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Feeding the Dairy Cow.

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Feeding the Dairy Cow.

By C. H. Eckles, Dairy Husbandry.

There are two factors which largely control the economic production of milk. One is the adaptability of the cow to this purpose and depends upon her individual and breed characteristics; the other is the amount and kind of food eaten.

The problem confronting the dairyman is the production of the largest amount of milk or butter at the least expense. In order that this may be realized, both the important factors mentioned must receive attention.

In most cases the largest direct expense is for feed, and every one familiar with the prevailing conditions knows that a large amount of feed is used without producing the return it should. It would not be extravagant to say that the average yearly milk production per cow could be increased by one-half or three-fourths by following better methods of feeding.

This question should interest the farmer who produces only milk and butter enough for his own family, as well as the man who makes dairying part of his regular business. For the former, one or two well selected and well fed cows would produce fully as much milk and butter as the three or four or even more often kept for the purpose, and at far less expense.

It is not the intention in this publication to give the results of new experimental work nor to lay down fixed rules for feeding, but to make some suggestions adopted to Mis-

souri conditions these suggestions being based on the facts developed by the practice of the best dairymen and by scientific experiments.

Turning on Pasture in Spring.

Every owner of a cow welcomes the time when the animal can be turned out to pasture. Not only is the labor and expense involved in winter feeding done away with, but every cow is expected to give the best results of the year when on grass.

In changing from dry feed to grass, it is well to go somewhat slowly, especially if the flow of milk is large. The young, immature grass, especially in early spring, as is well known, contains a large amount of water, a condition commonly called "washy." Wheat and rye pastures are of the same nature. The dry feed ration should therefore be continued and be gradually reduced for two weeks or more, after the grass is large enough for feeding.

Grain Feeding While on Pasture.

There is some difference of opinion on this question from the standpoint of economy. There is no question but that a cow will produce more milk if fed grain while on pasture, and if a large yield is of more importance than economy of production, grain should certainly be fed. Where a small amount of grain is fed, corn is well adapted as it will not unbalance the ration. If large quantities of grain are fed, other feed should be used in part, such as bran, gluten meal, oats, or cottonseed meal.

Experiments made by the Cornell Experiment Station, covering four years, showed that while an increase in milk yield was secured from grain feeding, it was not economical

to produce it in this way. In these experiments the pastures supplied an abundance of nutritious grass.

Providing for Periods of Short Pasture.

As long as fresh pasture grasses are abundant, the cow is about as well provided for as she can well be to produce milk economically. Unfortunately the season of abundant pasturage is often short. Nearly every year a dry period often of many weeks occurs during the middle or latter part of the summer when the pastures as a rule become short and insufficient to furnish a full flow of milk. This season is often the critical time of the year for the dairy cow. It is probable that more loss occurs, one year with another, by lack of feed at this time than during the winter season. When the season of dry feeding comes, the farmer expects to feed his stock and is prepared for it. On the other hand, as long as the cattle are on pasture and field work is pressing, the tendency is to let the cows get along the best way they can.

Very commonly a cow calves in the spring, gives a good of milk while the pastures are good, when hot weather, short pastures and flies come the flow drops one-half or two-thirds, and she is ready to dry up at the beginning of the winter. No amount of care and feed will bring the flow of milk back to the original amount if once allowed to run down. To make large returns from a cow, a large yearly production must be had, and to do this, the flow of milk must be kept up ten or eleven months of the year. The cheapest and most efficient feed to supplement pastures during this period probably is corn, either green or in the form of silage.

Professor Waters has summed up the advantages of corn as a soiling crop as follows:

"No plant now known to us equals corn in its adaptability to the soiling system. Varieties may be selected which will yield a continuous crop of succulent food, mature enough to have a high feeding value, from the middle of June until the severe frosts of autumn. The practice of relying upon corn almost exclusively from the time the earliest variety can be brought to a reasonable state of maturity, until the close of the season, is well founded and fully justified by the results of scientific research. Corn has the advantage of yielding a larger quantity of digestible matter per acre at less cost than any other crop suited to soiling, and furthermore it may be harvested, handled and fed more conveniently than any of the other crops used, and has a higher feeding value.

