

Buying horse hay

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Whether used for work, sports, recreation or companionship, horses need high-quality forage. Not all hay has the same quality, even that grown or harvested at the same time. Quality hay has a high nutrient content and is free of dust, mold, and other foreign matter. Horses can be nutritionally deficient even when plenty of forage is available to them. Alternately, leisure horses can be overfed and encounter health problems due to diets too rich from very high-quality hay. Knowing the hay's forage quality is the key. This publication describes the nutrient needs of horses, helps you determine how much and what quality hay you'll need, and provides a detailed checklist to guide you when contacting hay sellers.

Horses are natural forage eaters. Though not ruminants, they do best with forage-based diets. A horse's front teeth are ideally adapted for biting off grass. Its back molar teeth are better adapted for chewing feed

such as pasture or hay than for grinding corn. Horses have a smaller digestive tract than most ruminants and cannot handle as much bulk at one time. Even so, lack of sufficient forage in a horse's diet can lead to digestive orders.

The myths of feeding horses

There are more myths associated with feeding horses than with most other animals. The myths are often spread by horse owners who have little basic animal nutrition training. For some, "horse hay" means dry, dust-free, mature grass hay. This type of hay tends to be low in energy and protein, and may not meet the horse's needs. Grass hay or grass mixed with mature legumes is often best for mature idle horses that are housed primarily indoors. However, young growing horses, pregnant or nursing broodmares, and athletic performance horses need more energy, protein, vitamins and minerals than this type of hay can provide. Some horse

owners erroneously believe that feeding high-quality hay that contains legumes invariably leads to digestive upset. In fact, high-quality hay (e.g., young alfalfa) can reduce the need for additional supplement and will not cause digestive problems unless the quality or amount fed exceeds the animal's needs.

A more responsible approach is to recognize that all horses need some hay and pasture. Feeding costs generally decline and animal health improves as hay is maximized and grain is minimized in the horse diet. This can be accomplished by feeding the highest quality forage appropriate for your horse. The best quality forage for your horse will depend on many factors including age (growing vs. mature), physiological stage (e.g., pregnant vs. not), and activity level. Refer to figure 1 for specific forage quality needs for different activity levels.

The horse's digestive system

The horse's digestive system is vastly different from other large domestic animals (ruminants). While horses are natural forage eaters, they do not have the large rumen for forage to flow into and be digested by microbes. Instead, consumed feed goes immediately to the stomach, which has relatively limited capacity. This is why horses are more susceptible to molds that would be digested in the rumens of cows or sheep. Feed passes more rapidly through a horse's digestive system than it does through a ruminant's, preventing them from



using low-quality hay as effectively. This difference in digestive physiology also means that horses should be fed more frequently rather than given large amounts in a single feeding.

Once the horse takes a bite of the hay or pasture digestion begins as the forage is chewed and wetted with saliva. A horse will normally add 3 gallons of saliva to the feed daily. Chewing reduces the particle size of the forage and increases its surface area. Forage enters the stomach where soluble carbohydrates, proteins, fats and some minerals are enzymatically digested as would occur in our stomach. In about 15 minutes the forage goes into the small intestine where a high percentage of the protein, starch and fats from grain diets is digested to amino acids and absorbed. Only about one-third of the roughage component is digested in the small intestine. Most of the

vitamins A, D, E, and K are absorbed in the small intestine along with calcium, phosphorous, and B vitamins. Forage remains in the small intestine for 30-90 minutes.

The cecum and large colon of the horse is enlarged compared to ruminant species. This section of the horse's gut serves a function similar to the rumen and contains many species of bacteria, protozoa, and fungi to digest the fibrous components of feed (cellulose and hemicellulose). The microbes convert fiber and other feed components to volatile fatty acids which are absorbed by the horse as an energy source. These microbes also manufacture some protein, B vitamins, and vitamin K. The feed then proceeds through the small colon and rectum. Approximately 65 hours after it was consumed, the digested feed leaves the animal.

Nutrient needs of horses

The nutrients a horse needs depends on its physiological stage and activity level. Table 1 outlines the protein and energy requirements for various horse types. In general, a young growing horse has the highest requirement for energy, protein, minerals and vitamins per pound of body weight. This means that its diet needs to be the most concentrated in nutrients. In contrast, a non-pregnant, mature horse that is ridden less than daily (mature idle) has the lowest nutrient requirement. Other classes of horses fall in between these extremes. Horses that are worked hard daily or exposed to cold winter temperatures have slightly higher energy needs than idle horses.

So how do you decide what quality of forage to buy? You'll need to calculate the percent crude protein required and you'll need to consult figure 1 for the appropriate relative feed value. A mature, idle horse that weighs about 1100 pounds requires a minimum of 1.44 pounds of crude protein per day (from table 1). If the horse eats 2% of its body weight per day, it's consuming 22 pounds of hay. To determine the percent of crude protein needed, divide the crude protein requirement (1.44 lb/day) by the hay consumed (22 lb/day) and multiply by 100. In this example, hay that has at least 6.5% crude protein will provide all of the protein the horse needs; no additional protein supplements are needed. Based on this information, hay with a relative feed value (RFV) of 100-115 and crude protein (CP) of 6.5-15% will be adequate for this animal.

