USDA
United States Department of Agriculture
Natural Resources Conservation Service

March 2021

Nutrient Management Technical Note No. 190-NM-10

Feed and Animal Management for Horses

Acknowledgments

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Feed and Animal Management for Horses

Introduction

Many times, people see horses—all equines will be termed horses for this technical note—in a pasture as part of the landscape, not as a source of the environmental problems often associated with too many animals on too little land. There are about 9.2 million horses in the United States. Each 1,000 pound horse produces about 51 pounds of manure, urine, which includes bedding each day, or about 0.82 cubic feet (refer to NRCS Title 210, National Engineering Handbook, Part 651, "Agricultural Waste Management Field Handbook," Chapter 4, Table 4-14(b)). This translates into yearly production of a pile of horse manure a yard high and yard wide and almost 58,000 miles long, or more than twice around the Earth! The challenge, here, comes from feeding animals so that they reach their full potential, without overfeeding nutrients that ultimately become a problem in the environment. Feed management can be a tool to assist horse owners to meet the needs of their animals without harming water or air resources.

Some horses, called "easy keepers," require fewer nutrients than others. Other horses are difficult to keep weight on, requiring special attention. It is important to know what to feed the horse to make sure it gets all the nutrients it needs, without overfeeding nutrients that will ultimately be expelled as a waste product that must be accounted for in the environment.

Horses need to be fed based on their individual requirements, which poses challenges in how animals are kept and fed. As compared to other animals that are kept for production, horses are kept for use (riding, transport, pulling, etc.). Horses are fed for the level and type of activity they perform, which is different than other livestock that produce meat, milk, or eggs. They live longer, are kept onsite longer (20 years average life span) and many times are fed supplements based on performance or health requirement (i.e., biotin for hooves).

The nutrient requirements of a horse vary with its age, sex, weight, pregnancy or lactation, and the amount of work it performs. Good quality hay may be enough feed for a mature horse that is ridden very little. With an increase in work (riding, pulling, and pregnancy and lactation are all forms of work) grain should be added to its diet. Only a horse that is worked extremely hard would ever receive half of its ration in grain. A racehorse in heavy training is an example of a horse requiring half of its ration in grain.

Accumulation of excess nutrients on the farm results in a whole-farm nutrient imbalance that can contribute to water and air pollution. A major portion of nutrients brought onto farms with horses comes from purchased feeds. Carefully reducing feed nutrients or selecting more efficient feed nutrient sources and/or feeding techniques can significantly reduce the nutrient content of excreted manure, thereby helping to achieve a whole-farm nutrient balance while also helping to reduce odors and other gaseous emissions from manure. Carefully monitoring feed consumption can reduce waste feed that further contributes to excess nutrients that must be dealt with in the environment.

Table 1: Example of Daily Feed Required for the Average Adult 1,000-lb. Horse in Good Body Condition and Health[1,2]

Amount of Work	Hay Needs (lbs.)	Grain Needs (lbs.)
No Work	20–25	none
Light (1-2 hrs./day)	15–20	1–3 (1–1.5 lbs. grain/hr. of work)
Medium (2-4 hrs./day)	15–20	3–8 (1.5–2 lbs. grain/hr. of work)
Heavy (4 or more hrs./day)	15–20	5–10 (1.5–2.5 lbs. grain/hr. of work)

[1/] Adapted from Penn State University Extension Publication "Feeding Horses," December 2015.
[2/] Approximate amounts (1,000-lb. horse) to be used as an example rather than an NRCS recommendation. All hay and grain should be of good quality. Grain is a general reference. Most people feed some sort of commercially available ration and those rations have manufacturer's guidelines. Hay is also a general reference. Large differences in the kind of hay may mean substantially different amounts will be fed.

Digestion

The stomach and the small intestine make up the foregut of the horse; the cecum, large colon, small colon, and rectum make up the hindgut of the horse. Most starch, protein, fat, vitamins, and minerals are digested and absorbed in the foregut (primarily in the small intestine) by enzymes and other digestive substances. The hindgut contains microbes capable of digesting dietary fiber supplied by roughages in the diet. The horse does not produce enzymes that digest fiber. Instead, horses use microbes to break down fiber.

Nutrients

A horse requires five types of nutrients. These include carbohydrates, proteins, vitamins, minerals, and water. Each nutrient has an important role in the horse's body and is needed to keep the horse healthy. Nutrients contained in forages, grain and supplements are not always balanced based upon the animal's nutrient requirements (FDACS, 2011).

Water is usually the least considered animal nutrient, though it might be the most important. A horse drinks about 10–12 gallons of water daily depending on the work it is doing. In hot weather, a horse may drink up to 15–20 gallons of water. Quality of the water is important, and mineral content of the water should be considered as part of the nutrition of the animal. Areas of the country with water containing higher amounts of particular minerals may not need dietary mineral supplements provided in their feed.

