



Pasture and Hay for Horses

Horses are used in a wide variety of activities throughout Pennsylvania and adjoining states. Most of these horses are owned and managed for recreation or sport rather than for profit. One of the main expenses in owning a horse is feed. To minimize feed costs, it is important to keep horses healthy and feed them a balanced ration that meets their nutritional needs.

More myths are associated with feeding horses than with feeding most other animals, in part because an increasing number of horse owners are unfamiliar with the basics of horse nutrition. Nutritional needs vary considerably among horses, depending on age, weight, and level of activity. There are no magic supplements, high performance feed secrets, or short cuts that will transform any horse into a champion.

Horses naturally use forages as a primary component of their diets. Forages are a basic necessity for normal functioning of the equine digestive system, and forage requirements are supplied most easily by pasture and hay.

Mature horses generally consume 2 to 2.5 percent of their body weight in feed each day. For example, a 1,000 pound horse should consume approximately 20 to 25 pounds (90 percent dry matter) of feed daily. Because horses do not digest low-quality forages effectively,

a premium should be placed on using high-quality forages in the horse's diet. Poor digestion of low-quality forages can limit the amount of dry matter a horse can eat to the extent that daily nutrient requirements are not met.

Horses should consume at least 1 percent of their body weight in hay or pasture grasses and legumes each day. Mature horses performing minimal or no work can be maintained on high-quality forages without supplementing their diet with grain. Growing, breeding, or working horses require supplemental grain or concentrate to meet their additional nutrient requirements. Generally, for optimal horse growth and development, forages should supply one-half or more of the total weight of feed consumed daily. Table 1 shows estimated daily feed consumption rates recommended for various classes of horses.

Depending on quality and quantity consumed, forages provide varying amounts of required nutrients. Table 2 lists the major nutrient requirements for different types of horses. To properly balance the diet, the nutrient content of the forage and the concentrate in the diet must be determined. Once the nutrient content of the feeds is known, the proper amounts of each can be calculated to meet the horse's nutrient requirements. For more information on feeding horses and balancing their rations, contact the Penn State Cooperative Extension office in your county.

Table 1. Recommended air-dried feed consumption rates (about 90% dry matter).

	FORAGE ^a	CONCENTRATE ^b	TOTAL
—POUNDS PER 100 POUNDS BODY WEIGHT—			
Mature horse			
Maintenance	1.5-2.0	0-0.5	1.5-2.0
Mare, late gestation	1.0-1.5	0.5-1.0	1.5-2.0
Mare, early lactation	1.0-2.0	1.0-2.0	2.0-3.0
Working horse ^c	1.0-2.0	0.75-1.5	1.75-2.5
Young horse			
Weanling foal (6 mo)	0.5-1.0	1.5-3.0	2.0-3.5
Yearling foal (12 mo)	1.0-1.5	1.0-2.0	2.0-3.0
Two-year old (24 mo)	1.0-1.5	1.0-1.5	1.75-2.5

SOURCE: National Research Council, Nutrient Requirements of Horses, 1989.

^a Plant materials that are high in fiber (hay or pasture).

^b Feeds that are high in energy and low in fiber (grain is primary component).

^c Moderate work.

PASTURE

High-quality, properly fenced pastures are one of the best and least expensive sources of summer feed for a horse. A well-kept pasture also is the most natural and healthy environment for exercise and rest.

Productive, well-managed pastures can provide most of the feed requirements of horses for the least cost. Good pasture alone is sufficient to meet all of the nutritional requirements for many classes of horses. At the same time, poorly managed pastures supply little or no feed and frequently are the source of internal parasites.

If pasture is a feed source, horses with a mature weight of 1,000 to 1,200 pounds generally need the following amount of pasture: mare and foal, 1.75 to 2 acres; yearlings, 1.5 to 2 acres; and weanlings, 0.5 to 1 acre.

When acreage is very limited (less than an acre per horse), exercise may be the main pasture use. In that case, pasture will supply only a minimal amount of feed.



Table 2. Horse nutrient requirements per day

	DIGESTIBLE ENERGY	CRUDE PROTEIN	CRUDE PROTEIN	CALCIUM	PHOSPHOROUS	VIT. A
	MCAL	LB	% TOTAL DIET	%	%	IU/LB
Mature horse ^a						
Maintenance	16.4	1.4	7.2	0.21	0.15	750
Mare, late gestation	18.5	1.8	9.0	0.39	0.30	1490
Mare, early lactation	28.3	3.1	12.0	0.47	0.30	1130
Working horse ^b	24.6	2.2	9.4	0.28	0.22	970
Weanling (6 mo)	17.2	1.9	13.1	0.55	0.30	670
Yearling (12 mo)	21.3	2.1	11.3	0.40	0.22	790
Two-year old (24 mo)	26.3	2.5	10.1	0.31	0.17	840

SOURCE: National Research Council, Nutrient Requirements of Horses, 1989.

^a 1,100 pounds mature weight.

^b Moderate work.