Table 1. Minimum energy and crude protein requirements for an 1100-pound horse.

Horse status	Digestible energy calories (1000)	Crude protein (lb/day)
maintenance	16.4	1.44
working horse		
light	20.5	1.8
moderate	24.6	2.2
intense	32.8	2.9
mare, pregnant		
9th month	18.2	1.8
10th month	18.5	1.8
11th month	19.7	1.9
mare, lactating		
early	28.3	3.1
late	24.3	2.3
weanling		
moderate growth	15.0	1.7
rapid growth	17.2	1.9
yearling		
moderate growth	18.9	1.9
rapid growth	21.2	2.1
2 year old		
not in training	18.8	1.8
in training	26.3	2.5

Source: Nutrient Requirements of Horses, National Research Council, 1989

Selecting quality hay

Depending upon the use or the classification of the horse (maintenance, pregnant, lactating, etc.), hay can supply 50–100% of the needed nutrients. When buying horse hay, you should select the quality your horse needs at the lowest cost. To determine the quality needed, refer to figure 1 below.

Forage quality encompasses all characteristics that affect consumption, nutrient value, and resulting horse health and performance. Not surprisingly, there can be wide variations in hay quality. Hay can be analyzed to estimate how the horse will perform. But ultimately, it is the horse rather than the human that determines forage quality.

Quality terms

The following terms are commonly used to measure hay quality. When evaluating values, be sure they are expressed as a percent of dry matter of the hay. The numbers following each definition (where appropriate) represent the ideal range for horses.

Dry matter (DM). The percent of the forage that is not water.

Acid detergent fiber (ADF). The percentage of highly indigestible and slowly digestible material in the forage or feed. Lower ADF indicates more digestible forage and is more desirable. (30–45% dry matter)

Neutral detergent fiber (NDF). The percentage of cell wall material or fiber in the feed. Lower NDF results in greater animal consumption. (40–50% dry matter)

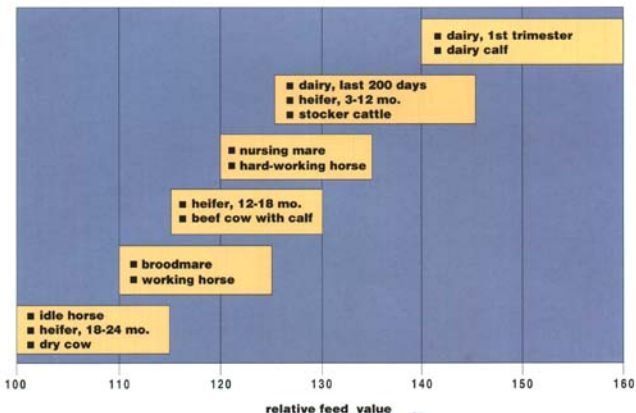
Crude protein (CP). A mixture of true protein and nonprotein nitrogen. Crude protein percentage indicates the capacity of the feed to meet an animal's protein needs. Forage cut in early maturity or with a high leaf-to-stem ratio has a high CP content. (8–20% dry matter)

Digestibility. The percentage of the forage that would be digested in a rumen. May be measured by *in vitro* digestibility (more accurate) or calculated from ADF (less accurate). Though horses do not have a rumen, this is the best estimate of energy available to them from a forage. Digestible energy is the energy in a forage that is processed by an animal and not excreted in feces. (50–60% dry matter)

Relative feed value (RFV). A calculated index used to rank forages by potential intake of digestible dry matter. Average full bloom alfalfa hay has an RFV of 100. Higher-quality hay would have an RFV greater than 100. Protein is not used in calculating RFV. (100–135)

Total digestible nutrients (TDN). The sum of crude protein, fat (multiplied by 2.25), non-structural carbohydrates, and digestible NDF. TDN is often estimated by calculation from ADF. It is better estimated from *in vitro* digestibility.

Figure 1. Forage quality need of horses and cattle.

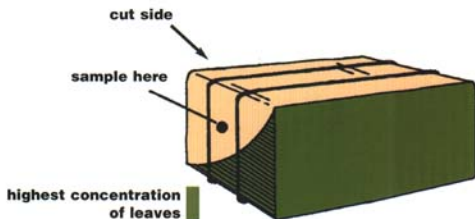


Quality differences and determination

Quality differences exist among grasses and legumes, plant species, growth stages, and growing environment. Legume hay and well-managed legume-grass hay are typically higher in protein, energy, and minerals than pure grass hay under similar management. However, with good management, most hay species or mixtures can be satisfactory for horses.

The most important factor affecting quality is the stage of maturity of the forage when it is harvested. As forage plants mature (from the vegetative stage to flower bud to bloom to seed formation), their nutritive value declines because they have fewer leaves and more stems (lower protein, higher fiber). For high-quality hay, alfalfa should be at the 10% bloom stage and cool-season grasses (orchardgrass, bromegrass, timothy, etc.) should be at the boot stage (seed head just ready to emerge from leaf whorl). Subsequent harvests can be taken at 30- to 35-day intervals.

