



HEIFER RAISING—WEANING TO CALVING

35) MEASURING GROWTH

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WHY USE A GROWTH CHART?

A growth chart is a tool that can be used to compare the height and weight of heifers to a standard curve and thereby determine whether feeding and other management practices are adequate or whether they must be adjusted during certain phases of the rearing period.

Under most management systems (pasture, group feeding in confinement), it is difficult to assess heifer performance. The use of a growth chart allows the producer to monitor heifer growth rates.

BODY WEIGHT, WITHERS HEIGHT AND BODY CONDITION SCORE

Body weight at a certain age is the most commonly used criterion to evaluate the growth of heifers. However, it should not be the only criterion. Body weight alone does not reflect the nutritional status of heifers. Heifer development is better evaluated when weight measurements are accompanied by a measurement of skeletal growth such as wither height or body length. The height of a heifer reflects frame growth (skeletal growth) while body weight reflects the growth of organs, muscles, and adipose tissue (fat).

Body condition score can also be used to evaluate heifer feeding (management) programs. This measurement evaluates the amount of body reserve stored as adipose tissue. Thus when it is used in conjunction with body weight and withers height, body

condition score helps characterize growth as either skeletal and muscular or adipose. Table 1 indicates desirable body condition scores at different ages on a scale of 1 (emaciated) to 5 (obese).

Table 1: Heifer body condition scores (BCS) at various ages¹

Age (mo.)	3	6	9	12	15	18	21	24
BCS	2.2	2.3	2.4	2.8	2.9	3.2	3.4	3.5

¹ Patrick Hoffman. 1995. Optimum growth rate for Holstein replacement heifers. In *Calves, heifers, and dairy profitability*. NRAES-74 152 Riley-Robb Hall, Ithaca, New York 14853-5701

MEASURING BODY WEIGHT

The most accurate method to determine body weight is to use a calibrated scale. However, time and labor involved in moving heifers around usually makes it impractical to use a scale even when it is available on the farm.

Measurement of hearth girth circumference can be used to predict body weight accurately. A non-elastic measuring tape should be placed just behind the front legs and behind the shoulders of the heifer. The tape should be pulled snug and the circumference recorded (Figure 1). Table 2 gives body weight for various hearth girth circumferences of small, medium and large dairy breeds from the United States. Constructing charts specific to other breeds and/or localities around the world should be a part of any dairy improvement project.



Figure 1: Measuring withers height and girth circumference (body weight) of heifers

Measuring wither height

Figure 1 illustrates a simple adjustable ruler that is used to measure wither height. The withers is the high point of the back located at the base of the neck and between the shoulder blades. The ruler should be placed right next the forelegs of the heifer (slightly ahead of where the tape is placed to measure girth circumference). A level can be used to ensure that the adjustable part of the ruler that rests on the heifer's withers is parallel to the floor at the time of measurement.

Alternatively, the ruler can be fixed (nailed or screwed) to the wall of an alley. A height scale could be drawn (painted) directly onto the wall. Measurement should be done carefully and consistently. Comparison of data over the years is a valuable management tool.

HOW OFTEN SHOULD HEIGHT AND WEIGHT BE MEASURED?

The assessment of growth rate can be done:

- Over the entire rearing period (birth to calving);

- Over specific phases or rearing periods (milk-feeding period, weaning period, indoor feeding period, grazing period, etc.).

To monitor the overall heifer growth rate, measurements at birth and at first calving are sufficient. However, multiple measurements of height, weight and body condition score at various points during the rearing period allow a producer to monitor specific phases of rearing (early calthood, weaning period, pre-pubertal growth, etc.). A change in season usually leads to changes in housing and feeding practices that may have strong effects on growth rate.

Unfortunately, most farms do not have the facilities to measure height and weight easily. Heifer monitoring will be more successful if it is simple and requires little labor. There are two practical approaches to measuring the height and weight of heifers. The first is to do these measurements when heifers are restrained or handled, which occurs most often when heifers are:

- Born;
- Moved from individual pens to group pens at weaning and (or) when they are dehorned;
- Restrained at the time of breeding;
- Placed in individual pens at first calving.

The second method is a single time measurement. In this approach, measurements are not taken over time for the same heifer, but rather on all heifers present in the herd at one time. Clearly, the higher the number of heifers in each group, the more accurate the estimate of growth will be.

In both approaches, average daily gain can be calculated or data can be plotted and compared to a growth chart (see below).

Table 2: Hearth girth circumference and body weight of dairy heifers of European breeds popular in the U.S.

Girth circumference (cm)	Body weight (kg)			Girth circumference (cm)	Body weight (kg)		
	Large breeds ¹	Medium breeds ¹	Small breeds ¹		Large breeds ¹	Medium breeds ¹	Small breeds ¹
68.6	37.2	31.3	25.9	137.2	220.9	214.1	205.0
71.1	37.4	32.4	28.1	139.7	230.4	223.2	216.4
73.7	38.6	34.9	31.3	142.2	242.7	233.1	228.6
76.2	40.6	37.6	34.9	144.8	254.9	248.1	240.9
78.7	43.5	41.3	39.5	147.3	266.3	259.5	252.2
81.3	46.7	44.9	43.5	149.9	279.0	272.2	267.2
83.8	51.7	50.8	49.9	152.4	289.8	283.0	278.1
86.4	56.2	55.8	55.3	154.9	305.3	298.0	291.7
88.9	61.2	61.7	61.7	157.5	316.2	309.8	303.9
91.4	67.1	67.1	67.1	160.0	331.6	325.7	320.2
94.0	73.9	73.9	73.9	162.6	343.8	337.9	332.5
96.5	80.3	80.3	80.3	165.1	360.2	354.7	349.7
99.1	87.1	87.1	87.1	167.6	374.7	369.7	364.2
101.6	94.3	94.3	93.9	170.2	390.5	385.1	379.7
104.1	101.6	100.7	100.2	172.7	403.2	397.8	392.4
106.7	110.7	109.3	108.4	175.3	421.8	415.9	410.5
109.2	117.5	116.1	114.8	177.8	435.9	428.6	422.7
111.8	126.6	124.3	122.5	180.3	455.0	448.6	438.2
114.3	134.3	131.5	129.3	182.9	474.0	459.5	450.0
116.8	143.3	140.2	137.0	185.4	489.4	476.7	464.5
119.4	151.5	147.9	144.2	188.0	507.1	490.3	475.8
121.9	161.9	157.4	152.9	190.5	525.3	506.2	487.2
124.5	169.6	164.7	160.1	193.0	539.8	517.1	494.9
127.0	179.6	173.3	169.2	195.6	563.8	534.3	504.8
129.5	189.1	183.3	177.8	198.1	584.2	547.0	510.3
132.1	200.0	193.7	187.8	200.7	600.6	556.6	513.5
134.6	210.0	202.8	197.3	—	—	—	—

¹ Large breed = Holstein and Brown Swiss; Medium breed = Guernsey and Ayrshire; Small breed = Jersey.

DAIRY HEIFER GROWTH CHART and BODY CONDITION SCORES

