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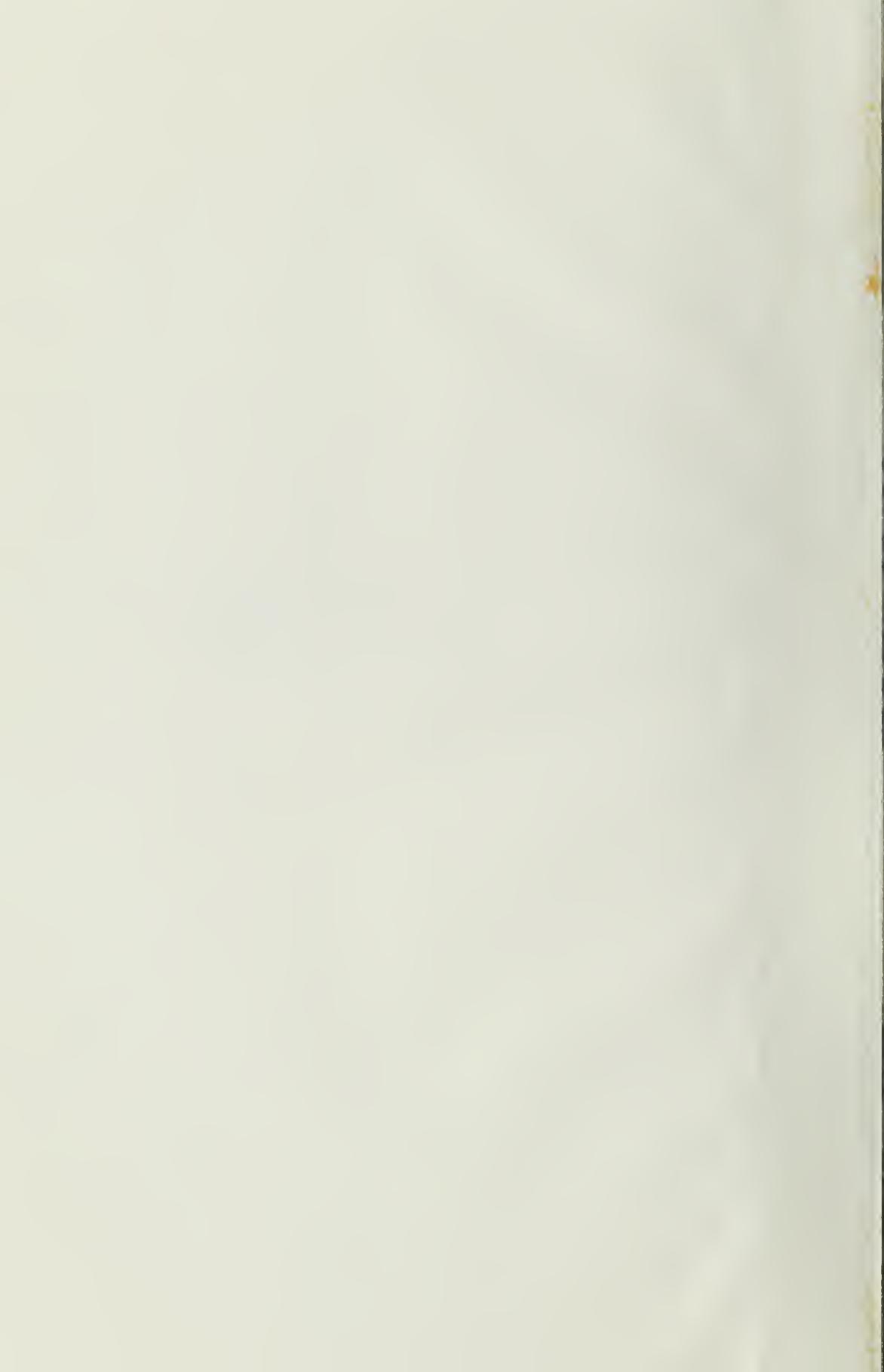
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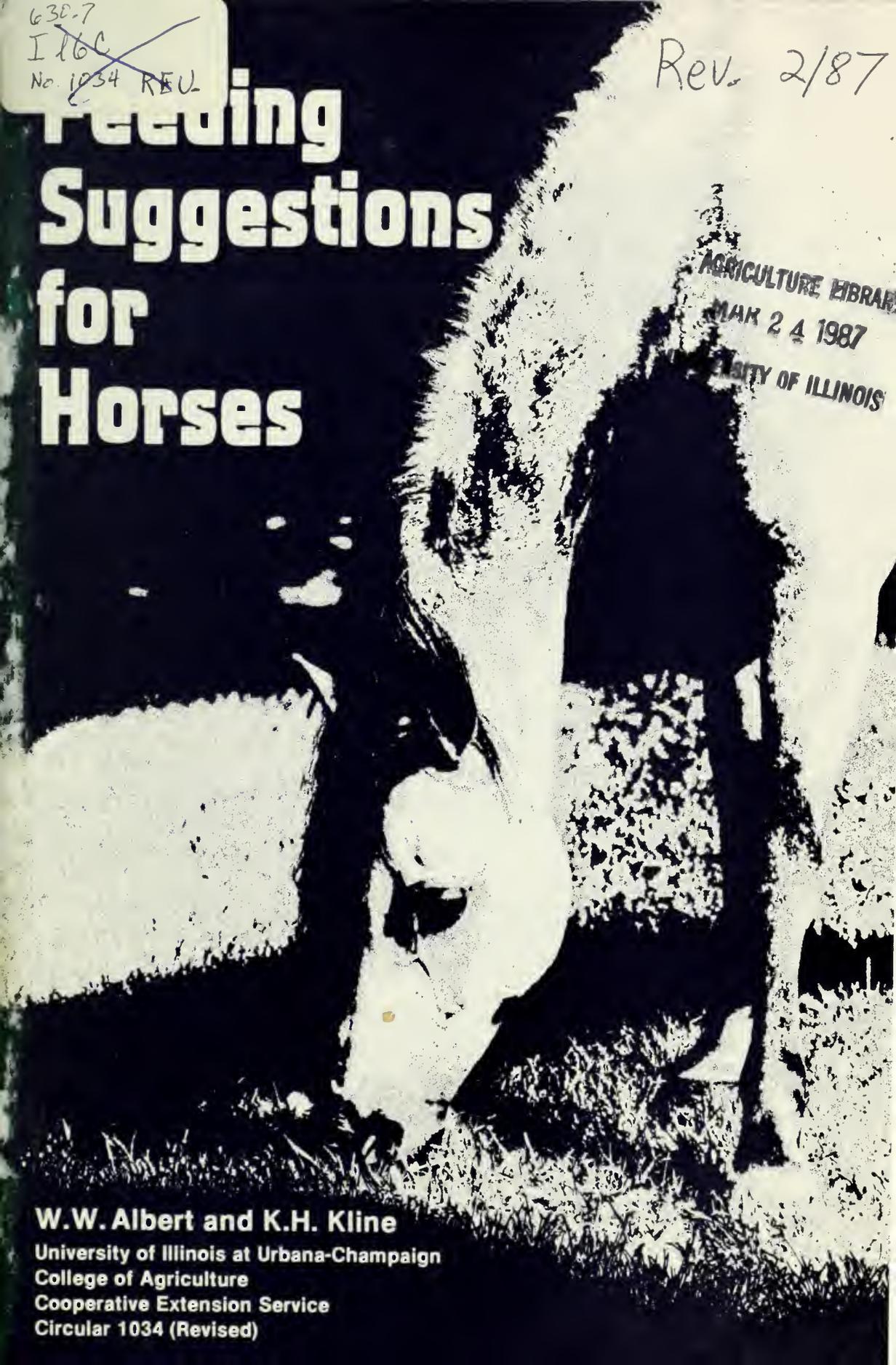
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Feeding Suggestions for Horses

