COLLEGE OF AGRICULTURAL, CONSUMER AND ENVIRONMENTAL SCIENCES

Hay Feeding Management Strategies as Cost-control Measures on Horse Farms

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INTRODUCTION

Equine nutritionists agree that quality forage is the foundation of a good feeding program. For most equine owners, hay purchases represent a significant portion of the annual cost of owning horses. Therefore, management practices that can reduce hay waste—while maximizing utilization—will help owners control their costs. This guide and the accompanying references provide a few ways that owners can minimize waste in terms of hay storage and subsequent feeding to horses.

ESTIMATING DAILY HAY INTAKE AND FORECASTING HAY NEEDS

The *Nutrient Requirements of Horses* (National Research Council, 2007) estimates that mature horses will consume about 2–3% of their body weight (BW) in dry matter intake of forage (hay or pasture) per day. For an 1,100-lb mature stock-type horse, and as-

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suming 90% dry matter of the hay, 2% of BW per day of as-fed hay would be 24.4 lb. We will use these numbers for the examples throughout this guide. To meet the dry matter intake needs of this horse, an owner would need to provide 732 lb of hay per month and about 4.5 tons of hay per year. It is important to note that this is a preliminary estimate of hay needs based upon the voluntary intake of the horse. This estimate for hay consumption would need to be adjusted downward for horses with access to pasture forage. The actual amount fed may be adjusted up or down depending on the nutrient requirements, behavior, environment (stall vs. paddock, weather conditions, etc.), and amount of daily exercise of each individual horse in order to maintain a desired body condition score (BCS) of 5 or more. For a review of body condition scoring, please visit the Horse Owners Minute video series playlist on the ACES YouTube channel at https://youtu.be/PXlcWkAfTP8.

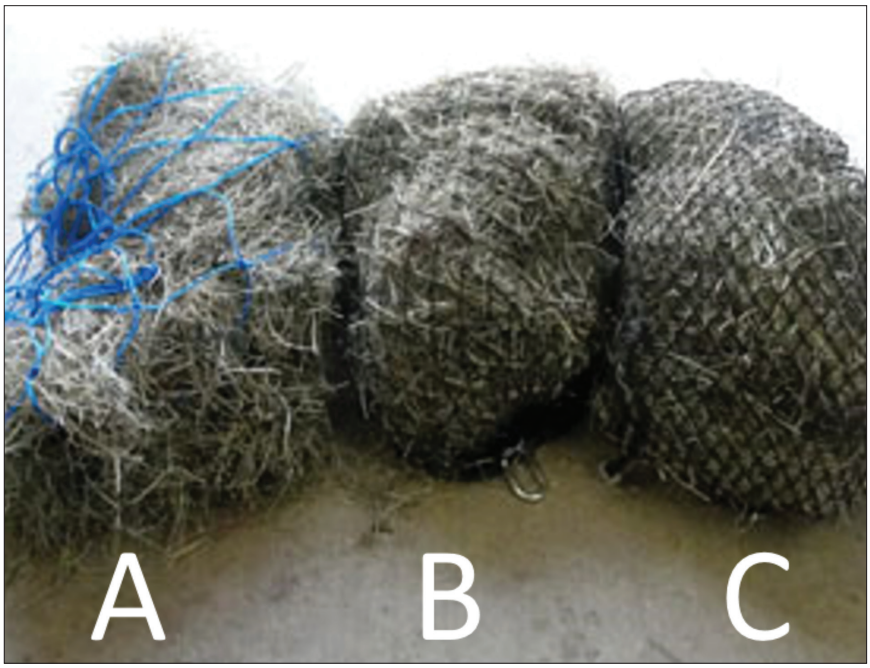

Figure 1. **Hay nets evaluated to control hay waste by Glunk et al. (2014). A. large (6 in. [15.2 cm]) openings, B. medium (1.75 in. [4.4 cm]) openings, and C. small (1.25 in. [3.2 cm]) openings. (Source: Glunk et al., 2014. Used with permission.)**

NUTRIENT ANALYSIS OF HAY

One essential component of a cost-reduction strategy is to have the hay analyzed for nutrient content. This allows the owner to know how much of the daily nutrient needs are supplied by the hay, and if any supplemental grain or other feed will need to be fed to meet the horse's requirements. Again, for horses that have access to pasture forage, a nutrient analysis of the forage will also be needed to determine the nutrients supplied in the total diet.