Carbohydrates are the main energy source for all animals. Cellulose—carbohydrates found in hay and grass—is a complex carbohydrate. Horses can digest cellulose (grass and hay) because the microbes in their large intestine (cecum) can break it down. The cecum acts somewhat like the rumen in cattle and sheep in breaking down feedstuffs for absorption by the animal.

Protein supplies material for body tissue. An adult horse on pasture probably only needs the protein that can be supplied by grass from the pasture with supplemental hay to be used for body maintenance. Working horses need grain or another supplement to provide more protein for muscle growth. Overfeeding protein means the excess will be expelled into the environment. Nitrogen and sulfur from protein breakdown may be elements that need to be accounted for.

Vitamins are needed in much smaller amounts than other nutrients. Depending on its diet, a horse may need vitamin supplements, though supplements usually are not necessary if a horse is allowed to graze on grass.

Small amounts of minerals usually are needed. Iron, copper, phosphorus, calcium, and magnesium are examples of minerals that are important for a horse's body. Without iron, blood cannot carry oxygen to the body's cells. Without calcium and phosphorus, bones and teeth will not form properly. Calcium and phosphorus should be fed in a ratio that ranges from 3:1 (three parts calcium for each part of phosphorus) to 1:1. An imbalance of these minerals can cause developmental bone disease in young, growing horses.

Certain minerals (usually zinc, copper, and phosphorus), if fed at amounts greater than the animal requires, are excreted in manure or urine. If manure is not handled properly, phosphorus and nitrogen can become pollutants that lead to reduced water quality in the environment.

Requirements for calcium and phosphorus are much greater during growth than for maintenance of mature animals. For all horses, the calcium to phosphorus ratio should be maintained at >1:1. A desirable ratio is approximately 1.5:1 (Ralston, 2015).

Types of Feeds

The horse can get its essential nutrients from many types of feed. These include roughage or forage, pasture, concentrates, and supplements.

Roughage/Forage

Roughage, typically hay or grass, is the bulk of the horse's food. Grass or alfalfa hay, or a combination of the two, are good sources of roughage. Grass hay is generally higher in fiber and dry matter than alfalfa, but alfalfa may be higher in protein, energy, vitamins, and calcium. Hay can be long-stemmed in hay bales, or it can come bagged in cubes or pellets. Many horse owners feed grass hay or straight alfalfa or a combination of grass and alfalfa to their horses. The performance requirement of the horse should determine what type of hay is fed. Alfalfa being higher in protein and energy may not be needed by a horse to meet a lower performance requirement. Higher protein and energy can lead to high energy levels in the horses, leading to bad behavior in the stable or paddock.

Horses need good quality hay. Color is an indicator of quality and nutrient content; good hay is a bright green. Hay should also be leafy and fine textured, with a fresh, pleasant aroma. Musty smelling hay or other indications of mold, heating, and dust can be unhealthy for an animal. Weeds and other foreign material in hay can result in importing unwanted seeds to a producer’s pasture.

Pasture

Good pasture or grass that an animal can graze can be an economical food for horses, but pasture must be maintained. Vegetation must be maintained at the proper growing heights for best management. Horses have both top and bottom sets of teeth—as opposed to cattle with teeth only on the bottom jaw. Horses can bite grass off very short, which can result in damage to the pasture if excessive grazing takes place. If animals graze on a pasture too long, the grass may be damaged. If there are too many animals on a given area of pasture, the grass may be damaged. Prolonged damage to grass may result in killing the pasture grass. A good rule of thumb in the Eastern United States might be at least 4 acres of pasture per 1,000 pound animal, with more acres per animal in the drier West or if the animal is larger than 1,000 pounds. Pasture grass selection should consider the durability of the grass selected for foot traffic and tolerance to grazing. The hooves, shoed or not, can inflict cutting disturbance to vegetation, especially during initial turnouts for exercise.

Well-managed pastures reduce supplemental feed costs and provide energy, protein, vitamins, and minerals to animals. When a grass stand becomes too thin, overgrown, coarse, or unappetizing to a horse, it should be clipped or mowed. Lush pasture forages can act as a laxative in early spring and may cause laminitis, commonly known as founder, due to high soluble carbohydrate (sugar) content. Introduce horses gradually to pastures by slowly increasing their daily grazing time and restrict the time on pasture when lush grass could cause health issues. Maintaining a mixed stand of grass is one management strategy. Having a mixed stand of both cool season and warm season grasses can reduce having a stand that is lush at one time of year and thin at another.

Concentrates

Small grains, such as corn, oats, and barley, are known as concentrates. Concentrates are lower in fiber and higher in energy than roughages. Some concentrates provide relatively high levels of protein. Grain quality is just as important as hay quality. Oats are the safest and easiest grain to feed with hay because they are high in fiber and low in energy, and higher in protein than corn. All grains are low in calcium, but high in phosphorus. Rather than mixing grain concentrates themselves, most producers feed a commercial formulated feed. This is usually preferable because commercially formulated feeds provide the minimum requirements for the horse's diet and include vitamins and minerals. Feed rations are commercially available in percent protein/percent fat/percent fiber. Producers need to determine the best feed to match the animal's performance requirement. Feed at the rate specified by the manufacturer. Avoiding unnecessary supplements can save the producer money and reduce what ends up in the manure and urine.