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Cooperative Extension Service
Circular 1034 (Revised)



CONTENTS

<i>Consumption and Weight</i>	1
<i>Formulating Horse Rations</i>	2
<i>Water</i>	2
<i>Protein for Horses</i>	2
<i>Minerals</i>	3
<i>Vitamins</i>	4
<i>Energy Needs</i>	5
<i>Grains for Horses</i>	6
<i>Roughage</i>	7
<i>Feeding Costs</i>	7
<i>Pastures</i>	9
<i>Examples of Daily Rations</i>	11
<i>Ration Calculations</i>	16
<i>Some Feeding Questions and Answers</i>	17

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Urbana, Illinois

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FEEDING SUGGESTIONS FOR HORSES

A WELL-FED, HEALTHY HORSE will be content and alert, have a keen appetite, and will have a sleek, lustrous coat. About 75 percent of the cost of raising horses (aside from purchase of breeding stock) is feed. Overfeeding can be wasteful and expensive, and underfeeding or a nutritional deficiency will not permit optimum performance. Since horses depend so much on their wind, feeds should be clean and free of mold and excessive dust. In order for a horse to be in the best possible condition, observe the following feeding practices.

- Feed a balanced ration. The term "ration" denotes feed for a 24-hour period.

- Accustom horses to feed gradually. In general, they may be given as much hay as they will eat. It is safe to start horses on $\frac{1}{2}$ pound of grain daily for each hundred pound's of the animal's weight. Thereafter, $\frac{1}{2}$ pound of grain added to the total ration every third day is advisable. Of course, as the grain ration is increased, roughage consumption will decline.

- Feed horses regularly. In warm weather, early and late feeding during the cooler hours is preferred.

- Feed two or three times daily. Usually feed grain before roughage.

- Avoid sudden or abrupt changes in types of rations. Horses can go off feed.

- Keep troughs and water containers clean.

- Exercise horses every day.

- Be sure your horse's teeth are sound.

Consumption and Weight

Horses can eat about 2 to $2\frac{1}{2}$ pounds of air-dry feeds (as grain in the bin and hay in the bale) daily per 100 pounds (cwt.) of their body weight.

In average condition, a light-legged mature mare over 14.2 hands (58 inches) will weigh approximately 1,100 pounds while mature geldings and stallions will weigh about 1,200 pounds.

Mature ponies under 46 inches will weigh from 400 to 600 pounds. Taller ponies up to 56 inches will average 700 to 900 pounds.

Weanling horse foals will weigh from 400 to 600 pounds when 7 months old. Pony foals will weigh from 200 to 300 pounds when 7 months old.

Well-fed foals will reach about 50 to 60 percent of their mature weight during the first year and about 75 percent at the end of the second year. Horses reach maturity between four and five years of age.

Formulating Horse Rations

Water, protein, minerals, vitamins, and energy are essential nutrients in a horse ration. Observe the following points when formulating the ration.

- Is the total quantity of the ration adequate?
- Is the energy produced by the ration suitable for the work or the performance required?
- Is the amount of crude protein (digestible protein) adequate?
- Is the proper amount of minerals and of vitamins A and D included in the ration?
- Is the ration economical but still nutritionally adequate?

Water

The average mature light horse may drink about 10 to 12 gallons of water daily varying with the amount of work, the type of feed, and the weather. Horses should be watered regularly and frequently. After heavy exertion, very warm or very thirsty horses should be watered lightly until they are properly cooled. In very cold weather, water should be heated to 40 or 50° F.

Protein for Horses

Horses need protein for muscle growth, for lactation, and for reproduction. Protein needs are expressed as percent crude protein (C.P.) or more precisely as percent digestible protein (D.P.) of the ration. Horsemen usually add supplemental protein such as linseed meal, soybean meal, or other purchased protein to grass hay and grain rations. Legume hays such as alfalfa and red clover are also good protein sources. The average ration should contain approximately 12 percent crude protein.

Two good common oilmeal protein supplements that can be added to grass hay and grains are linseed meal (36 percent C.P.), and soybean meal (44 percent C.P. with hulls; 50 percent C.P. without hulls). Soybean meal is more palatable and of higher quality for foals and young horses.

Other purchased protein supplements without urea can be used. In some cases peanut meal, cottonseed meal, and safflower meal are good substitutes if they are economical. Protein needs of various types of horses are summarized in Table 1.

Table 1. — Summary of Protein Needs for Horses

Type of horse	Percent crude protein (C.P.)	Percent digestible protein (D.P.)	Lb. oilmeal or protein equivalent to add to grass hay or grain rations daily ^a
Mature idle	10	7.5	.5
Dry mare in early pregnancy	11	8.5	.75
Yearling or 2-year old	12	9.0	1.0
Mare in last quarter of gestation	12	9.0	1.0
Lactating mare	14 ^b	10.0	1.5
Stallion in heavy service	14 ^c	10.0	2.0
Foal under 6 months	14+ ^d	10.0+	...