Figure 2. Alfalfa hay bale structure



Hay quality is determined by analysis of a sample at a forage testing laboratory. A hay analysis typically includes percent moisture, dry matter, acid detergent fiber, neutral detergent fiber, crude protein, and mineral content with many calculated values such as net energy, total digestible nutrients (TDN), and relative feed value (RFV).

Laboratories can analyze hay either by chemical or near infrared reflectance (NIRS) methods. Both are accurate. Allow 2 weeks for chemical analysis and 2-3 days for NIRS analysis. The list of National Forage Testing Association certified laboratories is available on the web at www.foragetesting.org.

Taking a representative sample

Taking a representative sample for hay analysis is essential. The laboratory will accurately analyze the sample, but if the sample does not represent the hay lot, the analysis will be meaningless. A few grab samples from hay flakes do not represent a cross-section of the bale and should not be used! The preferred sampling tool is a bale probe (14–24 inches long with a ½-inch diameter) designed to attach to an electric drill or Using the probe, take a core from the center of the end of 20 different small square bales (see figure 2). Combine the cores thoroughly and submit a ½-pound sample. Medium-sized bales (800–1200 lb) can be sampled anywhere on the ends. Round bales should be cored on the curved side straight in towards the bale center. If grab samples must be taken, be careful that the samples taken have the same leafiness as the rest of the bale. As with core samples, take several grab samples (because bales vary) and combine them to produce a single sample for analysis.

Visual criteria for quality

In addition to laboratory analysis (for dry matter, energy, protein and minerals), a visual inspection should be made. Evaluate the hay for leafiness (steminess), fineness of stem, color, odor, and freedom from weeds, molds, or other contaminants that will reduce animal consumption and cause health problems.

Leafiness is closely related to nutritive value and quality. Leaves contain more nutrients than stems. Baling before plants mature, baling at the proper moisture content, and having minimal insect and disease problems will help retain leaves on the stem. Loose leaves in the bale can be lost during handling and feeding.

Color is often deceiving and overestimated as an indicator of quality. Although bright green hay often indicates the absence of rain damage, weathering, molds, and heat damage, be careful not to evaluate bales on color alone. Color can be misleading for a variety of reasons. For example, bales are commonly bleached on the outside while the inside is still very green. Bright green weeds may have lower nutrient value than bleached alfalfa.

Leafy bleached hay may contain as much energy and protein as green hay if leafy. Hay preservatives (i.e., propionate) may reduce the bright green color of fresh hay, but they also reduce the leaf loss and improve digestibility of the forage. (See the hay preservatives section on page 8).

Odor may be indicative of molds or bacterial growth that could cause digestive problems. Many horses that are unaccustomed to the unusual odor of preserved hay may initially reject it, but generally consume it readily after a few days of acclimatization.

Texture or softness relates to stem size and palatability. Finestemmed hay that is "soft" to the touch indicates to some extent palatability or acceptance by the horse. Brittle hay may or may not be nutritious, but if horses have trouble eating it they will not perform well.

Freedom from mold, injurious weeds and insects, dust, and foreign matter will reduce the potential for animal health problems. Refer to the list on pages 6 and 7 for a description of factors and symptoms to watch for.



Toxicity problems with hay

Contact your veterinarian immediately if you suspect your horse has ingested or inhaled a poisonous substance.

Fungi

Dust and molds

Moldy and dusty hay can cause health problems affecting the horse's respiratory and digestive systems. A musty odor indicates the hay was harvested too moist, allowing molds to develop. The severity of a mold problem depends on the feeding conditions (is the space well ventilated?), the horse's ability to tolerate mold or dust, and the dust and mold itself. The best test of dust or mold is to smell the hay. A laboratory analysis for mold will not be helpful since many molds are not harmful.



Ergot

This fungus produces large, dark, spur-like structures protruding from the seedheads of cool-season grasses (brome, fescue, orchard, ryegrass, timothy, bluegrass, and quackgrass) and small grains (barley, oats, wheat and rye). The occurrence of ergot varies year to year and is triggered by cool, wet conditions during the spring period. Ergot can cause gangrenous type of poisoning and abortion. Ergot can be prevented in hay by harvesting before seedheads appear.

Plants

Many poisonous plants are not palatable and will be rejected by horses unless they are underfed. The extent of symptoms is influenced by the amount of weed consumed and the concentration of the toxic agent in the plant. For additional information and photographs, visit the University of Illinois Veterinary Medicine Library—Plants Toxic to Animals web site at www.library.uiuc.edu/vex/vetdocs/toxic.htm.

Alsike clover, hay and pasture

Symptoms include reddening and inflammation of the skin and mouth when areas are exposed to sunlight (photosensitization). Can also cause skin necrosis and liver damage. Light-colored horses are particularly susceptible.

Brackenfern

The first signs of brackenfern poisoning in horses are usually an unsteady gait, a "tucked up" appearance of the flanks, nervousness, timidity, congestion of the visible mucous membranes, and constipation. Later, the horse may stand with legs spread.