Establishing a rotational grazing system is the best way to maximize forage production and consumption on limited pasture acreage. A group of compatible horses can graze a paddock (area of divided pasture) for approximately 3 to 6 days, then be moved (rotated) to a fresh paddock. Limed and fertilized Kentucky bluegrass should be the main grass in this system, because it withstands close and continuous grazing better than most other grasses. When well established and properly fertilized, it produces a reasonably dense and attractive sod. Consult the *Penn State Agronomy Guide* (available through your county extension office) for more information on pasture systems.

Pasture improvement

If you already have good stands of desirable grass and legume species, you can maintain a satisfactory horse pasture with proper soil fertility and management practices. Most permanent bluegrass pastures produce less than 2,000 pounds of dry matter per acre per year, which is far below their potential. Yields on many pastures can be doubled simply by applying lime and fertilizer. Liming and top-dressing Kentucky bluegrass pastures with phosphate, potash, and nitrogen costs much less and is less work than completely renovating the pasture. It may even be possible to have lime and fertilizer custom-applied for a relatively low cost.

A soil test will determine pH (acidity), nutrient levels, and requirements. (Soil testing kits and information on how to take samples are available through your county extension office.) The response often is slow when lime and fertilizer are applied on the surface of established pastures. Depending on the lime needs and species present in the pasture, it may take one to three years for the sod to become thick and productive again.

Pasture renovation

If you do not have a good stand of desirable species, you may want to renovate the pasture by destroying the existing plants and introducing productive mixtures. This process usually results in the highest yield increase per acre, but

will be relatively expensive to complete. The following steps are recommended for pasture renovation.

1. Soil test to determine exactly how much lime and fertilizer are needed.
2. Apply required lime several months before seeding. Disk or plow to mix lime evenly with the soil. If large amounts of fertilizer are to be applied, it should be disked into the soil prior to planting. Small amounts of fertilizer can be applied through the seeder at planting.
3. Select a seed mixture that complements the pasture drainage characteristics (Table 3).
4. Destroy or suppress old pasture by plowing or using herbicides.
5. Use the appropriate method of seeding, based on extent of tillage.
6. Protect the seeded area until new plants are well established. When recommended mixtures are seeded without a companion crop and weeds are controlled, new seedlings can become established in a single year.

While generally considered less palatable than bluegrass, tall fescue produces one of the toughest sods of any adapted grass. It may be used in heavy traffic areas, along fences, and around gates and water troughs. Older stands of fescue often are infested with an endophyte, a fungus within the plant. In mares, toxins associated with this fungus can lower reproductive rates and cause abortion, agalactia (lack of milk), and prolonged gestation. Use endophyte-free tall fescue seed to establish new fescue stands for horses. Brood mares should be removed from pastures containing endophyte-infested tall fescue at least 90 days prior to foaling.

Pasture management

Whether you improve your pastures by using lime and fertilizer or renovate by reseeding, sound management is essential to keep the desired species persistent and productive.

—**Avoid over or under grazing.** Horses typically graze in spots. Unless they are moved frequently into new pastures, they will seriously damage desired species in some areas. Rotational grazing is therefore desirable.

Table 3. Seeding mixtures for horse pastures.

SOIL DRAINAGE	SEEDING MIXTURE	SEEDING RATE LB/ACRE
Well drained	Kentucky bluegrass	6
	Timothy, smooth bromegrass, or perennial ryegrass	4
	Ladino clover	1
	Red clover	2
Varying drainage	Kentucky bluegrass	8
	Timothy, smooth bromegrass, or perennial ryegrass	4
	or Kentucky bluegrass	6
	Timothy or perennial ryegrass	2
	Birdsfoot trefoil	6
Poorly drained	Reed canarygrass or tall fescue	8
	Birdsfoot trefoil	6

While the correct acreage per horse depends on the season and other factors, generally it is best to provide at least one acre of good quality pasture per horse. Set up five or six paddocks, letting the horses graze in one area for about a week, then move to another area. This system enables legumes and grasses to grow better, increasing feed availability per acre. By rotating the horses from pasture to pasture, you also can break the life cycle of some parasites.

- **Clip pastures regularly during the growing season.** Clipping at a height of 2 to 3 inches after horses are moved to a new paddock helps to control weeds, prevents grasses from heading, and generally keeps the pasture in better condition.
- **Drag pastures with a chain link harrow at least once a year.** Dragging helps to spread manure droppings, reducing parasite populations by exposing them to air and sunlight. Dragging also helps to smooth over areas dug up by horses' hoofs on wet soil.
- **Apply fertilizer as needed.** Improved horse pastures must be fertilized annually if legumes and grasses are to persist and remain productive. Fertilizer choice depends on pasture species present. The best way to establish fertilizer requirements is to have a complete soil test every two or three years.

HAY

High-quality hay can provide most of the nutrients needed for a mature horse. The hay should be cut early and be leafy, green, and free of mold, dust, and foreign matter, such as weeds and stubble. Horses readily consume good hay, which is rich in energy, protein, minerals, and vitamins.

