9 scale) and gaining weight to withstand the stress of calving, beginning of lactation and rebreeding on time.

Level of Production

Heavy weaning weights are usually accompanied by high milk production in the cow herd and often by larger cows. Both milk production and cow size influence nutrient requirements. Failure to supply the adequate nutritional level reduces the milk supply and prevents the calf from growing to its full genetic potential and, more importantly, affects the cow's ability to cycle and rebreed on time. Table 6-4 shows differences in nutritional requirements that may exist.

TABLE 6-4. Nutritional Requirements as Influenced by Weight and Milk Production

Mature Cow Weight	Peak Milk Production			
	10 lbs/day		20 lbs/day	
	900 lbs	1,200 lbs	900 lbs	1,200 lbs
	Requirements daily, lbs			
Dry matter	20.6	24.9	23.5	27.8
Crude protein	1.92	2.19	2.70	2.97
TDN	11.7	13.9	14.5	16.7
Calcium	0.053	0.062	0.077	0.086
Phosphorus	0.035	0.042	0.051	0.057

Age

The nutrient requirements of females vary greatly between the young, growing heifer or first-calf cow and the mature cow. Replacement heifers and first-calf cows must perform all the reproductive functions of the mature cow plus maintain an adequate level of growth. Requirements for mature cows are primarily related to size and the stage of production. Separating replacement heifers from mature cows is necessary to provide the most adequate and economical feeding system.

Weight

Nutrient requirements vary with cow size. Large cows have greater nutrient requirements than small cows and must be fed accordingly if adequate reproduction levels are to be maintained.

Condition

Condition, or the amount of flesh on the cow, is important. In a spring calving program, cows that are in above-average condition in the fall can be fed less and lose weight over the winter but still maintain an adequate reproduction level. (See information on body condition scores in the section on "Beef Cattle Management Practices.") Thin cows will have to be fed more and gain weight prior to calving or reproductive efficiency will be adversely affected. Table 6-5 shows reproductive performance of cows in different body conditions at calving.

TABLE 6-5. Reproduction of Cows in Different Body Conditions

Body Condition at Calving	Percent Pregnant after Breeding for	
	20 Days	80 Days
Thin	33	76
Moderate	47	93
Fleshy	58	96

Source: Dr. J. N. Wiltbank, Texas A & M University

Weather Stress

The cow's energy requirements will increase 20 percent or more in extremely cold or cold and wet weather.

Some of the guesswork while feeding during severe winter months is eliminated by using a cattle feed index as a guideline to adjust the quantity of feed fed. The National Weather Service issues the index so that cattle producers can schedule extra feed deliveries or determine labor requirements.

Cattle producers can associate the feed index with the percent of additional feed energy an exposed animal needs during the next 24 hours to maintain body heat without weight loss. If, for example, an animal normally consumes 20 pounds of hay, but the index is 30, then 6 more pounds of hay would be required for that day (20 × 30% = 6). The new ration would be 26 pounds. If the animal would not consume this

amount, then supplemental grain or higher quality forage should be fed so that daily feed energy (TDN) could be increased by 30 percent.

Special Nutrient Deficiencies

Some specific nutrients, primarily minerals, may be deficient on a farm depending on the forage production system and the intensity of grazing. Copper, selenium, zinc and magnesium all have been shown to be deficient under some Arkansas conditions.

Feeds Produced in Arkansas

Arkansas has an abundance of forage and a surplus of protein supplements, but grain production is limited. Most cropland suitable for grain production is used for soybeans, cotton or rice.

Energy Feeds

Milo and some **other grain sorghums** are produced in relatively large quantities in some sections of Arkansas. Much of the sorghum grain produced is used in poultry and swine rations. One limitation to using grain sorghum as a cattle feed is grain sorghum should be processed for feeding.

Wheat is relatively abundant in some areas, but most wheat grain is sold for milling rather than use in cattle rations. As a feed grain, wheat is often more costly than other grains. Similar to milo, wheat grain requires processing for cattle to digest the wheat at its fullest potential. Wheat that is ground into a flour should not be used without seeking advice from a nutritionist.

Corn acreage in Arkansas increased with demand for fuel ethanol. Despite Arkansas not being a major corn production state, its abundant supply makes it a competitive energy supplement for beef cattle. The energy value of many feedstuffs is tied to corn price. Unlike the smaller grains, corn can be fed whole to beef cattle.

Rice bran often serve as both energy and protein sources. Rice bran (unless de-oiled) is quite high in fat content which limits its inclusion rate in some rations.

Soybean hulls (seed coats) often serve as a good source of both energy and protein, especially for cattle on forage diets. They are usually used in rations for cows and growing animals. Although the hulls are relatively high in fiber content, the fiber is highly digestible.

Protein Feeds

Soybean meal and **cottonseed meal** are produced in large quantities in Arkansas. They are commonly used to supplement low-protein feeds. Both are very satisfactory feeds used for beef cattle.

Brewers grain is moderately high in both protein and energy. It is available to some producers in Arkansas from sources within the state or in close proximity to the state. It is usually fed as a high-moisture feed; therefore, spoilage and the additional expense of hauling water are two issues to consider with brewers grains.

Corn gluten feed and **corn distillers grains** are by-products of corn syrup and corn ethanol production. These feeds are routinely used as both protein and energy supplements in Arkansas.

Roughages

Cottonseed hulls, a by-product of the cotton industry, are used as a roughage substitute for beef cattle. Hulls are easily mixed with other ingredients and are eaten quite readily by cattle. The nutritional value of cottonseed hulls is low; therefore, cottonseed hulls do not work well as a sole feed source for beef cattle.

Bermudagrass, fescue, johnsongrass, orchardgrass and **other grass hays** furnish a large portion of the harvested forages fed to beef cattle in Arkansas. They tend to be moderately low in protein (8 to 10 percent) unless heavily fertilized and cut in early stages of growth. Energy supplementation is often necessary for lactating cows, and protein supplementation is sometimes needed when these forages are fed to lactating cows.

Legume hays, such as clover, alfalfa or lespedeza, are good sources of protein, calcium and energy. No protein supplement is needed for beef cattle if at least half of their feed supply is good-quality legume hay. Nutritional requirements of the animal and stage of harvest for the legume hay will dictate how much supplemental energy is needed.

Haylages and **silages.** Both corn silage and grass hay silage continue to grow in popularity. Corn silage harvested at the right stage of maturity will only require protein supplementation. Many cattle producers inaccurately assume grass silage is of greater quality than grass hay. Grass silage can often be of lesser quality if not ensiled properly. One common mistake made on ranches using round bale silage for the first time is not feeding enough. Round bale silage is 50 to 60 percent moisture, whereas hay is 10 percent moisture. Cow intake is generally attributed to the amount of diet dry matter; therefore cows need to be fed a lot more silage round bales compared to dry hay bales for them to be able to meet their daily dry matter fill.