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FEEDING DAIRY COWS.

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1. Secure the rough fodders in the best possible condition and use them liberally, as they are much cheaper than concentrates.

2. Feed concentrates in proportion to the milk flow.

3. Study and supply the individual needs of each cow.

Before man had control over animals and they became domesticated, there were no highly specialized forms, and when they roved wild on the prairies or in the forests, the problem of the particular kind and character of their food supply was not an important one for they were not expected to draw loads of several tons weight, or to produce the abnormal yields of milk that are given by the highly developed dairy cows of today. However, after man domesticated animals and began to develop breeds suited to special purposes, as draft, speed, beef, or milk, the question of their food supply became an all important one, for in order to secure the best results their food must be adapted to their special needs.

One fact of great importance, and which must not be lost sight of in economical feeding, is, that the amount, kind, and character of the food an animal requires depends entirely upon the use to which that animal is going to put the food. A cheap team may be kept through

an idle time on a kind of feed that would not be at all suited to the needs of a race horse during the training season, or of a valuable cow yielding 100 pounds of milk a day during an official test.

In order that a cow may produce the greatest yield of which she is capable she must be given the right kinds of feed and the correct amount of each. There is little use in paying high prices and establishing a good dairy herd unless careful attention is to be given to the amount and character of the feed, for however well bred and efficient the individuals they cannot give in their product what they do not receive in their food.

The nutrients contained in all feeding stuffs, as well as in animal bodies and in milk, may be divided into five classes as follows:

Water.
Ash, (mineral compounds.)
Protein, (nitrogen compounds.)
Carbohydrates, (starches, sugar, etc.)
Fats, (or oils.)

While an ample supply of pure water is one of the first requisites of good stock feeding, it is usually supplied in abundance at comparatively little cost and will not be considered further in this discusion.

Ash or mineral matter is present in all feeding stuffs in sufficient quantities so that an animal properly nourished with the other constituents is sure to receive enough mineral matter; we will, therefore, pass this group of substances also.

Protein.

Protein is the name applied to the constituents of feeds which contain nitrogen, and feeding stuffs which are rich in this element are frequently called nitrogenous feeds. Among these are: oil meal, cotton-seed meal, gluten meal, and the legumes, as cowpeas, alfalfa, and clover. The white of an egg, the lean part of meat, and the casein of milk are all good examples of protein.

The principal uses of protein in the body of the cow are to build muscles, replace their waste, and form casein in milk. There are two reasons why special attention should be given to the amount of protein contained in the different feeds: first, because it is usually deficient in feeds for dairy cows; second, because no other nutriment answers the same purpose.

Carbohydrates.

Carbohydrates is the name applied to the carbonaceous group of

substances such as starch, sugar, and the woody parts of plants known as crude fiber. This group forms the larger part of the food consumed by animals, as we shall see later. Carbohydrates furnish energy to perform the body functions and for the muscular activity. The heat of the body is the result of energy expended. It takes a large amount of energy to build up a product like milk. If carbohydrates are fed in excess of the demands for energy, fat may be stored up in the body. In the case of the dairy cow, carbohydrates, besides supplying the above requirements, furnish the constituents for forming milk sugar and fat in milk.

Fat.

Every one is familiar with fat in its different forms; as tallow in the steer, lard in the hog, and butter fat in milk. In corn there is about 4.3 percent of fat, or oil, and in flaxseed a much larger proportion, while in most of the rough fodders there is comparatively little. Fat in the food nourishes the body in exactly the same way as do carbohydrates: namely, furnishes energy and forms fat. The chief difference between fat and carbohydrates is that the former is a more concentrated form of food, one pound being equal to 2.4 pounds of carbohydrates. It should be remembered that fat and carbohydrates are interchangeable, that is, whichever one is in excess may take the place of the other, but it must also be borne in mind that however great the excess of carbohydrates and fat in the ration, no more muscle can be formed in the body, or casein produced in the milk than there is protein in the food supplied. In other words, where protein is in excess it can take the place of carbohydrates and fat, but no amount of carbohydrates and fat can take the place of protein in the least degree.

Digestible Nutrients.

The digestibility of the different constituents of feeds is of great importance, as only that portion of feeding stuffs which passes into solution during the process of digestion and is absorbed into the blood is of value in nourishing the animal. This portion of the various feeds is known as the digestible nutrients.