Cocklebur

Seeds and seedlings are the most toxic due to present of glucosides. Symptoms include loss of appetite, staggering, spasmodic contraction of leg and neck muscles, paralysis, anorexia, reduced responsiveness, vomiting, rapid weak pulse, and muscular weakness.

Foxtail millet

Foxtail millet has been reported to have a diuretic effect on horses. In addition, barbs from the coarse, fuzzy seed heads may become embedded in the horse's mouth.

Hoary alyssum

Horses experience depression and a "stocking up" or swelling of the lower legs. A fever and short-term diarrhea may occur as well as a founder with a stiffness of joints.

Horsetail

Ingestion of foliage causes loss of condition, excitability, unthriftiness, staggering gait, rapid pulse, difficult breathing, diarrhea and emaciation. Death preceded by convulsions and coma.

Milkweed, common



Weakness, loss of muscle control, and staggering appear soon after ingestion. Seizures, rapid breathing, and dilated pupils

also occur. The toxin is a resinoid—galitoxin—but the foliage also contains glucosides and alkaloids.

Nightshade family (black nightshade, horse nettle, jimson weed) Foliage and green fruit contains alkaloids affects the nervous system causing weakness, trembling, labored breathing, nausea, constipation or diarrhea, death. First symptoms may be paralysis of tongue and dilated pupils.

Red clover, hay and pasture

Red clover hay may trigger excessive salivation, which is more of a nuisance or cosmetic issue than a danger to the horse. Slobbering appears to be associated with a fungal plant disease called black patch.

Sudangrass and sorghum-

sudangrass, hay and pasture Sudangrass and sorghum-sudangrass contain cyanide compounds and nitrates. They have been reported to cause lower spinal cord damage resulting in urinary disorders, abortion, birth defects, and paralysis.

Tall fescue, endophyte-infected, hay The hay of endophyte-infected tall fescue should not be fed to pregnant mares, especially during the last 3 months of gestation. Hay may be tested for presence of the endophyte at a forage laboratory.

Tree leaves

The leaves of several species of trees are toxic to horses. These include oak, red maple, locust, and black walnut.

White snakeroot

Leaves contain the aromatic oil tremetol, which causes congestive heart failure in horses. Animals may be reluctant to move, stand with legs wide apart, and may stumble if forced to walk. Profuse sweating may be evident especially between rear legs. Bloody urine and/or choking may also occur. The toxin can be passed through the milk to foals.

Insects and animals

Blister beetles (four types: striped, black, ash gray, margined) Blister beetles produce a toxic compound, cantharadin. Consuming as few as 12 beetles, even if they are killed or smashed during the hay-making process, can kill a horse. The beetle is rarely present in first cutting alfalfa. Subsequent cuttings should be made before bloom since the insect is attracted to flowering alfalfa. Blister beetles are more commonly found in hay produced in the southern United States and in periods of drought when grasshoppers are present.



Margined blister beetle



Ash gray blister beetle

Opossums

Try to keep opossums out of the hay storage area. They carry a potentially fatal parasitic disease that is shed in their feces. Horses become infected if they eat hay contaminated by opossum feces.

Other

Nitrates, high levels in hay or pasture High levels of nitrates may cause death. Symptoms include increased salivation, labored breathing, unco-ordination, weak pulse, muscle tremors, vomiting, diarrhea, and sulfocation. A characteristic finding is the chocolate discoloration of the blood and blueness of membranes. Some weeds—pigweed, lambsquarter, and nightshade—naturally accumulate nitrates. Grasses heavily fertilized with nitrogen (including manure) or produced under drought conditions may have toxic levels of nitrate and should be tested prior to feeding. If in doubt, have hay tested at any forage testing laboratory.



Black blister beetle



Striped blister beetle

Which cutting to buy?

Horse owners frequently ask what is the best cutting to buy. Hay from any cutting can be very high or very low in quality depending on maturity of forage when cut and how good the haymaking and storage conditions were. Hay buyers should not be overly concerned about which cutting, but should instead ask about the stage of maturity when the forage was baled and an analysis of hay quality.

Hay preservatives

Organic acid hay preservatives (for example, buffered propionic acid) properly applied at the time of baling inhibit mold growth that occurs in hay baled above 18–20% moisture and eliminate pockets of mold growth in hay. Their use can also decrease field drying times and reduce leaf loss by allowing for baling at up to 25% moisture. Research indicates that hay treated with most chemical preservatives is safe to feed to horses as long as no dust or mold is present.

Purchasing, transporting, and storing hay

How much hay do I need?

Horses will eat 1.5–2.5% of their body weight every day in dry matter. Grass or hay can meet 50–100% of that requirement. So if an 1100-pound horse eats 2% of his body weight each day in hay for 6 months, the horse will eat approximately 4000 pounds (2 tons) of hay. You can figure out how much hay your horse will eat using the calculations below.