^a Four pounds of quality legume hays (alfalfa or clover) furnish approximately the same amount of digestible protein as 1 pound of soybean, linseed, or cottonseed meal.

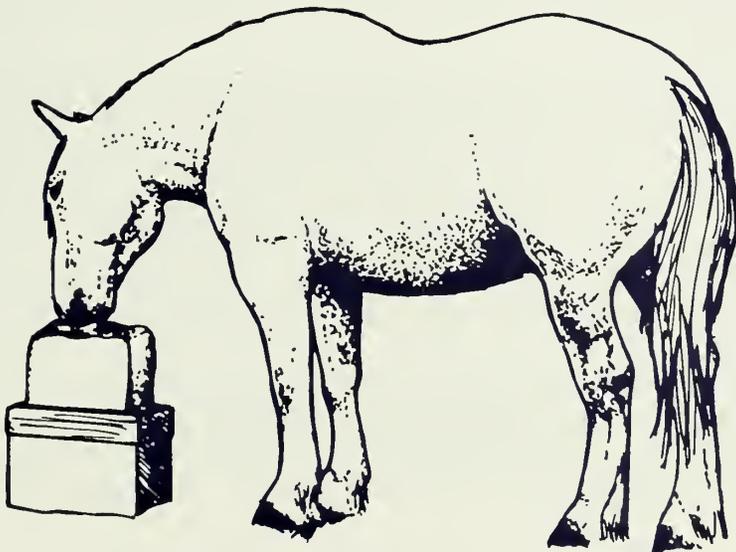
^b The highest amount of protein is needed during early lactation. Later the amount can be reduced.

^c The amount of protein needed depends on how heavy is the breeding service. The minimum is 14 percent.

^d A very young foal may need up to 20 percent protein. At 6 months, 14 percent is sufficient.

Minerals

Common farm feeds provide minerals, but most horses need extra calcium, phosphorus, salt, and possibly some trace minerals such as iron, copper, zinc, manganese, iodine, and selenium. The daily salt requirement is about 2 to 3 ounces. Routinely providing free-choice salt that is trace-mineralized for horses will satisfy both salt and trace mineral requirements with the possible exception of those for selenium. Not all trace mineral salt formulations contain selenium; check the feed label when in doubt.



Salt can be provided in a free-choice block.

The calcium requirement varies from as little as 0.3 percent dietary calcium for fully mature horses to as much as 0.85 percent in weanling foals. The phosphorus requirement may range from 0.2 percent dietary phosphorus for fully mature horses to 0.6 percent in weanling foals.

The calcium and phosphorus needs of mares in early lactation are approximately double those of mature horses that are not providing milk for foals. A calcium-to-phosphorus ratio of 1.1:1 should be provided for young horses. Older horses can usually tolerate a higher ratio, possibly one as high as 6:1. There should not be more phosphorus than calcium in a horse's diet.

A good way to furnish supplemental minerals is to offer a free-choice mixture of equal parts of dicalcium phosphate and trace-mineralized salt in a box protected from the weather. In formulating complete mixed hay and grain rations, about 1 percent dicalcium phosphate and 0.5 percent trace-mineralized salt should be added.

Vitamins

Special attention should be given to a horse's needs for vitamins. Generally, green grasses and hays furnish carotene that the horse converts to vitamin A. Vitamin A is important in maintaining the skin and epithelial linings of the digestive, respiratory, urinary, and reproductive tracts. Vitamin D is often called the sunshine vitamin because the sun's rays convert substances in the animal's skin and substances in sun-cured forages into vitamin D. Vitamin D is especially important in the absorption and metabolism of calcium and phosphorus for normal bone growth and maintenance. An average pleasure horse needs about 20,000 to 30,000 International Units (I.U.) of vitamin A and about 3,000 I.U. of vitamin D daily.

Vitamin E is often associated with improved reproduction and muscle maintenance. Green feeds, wheat bran, and wheat germ oil are usually rich in vitamin E. Under conditions of barn confinement, drouthy pastures, or feeding poor-quality forage, horses may not receive adequate amounts of vitamins A, D, and E. In such cases, economical supplements of these vitamins can be mixed in the feed, injected intramuscularly, or furnished in stabilized mineral blocks. Vitamin K, necessary for blood clotting, is synthesized sufficiently in the body.

The necessary B vitamins are synthesized in the horse's cecum. Small supplemental amounts may be beneficial under stress conditions of fast growth, intense training, heavy racing, or breeding. Spent brewers' yeast may be an economical supplemental source of B vita-

mins. An economical premix of vitamins, as listed below, can be added to grain mixtures if desired at the rate of 0.5 percent (10 pounds) per ton of the grain mixture. Some horsemen prefer to add a small amount daily over the grain.

<i>Vitamin</i>	<i>Amount per lb. of premix</i>
A.....	1,000,000 I.U.
B ₁ (Thiamine)	1,000 mg.
B ₂ (Riboflavin).....	1,000 mg.
B ₆ (Pyridoxine).....	300 mg.
B ₁₂	1,500 mg.
C.....	10,000 I.U.
D.....	100,000 I.U.
E.....	10,000 I.U.
Choline chloride	25,000 mg.
Folic acid.....	300 mg.
Niacin.....	2,000 mg.
Pantothenic acid.....	1,500 mg.

Energy Needs

The basic ration for a horse is hay plus grain. The amount of grain a horse needs depends on the growth or performance expected. The amount of total ration is based on a consumption of 2¼ pounds of air-dry fed per cwt. Thus a 1,000-pound horse would receive a total daily ration of 22½ pounds. The energy need is often expressed as total digestible nutrients (T.D.N.). Generally grains provide more energy than hays because they analyze higher in T.D.N. and lower in crude fiber (C.F.). Table 2 gives grain requirements for several types of horses.

Table 2.— Amount of Grain To Be Included in a Horse’s Ration Per Cwt. of the Horse’s Weight

Grain per cwt., lb.	Work expected from the horse	Gain or growth	Breeding stock
None	Idle mature horse	Maintenance
.50	Light (0 to 3 hours per day)	Light
1.00	Moderate (3 to 6 hours per day)	Average	Mare in drylot nursing foal
1.25	Heavy (more than 6 hours per day)	Faster growth or fattening	Stallion in heavy service

The table suggests that an idle mature horse weighing 1,000 pounds should receive 22½ pounds of hay with no grain while a similar horse doing heavy work or a stallion in heavy service should receive about 10 pounds of hay and 12.5 pounds of grain daily.

