



# Bale Weight: How Important Is It?

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**B**ale weight and nutrient content are critical factors in determining the value of a given bale. Bale weight affects not only the amount of hay being bought or sold, but also the cost of feeding and transporting it. To accurately compare the value of different bales—including their transportation and feeding costs—you will need to know their size, weight, and density.

## ***Bale size and weight***

Round bales are generally described by bale width  $\times$  bale diameter, or bale height. For example, a 5'  $\times$  6' bale would be 5 feet wide and 6 feet in diameter and a 4'  $\times$  5' bale would be 4 feet wide and 5 feet in diameter.

Table 1 shows the effect that bale size has on bale weight by using a 5'  $\times$  5' bale that weighs 1,100 pounds (lb) for comparison; this bale would have a

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density of 11.21 cubic feet (ft<sup>3</sup>). If all the bales in the table had the same density, those of varying sizes would range in weight from 563 to 1,584 pounds.

Table 1 also illustrates the percentage difference among various sizes of bales:

- A 4'  $\times$  4' bale is only 51 percent the size of a 5'  $\times$  5' bale.
- A 5'  $\times$  6' bale is 44 percent larger than a 5'  $\times$  5' bale.

Given constant quality, we can also compare the relative value of various bale sizes. If a 5'  $\times$  5' bale were worth \$50, then a 4'  $\times$  4' bale would be worth only \$25.60, whereas a 5'  $\times$  6' bale would be worth \$72.

The last column in Table 1 shows what the price per ton would be, if all bales—regardless of weight—were priced at \$50 each. The 1,100-pound bales would cost \$90.91/ton ( $\$50 \div 1,100 \text{ lb} = \$0.04545/\text{lb}$ ;  $2,000 \text{ lb} \times \$0.04545 = \$90.91/\text{ton}$ ). In comparison, the 563-pound bales would cost \$177.56/ton.

**Table 1.** Effect of bale size on bale weight and value of large round bales

Bale width, ft	Bale diameter, ft	Bale volume, ft <sup>3</sup>	Estimated bale weight, lb <sup>1</sup>	Bale size, % of a 5' x 5' bale	Bale value in relation to a 5' x 5' bale <sup>2</sup>	Price per ton if bale cost \$50.00 <sup>3</sup>
4	4	50	563	51	\$25.60	\$177.56
4	5	79	880	80	\$40.00	\$113.64
4	6	113	1,267	115	\$57.60	\$78.91
5	5	98	1,100	100	\$50.00	\$90.91
5	6	141	1,584	144	\$72.00	\$63.13

<sup>1</sup> Assumes all bales are the same density as a 5' x 5' bale that weighs 1,100 lb (11.21 lb/ft<sup>3</sup>).

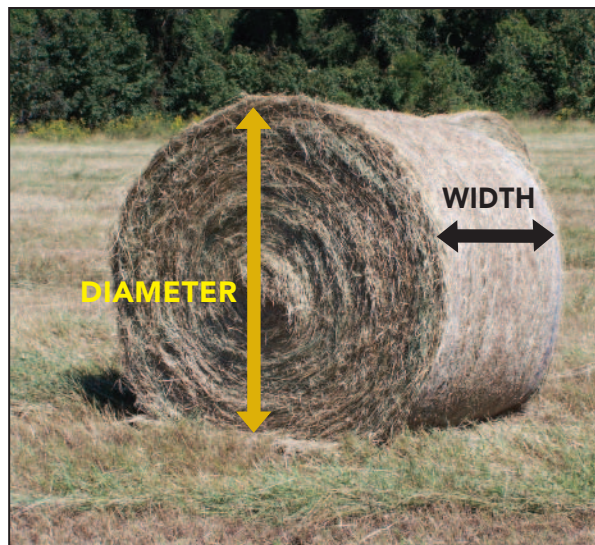
<sup>2</sup> Assumes all factors are equal except bale size and weight.

<sup>3</sup> Price per ton assuming all bales, regardless of size and weight, cost \$50 each.