Before placing an order, you'll need to make several adjustments to the calculations. First, deduct any pasture consumed by the horse. In the upper Midwest, pasture can meet the full needs of most horses for 5–7 months of the year. Then factor in the amount lost to spoilage and feeding waste. The amounts lost vary depending on bale type and storage and feeding decisions and are discussed in the next section.

What kind of bale should I buy?

Traditionally, horse owners have preferred using small square bales. However, there are situations where owners should consider purchasing either large rectangular or round bales. If you will be remodeling your barn, it may be worth your time and money to consider accommodating large rectangular bales because these are becoming more available than small square bales and cost less per ton of feed. At a minimum, a 12-ft x 12-ft door is needed to back a truck in for easy unloading. For larger loads and trucks, consider a 16-foot-high door. For a comparison of the different bale types, refer to table 3.

No matter what type of bale you purchase, there will be differences in the weight of the bales. The type of hay, moisture content, and how densely the equipment packs or compresses it can cause substantial differences in the weight. Note that, especially with small square bales, you can get up to twice as much hay in some bales as in others.

How much hay will your horse eat in a year?

You can figure out how many bales or how many tons of hay your horse will eat in a year using the following equations:

$$\text{Horse weight (lb)} \times (\text{percent daily intake} \div 100) = \text{lb eaten/day}$$

$$\text{lb eaten/day} \times 365 \text{ days/year} = \text{lb/year}$$

$$\text{bales/year} = \text{lb/year} \div \text{lb/bale}$$

$$\text{tons/year} = \text{lb/year} \div 2000 \text{ lb/ton}$$

Example:

A horse weighs 1100 pounds and has a daily intake of 2%. Note the difference bale weight plays in the total number of bales needed when the average bale weight is 35 pounds vs. 50 pounds.

$$1100 \text{ lb} \times (2\% \div 100) = 22 \text{ lb hay/day}$$

$$22 \text{ lb/day} \times 365 \text{ days/year} = 8030 \text{ lb/year}$$

$$\text{bales/year: } 8030 \text{ lb/year} \div 35 \text{ lb/bale} = 230 \text{ bales/year}$$

$$8030 \text{ lb/year} \div 50 \text{ lb/bale} = 160 \text{ bales/year}$$

$$\text{tons/year: } 8030 \text{ lb/year} \div 2000 \text{ pounds/ton} = 4 \text{ tons/year}$$

Table 3. Comparison of various bale types.

Description	Advantages	Disadvantages	Uses
<p>Small square bales Size: 14 in x 18 in x 38 in Weight: 35–80 lb for two-string (twine or wire) bale Feeds one horse:^b 2–3 days</p>	<p>Easy to handle and store. Easy to break off flakes (small portions).</p>	<p>Highest cost per ton. Wire bales need to be opened cautiously to prevent splinters of metal in the hay. Higher cost and labor to move bales.</p>	<p>In barns or horse trailers to feed any number of horses.</p>
<p>Rectangular (“square”) bales Medium Size: 6 ft x 3 ft x 2 ft Weight: 800–1200 lb (equivalent to 16–24 small square bales^a) Feeds one horse:^b 36–54 days</p> <p>Large Size: 8 ft x 4 ft x 4 ft Weight: 1500–2500 lb (equivalent to 30–50 small square bales^a) Feeds one horse:^b 60–100 days</p>	<p>Efficient use of storage space. Able to use small portions as with small square bales. Easier to load and transport than round bales. Becoming more readily available than small square bales. If the farm is nearby, the supplier might be willing to provide a service of periodically delivering bales directly into feeders.</p>	<p>Requires equipment to move bales. Need to use feeders to prevent waste, but few pasture feeders are available. If used outdoors, bales must be stored off the ground and covered since they readily absorb water and can mold. Can have significant waste if fed to fewer than about 10 horses.</p>	<p>In pastures to feed a large number of horses (10 or more) during winter to minimize labor of delivering hay daily. In dry lots to minimize labor of moving hay bales every day. In barn feeding.</p>
<p>Round (rolled) bales Size: 4 ft x 5 ft Weight: 500–1200 lb (equivalent to 10–24 small square bales^a) Feeds one horse:^b 20–50 days</p>	<p>Readily available in the Midwest. Less expensive per ton than small square bales. Reduced labor costs if machinery is available to move bales. Good for pastures where a large number of horses are being fed. If the farm is nearby, the supplier might be willing to provide a service of periodically delivering bales directly into feeders.</p>	<p>Difficult to store and move. Delivery of a single bale is costly unless the farm is near your stable. Difficult to unroll a small portion (flake) for one horse. If stored unprotected outside, may lose nearly half the dry matter weight to spoilage. Cover with tarp and store off the ground to preserve quality. If fed free choice on the ground outside, may lose up to 40% due to spoilage and trampling by horses. Consider using a round bale feeder and placing bales on pallets.</p>	<p>In pastures to feed a large number of horses (10 or more) during winter to minimize labor of daily delivering hay. In dry lots to minimize labor of moving hay bales every day.</p>

^a 50-lb bales

^b Assumes one horse eats 22 pounds per day. The calculation allows 10% waste for storage and feeding. If feeding horses free choice on the ground outdoors, plan on 30% waste for small square bales and 60% waste for round and large rectangular bales.