It is usually sound economically to feed and grow weanlings well the first and second years because young horses are more efficient and generally need less feed per pound of weight increase. Some horses can be safely fed more than 1¼ pounds of grain per hundredweight. However, when fed heavily, care should be taken to see that horses get plenty of exercise and do not become swollen or puffy in their legs.

Grains for Horses

Oats have been the preferred grain for horses because they contain 12 percent crude protein and are more safely fed than other grains because of their fiber or bulk. However, the price of oats often becomes prohibitive. Sometimes they are crimped or crushed for cleaning and palatability. Horses like variety, so mixed grains are often fed. Other grains can be substituted for oats, but shelled corn, milo, wheat, and rye are low in fiber or bulk and much more dense than oat in volume-to-volume comparison.

Occasionally these grains can cause impaction or colic if they are fed alone or if they are eaten too fast by greedy horses. It may be safer to mix shelled corn, milo, wheat, or rye with oats or place some baseball-sized stones in the grain box to slow ravenous eating. Whenever one of these more dense grains is substituted for oats, it should be substituted on a weight basis rather than a volume basis.

Barley is similar to oats, but is harder and should be rolled or crushed.

Shelled corn is high in energy and contains little fiber. It is better utilized by the horse when it is coarse-cracked before feeding. Corn is generally more economical than oats and is nearly twice as high in energy on a volume basis.

Ear corn or ground ear corn can be fed and it will minimize gulping the grain.

Milo needs to be crushed or cracked; otherwise it may be voided as whole grain in the manure.

Wheat is often expensive and needs cracking or crushing. Wheat and rye have a tendency to gum when chewed and should not make up over 50 percent of the grain mix.

Rye is not very palatable and, like wheat, needs cracking or crushing.

Wheat bran is good as bulk. One pound a day is enough for a mature horse. A warm, soaked mash of 3 to 4 pounds of wheat bran alone or mixed with oats is an excellent idle-day feed. High levels of bran should not be fed routinely to young, growing horses because wheat bran is relatively low in calcium but very high in phosphorus.

Roughage

Hay is used in the ration for bulk and energy, and can be fed loose, pelleted, or chopped.

While growth, work, and reproduction require that some of the ration consists of grain, nonlactating broodmares and idle mature horses can get along satisfactorily on hay alone. On the other hand, working horses can easily be fed too much roughage, resulting in labored breathing and lack of stamina.

Grass hays usually contain about 5 to 10 percent crude protein. However, this figure can be higher if grass hays are harvested in early bloom.

Bromegrass is a perennial, palatable forage.

Orchard grass is a perennial, palatable forage often seeded with bromegrass.

Timothy is highly regarded but, in Illinois, it is a less-productive hay.

Prairie hay is a mixture of grasses of western or south-western origin.

Legume hays usually contain about 15 percent crude protein or more when they are cut at the one-third bloom stage. Very green legume hays may be a little laxative and may cause more frequent urination, however no real harm will ensue.

Alfalfa, a perennial, is hardy and productive.

Red clover, a biennial, will need reseeding after two years. Occasionally, second-cutting red clover may cause slobbering.

Lespedeza is commonly grown in southern Illinois.

Mixed hays include grass and legumes. They offer variety and more protein than straight grass hay.

Straws are used primarily for bedding but clean oat and wheat straw can be used as a filler roughage. Oat straw is more palatable.

Feeding Costs

The cost of feeding a horse varies with the season and the availability of feed. Some approximate on-farm costs of feedstuffs and

supplements are given below. These costs will be higher in urban areas because of additional expenses for transportation and handling.

Hay costs \$50 to \$140 per ton, or 2½ cents to 7 cents per pound.

Oats cost \$1.50 to \$2 per bushel, or 4½ to 6 cents per pound.

Shelled corn costs about \$2 to \$3 per bushel, or 3½ to 5½ cents per pound.

Soybean meal (42 to 50 percent crude protein) costs about \$150 per ton, or 7½ cents per pound.

Linseed meal (36 percent crude protein) costs about \$150 per ton, or 7½ cents per pound.

Complete pelleted feed costs \$220 to \$250 per ton, or 11 to 12½ cents per pound.

Dicalcium phosphate costs about \$15 per 100 pounds, or 15 cents per pound.

Trace-mineralized salt costs about \$8 per 100 pounds, or 8 cents per pound.

Three examples of the cost of feeding a horse are given below. These figures assume that a horse consumes about 2 pounds of feed per 100 pounds of body weight per day.

Example A: Horse weighing 1,000 pounds fed only mixed grass-legume hay.

1,100 pounds × 2 pounds per hundredweight = 22 pounds hay daily

22 pounds × 365 days = 8,030 pounds hay annually

8,030 pounds × 5 cents = \$401.50 annual cost

Example B: Horse weighing 1,100 pounds and working about 3 to 6 hours per day fed grain, hay, and meal.

11 pounds grain × 5½ cents per pound = 60½ cents

13 pounds grass hay × 4 cents per pound = 52 cents

1 pound soybean or linseed meal × 7½ cents = 7½ cents

Total daily cost = \$1.20

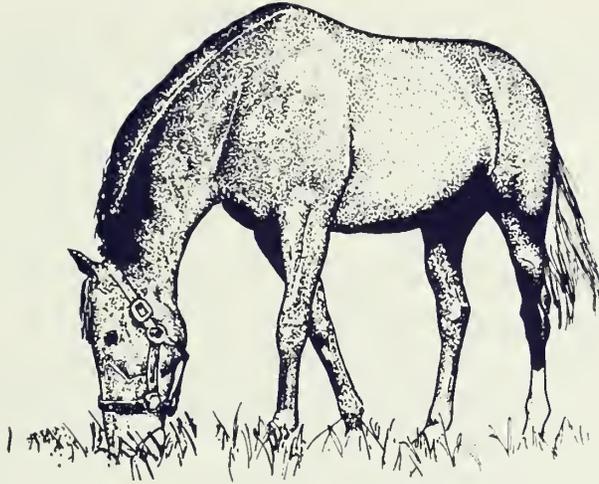
Total annual cost: \$1.20 × 365 days = \$438

Example C: Horse weighing 1,000 pounds fed a complete pelleted ration.

