

Cattle Business in Mississippi – June/July 2009 “Beef Production Strategies” article

Beef Cattle Water Requirements

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Water is the most abundant nutrient in the body and a critical nutrient for all classes of beef cattle. Cattle need access to adequate supplies of clean water at all times and should not have to travel long distances for water. Water is a critical nutrient required for a wide variety of body functions in cattle. It is needed for body temperature regulation, growth, reproduction, lactation, digestion, nutrient utilization, mineral balance maintenance, pH buffering of body fluids, waste removal, joint lubrication, nervous system cushioning, hearing, and eyesight.

Cattle Water Requirements and Intake Levels

Cattle water requirements and consumption depend on a number of factors including air temperature, humidity level, water temperature, milk production, pregnancy status, physical activity, growth rate, animal size, breed, diet type, moisture level in the diet, salt intake, and dry matter intake. Lower evaporative losses of water from cattle in high humidity conditions can slightly lower water intake requirements. Diets high in protein, salt, minerals, or diuretic substances that increase urination can raise water requirements of cattle. Brahman-influence cattle have an enhanced ability to adapt to hot, dry conditions and may withstand short-term water deprivation better than other breeds. Water intake studies of Brahmans compared with Herefords revealed lower water intake by Brahmans.

Environmental Temperature

Seasonal differences in water intake occur. Water intake is highest in summer, intermediate in spring and autumn, and lowest in winter. Providing shade in summer can reduce water intake. Temperature increases from 50 degrees Fahrenheit to 90 degrees Fahrenheit can increase daily water requirements by 2.5 times. According to the most recent edition of the Nutrient Requirements of Beef Cattle, a 400-pound growing calf requires approximately 5.8 gallons of water per day when the temperature is 70 degrees Fahrenheit. This increases to 9.5 gallons per day when the temperature reaches 90 degrees Fahrenheit. As the size of the calf increases, water requirements also rise. For a 600-pound calf, daily water intake needs are 7.8 gallons at 70 degrees Fahrenheit and 12.7 gallons at 90 degrees Fahrenheit. A guide to cattle water requirements is provided in Table 1.

Table 1. Beef Cattle Water Intake Estimates

	Water intake estimates, gallons					
	Temperature, °F					
Weight, lb	40	50	60	70	80	90
Growing beef calves						
400	4.0	4.3	5.0	5.8	6.7	9.5
600	5.3	5.8	6.5	7.8	8.9	12.7

800	6.3	6.8	7.9	9.2	10.6	15.0
Finishing cattle						
600	6.0	6.5	7.4	8.7	10.0	14.3
800	7.3	7.9	9.1	10.7	12.3	17.4
1,000	8.7	9.4	10.8	12.6	14.5	20.6
Pregnant cows						
900*	6.7	7.2	8.3	9.7	NA	NA
Lactating Cows						
900	11.4	12.6	14.5	16.9	17.9	16.2
Mature bulls						
1,400	8.0	8.6	9.9	11.7	13.4	19.0
1,600+	8.7	9.4	10.8	12.6	14.5	20.6

*NA = not available.

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

High humidity levels are common in Mississippi. The combined effect of both temperature and humidity on cattle is important to consider. Humidity can intensify the effects of environmental temperature on livestock comfort, water intake, feed intake, and performance. The Temperature-Humidity Index (THI) serves as a useful indicator of the simultaneous temperature and humidity conditions livestock experience. The Livestock Weather Safety Index classifies THI values as normal, alert, danger, or emergency conditions for cattle (Figure 1). Water intake increases when the Temperature-Humidity Index goes above 75.

Temperature	Relative Humidity											
	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%
100 °F	84	85	86	87	88	90	91	92	93	94	95	97
98 °F	83	84	85	86	87	88	89	90	91	93	94	95
96 °F	81	82	83	85	86	87	88	89	90	91	92	93
94 °F	80	81	82	83	84	85	86	87	88	89	90	91
92 °F	79	80	81	82	83	84	85	85	86	87	88	89
90 °F	78	79	79	80	81	82	83	84	85	86	86	87
88 °F	76	77	78	79	80	81	81	82	83	84	85	86
86 °F	75	76	77	78	78	79	80	81	81	82	83	84
84 °F	74	75	75	76	77	78	78	79	80	80	81	82
82 °F	73	73	74	75	75	76	77	77	78	79	79	80
80 °F	72	72	73	73	74	75	75	76	76	77	78	78
78 °F	70	71	71	72	73	73	74	74	75	75	76	76
76 °F	69	70	70	71	71	72	72	73	73	74	74	75
	Normal <74			Alert 75 to 78			Danger 79 to 83			Emergency >84		

Source: LCI, 1970. Adapted from Patterns of Transit Losses.

Figure 1. Livestock Weather Safety Index guide to various levels of cattle heat stress

Body Water Losses

Anything that influences body water losses will increase a calf's water intake requirements. Cattle lose water through urine, feces, sweat (to a limited degree), and by

evaporation from the lungs and skin. Diet content influences water losses in feces with lush diets and diets high in mineral content resulting in higher fecal water output. Health conditions causing diarrhea or loose feces impact water losses from the animal

Cattle cannot adapt to water restriction very well. Restricting water intake to less than is required by the animal will result in decreased feed intake and reduced performance. Water deprivation for extended periods can ultimately result in death. Thirst is a result of water need, and cattle drink to fill this need. Thirsty cattle may indicate that water needs are not being met. Cattle should be supplied with all the water they can drink to avoid stress, production losses, and possible dehydration.

Water Sources other than Drinking

Not all water required by cattle must come from drinking. Feeds and forages contain water, and digestion of feeds can produce water in the body, particularly high energy feedstuffs. Water intake usually refers to free-drinking water plus water from feedstuffs. Pasture forages, green chop, and silage generally contain large amounts of water, while hay and feed grains tend to contain lower amounts of water. Lush forage may consist of approximately 75 percent water, while forage in the form of hay may contain closer to 10 percent water. Water is listed as moisture on a forage or feed analysis report. Subtracting the dry matter percent of a feedstuff from 100 percent yields the moisture percent. High energy feedstuffs supply more body water during digestion than low energy feedstuffs.

Water Temperature

Water temperature has been identified as affecting animal preference to water. Water temperature may affect water intake by cattle. Warming of water can reduce intake, and cooling of water can increase both water and feed intake. Cool water helps cattle maintain a proper body temperature and can increase water intake. A recent study found that water intake by cattle increased when water temperatures were below 77 degrees Fahrenheit. This increased water intake is often associated with improved feed intake and cattle weight gains. There are also production benefits to maintaining cool drinking water supplies for cattle.

Most groundwater supplies to cattle operations are naturally cool. Ponds generally maintain a constant temperature during the day, but the temperature rises with direct sunlight exposure throughout the day. Deep ponds do not usually warm up to the point where they will have an effect on intake. Small water troughs in the summer and shallow sloughs and ponds may be a concern. Trough water heats up by late afternoon, but then cools down during the night. Cattle water intake typically peaks in mid-morning hours and also during the hottest period of the day. Cattle tend to graze during early morning hours, then seek water, and finally seek shade or graze less intensively during hot afternoon hours. Reduced water consumption may be a sign of illness in cattle. Water consumption changes should be observed closely. For more information on beef cattle nutrition or related topics, contact a local office of the Mississippi State University Extension Service.