The information in table 4 will help you compare the costs associated with different bale types and storage and feeding options. In this example, six 1100-pound horses will consume 51 round bales or 646 small square bales over a 220-day period. However, storage and feeding losses will significantly reduce the amount of hay actually available. Extra hay needs to be purchased to offset these losses. If round bales are stored outdoors unprotected on the ground and fed free choice, an additional 60% more hay must be purchased (25% storage loss + 35% feeding loss). By contrast, covering round bales with tarp, storing them off the ground, and feeding them in a feeder would cut the losses to 10%. The difference between these storage and feeding practices translates to a savings of \$728 (26 bales x \$28/bale); actual savings are higher if you include the cost of handling the extra bales.

How is a fair hay price determined?

The price for hay includes all of the costs for raising and harvesting the hay. It may or may not include storage and transportation costs. Farmers know their bottom line costs and set their price accordingly. Therefore, prices generally are not negotiable when purchasing on a bale-by-bale basis. If you are willing to purchase hay by the ton or semi-load, there might be some room for negotiating a lower price depending on the farmer and their costs. Keep in mind that quality and bargains are rarely found together.

Prices within a region do not vary much. However, prices may change from year to year depending on the growing season, amount of hay produced in the region and the demand for hay. Generally, hay prices are lower during the growing season and rise in the winter and spring. Your county Extension agent can tell you what the current hay prices are in your region. Another source of information is available on the web at www.hayexchange.com/hay.htm.

Consider buying one year's supply of hay from one lot of hay. A "lot" refers to hay that comes from the same cutting and the same hay field. If all the hay comes from one lot, you should be able to minimize variations in hay quality. When hay comes from different lots, you need to gradually change to the new hay over 4-7 days to reduce feed refusal.

Buying hay "out of the field" during the summer is often more economical since it does not include storage charges. You would take immediate delivery of the hay and store it in your barn or hay sheds. You might consider purchasing your own wagon so that the hay can be placed directly on your wagon in the field, minimizing handling costs. Farmers will also appreciate this because their wagons are not tied up while you haul a load home and unload it.

Table 4. Comparison of hay costs with storage and feeding losses included. (Calculates the hay needed to feed six 1100-pound horses for 220 days. Assumes 2% dry matter intake.)

	Round bales (576 lb)		Small square bales (45 lb)	
	Unprotected and fed free choice on the ground	Protected bales fed in a feeder	Fed on ground	Fed into a feeder
Feed needed for 220 days ^a	51 bales	51 bales	646 bales	646 bales
Storage losses, % dry matter	25%	5%	5%	5%
Feeding losses, % dry matter	35%	5%	25%	5%
Total bales required —losses included	82 bales	56 bales	840 bales	711 bales
Price per bale	\$28.00	\$28.00	\$2.50	\$2.50
Total cost	\$2296.00	\$1568.00	\$2100.00	\$1777.50

^a Feed needed = (22 lb/day x 6 horses x 220 days) ÷ bale wt

^b Total bales required = feed needed + ((total losses x feed needed) ÷ 100)

If you cannot buy hay out of the field, consider contracting for all the hay you will need for the year during the growing season rather than waiting until winter when prices rise. The contract price would include hay storage at the farm until it is picked up or delivered.

Minimizing transportation costs

Transportation of hay is expensive due to labor, fuel, and equipment maintenance and depreciation costs.

To get the best price per ton, you need to purchase a semi-truckload of hay—not just a few bales. Table 5 will give you an idea of how many bales will fit in a truckload. If a neighboring horse owner is interested, you may be able to purchase a truckload together and request that the delivery be separated at the two barns. Since delivery costs are similar for large and small loads, the total price per ton is significantly higher for small loads.

Minimizing handling costs

Unloading the truck may or may not be negotiable. Discuss this with the hay dealer before purchasing the hay. If you're unloading the truck by hand, keep in mind that time is money. Plan to have enough people on hand to quickly unload the truck and get the truck back on the road. A rule of thumb is that one healthy, strong adult can unload 60–80 small square bales in one hour depending on the distance to where the bales will be stacked.



There are several things you can do to save significant amounts of time while unloading and storing hay:

- Use a forklift to unload hay stored on pallets from the truck.
- Consider purchasing your own wagon. Deliver it to your hay dealer before hay cutting. Once the hay is loaded, you can drive it to your shed and store it on the trailer until you are ready to use it or have time to store it in your barn.
- Live-floor wagons are smaller and can quickly, mechanically unload all the bales at once. If your barn has 12-ft x 12-ft doors, a live-floor trailer could be backed in to unload hay.

If building a new facility, think about creating storage space that's readily accessible to vehicles. If the truck can easily be driven up close to the storage site, the seller will be more likely to want to sell more hay than if each bale has to be carried some distance by hand into the barn.

Table 5. Approximate number of bales that can fit in a load. Actual amounts will vary depending on the trailer and bale size.