The difference between the total nutrients and the total digestible nutrients is marked: for example, by referring to feeding tables we find that in 100 pounds of clover hay there are 12.3 pounds of protein, but of this only 6.8 pounds are digestible and can be used to nourish the animal. The digestible nutrients are, therefore, the only ones considered in making up rations.

TABLE 1. DIGESTIBLE NUTRIENTS REQUIRED PER DAY FOR A 1000-POUND COW FOR MAINTENANCE AND FOLLOWING YIELDS.

	Protein, lb.	Cabohydrates, lb.	Fat, lb.	Nutritive ratio.
For maintenance	.7	7.	.1	1: 10.3
10 lb. milk 3% fat	1.10	8.81	.24	1: 8.3
10 " " 4% "	1.17	9.16	.26	1: 8.4
10 " " 5% "	1.24	9.51	.29	1: 8.2
20 lb. milk 3% fat	1.49	10.62	.37	1: 7.7
20 " " 4% "	1.63	11.32	.42	1: 7.5
20 " " 5% "	1.77	12.02	.47	1: 7.4
30 lb. milk 3% fat	1.89	12.43	.51	1: 7.2
30 " " 4% "	2.10	13.48	.58	1: 7.1
30 " " 5% "	2.31	14.53	.66	1: 7.0
40 lb. milk 3% fat	2.29	14.24	.64	1: 6.9
40 " " 4% "	2.57	15.64	.74	1: 6.8
40 " " 5% "	2.85	17.04	.84	1: 6.7
50 lb. milk 3% fat	2.68	16.05	.78	1: 6.7
50 " " 4% "	3.03	17.80	.90	1: 6.6
50 " " 5% "	3.38	19.55	1.03	1: 6.5
60 lb. milk 3% fat	3.08	17.86	.92	1: 6.5
60 " " 4% "	3.50	19.96	1.07	1: 6.4
60 " " 5% "	3.92	22.06	1.22	1: 6.3

Much careful study and investigation has been devoted to the question of determining the amounts of digestible protein, carbohydrates, and fat needed for cows of different weights and varying yields. To Professor T. L. Haecker belongs the credit of securing the data from which Table 1 has been computed.

In all animals there is a constant breaking down of the body tissues caused by wear, and there is energy expended in keeping up the vital processes and in maintaining the body temperature. The food used to rebuild worn-out tissues and to furnish heat and energy when the animal is at rest is called the food of maintenance. If a 1000-pound cow is producing 30 pounds of 4 percent milk she will require digestible nutrients about as follows:

	Protein, lb.	Carbohydrates, lb.	Fat, lb.
For maintenance	.7	7.	.1
For producing 30 lb. of 4% milk	1.40	6.48	.48
Total nutrients required for maintenance and milk	2.10	13.48	.58

A cow of the same weight producing 40 pounds of 4 percent milk will require a ration containing 2.57 pounds protein, 15.64 pounds carbohydrates and .74 of a pound fat. If her yield were 50 pounds of 4 percent milk her ration should contain 3.03 pounds protein, 17.80 pounds carbohydrates and .90 of a pound fat.

In feeding dairy cows, the fact that they should be fed according to their milk production, is frequently overlooked. A cow capable of producing 60 pounds of 4 percent milk a day must be fed a much larger amount of digestible nutrients, if she is to produce her greatest yield, than a cow giving only 10 pounds of milk testing 3 percent. This point should be strongly emphasized, for a cow cannot give in her product what she does not receive in her food. By referring to Table 1 the nutrients required for any yield of milk may be easily determined. If the cow weighs more or less than 1000 pounds a proportional increase or decrease in the food for maintenance should be made.

From the weight of a cow and the amount of milk she will produce on liberal feeding the required nutrients may be determined. The next step is to select such feeds as will best supply these nutrients. We will take, for example, a 1000-pound cow producing 30 pounds of 4 percent milk, and by referring to Table 1, find that she requires 2.1 pounds protein, 13.48 pounds carbohydrates and .58 of a pound fat.