A basic analysis costs about $20–30 per sample. However, if we are able to decrease the amount of hay fed per day by 5% based on the analysis, while still maintaining desirable BCS in horses, we would realize a savings of 1.22 lb of hay per day, or 445 lb per year. At a cost of $280/ton, this would mean a savings of about $62 per year, which easily covers the cost of analysis. NMSU Extension Circular 641, *Hay Quality, Sampling, and Testing* (https://pubs.nmsu.edu/_circulars/CR641.pdf), explains how to take samples and provides information about certified forage testing laboratories. If you require assistance interpreting your sample analysis as it relates to your horse feeding program, you can contact your local Cooperative Extension Service agent (https://aces.nmsu.edu/county/) or the NMSU Extension Horse Specialist.

STORING HARVESTED HAY

In New Mexico, hay is often harvested in two-string and three-string small square bales, 4' × 5' or larger round bales, or 3' × 3' × 8' or larger square bales. Besides available equipment for transport and handling, there are many other factors to consider when selecting which size of hay bale to purchase for your operation. The Texas A&M AgriLife Extension publication E-319, *Bale Weight: How Important Is It?* (Banta, n.d.), reviews many of these factors in more detail. In

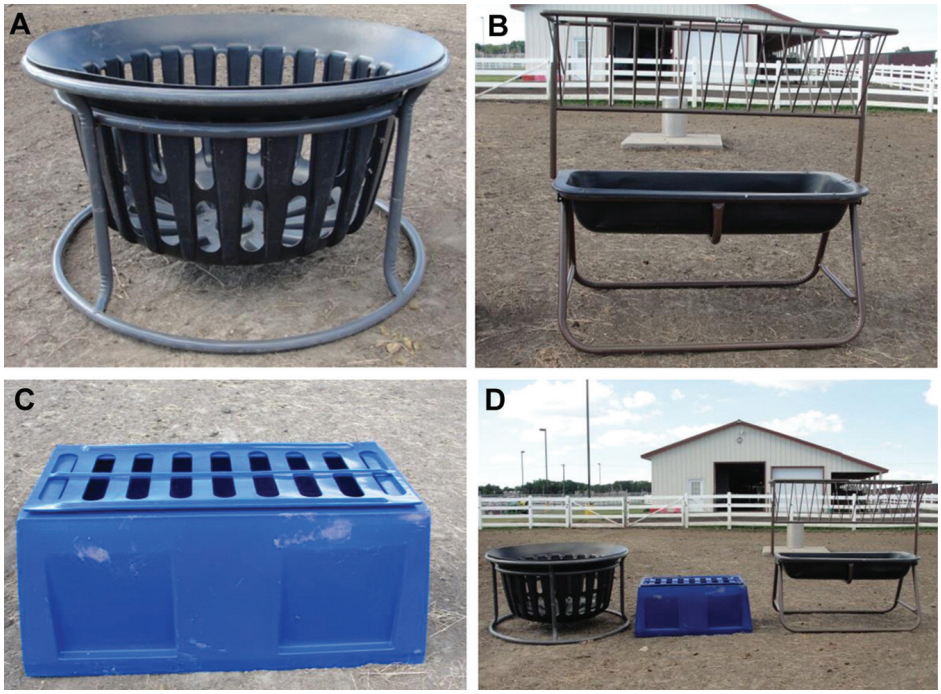

Figure 2. **Small square-bale feeders evaluated to control hay waste by Grev et al. (2014): A. Equine Hay Basket, .B. Horse Bunk Feeder and Hay Rack, C. Natural Feeder, and D. all three photographed together. (Source: Grev et al., 2014. Used with permission.)**

general, purchasing bulk quantities of large bales typically results in a lower price per ton than small lot purchases of two-string small square bales. Owners can estimate the cost difference between small and large bales by reviewing hay prices listed in the USDA Agricultural Marketing Service Hay Reports at https://www.ams.usda.gov/market-news/hay-reports.

The conditions under which hay is stored greatly influence the amount of dry matter and nutrient loss that occurs before the hay is fed. Losses in properly cured hay stored inside a barn are much less than twine-wrapped round bales stored outside on the ground with no covering. Simply put, the longer the hay is exposed to adverse weather conditions, the greater the loss of usable forage and nutrients. Therefore, owners should seek to optimize hay storage conditions on their operation as part of the entire strategy to minimize hay waste from weathering, which can be as high as 50% in some circumstances. The publication *Minimizing Losses in Hay Storage and Feeding* (Ball et al., 1998) is an excellent source of information on several different methods owners can use to reduce hay loss during storage.