People used to think that horses should not be fed legume hay because it would cause digestive disorders. But research has dispelled this notion. Respiratory or digestive disturbances associated with feeding hay are more likely caused by dust and mold than by mixtures. Straight legume hay or legume-grass mixed hay is a desirable feed if cut early. The hay should be leafy and free of molds and dust.

Well-managed legume-grass hays generally are higher in protein and minerals than are straight grasses under similar management. But time of cutting and other hay-making practices affect protein and mineral levels. With good management, most hay species or mixtures can be satisfactory for horses. Alfalfa hay, while normally high in protein, may contain an excessive amount of calcium in relationship to phosphorus (wide Ca:P ratio) when fed as the sole source of forage to young, growing horses.

To be sure of the nutritive quality of the hay being fed, you must have it analyzed. For more information on testing forages, contact your county extension office.

Hay production

If you plan to grow and harvest your own hay, the steps listed below will help you to consistently produce high yields of good hay.

- **Select adapted species, varieties, and mixtures.** In general, simple mixtures consisting of a single legume, such as alfalfa, and a single grass, such as timothy, are preferred over straight legume or straight grass seedings. The *Penn State Agronomy Guide*, available through your county extension office, is an excellent source of information on species and mixture selection.
- **Fertilize annually.** A complete soil test is the best guide to proper fertilization. If soil test information is unavailable, topdress legume-grass stands annually with a minimum of 50 pounds of phosphate and 150 pounds of potash (e.g., 500 pounds of 0-10-30 fertilizer or equivalent) per acre. If your hay field contains less than a 30 percent stand of legumes, you can increase yield by applying 60 pounds of nitrogen per acre in late winter or early spring.
- **Harvest on time.** To ensure high-quality feed and keep stands productive and persistent, harvest hay at the maturity stages indicated below:

Type of hay	First cut	Later cuts
Alfalfa	Full bud	First flower
Birdsfoot trefoil	1/10 bloom	1/2 bloom
Red clover	1/4 bloom	1/4 bloom
Perennial grasses	Boot	Every 35 days

- **Plan hay-making operations to save leaves.** When hay is cut early and conditioned, it generally contains more leaves and dries much faster than nonconditioned hay. It also tends to be softer and is accepted more readily by animals. Leaves are higher in digestibility and feed value, including protein and minerals, than are other plant parts. Field operations such as raking should be done when hay is moist enough to minimize leaf loss.
- **Dry and store hay to prevent dusts and molds.** Conventional field-dried hay should have less than 20 percent moisture to prevent molding. Of the perennial species grown for hay in Pennsylvania, red clover is among the most difficult to field cure. By applying a chemical preservative when baling, it is possible to store hay safely at moistures up to 25 percent. Hay treated with most chemical preservatives is safe to feed to horses as long as no dust or mold is present.

FORAGE CONCERNS

- Always feed horses clean, unmoldy forages.** Horses are extremely susceptible to molds, fungi, and other toxic substances in forage. Mold problems generally occur in hay that has been baled at too high a moisture level (20 percent or more) without the use of a preservative. This is especially a problem with first-cut hay, because it is harvested at a time when rain is frequent and weather conditions are not optimal for hay drying.
- Do not feed horses sudangrass or sorghum-sudangrass hybrids.** Sudangrass and sorghum-sudangrass hybrids contain compounds that can cause muscle weakness, urinary problems, and, in severe cases, death.
- Do not feed mares tall fescue containing an endophyte fungus.** Older varieties of tall fescue may contain an endophyte fungus that can cause severe health problems when eaten in summer. Mares are especially sensitive to the fungus. During the last three months of gestation,

mares should be removed from pastures containing endophyte-infected tall fescue. Tall fescue varieties that are free of the endophyte fungus are now available.

- Do not feed horses hay containing blister beetles.** The beetles irritate the lining of the horse's digestive tract, usually causing death. The beetles are most likely to be found in alfalfa hay produced in southern areas of the United States. Purchase hay that is guaranteed to be free of blister beetles.
- Identify and remove poisonous plants from pastures.** Poisonous plants in pastures or hay can be fatal to horses. Ornamental shrubs and nightshade are the most common poisonous plants in Pennsylvania, but any plant that is known to be poisonous to other animals is probably poisonous to horses. Fortunately, many poisonous plants are not palatable, and horses will not eat them if forage is adequate to meet their needs.

Prepared by Marvin H. Hall, associate professor of agronomy, and Patricia M. Comerford, instructor of animal science

Where trade names appear, no discrimination is intended, and no endorsement by the Cooperative Extension Service is implied.

Issued in furtherance of Cooperative Extension Work, Acts of Congress May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture and the Pennsylvania Legislature. L.F. Hood, Director of Cooperative Extension, The Pennsylvania State University.

This publication is available in alternative media on request.

The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. The Pennsylvania State University does not discriminate against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, or veteran status. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 201 Willard Building, University Park, PA 16802-2801; tel. (814) 863-0471; TDD (814) 865-3175.