If one wishes to feed clover hay and corn and cob meal he can make up a trial ration by taking 15 pounds of clover hay and 8 pounds of corn and cob meal. The nutritive value of each of these feeds can then be found from the table on page 15, which gives the amount of digestible nutrients in 100 pounds of the different feeds. We find that 100 pounds of clover hay contain 6.8 pounds protein, 35.8 pounds carbohydrates and 1.7 pounds fat. Dividing each of these amounts by 100 we have the digestible nutrients in one pound; multiplying by 15 we have the digestible nutrients in 15 pounds, which are 1.02 pounds protein, 5.37 pounds carbohydrates and .25 of a pound fat. In the same manner are found the protein, carbohydrates and fat in 8 pounds of

corn and cob meal, and taking the total digestible nutrients in the given amounts of each of these substances we have the following trial ration:

RATION A.

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Clover hay	15	1.02	5.37	.25
Corn and cob meal	8	.35	4.80	.23
Total nutrients in ration		1.37	10.17	.48
Nutrients required for a 1,000-lb. cow giving 30 lb. 4% milk		2.1	13.48	.58

By comparing the total nutrients in this ration with the required nutrients for a cow producing 30 pounds of 4 percent milk, it is found that the ration is deficient in both protein and carbohydrates. To bring the nutrients up to the amount required we try adding six pounds of bran and the ration is then as follows:

RATION B.

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Clover hay	15	1.02	5.37	.25
Corn and cob meal	8	.35	4.80	.23
Bran	6	.73	2.35	.16
Total nutrients in ration		2.10	12.52	.64
Nutrients required for a 1,000-lb. cow giving 30 lb. 4% milk		2.10	13.48	.58

The amount of protein, carbohydrates, and fat now corresponds closely enough with the nutrients required, for all practical purposes.

If one wishes to feed clover hay, corn silage, corn meal, and ground oats, he can make up a trial ration by taking 8 pounds of clover hay, 40 pounds of silage, 4 pounds of corn meal, and 4 pounds of ground oats. The nutritive value of each of these feeds can then be

determined from the amount of digestible nutrients in 100 pounds given in the table on page 15. Taking the digestible nutrients in the given amounts of each of these substances we have the following trial ration:

RATION C. (Trial ration.)

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Clover hay	8	.54	2.86	.14
Corn silage	40	.36	4.52	.28
Corn meal	4	.31	2.67	.17
Ground oats	4	.37	1.89	.17
Total nutrients in ration		1.58	11.94	.76
Nutrients required for a 1,000-lb. cow giving 30 lb. 4 % milk		2.10	13.48	.58

By comparing the total nutrients in this ration with the required nutrients for a cow producing 30 pounds of 4 percent milk, it is found that the ration is deficient in both protein and carbohydrates, but needs a larger proportion of protein than of carbohydrates to bring the nutrients up to the amount required. Adding one pound each of corn meal, ground oats, and linseed meal, we have ration D, which is a good economical ration and fulfils the desired requirements.

RATION D.

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Clover hay	8	.54	2.86	.14
Corn silage	40	.36	4.52	.28
Corn meal	5	.39	3.34	.22
Ground oats	5	.46	2.36	.21
Linseed meal	1	.29	.33	.07
Total nutrients in ration		2.04	13.41	.92
Nutrients required for a 1,000-lb. cow giving 30 lb. 4 % milk		2 10	13.48	.58

Nutritive Ratio.

Since protein on the one hand and carbohydrates and fat on the other serve different functions in the body, the relative amount of each should be carefully considered, and the ratio of the protein to the carbohdrates, which is called the nutritive ratio, is determined in the following manner: The value of a pound of fat in feeds has been found to be 2.4 times that of a pound of carbohydrates, and as fat nourishes the body in the same way as carbohydrates, the amount of fat is multiplied by 2.4 and added to the carbohydrates; this sum divided by the amount of protein gives the ratio of the protein to the carbohydrates, and is known as the nutritive ratio.

This may be illustrated by taking the total digestible nutrients in trial ration C on page 7, which contains 1.58 pounds protein, 11.94 pounds carbohydrates, and .76 of a pound fat.

.76 of a pound fat $\times$ 2.4 = 1.82.
11.94 pounds carbohydrates + 1.82 = 13.76.
13.76 $\div$ 1.58 (amount of protein) = 8.7.

Since there are 8.7 times as much carbohydrates as protein in this ration, the ratio is as 1 : 8.7; which is known as the nutritive ratio of this ration.