IMPACT OF HAY FEEDER DESIGN ON WASTE

Before we consider specific hay feeder designs, let us consider the three main reasons it is important to use a feeder. First, using a feeder should help minimize the ingestion of sand, dirt, or other foreign objects that may cause colic or other ailments in horses. Second, strategic placement or movement of the feeder over time can concentrate, or more widely distribute, the impact of animal congregation and traffic on the vegetation, turf, and soil in the feeding area. Finally, and the purpose of this section, is the role of the feeder in minimizing waste of hay by horses.

Using slow feeders or hay nets for stalled horses

When horses are kept in stalls or small paddocks and fed hay from small square bales on a daily basis, smaller amounts of hay are offered, and waste is reduced compared to large square or round bales. In addition, using a hay feeder for individually stalled horses fed flakes from small square alfalfa bales resulted in a 6% reduction in hay waste when compared to feeding the hay from the stall floor (McMillan et al., 2009a). Glunk et al. (2014) evaluated differences in hay waste, total hay intake, and time to consumption between commercially available hay nets with large (6 in. [15.2 cm]), medium (1.75 in. [4.4 cm]), and small (1.25 in. [3.2 cm]) openings (Figure 1). Feeding hay from the floor of the box stall served as a control. While there was no difference in the amount of hay wasted by horses

Figure 3. **Round-bale feeder designs evaluated to control hay waste by Martinson et al. (2012): a. Cinch Net, b. Cone Feeder, c. Covered Cradle, d. Hayhut, e. Hay Sleigh, f. Poly Ring, g. Tombstone Feeder, h. Tombstone Saver, and i. Waste Less. (Source: Martinson et al., 2012. Used with permission.)**

between the control or any of the hay nets, they did report that using a hay net increased the total time to consume the amount of hay offered. This may have positive impacts in improved forage digestibility and gastric health. They also mentioned that using the medium-opening hay net may be more desirable than the small-opening net because the latter may be too restrictive in limiting hay intake for some horses. However, if the goal of hay net use is to limit forage consumption to decrease BCS or body weight, the small-opening net may serve that purpose.

Upon first use of hay nets in stalls, owners should ensure that hay nets or bags are hung with the horse's safety in mind and observe horses for negative impacts on behavior (e.g., frustration, biting and tearing the hay bag or net, etc.). Rochais et al. (2018) observed this when using hay bags, and for this reason recommended the use of a "slow feeder" trough over a hay bag to avoid the undesirable behavior. Raspa et al. (2021) suggested that stall hay feeders that allow horses to eat at ground level permit a more natural body position that may have beneficial effects on equine health related to proper dental wear, feed digestibility, and muscle flexibility.

Collectively, these studies suggest that using hay nets may offer only a slight reduction in hay waste. However, there may be associated benefits on health from increased time to consume the forage for horses that would otherwise rapidly consume the forage ration.

Using small bale feeders for horses kept in paddocks or pastures

For horses kept in larger stalls with runs, small paddocks, or pastures, using a small hay bale feeder may be less labor intensive than filling hay nets on a daily basis. Grev et al. (2014) evaluated hay waste among three such feeders (Figure 2) when feeding small groups of horses. The study reported 1% hay waste for Feeder C, 3% hay waste for Feeder A, 5% hay waste for Feeder B, and 13% hay waste when hay was fed from the ground without a feeder in drylot paddocks. They noted that Feeders B, A, and C paid for themselves in 12, 11, and 9 months, respectively.

While feeders such as these reduce waste and can reduce hay cost over time, it is important for horse owners to consider their individual horses' temperament, and their small herd dominance hierarchy, if they plan to feed horses together as groups. Since these feeders are smaller in size and offer a smaller ration of forage each day compared to large bale feeders, there is the chance that the dominant individual(s) in the

Table 1. Rank of Individual Round Bale Hay Feeders According to Hay Wastage by Horses		
Feeder Letter from Figure 3	**Feeder Name**	**Hay waste (%)**
i	Waste Less	5
a	Cinch Net*	6
d	Hayhut	9
c	Covered Cradle	11
h	Tombstone Saver	13
b	Cone Feeder	19
g	Tombstone Feeder	19
f	Poly Ring	19
e	Hay Sleigh	33
	"No feeder" control	57
*The study recommended using the Cinch Net in combination with another feeder because after two days on the study the bale collapsed such that horses were able to stand in the middle of the net and defecate on the hay bale.		

group could guard the feeder and keep more timid horses from consuming their daily ration of hay.