Large “square” bales also vary in size, weight, and relative value. They typically come in three sizes: 3' x 3' x 8', 3' x 4' x 8', or 4' x 4' x 8'. Assuming the same density used for the round bale example, large “square” bales would range from 807 to 1,435 pounds (Table 2).

**Bale density**

Density as influenced by tightness of wrap, or bale compression, can vary considerably, depending on operator preference and the equipment being used. Most balers have a range of settings that allow the operator to increase or decrease wrap tightness and bale compression. Also, some balers can compress more tightly than can



standard equipment; these types of balers are generally used for baling low-density forages like wheat straw.

Another factor affecting bale density is that some forages are naturally denser than others. Both plant maturity and forage species influence forage density. As plants mature, the neutral detergent fiber (NDF) content generally increases, which reduces density.

Consequently, hay produced from young, immature

bermudagrass is denser than hay from mature bermudagrass. Differences in forage species also affect density; for example, alfalfa is typically denser than bermudagrass, and bermudagrass is denser than wheat straw.

The examples in Tables 1 and 2 assume a constant density. Table 3 shows how density can affect bale weight when comparing bales of equal size.

**Bale transportation and feeding**

Moving harvested forage from the field to a storage area is a time- and fuel-consuming process, just as is moving the hay from storage to feeding area. The number of trips and the amount of time it takes to move hay from the field to a hay lot or barn is directly related to bale size and density.

Table 4 compares the number of trips per acre required to move various size bales if 11,000 pounds of forage is produced per acre during the hay season. If only two bales can be moved at a time, it will take

**Table 2.** Effect of bale size on bale weight of large square bales

Bale height, ft	Bale width, ft	Bale length, ft	Bale volume, ft <sup>3</sup>	Estimated bale weight, lb
3	3	8	72	807
3	4	8	96	1,076
4	4	8	128	1,435

<sup>1</sup> Assumes all bales are the same density as a 5' x 5' bale that weighs 1,100 lb (11.21 lb/ft<sup>3</sup>).

twice as much time and money to move bales that weigh 563 pounds than 1,100-pound bales.

Bale weight also affects how often hay must be fed. Table 5 lists the number of bales that would be fed per week if each cow consumes 32.5 pounds per day and there are 30 cows to feed. It would be more economical to feed 6 bales than 14 bales each week.

Other factors that need to be evaluated are the cost of transporting purchased or raised hay and the influence of bale size, weight, and shape on this cost. Consider the number of bales and the number of tons of hay that will fit on a 53-foot semitrailer without exceeding standard width and height regulations. Table 6 illustrates that it is more economical to transport large “square” bales than round bales because more tons of hay can be hauled per load. If transportation costs are \$3.00 per loaded mile, it would cost \$17.94 per ton of hay to transport 38 round bales for 100 miles, compared to only \$13.77 per ton to transport 54 large “square” bales that were 3' × 3' × 8'.

To weigh the hay, have the driver stop at a grain elevator, truck stop, or feed coop with truck scales and get a weight both before and after the hay is loaded or unloaded. Many of these locations will charge only a small fee to get an “empty” weight (such as a semi or truck and trailer without hay) and a “loaded” weight (a semi or truck and trailer with hay); the fee is typically less than \$10 for both weights.

To determine the average bale weight, divide the total weight of the hay by the number of bales on that load. This same process could also be used for hay produced on your property.

**Table 3.** Effect of bale density on bale weight

<i>Bale width, ft</i>	<i>Bale diameter, ft</i>	<i>Bale density, lb/ft<sup>3</sup></i>	<i>Bale weight, lb</i>
5	5	9.53	935
5	5	10.09	990
5	5	10.65	1,045
5	5	11.21	1,100
5	5	11.77	1,155
5	5	12.33	1,210

An alternative option is to borrow a set of portable load cells and place a platform on top of the load cells (many people have portable load cells for weighing cattle). Individually place a few bales on the platform to determine the average bale weight for each cutting of hay.