After adding one pound each of corn meal, ground oats, and linseed meal, we have ration D which contains 2.04 pounds protein, 13.41 pounds carbohydrates, and .92 of a pound fat. The nutritive ratio of this ration, found in the same manner as before, is as 1 : 7.6, which is nearer the ratio of the digestible nutrients required for a 1000 pound cow giving 30 pounds of 4 percent milk, as given in Table 1.

Balanced Ration.

If the protein and the carbohydrates are in such proportion as will best suit the needs of the animal the ration is said to be balanced. If the amount of protein in the ration is small in proportion to the carbohydrates the ration is called wide; if the amount of protein is large in proportion to the carbohydrates, the ration is called narrow.

Since the needs of different animals vary greatly, it will be seen that a ration which is balanced for one animal or class of animals may be decidedly too wide or too narrow to be economical for another class. Young and growing animals and cows producing a large flow of milk require a much larger proportion of protein, or in other words a

narrower ration, than animals after they have completed their growth, or cows when giving a smaller flow of milk, or entirely dry. The difference in the amount of protein required by cows giving large and small flows of milk may be seen by referring to Table 1.

In feeding dairy cows several things must be considered besides the amount of digestible nutrients contained in the feed. The ration must be palatable and of such a nature that a cow can eat a sufficient quantity to supply her needs.

There is enough nutriment in 300 pounds of oat straw for a cow giving 60 pounds of 4 percent milk, but it would be absurd to expect a cow to produce such a yield on oat straw alone, as her capacity could not handle more than one tenth this bulk in one day. The concentrates, too, must be in the proper form to be best utilized by the cow. To get the most out of grains they should be ground, for the mastication is seldom, if ever, complete enough to break all the kernels, and those passing through the digestive tract unbroken are of no use to the animal and are, therefore, wasted. This difficulty may be partially obviated by mixing the grain and coarse fodder together. By feeding oats in the sheaf, or in the form of hay, or by mixing chopped hay with the grain it will be much more thoroughly masticated, as grain eaten with roughage passes to the rumen and is remasticated in chewing the cud.

RATION E. Roughage not palatable and Concentrates too heavy.

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Corn stover	10	.17	3.24	.07
Oat straw	7	.08	2.70	.06
Corn meal	8	.62	5.34	.34
Linseed meal, N. P	4	1.13	1.60	.11
Total nutrients in ration		2.00	12.88	.58
Nutrients required for a 1,000-lb. cow giving 30 lb. 4 % milk		2.10	13.48	.58
Nutritive ratio of ration E, 1: 7.1.				

It will be seen that this ration is correct so far as the chemical composition is concerned, but that the roughage is lacking in palata-

bility so that a cow will not relish it, and the concentrates, while highly nutritious, are what dairymen call too heavy. Oil meal is so highly concentrated that it should not be fed in large quantities. This ration should be lightened by adding some light bulky concentrate, as bran or ground oats, and made more palatable by substituting oat hay for oat straw. After making these slight changes we have Ration F, which is lighter and more palatable, yet contains practically the same amounts of the different digestible nutrients.

RATION F. An Economical Ration.

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Corn stover	10	.17	3.24	.07
Oat hay	7	.30	3.25	.11
Corn meal	6	.47	4.00	.26
Bran	6	.73	2.35	.16
Linseed meal, N. P	1	.28	.40	.03
Total nutrients in ration		1.95	13.24	.63
Nutrients required for a 1,000-lb. cow giving 30 lb. 4 % milk		2.10	13.48	.58
Nutritive ratio of ration F, 1 : 7.6.				

Examples of Practical, Economical Rations.

The rations given below are compounded so as to be palatable and at the same time have the proper chemical composition. They are suited to the needs of a 1000-pound cow giving 30 pounds of 4 percent milk, the same as the preceding ones, the requirements being 2.10 pounds protein, 13.48 pounds carbohydrates and .58 of a pound fat.

Ration G.

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Clover hay	12	.82	4.30	.20
Corn silage	40	.36	4.52	.28
Corn meal	2	.16	1.33	.09
Oats	2	.18	.95	.08
Bran	2	.24	.78	.05
Gluten meal	1	.26	.43	.11
Total nutrients		2.02	12.31	.81
Nutritive ratio, 1 : 7.5.				

Ration H.