The problem with those who follow this system is to find some plant to cover the period of early spring before corn can be brought to maturity. In the solution of this problem it has been found that corn silage kept over from the preceding season will answer this purpose more fully and more satisfactorily than any crop that can be grown at that season of the year. Thus the corn plant lends itself to the farmer who by reason of limited area and high-priced land is forced to produce the largest possible quantity per acre, quite as well as to the farmer on the broad fertile prairies of the west where the greatest possible number of acres must be managed by one man."

The use of silage for the same purpose is spreading rapidly and gives splendid satisfaction.

Any of the common crops which furnish green feed at this season can also be used. Next to corn, sorghum is probably used most extensively in Missouri. Where alfalfa is grown, it may be used for the same purpose.

Winter Feeding.

Fortunately the period of winter feeding in Missouri is shorter than in most of the dairy states. By pasturing wheat and having a bluegrass pasture which has not been eaten down, to turn into late in the fall, the pasturing season can be greatly prolonged.

There are two common mistakes made in feeding cows.

First, not feeding liberally enough.

Second, feeding a ration not properly balanced.

It has been found by experiments that about sixty per cent of what a cow can eat is necessary to merely maintain her without producing any milk or gaining in weight. This being true, it is evident that it is not economy to feed only a little more than this sixty per cent needed to keep up the cow's body. If one goes to the expense of giving a cow the amount necessary to keep her alive, it is the poorest kind of economy to refuse to furnish the other forty per cent, the portion on which a profit is to be made. Still for some reason many cow owners think it not economy to feed a cow liberally, even if giving a liberal flow of milk, while at the same time he will feed his fattening hogs or steers all they will eat. Investigation will show that as a rule the heaviest feeders in the herd produce a pound of milk or butter at the least cost and at the greatest profit. These statements are not to be taken to indicate that an excessive grain ration is to be used, or that a cow cannot be fed more than she will make use of economically.

The Reason for Feeding a Balanced Ration.

Probably the feeding of a ration not properly balanced is the most common mistake made in the corn belt, on account of the usual abundance and cheapness of corn and corn

fodder. All good rations contain substances which serve two quite distinct purposes when taken into the body.

First. Certain substances known as protein build up muscle, bone and hair. Protein is found in almost all foods, but in especially large quantities in alfalfa, clover and cowpea hay, bran, cottonseed, linseed and gluten meals, also in nearly a pure form in lean meat, the white of an egg, and curd in milk. No other element can take the place of protein.

Second. Another class of substances supply heat to keep the body warm, fat to be stored in the tissues as body fat or put into milk as butter fat, and energy to keep up the functions of the body.

This class is represented by two kinds of material, different in character but serving largely the same purpose in the body called carbohydrates and fats. The carbohydrates are present in large quantities in nearly all grains such as corn, wheat and barely, and in corn fodder and timothy hay in the form of starch. In other plants, as sorghum and sugar beets, it is found in form of sugars.

The fats are found in varying quantities in all grains, corn and oats containing the common farm grains. All properly balanced rations must contain protein, carbohydrates and fat, and no amount of carbohydrates or fat can take the place in the body of protein.

A cow secreting milk must produce substances in the milk of each of these classes. In one hundred pounds of average milk we find about 3.3 pounds of protein in form of casein and albumen (curd), five pounds of carbohydrates in form of milk sugar, four pounds of fat in form of butter fat. Since these three kinds of solids must be present in order to form milk, it is necessary to furnish them in the feed in sufficient quantities and in about the right

proportion, so there will be no loss. When this is done, the ration is properly balanced. If a cow be supplied with sufficient material in her feed to produce thirty pounds of milk per day, but on account of lacking protein produces but fifteen pounds, it is useless to further increase the fat producing material and expect the flow of milk to be increased. The surplus fat in the feed will not be put into the milk and make it unusually rich. The results of numerous experiments carried on by various investigators show that the proportion of butter fat in a cow's milk cannot be changed appreciably by the kind of feed given. The richness of a cow's milk is a natural characteristic as much as is the color of their hair, and is about as much affected by the kind of feed consumed.

Returns from liberal feeding and care in balancing the ration should be looked for in a larger yield of milk and not in a richer milk. The quality or richness of milk is controlled by the selection of the individual animals and to a certain extent by the breed. The problem the feeder has before him constantly is how to best combine his feeds to furnish the necessary food elements in the right proportion and with the greatest degree of economy.

As an aid in properly balancing the rations, it is useful to divide our common feeds into two classes.