Another simple option if you have a hay spike on your feed truck is to stop by the local feed or fertilizer dealer and have the bale weighed there. Weighing one bale is not as accurate as weighing all of them or at least several bales from each cutting, but it is better than not knowing what any of the bales weigh. To get a good estimate of weight, choose a bale that appears representative of the cutting, or take several by at the start of the feeding period.

In general, hay bales from the same field using the same baler will be similar in density and weight. Therefore, when buying hay it may not be necessary to weigh all of the hay to get an accurate assessment of the average weight per bale. Weighing one load

**Table 4.** Effect of bale weight on the number of trips required to move hay from the field to a hay lot

<i>Bale width, ft</i>	<i>Bale diameter, ft</i>	<i>Bale weight, lb<sup>1</sup></i>	<i>Forage production per acre, lb</i>	<i>Bales produced per acre</i>	<i>Number of trips required to move 2 bales at a time from 1 acre of production<sup>2</sup></i>
4	4	563	11,000	19.5	10
4	5	880	11,000	12.5	7
4	6	1,267	11,000	8.7	5
5	5	1,100	11,000	10.0	5
5	6	1,584	11,000	6.9	4

<sup>1</sup>Assumes all bales are the same density as a 5' × 5' bale that weighs 1,100 lb.

<sup>2</sup>Assumes that you transport two full-sized bales every trip, except the last trip. In reality, this will not always be possible.

**Table 5.** Effect of bale weight on the number of bales needed to feed 30 cows for 1 week

<i>Bale width, ft</i>	<i>Bale diameter, ft</i>	<i>Bale weight, lb<sup>1</sup></i>	<i>Bale weight after storage losses, lb<sup>2</sup></i>	<i>Bale weight adjusted for feeding losses, lb<sup>3</sup></i>	<i>Hay consumed per cow per day, lb<sup>4</sup></i>	<i>Bales needed per week for 30 cows</i>
4	4	563	507	482	32.5	14.2
4	5	880	792	752	32.5	9.1
4	6	1,267	1,140	1,083	32.5	6.3
5	5	1,100	990	941	32.5	7.3
5	6	1,584	1,426	1,354	32.5	5.0

<sup>1</sup>Assumes all bales are the same density as a 5' x 5' bale that weighs 1,100 lb.

<sup>2</sup>Assumes a 10% loss during storage; depending on the situation, storage losses could be lower or much higher.

<sup>3</sup>Assumes a 5% loss during feeding; depending on the situation, feeding losses could much higher.

<sup>4</sup>The amount of hay required per cow per day will vary depending on hay quality, nutrient requirements of the cow, and hay feeding losses. This example assumes a 1,300 lb cow eating 2.5% of her body weight per day.

consisting of several bales should be adequate to determine the average for that field.

However, hay from different fields or varieties should be weighed separately, even if baled with the same baler and the same tension setting on the baler.

Although not addressed in this paper, other important factors that should be considered when buying or selling hay include nutrient content (such as TDN [total digestible nutrients] and percent crude protein), forage condition (free of mold, foreign objects, and weeds), forage species, the potential presence of toxic compounds (such as nitrates), and palatability.

In addition to bale weight, make sure you also consider storage and feeding losses and the cost per unit of energy and protein from each load or cutting of hay to help minimize cattle feeding costs.

**Table 6.** Effect of bale size and shape on transportation costs<sup>1</sup>

<i>Bale shape</i>	<i>Round</i>		<i>Large "square"</i>		
<i>Bale size</i>	4' x 5'	4' x 5'	3' x 3' x 8'	3' x 4' x 8'	4' x 4' x 8'
<i># of bales/load</i>	34	38	54	39	26
<i>Bale weight, lb<sup>2</sup></i>	880	880	807	1,076	1,435
<i>lb/load</i>	29,920	33,440	43,585	41,971	37,308
<i>tons/load</i>	15.0	16.7	21.8	21.0	18.7
<i>\$/ton/100 miles</i>	\$20.05	\$17.94	\$13.77	\$14.30	\$16.08

<sup>1</sup>Assumes \$3.00 per loaded mile for a 53' semitrailer.

<sup>2</sup>Assumes all bales have a density of 11.21 lb/ft<sup>3</sup>.

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