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Corn silage	30	.27	3.39	.02
Cowpea hay	7	.76	2.70	.08
Oat hay	7	.30	3.25	.10
Corn and cob meal	5	.22	3.00	.14
Bran	3	.37	1.18	.08
Linseed meal, N. P	1	.28	.40	.03
Total nutrients		2.20	13.92	.45
Nutritive ratio, 1 : 6.8.				

RATION I.

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Corn stover	10	.17	3.24	.07
Clover hay	8	.54	2.86	.14
Oat hay	8	.34	3.71	.12
Corn and cob meal	5	.22	3.00	.14
Bran	2	.24	.78	.05
Cotton-seed meal	2	.74	.34	.24
Total nutrients		2.25	13.93	.76
Nutritive ratio, 1 : 7.				

RATION J.

	Lb.	Digestible nutrients.		
		Protein, lb.	Carbohydrates, lb.	Fat, lb.
Corn stover	10	.17	3.24	.07
Cowpea hay	10	1.08	3.86	.11
Corn and cob meal	7	.31	4.20	.20
Bran	4	.49	1.57	.11
Total nutrients		2.05	12.87	.49
Nutritive ratio, 1 : 6.8				

The farmer should, as a rule, aim to raise the greater portion of the feed for his stock on the farm. Since rough feed is usually much cheaper than grain, too much importance cannot be placed on securing hay and fodder in the best possible condition. If hay is unduly exposed to dew and rain during the time of curing it loses much, both in nutrition and palatability. It is also important that hay and fodder be cut at the proper stage, before becoming too ripe and the stems woody.

Leguminous plants, (those bearing their seeds in pods or legumes,) as clover, alfalfa, cowpeas, beans, etc., are rich in protein and should

be raised in sufficient quantities to supply the necessary protein for the stock. If the supply of protein is deficient some feed rich in that substance should be purchased to complete the ration.

Grain feed should not usually compose over half the ration, and from that to nothing, according to the character of the roughage available and amount of milk given by the cow. In general it is a safe rule to feed liberally on good roughage and vary the grain feed to suit the requirements of the individual.

When cows have luxuriant pasture during the late spring before the heat is excessive or the flies troublesome the conditions are as near ideal for dairy cows as it is easy to obtain. The nearer we can approach these conditions the year around the better for milk production. It is, therefore, essential to the best yields and most economical results that succulent food be provided for cows during the winter months. There are two ways of providing this succulent food—by silage and by root crops.

By comparing the results obtained at several different experiment stations it is found that corn commonly yields about twice as much nutrients per acre as do root crops. Since roots require much more hand labor, which is so expensive in this country, it is more economical for the Illinois farmer to get the succulent feed during the winter from corn silage than from root crops.

Silage is especially valuable on farms or in communities where rough feed is scarce, for more stock can be kept on a given area of land where the crops are made into silage than in any other way with the same amount of labor expended. No farmer keeping ten or more cows can afford to be without a silo.

Green Feed for Summer Drought.

Dairymen suffer greatly nearly every summer by not supplying proper green feed for their cows during the hot dry weather of midsummer. This shortage of feed comes at a very inopportune time since the cows are already beginning to feel the effect of the heat and flies which of themselves quite perceptibly lessen the flow of milk, and if feed is cut short at the same time the shrinkage is certain to be large, resulting in great loss, for it is practically impossible to restore the shrinkage during that period of lactation. A continuous supply of feed is equally essential to the successful maintenance of young and growing animals.

A pasture will carry much more stock during spring, early summer and fall than it will in the dry weather of mid-summer. By helping it out during this season with partial soiling the cattle have better feed and more stock can be carried on a given area than by pasturing alone. Such crops should be planted as will mature in proper succession with each in its best stage of growth, insuring a continuous supply of green feed during the dry season.

TABLE 2. CROPS FOR PARTIAL SOILING DURING MIDSUMMER.