Vehicle type	Small square bales	Round bales	Large rectangular bales
Semi-truck	460–800	22	80–130
Live-floor trailer	180–225	12	30–38
Wagons, flat racks, floor trailers	100–250	3–6	17–42



Buy by weight not volume

Hay can be priced on a per bale or per ton basis. Knowing the price per ton can help you comparatively shop between hay dealers. Then it won't matter how many pounds per bale—only how many bales should be delivered for your settled price. Table 6 provides a quick look-up table to see how many bales of various weights make up a ton. For example, if you pay \$3.00 per bale and the average weight of the bales is 50 pounds, a ton of hay costs \$120 (price/bale x bales/ton). If you had paid \$3.00 per bale for hay that averaged 40 pounds per bale, the cost

per ton would be \$150. You may or may not get the same number of flakes from each of these bales depending on how the hay was baled. For help converting prices between cost per ton and cost per bale, refer to the conversion equations below.

Weighing bales. A common bathroom scale is adequate for weighing small square bales. Check the weight of 5–10 bales from different parts of the lot to get an average weight of the bales from that lot. Large rectangular bales and round bales need to be weighed on a truck scale.

Buying hay on the Internet

Many web sites now list farmers that have hay for sale on a state-by-state basis. Keep in mind as you look at different sellers, that transportation costs raise the price of hay substantially the farther the farm is from your stable. To make a wise purchase—whether online or in person—the following checklist will help make the purchase process smoother. And prior to finalizing the sale, verify the delivered price of the hay and define in detail your right to refuse bales since you won't be able to check the quality until it arrives.

Table 6. Estimating the number of bales per ton of hay at various bale weights.

Average bale weight (lb)	30	35	40	45	50	55	60	65	70	75
Number of bales per ton	66.7	57.1	50.0	44.4	40.0	36.4	33.3	30.7	28.6	26.7

Compare hay prices by converting price/bale to price/ton

Bale weights often vary from seller to seller making it difficult to accurately compare hay prices. By converting to price/ton you can determine which lot is the best buy. First, you'll need to know the average bale weight. To do this, weigh three bales from different locations within the lot. Add the weights and divide by three to compute the average. Then use the calculations below to make the conversion.

Price/bale → Price/ton

$2000 \text{ lb/ton} \div \text{average bale weight} = \text{bales/ton of hay}$
 $\text{Bales/ton} \times \text{price/bale} = \text{price/ton}$

Example:

Average bale weight is 50 lb and hay costs \$2.75/bale.
 $2000 \text{ lb/ton} \div 50 \text{ lb/bale} = 40 \text{ bales/ton}$
 $40 \text{ bales/ton} \times \$2.75/\text{bale} = \$110/\text{ton}$

Price/ton → Price/bale

$\text{Price/ton} \div 2000 \text{ lb/ton} = \text{price/lb}$
 $\text{Price/lb} \times \text{average bale weight} = \text{price/bale}$

Example:

Average bale weight is 50 lb and hay costs \$120/ton.
 $\$120/\text{ton} \div 2000 \text{ lb/ton} = \$0.06 \text{ per pound of hay}$
 $\$0.06/\text{lb} \times 50 \text{ lb/bale} = \3.00 per bale

Hay storage considerations

Whether you store hay indoors or out, the following considerations can help to make your storage site more accessible and minimize losses due to deterioration and rodent damage.

Select a dry location that's convenient for delivery and feeding.

During the winter, indoor storage makes feeding easier than outdoor storage.

Protect the bales from rain and snow.

Although inside storage is preferable and more convenient, outdoor storage can be acceptable if bales are adequately protected. Cover outdoor bales with plastic or tarp and tie it down to keep it from blowing in the wind. Although round bales shed water better than square bales, they still suffer significant losses if they're left uncovered in storage. Round bales may be stacked and covered or individual bales may be wrapped or covered with plastic. In the latter case, make sure that bale ends do not touch because this will be a place for water or snow to remain and be absorbed, causing mold and deterioration.

Store hay in a dry location off the ground.

Regardless of whether hay is stored indoors or out, select an area where water does not accumulate. Place bales on a cement slab, gravel bed, layer of tires, wooden pallet, or other object that will break the soil contact and prevent moisture uptake. If bales are left in direct contact with the ground, as much as 12 inches of the lower layer of hay may be lost to mold and deterioration.

Try to keep the storage area relatively rodent free. Rodents can invade a haystack and cause significant losses as well as potential animal health problems.

Feeding hay

Respiratory problems from dusty hay are always a major concern to horse owners. It is important to recognize that all hay will have some dust as leaves and stems are broken. Thus, while very dusty and, especially, moldy hay should be avoided, moderate amounts of dust can be tolerated by having good feeding conditions.