1,100 pounds × 2 pounds per hundredweight = 22 pounds daily

22 pounds pellets × 12½ cents per pound = \$2.75

Total annual cost: \$2.75 × 365 days = \$1,003.75



Pastures

Good pastures are an excellent source of nutrients. Pastures can supply the complete ration, but usually working horses and lactating mares are fed additional grain. Foals on pasture are often creep-fed as well.

The pasture season in central Illinois begins about the first week in May and lasts until about the middle of October. It begins about a week earlier for each 100 miles south of central Illinois and a week later for each 100 miles north of central Illinois.

Both temporary (one-season) and permanent pastures are used to provide feed for horses. An example of a temporary pasture schedule is given below.

<i>Season</i>	<i>Forage</i>	<i>Seeding time</i>	<i>Grazing time</i>
Spring	Oats and barley	Late March and April	May and June
Summer	Pearl millet	Late April and May	June until frost
Fall	Wheat and rye	Late August and September	October and No- vember; April

Some horsemen use sudangrass during the summer, but an occasional case of urinary cystitis infection has been recorded from sudangrass grazing. Sudangrass is not safe for grazing immediately after frost or when severely stunted by drouth. Cured sudangrass can be used as hay.

Mixtures of legume and grasses in permanent pasture provide variety and more forage. Bromegrass or orchardgrass with alfalfa are suitable in most of Illinois. Fescue with lespedeza is often used in southern Illinois, however deficient milk production and foaling problems have been reported in some mares grazing in fescue pastures.

Establishment of a permanent pasture involves a considerable investment in money and labor. Good management is also required. The following suggestions will help you establish and maintain a good permanent pasture.

- Test the soil fertility and add necessary limestone, phosphorus, potassium, and nitrogen.
- Prepare a good seedbed.
- Use recommended and adapted seeds and inoculate legumes.
- Use a grass-legume mixture.
- Seed at the proper time, preferably in early spring or fall.
- Seed with a nurse crop. Oats are good. Remove the nurse crop early when oats are in the dough stage.
- Cover the seed with $\frac{1}{4}$ to $\frac{1}{2}$ inch of soil.
- Firm the seedbed by rolling.
- Clip weeds, setting the sickle bar high.
- Do not pasture the first season because horses will trample the seedlings.

● To improve forage growth, topdress pastures with nitrogen in early spring (where legumes are less than 25 percent) with 50 to 70 pounds of actual N per acre.

Permanent and rotation pasture mixtures per acre for central and northern Illinois:

Alfalfa	8 lb.	Alfalfa	8 lb.
Bromegrass	12 lb.	Bromegrass	6 lb.
	20 lb.	Orchardgrass	6 lb.
			20 lb.

These mixtures are very productive for both pasture and hay. The inclusion of orchardgrass with bromegrass will furnish more grazing in midsummer when bromegrass may be semidormant. Seed mixtures in late March or early April or in early fall, preferably before August 25.

Permanent pasture mixture per acre for southern Illinois where bromegrass and orchardgrass may not be as productive:

Kentucky fescue (low endophyte)	14 lb.
Alfalfa or lespedeza	8 lb.
	22 lb.

Examples of Daily Rations

Some examples of daily rations for several types of horses are given below. Modifications can be made in these rations depending on the availability and cost of feeds.

Example A: Idle mature horse or pony

Nutrient requirements:

	Weight, lb.	Daily ration, lb.	Daily T.D.N., lb.	Daily D.P., lb.
Horse.....	1,200	20 to 24	9.6	.8
Pony.....	800	16 to 18	6.4	.6

Ration 1:

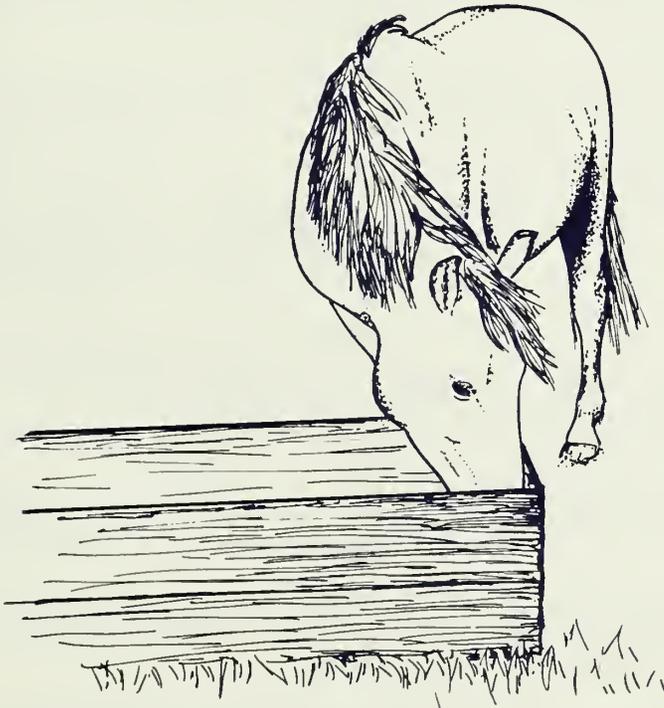
Horse: 20 to 24 pounds mixed hay ($\frac{1}{3}$ alfalfa and $\frac{2}{3}$ grass).

Pony: 16 pounds mixed hay.

Ration 2:

Horse: 20 to 24 pounds grass hay and $\frac{1}{2}$ pound linseed meal or soybean meal.

Pony: 14 to 16 pounds grass hay and $\frac{1}{4}$ pound oilmeal.



Daily rations can be given at an outdoor feeder.

Example B: Mature horse or pony doing moderate work

Nutrient requirements:

	Weight, lb.	Daily ration, lb.	Daily T.D.N., lb.	Daily D.P., lb.
Horse.....	1,200	20 to 24	14.0	1.3
Pony.....	800	16 to 18	11.0	.92

Ration 1:

Horse: 15 pounds mixed hay ($\frac{1}{3}$ alfalfa and $\frac{2}{3}$ grass) and 9 pounds oats.

Pony: 10 pounds mixed hay and 6 pounds oats.

Ration 2:

Horse: 15 pounds mixed hay ($\frac{1}{3}$ red clover and $\frac{2}{3}$ grass), 6 pounds oats, and 3 pounds cracked corn.

Pony: 10 pounds mixed hay, 4 pounds oats, and 2 pounds cracked corn.