Kinds of fodder.	Amount of seed per acre.	Approximate time of seeding.	Approximate time of feeding.
1. Corn—early, sweet or dent.	6 quarts	May 1	July 1—Aug. 1
2. Corn—medium dent	5 quarts	May 15	Aug. 1—Sept. 30
3. Cowpeas	1 bushel	May 15	Aug. 1—Sept. 30
4. Soy beans	1 bushel	May 15	Aug. 1—Sept. 15
5. Oats and Canada peas (each)	1 bushel	April 15	July 1—July 15
6. Oats and Canada peas (each)	1 bushel	May 1	July 15—Aug. 1
7. Rape (Dwarf Essex)	4 pounds	May 1	July 1—Aug. 1
8. Rape, second sowing	4 pounds	June 1	Aug. 1—Sept. 1
9. Rape, third sowing	4 pounds	July 1	Sept. 1—Oct. 1

For central and southern Illinois there is no crop that will produce more feed to the acre than corn, and by planting a small quantity of an early variety with the general crop, corn may be had in the proper condition for feeding from July 15 until frost. There are several early varieties that will mature for feeding in from sixty to seventy-five days after planting. Corn should not be fed too young. When it is nearly full height it contains only one-third as much nutriment as when in the roasting ear.

Some other crop should be fed in connection with corn to balance the ration and afford variety. Leguminous crops as clover, Canada, peas, cowpeas, soy beans, etc., are especially valuable for this purpose, being unusually rich in protein.

Cowpeas and soy beans give a large amount of valuable forage, furnishing feed from the first of August until frost. If more feed has been grown than can be fed green, it may be made into hay of excellent quality.

Oats and Canada peas yield well. They are not in condition to feed for more than two or three weeks but the supply may be length-

ened by sowing at different dates. If a portion becomes too ripe it may be utilized by making it into hay.

If the pastures are short and no allowance has been made for green feed, corn cut from the regular crop, if it is near the roasting ear stage, will bring the best of returns. Never under any consideration allow the stock to go hungry and suffer the losses incident to shortened feed at a time which for every reason is the most trying to live stock.

Those who wish to study this subject further are referred to some of the standard books on feeding; among the best being "Feeds and Feeding" by Professor Henry, Director of the Agricultural Experiment Station, at Madison, Wisconsin; and "Feeding Farm Animals" by Dr. Jordon, Director of the Agricultural Experiment Station at Geneva, New York. The former gives a very complete description of the results of feeding investigations both in this country and abroad; the latter is a well written popular treatise upon the subject of feeding.

TABLE 3. AVERAGE AMOUNT OF DIGESTIBLE NUTRIENTS IN AMERICAN FEEDING STUFFS. FROM HENRY'S "FEEDS AND FEEDING."

	Digestible nutrients in 100 lb.		
	Protein, lb.	Carbohydrates, lb.	Fat, lb.
CONCENTRATES.			
Dent corn	7.8	66.7	4.3
Sweet corn	8.8	63.7	7.0
Corn and cob meal	4.4	60.0	2.9
Corn bran	7.4	59.8	4.6
Gluten meal	25.8	43.3	11.0
Germ meal	9.0	61.2	6.2
Grano-gluten	26.7	38.8	12.4
Hominy chops	7.5	55.2	6.8
Gluten feed	20.4	48.4	8.8
Wheat	10.2	69.2	1.7
Wheat bran	12.2	39.2	2.7
Wheat shorts	12.2	50.0	3.8
Wheat middlings	12.8	53.0	3.4
Rye	9.9	67.6	1.1
Rye bran	11.5	50.3	2.0
Rye shorts	11.9	45.1	1.6
Barley	8.7	65.6	1.6
Brewers' grains, wet	3.9	9.3	1.4
Brewers' grains, dried	15.7	36.3	5.1

TABLE 3—Continued.