Using large bale feeders for horses kept in paddocks or pastures

As mentioned previously, given similar nutrient content, purchasing hay as large bales in bulk quantities is normally the best means of securing the lowest price per ton. However, unless you are feeding a large herd of horses that can consume an unrolled round bale on the ground on a daily basis, some sort of round bale feeder is needed to reduce hay waste. The same logic applies when a large square bale (e.g., 3' × 3' × 8') is fed all at once to a group of horses.

McMillan et al. (2009b) reported approximately a 22% reduction in the amount of wasted alfalfa hay from round bales when fed inside a hay ring as compared to when the round bales were fed without any type of feeder. The reduction in waste was even more pronounced when round bales of Bermudagrass were fed—feeding with a ring feeder reduced waste by almost 36%.

Martinson et al. (2012) fed orchardgrass hay to groups of five horses each to evaluate differences in hay waste using the nine feeders shown in Figure 3; the individual ranking for each feeder in terms of hay waste is shown in Table 1. Collectively, the more "restrictive" round bale feeders more effectively reduced hay waste. Let us consider the reduction of hay waste offered by one of the "moderate" feeder designs, such as the Tombstone Feeder that is readily available at many farm stores in New Mexico. When compared to the "no feeder" control, the Tombstone Feeder reduced hay waste by 38 percentage points. If we use a 1,200-lb round bale of hay priced at $280/ton, then the Tombstone Feeder would save 456 lb of hay worth $63.84. If the feeder costs $500, then we would recover the cost of the feeder after feeding about eight round bales of hay. The 456 lb of hay saved would be enough to feed an 1,100-lb horse for 18 days.

Another factor for horse owners to consider when feeding large bales of hay to horses is how long it takes them to consume their daily ration of hay. If our goal is for a horse to consume 2% of their BW per day (as mentioned previously), it is important to realize that they may accomplish this after only a few hours of access to the hay. Glunk et al. (2014) reported that horses consumed 1% of their BW of hay fed from the stall floor in about 3 hours. The *Nutrient Requirements of Horses* (2007) states the average time for a mature horse to consume 1 kg (2.2 lb) of dry hay is 36.5 minutes, which is similar to the intake rate observed by Glunk et al. (2014). Therefore, an 1,100-lb mature horse might likely consume 2% of their BW in 6–7 hours when given access to the large bale. If horses are allowed unlimited access to the bale on a daily basis, it is very likely that they will voluntarily consume more than 2% of their body weight per day, which can result in increased BCS and overall hay costs on the operation. To remedy this, owners can monitor BCS

of the horse(s), and perhaps limit access to the bale if they observe an increase in BCS score.

To estimate the hay consumption rate for their horse, owners can weigh 1% of the horse's BW in hay and feed it to them in a trough or manger in a stall or small pen. After recording the time it takes the horse to consume that ration, the owner can then use that as a starting point to set the time allowed for the horse to access the large bale. For example, if our 1,100-lb horse consumes 12.2 lb of hay in 4 hours, we might consider giving the horse 8 hours of total access to the large bale to consume their daily ration of 24.4 lb. This could be divided into two "meals" with 4 hours access in the morning and 4 hours in the evening if labor and management can provide that.

If feeding horses as a group, you might determine the hay consumption rate for each horse, and then take an average of the group. Again, when feeding groups of horses on large bales, it is important to ensure that dominant horses do not guard the feeder and prevent hay consumption by more timid horses. If this occurs, it might be wise for owners to separate horses into "dominant" and "timid" groups and feed them separately. Routine evaluation of BCS is our simplest means of determining adequate energy intake for individual horses, especially in group feeding situations.

CONCLUSION

This guide provides many points to consider where owners can control costs by extending the hay supply in the feeding portion of their horse operation. Improving efficiency in this manner always makes good sense. In times of drought, which are common in New Mexico and the broader hay-purchasing region, available hay supply is much less than demand and hay cost is greater. Under these circumstances, these strategies may warrant even greater consideration as a way to mitigate the impact of increased hay costs to the operation.

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