The following suggestions can reduce animal health problem due to dust:

- **Feed in a well-ventilated barn.** Many horse barns are so poorly ventilated that, when horses stir up dust from their feed and bedding, it remains in the air rather than being moved out and exchanged for fresh air. The barn should have an exhaust fan or natural ventilation that exchanges total barn air volume once or twice per hour.
- **Hay should be fed in a shallow manger.** Making the horse reach down into a deep manger to get hay forces him to breathe in an area where dust has been concentrated. Wire mangers can also be used to eliminate this problem.
- **Put hay and bedding in the stall when the horse is out.** This will allow the dust to dissipate before the horse returns.
- **Wet down hay if it is dusty.** Wetting the hay will keep dust with the hay and not allow it to become airborne.
- **Feed animals outside if possible.** Open-air feeding allows dust to dissipate quickly, so the horse inhales less of the dust from the hay. This has the added benefit of reducing the amount of manure deposited indoors.



Hay checklist: things to consider before you buy

Being a knowledgeable hay buyer is part of being a responsible horse owner. It is important to find a hay dealer who doesn't mind if you ask questions. If possible, inspect hay at the farmer's shed. Check the entire lot of hay you are purchasing. Select a couple of bales from various portions of the storage lot and break them open to check for consistency. If the hay is being delivered, inspect three to five bales from different sections of the truck, before unloading the hay.

Growing season and forage information

- What stage were the plants at when the field was cut? The ideal cutting time is before flowering; you do not want many seed heads present.
- What is the approximate mix of legumes and grasses present? This is an indication of forage quality—at least 30% legumes is desirable.
- Was the hay rained on? There is a potential for the loss of some vitamins and energy if there was a delay in baling the hay.
- What types of legumes (alfalfa, clover, etc.) are present? If your horse is sensitive to red clover, alfalfa, or some other legume, and you do not want this in the hay, make certain you specify this so there is no misunderstanding.
- What weeds or trees are present in and around the field? Are any of these poisonous to horses?
- What types of grasses (orchard-grass, smooth bromegrass, etc.) are present?



- What cutting of hay is this? Overall, there are not great differences in quality between cuttings. However, first cutting hay can have larger stems, which horses may reject.
- Were there any blister beetles present this cutting?
- Is there tall fescue in the hay field? Fescue toxicosis causes problems for brood mares.
- Can I inspect the field where my hay will come from? You would want to check for poisonous or unpalatable plants that the hay dealer may not know are poisonous to horses.

Bale information

- If buying by the bale, what is their average weight? How was this determined? If on delivery, bale weight is less than described, the price/bale should be renegotiated. Refer to the sidebar on page 12 to calculate a fair price.
- Is there any mold in the hay? Avoid purchasing moldy hay.
- Are bales bound by twine or metal?
- Are all the bales from the same lot / cutting of hay? This will assure consistent quality.
- If you have access to a forklift: Are small square bales available on pallets? This can simplify unloading and storage.

Quality information

- Is there a lab analysis describing the hay quality? Compare the price per quality as well as the price per ton. If you are buying a large quantity, the hay dealer may be willing to have the hay tested.
- How was the hay cured?
- Ask to break one or two bales open from different part of the lot. Look for color, presence of undesirable materials, consistency of forages present, etc.

Price and payment information

- Is hay sold by bale, ton, truckload?
- Does the price include loading at the farmer's barn?
- Does the price include transportation to your stable?
- Does the price include unloading and storing the hay at your stable?
- If you are picking up the hay, does the seller have anyone who can help you load? Will there be a charge for this help? You can usually load hay faster than unloading and properly stacking the hay.
- Are taxes included in the price?
- Is payment by cash, check, or credit card? When is payment due? Most likely this will be at time of order, particularly if the price includes delivery.
- For independent or small farmers: Would they be willing to exchange your labor for a lower price? The farmer may not be willing to do this for safety and insurance reasons.

Storage information

- How will the hay be stored until it is picked up or delivered?
- How long can the dealer store the hay?
- If the dealer stores the hay, is there an added fee?
- If I contract the hay this summer and the farm stores the hay, can the dealer guarantee all the hay delivered to your stable comes from the same lot of hay?
- Are there rodent, snake, and/or small mammal carcasses present? A decomposing animal in one bale can contaminate a large number of bales surrounding it with an odor that will cause horses to reject it. It may also potentially introduce botulism, usually a fatal disease.
- Is the hay off color? Yellow hay may indicate sun bleached or rained on hay. The quality might be slightly lower, but still adequate for horses. If the hay is dark brown or black, this indicates problems with storage and the hay is not good.

When do I have a right to reject a bale or load?

- What if I accept a load at the time of delivery and later discover that it has mold or another problem? What recourse do I have? Will the dealer exchange the bales?
- Is mold present (off odor, white powder)?
- Is the hay dusty? Dust can irritate horses and cause respiratory problems.
- Are there any poisonous plants? There should be no poisonous plants.
- Are there excessive weeds?
- Are the forages present that were contracted for?
- Are there a large number of seed heads present? Seed heads indicate the hay was harvested late and that the nutritional quality is lower.
- Does the hay shatter? If the leaves fall off of the stems when it is squeezed, this can lead to respiratory problems for horses and a dusty barn. Most of the nutrients are in the leaves so you don't want to lose them.
- Are there large or stiff stems? Brittle stems or large stems can be difficult for horses to consume. It often indicates that the hay was harvested very late and the nutritional quality has declined.



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