	Digestible nutrients in 100 lb.		
	Protein, lb.	Carbohydrates, lb.	Fat, lb.
CONCENTRATES—continued.			
Oats	9.2	47.3	4.2
Oat feed or shorts	12.5	46.9	2.8
Oat dust	8.9	38.4	5.1
Oat hulls	1.3	40.1	0.6
Buckwheat bran	7.4	30.4	1.9
Buckwheat middlings	22.0	33.4	5.4
Flax seed	20.6	17.1	29.0
Lindseed meal, old process	29.3	32.7	7.0
Linseed meal, new process	28.2	40.1	2.8
Cotton seed	12.5	30.0	17.3
Cotton-seed meal	37.2	16.9	12.2
Cottons-seed hulls	0.3	33.1	1.7
Peas	16.8	51.8	0.7
Soy bean	29.6	22.3	14.4
Cowpea	18.3	54.2	1.1
Horse bean	22.4	49.3	1.2
ROUGHAGE.			
Fodder corn, green	1.0	11.6	0.4
Fodder corn, field-cured	2.5	34.6	1.2
Corn stover, field-cured	1.7	32.4	0.7
FRESH GRASS.			
Pasture grasses (mixed)	2.5	10.2	0.5
Kentucky blue grass	3.0	19.8	0.8
Timothy, different stages	1.2	19.1	0.6
Orchard grass, in bloom	1.5	11.4	0.5
Redtop, in bloom	2.1	21.2	0.6
Oat fodder	2.6	18.9	1.0
Rye fodder	2.1	14.1	0.4
Sorghum	0.6	12.2	0.4
Meadow fescue, in bloom	1.5	16.8	0.4
Hungarian grass	2.0	16.0	0.4
Green barley	1.9	10.2	0.4
Peas and oats	1.8	7.1	0.2
Peas and barley	1.7	7.2	0.2
HAY.			
Timothy	2.8	43.4	1.4
Orchard grass	4.9	42.3	1.4
Redtop	4.8	46.9	1.0
Kentucky blue grass	4.8	37.3	2.0
Hungarian grass	4.5	51.7	1.3
Mixed grasses	5.9	40.9	1.2
Meadow fescue	4.2	43.3	1.7
Soy-bean hay	10.8	38.7	1.5
Oat hay	4.3	46.4	1.5

TABLE 3—Continued.

	Digestible nutrients in 100 lb.		
	Protein, lb.	Carbohydrates, lb.	Fat, lb.
STRAW.			
Wheat	0.4	36.3	0.4
Rye	0.6	40.6	0.4
Oat	1.2	38.6	0.8
Barley	0.7	41.2	0.6
FRESH LEGUMES.			
Red clover, different stages	2.9	14.8	0.7
Alsike, bloom	2.7	13.1	0.6
Crimson clover	2.4	9.1	0.5
Alfalfa	3.9	12.7	0.5
Cowpea	1.8	8.7	0.2
Soy bean	3.2	11.0	0.5
LEGUME HAY AND STRAW.			
Red clover, medium	6.8	35.8	1.7
Red clover, mammoth	5.7	32.0	1.9
Alsike clover	8.4	42.5	1.5
White clover	11.5	42.2	1.5
Crimson clover	10.5	34.9	1.2
Alfalfa	11.0	39.6	1.2
Cowpea	10.8	38.6	1.1
Soy-bean straw	2.3	40.0	1.0
Pea-vine straw	4.3	32.3	0.8
SILAGE.			
Corn	0.9	11.3	0.7
Clover	2.0	13.5	1.0
Sorghum	0.6	14.9	0.2
Alfalfa	3.0	8.5	1.9
Grass	1.9	13.4	1.6
Cowpea vine	1.5	8.6	0.9
Soy bean	2.7	8.7	1.3
Barnyard millet and soy bean	1.6	9.2	0.7
Corn and soy bean	1.6	13.0	0.7
ROOTS AND TUBERS.			
Potato	0.9	16.3	0.1
Beet, sugar	1.1	10.2	0.1
Beet, mangel	1.1	5.4	0.1
Flat turnip	1.0	7.2	0.2
Rutabaga	1.0	8.1	0.2
Carrot	0.8	7.8	0.2
Parsnip	1.6	11.2	0.2
Artichoke	2.0	16.8	0.2
MISCELLANEOUS.			
Cabbage	1.8	8.2	0.4
Pumkin, field	1.0	5.8	0.3
Pumkin, garden	1.4	8.3	0.8

TABLE 3—Continued.

	Digestible nutrients in 100 lb.		
	Protein, lb.	Carbohydrates, lb.	Fat, lb.
MISCELLANEOUS—continued.			
Prickly comfrey	1.4	4.6	0.2
Rape	1.5	8.1	0.2
Dried blood	52.3	.0	2.5
Meat scrap	66.2	.3	13.7
Beet pulp	0.6	7.3	.....
Beet molasses	9.1	59.5	.....
Cow's milk	3.6	4.9	3.7
Cow's milk, colostrum	17.6	2.7	3.6
Skim milk, gravity	3.1	4.7	0.8
Skim milk, centrifugal	2.9	5.2	0.3
Buttermilk	3.9	4.0	1.1
Whey	0.8	4.7	0.3