Ration 3:

Horse: 15 pounds grass hay, 6 pounds oats, 3 pounds cracked corn, and $\frac{1}{2}$ pound linseed meal or soybean meal.

Pony: 10 pounds grass hay, 4 pounds oats, 2 pounds cracked corn, and $\frac{1}{4}$ pound linseed meal or soybean meal.

Example C: Mare nursing foal

Nutrient requirements:

	Weight, lb.	Daily ration, lb.	Daily T.D.N., lb.	Daily D.P., lb.
Mare.....	1,100	20 to 22	18	1.9

Ration 1:

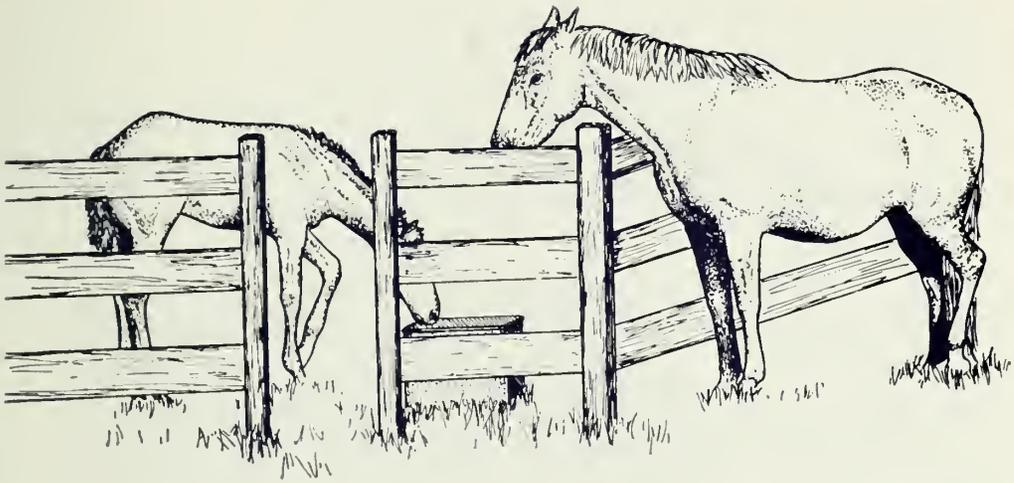
Pasture and 6 pounds grain. The grain might consist of 4 pounds oats, 1 pound cracked corn, and 1 pound bran.

Ration 2:

11 pounds mixed hay ($\frac{1}{3}$ alfalfa and $\frac{2}{3}$ grass), 7 pounds oats, 3 pounds cracked corn, and 1 pound linseed meal or soybean meal.

Ration 3:

11 pounds grass hay, 7 pounds oats, 3 pounds cracked corn, and $\frac{1}{2}$ pounds linseed meal or soybean meal.



Foals can be offered grain in a creep feeder.

Example D: Weaning 6 months to 1 year old

Nutrient requirements:

	Weight, lb.	Daily ration, lb.	Daily T.D.N., lb.	Daily D.P., lb.
Weanling	600	12 to 14	10 to 11	1.3

Ration 1:

8 pounds mixed hay ($\frac{1}{3}$ alfalfa and $\frac{2}{3}$ grass), 6 pounds oats, and $\frac{1}{2}$ pound linseed meal.

Ration 2:

8 pounds grass hay, 3 pounds oats, 3 pounds cracked corn, and 1 pound soybean meal or linseed meal.

Example E: Yearling to 2-year-old horses

Nutrient requirements:

	Weight, lb.	Daily ration, lb.	Daily T.D.N., lb.	Daily D.P., lb.
Yearling to 2-year-old	900	18 to 20	12	1.5

Ration 1:

11 pounds mixed hay ($\frac{1}{3}$ red clover and $\frac{2}{3}$ grass), 6 pounds oats, 3 pounds cracked corn, and $\frac{1}{2}$ pound linseed meal or soybean meal.

Ration 2:

11 pounds grass hay, 6 pounds oats, 3 pounds cracked corn, and 1 pound linseed meal or soybean meal.

Example F: Breeding stallion in moderate service

Nutrient requirements:

	Weight, lb.	Daily ration, lb.	Daily T.D.N., lb.	Daily D.P., lb.
Stallion.....	1,300	22 to 26	16	2.5

Ration 1:

12 pounds mixed hay ($\frac{1}{3}$ alfalfa and $\frac{2}{3}$ grass), 8 pounds oats, 4 pounds cracked corn, 1 pound wheat bran, and 1 pound linseed meal.

Ration 2:

12 pounds grass hay, 8 pounds oats, 4 pounds cracked corn, 1 pound wheat bran, and $1\frac{1}{2}$ pounds linseed meal or soybean meal.

Example G: Creep rations for a nursing foal

A creep ration is commonly fed free choice where only foals can eat it.

Ration 1:

5 parts crimped oats, 3 parts cracked corn, and 1 part linseed pellets.

Ration 2:

8 parts crimped oats and 1 part linseed pellets.

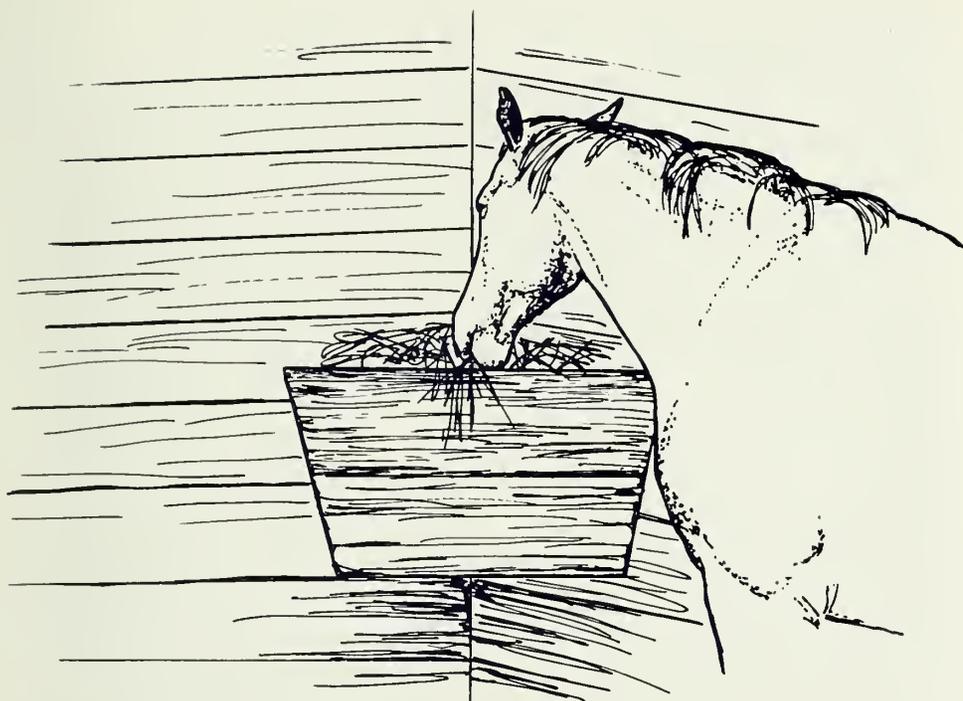
Ration 3:

This is a formula for a highly palatable creep ration. It analyzes approximately 18 percent C.P. (13.5 percent D.P.), 70 percent T.D.N., and 8 percent C.F.

<i>Ingredient</i>	<i>Percent</i>
Crimped oats.....	40
Cracked corn.....	30
Soybean meal (50-percent).....	20
Dehydrated alfalfa.....	4
Dried molasses.....	4
Dicalcium phosphate.....	1
Trace-mineralized salt.....	.5
Vitamin mix ^a5
Aurofac ^b	+

^a To furnish 5,000 I.U. of vitamin A per pound of ration plus B vitamins.

^b To furnish 40 mg. of antibiotic per pound of ration.



Many horses are housed in boxstalls and fed from individual mangers.

Example H: Complete pelleted ration

This formula analyzes approximately 14 percent C.P. (9.8 percent D.P.), 58 percent T.D.N., and 24 percent C.F.

<i>Ingredient</i>	<i>Percent</i>
Alfalfa hay (chopped)	62
Oats.....	15
Cracked corn.....	15
Dried molasses.....	4
Soybean meal (50 percent C.P.).....	2
Dicalcium phosphate	1
Trace-mineralized salt.....	.5
Vitamin premix ^a5

^a To furnish 2,000 I.U. of vitamin A per pound of ration.

Ration Calculations

A knowledge of the composition of a ration along with feed analyses (Table 3) makes it possible to calculate the percent protein and percent energy of a ration. Research shows that the maintenance requirement of a horse is about 0.8 pound of T.D.N. per cwt. and that a pound of gain above maintenance requires about 3.63 pounds of T.D.N. per cwt.

The percent of crude protein (C.P.) and digestible protein (D.P.) in a typical ration for an 800-pound yearling can be calculated as in the following example. The C.P. figures are taken from Table 3.

<u>Daily ration of:</u>	<u>lb.</u>	<u>×</u>	<u>C.P.</u>	<u>=</u>	<u>lb. C.P.</u>
Oats.....	6		.12		<u>.72</u>
Corn.....	2		.08		.16
Alfalfa.....	5		.15		.75
Bromegrass.....	5		.05		.25
Soybean meal.....	.75		.50		.375
Totals.....	<u>18.75</u>				<u>2.255</u>

Dividing the total C.P. in pounds by the total amount of the ration ($2.255 \div 18.75$) gives a C.P. content of 12 percent. The average digestion coefficient for crude protein of grain is about 75 percent and about 65 percent for the crude protein of roughages. Taking an average of 70 percent and multiplying the C.P. figure by this amount ($12 \times .70$), a result of 8.4 percent for the digestible protein (D.P.) in the ration is obtained.

The percent T.D.N. in the ration can be calculated in a similar manner. The figures for percent T.D.N. in various feeds in the following example are taken from Table 3.

<u>Daily ration of:</u>	<u>lb.</u>	<u>×</u>	<u>T.D.N.</u>	<u>=</u>	<u>lb. T.D.N.</u>
Oats.....	6		.72		4.32
Corn.....	2		.80		1.60
Alfalfa.....	5		.50		2.50
Bromegrass.....	5		.50		2.50
Soybean meal.....	.75		.80		.60
Totals.....	<u>18.75</u>				<u>11.52</u>

Dividing the total T.D.N. in pounds by the total amount of the ration ($11.52 \div 18.75$) gives a T.D.N. content of 61.4 percent.

Table 3. — Average Analyses of Some Horse Feeds on an Air-Dry Basis

Feed	Total digestible nutrients (T D.N.)	Crude protein (C.P.)	Digestible protein (D.P.)	Crude fiber (C.F.)
	<i>percent</i>	<i>percent</i>	<i>percent</i>	<i>percent</i>
Grains				
Oats.....	72	12	9.4	12
Shelled corn.....	80	8 to 9	7	3
Barley.....	79	12	9	6
Milo.....	79	9	7	3
Ground ear corn.....	75	7.5	6	9
Wheat.....	82	12	10	3
Wheat bran.....	70	17	13	9
Protein oil meals				
Linseed meal.....	75	36	31	9
Soybean meal with hulls.....	79	44	36	5
Soybean meal without hulls...	80	50	42	0
Cottonseed meal.....	80	44	35	9
Peanut meal.....	80	50	43	5
Grass hays				
Bromegrass.....	45 to 50	5 to 6	3 to 3.5	33
Orchard grass.....	45 to 50	5 to 6	3 to 3.5	33
Timothy.....	45 to 50	5 to 6	3 to 3.5	33
Prairie hay (western).....	45 to 50	5 to 6	3 to 3.5	33
Legume hays				
Alfalfa.....	50 to 55	15	10	33
Red clover.....	50 to 55	13 to 15	9	33
Mixed hays				
1/3 alfalfa and 2/3 grass.....	50	8 to 9	5	33
Straw				
Oats.....	40	4	1	40
Wheat.....	40	3 to 4	.5 to .75	40

The 800-pound yearling used in the examples requires 6.4 pounds T.D.N. for maintenance (800 lb. × 0.8 lb. per cwt.). Subtracting 6.4 pounds from 11.52 (the T.D.N. in the ration) leaves 5.12 pounds T.D.N. available after maintenance. Dividing 5.12 pounds by 3.63 pounds (the amount of T.D.N. required for 1 pound of gain) gives a daily gain of 1.4 pounds for an 800-pound yearling fed the ration used in the above examples.