Supplements

Supplements should only be added to the diet if something is lacking or missing. Protein, vitamin, and mineral supplements are added to the diet to increase the diet's concentration. Grains are energy supplements to a high forage diet. Vitamin and mineral supplements should only be added to the diet if the horse is deficient. Generally, the only minerals of concern in feeding horses are calcium, phosphorus, and salt. In some geographical areas, lack of selenium, and in growing horses, copper and zinc, are a concern.

Wastage

All animals tend to waste some amount of the food that is fed to them. Horses are no exception. Because feed cost may be most of the cost of keeping the animal, wasted feed can have a negative impact on the financial circumstances for keeping horses, whether they are kept as a business or for pleasure. In addition to the cost of wasted feed, all the nutrients in that feed must be accounted for in the system so they do not contribute to environmental degradation.

Horses may waste a great deal of the hay that is fed to them. Research from the University of Minnesota has shown that hay presented to horses without any sort of feeding apparatus can result in wastage of up to almost 60 percent since hay fed on the ground or on the floor of the stall is trampled and mixed with manure, bedding, and soil. Any type of feeder tested reduced wastage from almost 60 percent to a range of 5–33 percent (University of Minnesota Extension, 2018). A nonworking horse, requiring 20 pounds of hay per day, eats almost 4 tons of hay per year. If the feeding system allows up to 50 percent wastage, that means that almost 4 tons will be wasted. If hay costs $150 per ton, then $600 of the total cost of feeding hay to the animal is wasted.

If more than one horse is being kept, the competitive interaction between the animals for feed may actually increase the amount of wasted hay. In any case, the nutrients in this waste feed will have some environmental impact as the hay decomposes. Slow feed nets can reduce hay wastage by restricting the amount of hay a horse can eat at a time. Feeders should be movable to address nutrient accumulation around the feeders from the animals' waste. Protecting hay from rainfall can also reduce wastage due to mold and prevent horse health issues.

Conservation Practices

In addition to NRCS Conservation Practice Standard (CPS) Feed Management (Code 592), several other CPSs exist that NRCS may be able to assist horse farms implement. Several of these deal with water quality and availability, some deal with waste handling and storage, while others deal with forage and range health and management. Among others, these NRCS CPSs include—

- Forage Harvest Management (Code 511).
- Pasture and Hayland Planting (Code 512).
- Prescribed Grazing (Code 528).
- Range Planting (Code 550).
- Spring Development (Code 574).
- Livestock Shelter Structure (Code 576).
- Watering Facility (Code 614).
- Water Well (Code 642).
- Heavy Use Area Protection (Code 561).
- Fence (Code 382).
- Roof Runoff structure (Code 558).
- Underground Outlet (Code 620).
- Filter Strip (Code 393) or Vegetative Treatment Area (Code 635).
- Waste Storage Facility (Code 313).
- Composting Facility (Code 317).
- Short Term Storage of Animal Waste and By-products (Code 318).

Summary

The United States has a large number of horses, sparsely distributed throughout the country, with many in a situation where there may be only one or just a few animals on a property. In many cases these animals are in nearly a "maintenance" status where the animals are adult (no longer growing) and not being worked. Any excess nutrients provided to the animal will either be stored as fat or excreted. The excreted nutrients need to be accounted for in the environment.

Observation would indicate that many of these smaller operations have too many animals for the available amount of pasture. In these cases, pastures become degraded, which can lead to soil erosion and water quality problems. A good rule of thumb is to provide at least 4 acres of pasture per 1,000 pound animal, and rotate animals between pastures to give the vegetation time to recover to the recommended grazing height. Having a sacrifice area can assist producers to be better managers of pastureland.

In the long run, feed management for horses strives for conservation of natural resources by not over feeding or wasting nutrients that must be accounted for later and providing enough pasture for the animals that environmental problems are not created.

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Appendix 1

Glossary of Terms

Byproducts.—Feed ingredients sources that are normally waste products from other industries.

Concentrates.—Plant materials (feeds) that contain relatively high starch content.

Crude Protein.—A measure of the dietary protein that assumes that the "average" amino acid in protein contains 16 percent N. Thus, total chemically determined N times 6.25 (or 100 divided by 16) = crude protein.

Diet Formulation.—The process of combining an assortment of feed ingredients into a diet that will meet the nutrient and energy requirements for the intended purpose for which the animal is produced.

Digestibility.—The relative amount of nutrients released from the digestion process.

Dry Matter Intake.—The amount of completely dry feed consumed by animals.

Forage.—Plant material that contains relatively high fiber content.

Nonruminant.—An animal that has a simple stomach (one compartment) and must utilize concentrate diets, also referred to as monogastric.

Ruminant.—An animal capable of digesting forages (roughages) because they have a large stomach with four compartments with microorganisms present.

Total Digestible Nutrients.—Total of all the nutrients in the diet that are available to the animal.