Some Feeding Questions and Answers

- Can ear corn be fed to horses? Ear corn is a satisfactory feed, assuming it is adequately dried and free from mold. It is good for greedy horses that bolt grain.

- Are pelleted rations satisfactory? Yes. Pelleted rations have proven popular because they are convenient to handle, easily stored, and reduce dustiness. However, grinding and pelleting increase ration costs.

- What causes wood chewing and how can it be minimized? Wood chewing may be a result of boredom or of a deficiency in the diet. Boredom may be reduced by feeding three times daily, increasing exercise, or offering some additional straw or coarse hay to the horse when feeding pellets.

- Can silage be fed to horses? The use of silage requires especially good management. However, good-quality silage free from mold and not frozen can be a good roughage during the winter. If silage is fed, it is a good idea to also use 3 to 4 pounds of dry hay daily.

- How many pounds of silage are equivalent to a pound of hay? Corn silage is ensiled at 60 to 65 percent moisture. About 2.5 wet pounds of corn silage are equal to 1 pound of air-dry hay. Grasses and legumes are usually ensiled at 40 to 50 percent moisture and are called haylage. About 1.6 pounds of wet haylage is equal to 1 pound of air-dry hay.

- Of what value is molasses? Wet or dry molasses are sometimes included in the ration to increase palatability and consumption. To keep the ration from being too laxative, it should not include more than 4 to 5 percent molasses.

- If legume hays analyze higher in crude protein, why do horsemen often prefer grass hay? Grass hays often cure more easily and thus are considered to be cleaner and less apt to contain mold.

- Is it advisable to limit feed hay? Hay is often limited for race horses to insure an ingestion of more energy from grain. Roughage is sometimes limited for show horses to avoid hay bellies.

- Is it possible to feed rations that are too rich? Yes. Overfeeding, or bringing to a heavy feed of grain too quickly without sufficient exercise, can result in colic, stocked legs, and puffy or swollen hocks.

- How can greedy horses be prevented from bolting or eating their grain too quickly? Put a few baseball-sized smooth stones in the grain box. Ear corn will also help.

- What is founder? Founder is a metabolic disorder resulting from overeating, drinking cold water when overheated, or other types of stress. It can lead to separation of live and horny portions of the hoof, which causes severe lameness. Immediately placing cold packs on the horse's legs or standing the front legs in cold water are good first aid measures. Severe cases require the attention of a veterinarian.

• What is colic? Colic is simply a bellyache and can result from any number of causes. Drenching with a pint of mineral oil or several quarts of water containing one half cup of salt or epsom salt may offer relief. Colic should always be considered an emergency; consult a veterinarian.

• Can horses use urea or other nonprotein nitrogen sources for protein? Not efficiently because the cecum (a pouch of the large intestine where nonprotein nitrogen would be converted to useful protein) is located too far down the digestive tract. Too much urea could be toxic to the horse so avoid using it.

• Do antibiotics improve growth? The feeding of 85 milligrams of aureomycin daily to foals up to 1 year old improves growth rates slightly. When properly prescribed, antibiotics appear to be more desirable for therapeutic uses for diseases.

• What should one look for on a feed tag or label when buying commercial horse feed? Take special note of the percentages of total digestible nutrients (TDN) if provided, crude protein (CP), crude fiber (CF), and the feed ingredients. Also be sure to read the feeding directions.

12% CRUDE PROTEIN COMPLETE PELLETTED HORSE FEED

GUARANTEED ANALYSIS

Crude Protein	(Min.) 12.0%
Crude Fat	(Min.) 2.0%
Crude Fiber	(Max.) 20.0%
Vitamin A	Not less than 2,5000 IU/Lb.
Vitamin D ₃	Not less than 1,500 IU/Lb.

INGREDIENTS

Grain products, plant protein products, processed grain by-products, forage product, roughage product, cane molasses, vitamin A supplement, D-activated animal sterol (source of vitamin D₃), vitamin B₁₂ supplement, vitamin E supplement, riboflavin supplement, niacin supplement, calcium pantothenate, ground limestone, salt, copper oxide, cobalt carbonate, manganous oxide, iron sulfate, iron carbonate, ethylenediamine dihydriodide and zinc oxide.

● What is meant by percent T.D.N.? The percent T.D.N. (total digestible nutrients) is that part of the ration that will be digested and retained in the horse's body as energy.

● Of what significance is crude fiber (C.F.) in the ration? Generally, the higher the percent crude fiber, the lower the percent T.D.N. in the ration. Shelled corn analyzes about 3 percent crude fiber, oats 12 percent, and hays 24 to 30 percent. Rations analyzing more than 8 to 12 percent crude fiber probably contain considerable roughage.

● Can an orphan foal be raised on cow's milk? Yes, but at the beginning it is desirable for the foal to receive some colostrum. There are also milk replacers available on the market.

● How should cow's milk be modified for a foal? Mare's milk, as compared with cow's milk, is lower in protein and fat and higher in water and sugar. Therefore, add one tablespoon of sugar and four tablespoons of water to a pint of cow's milk. Warm to about 100° F. and feed ½ pint every two hours for the first few days. After four weeks the foal can be gradually switched to undiluted cow's milk or skimmed milk.

● Why furnish extra vitamin A in the ration if green feeds are a good source of carotene that can be converted to vitamin A in the body? Research has shown that high uptake of nitrogen in plants can interfere with carotene conversion to vitamin A. Vitamin A is especially important for breeding horses. Supplemental vitamin A is inexpensive and good insurance for the horse's health.

● Should salt be fed loose or in the block? Salt can be fed either way, but consumption may be higher in the loose form.

● Do mares need grain before foaling? Mares fed good hay and in thrifty condition (healthy and neither fat nor thin) may not need extra grain. Thin or old mares may need some grain. In late gestation, a light grain ration along with good roughage is acceptable, but the mare should not be overfed. Heavy feeding can cause foaling trouble because the mare may become too fat.

● How should mares be fed after foaling? Feed only light grain with hay for 7 to 10 days after foaling. Lactation that is too heavy can cause scouring. Increase grain slowly for the mare until the foal is old enough to take more milk.

● Do horses need tooth care? Yes. Irregular wear may leave sharp jagged edges that can cause pain or poor mastication of feed. File with a float or guarded rasp. Occasionally milk teeth that remain in too long need to be pulled; otherwise they may cause crooked permanent teeth.





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