Class I. Including those feeds which contain a large amount of fat producing material (carbohydrates and fat), but which are notably deficient in protein; the elements required for producing milk and growth in young animals.

In this class we have:

Corn,	Oat Straw,
Corn Fodder,	Wheat Straw,
Corn Silage,	Millet Hay,
Timothy Hay,	Sorghum Hay.

Class II. This class contains a much larger proportion of protein, the growth and milk producing elements, and smaller quantities of the fat making materials. It includes:

Clover Hay,	Cottonseed Meal,
Alfalfa Hay,	Gluten Meal,
Cowpea Hay,	Linseed Meal,
Bran,	Soy Beans,
Oats.	

A properly balanced ration will, therefore, include some of the feeds from each of these two lists. One of the cheapest ways to balance the ration is by having clover, alfalfa or cowpea hay to form a large part of the roughness fed and some cheap grain like corn to constitute the greater part of the grain ration. A balanced ration may be made up with corn fodder and timothy hay furnishing the roughness, but only by using some of the costly protein feeds such as cottonseed meal, gluten meal or bran. While it is often economy to buy some of the high-priced feeds, it is generally possible for the Missouri farmer to raise the feeds on the farm that will form a balanced ration.

The following rations furnish the material necessary to produce milk in about the right proportions. By the term ration is meant the feed for twenty-four hours. If a cow will not give a good flow of milk in the early part of the milking period, when fed a liberal amount of one of these rations, it indicates that she is not adapted by nature to be a dairy animal and she should be disposed of. The amounts given are considered about right for a cow giving from twenty to twenty-five pounds of milk per day. For heavy milkers these rations are to be increased, and reduced for lighter milkers. In making up these rations, it is designed that the cow be given practically all of the rough-

ness she will eat, and then sufficient grain is added to furnish the necessary amount of digestible material.

1.	Clover Hay	20	pounds
	Bran	5	"
	Corn	6 to 8	"
2.	Clover Hay	20	"
	Oats	4 to 5	"
	Corn	6 to 8	"
3.	Clover Hay	20	"
	Corn and Cob Meal	8 to 10	"
	Gluten or Cottonseed Meal	2	"
4.	Alfalfa or Cowpea Hay	15 to 20	"
	Corn	9 to 12	"
5.	Alfalfa or Cowpea Hay	10	"
	Corn Stover	10	"
	Corn	8 to 10	"
	Bran	2	"
6.	Corn Silage	30	"
	Clover Hay	15	"
	Corn	4 to 6	"
	Bran	4	"
7.	Corn Silage	40	"
	Alfalfa or Cowpea Hay	10	"
	Corn	6	"
	Bran	1	"
	Cottonseed Meal	1	"
8.	Corn Silage	20	"
	Alfalfa or Cowpea Hay	15	"
	Corn	8 to 10	"
9.	Cornfodder	5	"
	Timothy Hay	15	"
	Corn	3	"
	Bran	5	"
	Cottonseed Meal	2	"

Ration No. 9 is made up only for the purpose of showing how timothy hay may be balanced to make a fair ration. It is not to be recommended, however, as timothy hay cannot be fed to dairy cows with economy.

Importance of Growing Leguminous Crops.

The cheapest and most satisfactory feeds are those which are for the most part grown on the farm. To meet this requirement, clover, cowpea or alfalfa hay should be the basis of the ration. Where one or more of these roughnesses are used, the grain may be chiefly corn, which is generally our cheapest grain, and one of the best when used in proper combinations. When hay is to be purchased, it should always be of this class as the market price is about the same or lower than that of timothy, which is far inferior as a milk-producing food. If any hay is sold from the farm it should be timothy and not clover.

Timothy Hay. This hay is usually over-estimated in value as a feed for producing milk. For this purpose it ranks very low in comparison with its selling price. Another objection is that the yield per acre is generally small. When timothy hay is on hand, it will pay to exchange it for clover even at considerable expense for labor, or sell it and buy bran. Timothy hay can be largely or entirely replaced with corn fodder which serves about the same purpose at a far less cost. If timothy hay forms all or a large part of the rough feed, it is impossible to make a balanced ration without using considerable quantities of some of the feeds rich in protein, as bran, cottonseed meal, gluten meal or linseed meal.

Palatability. There are other factors to be considered in feeding, besides simply furnishing the necessary kind and amount of food material, among which is the palatability of the ration. It is possible to offer an animal everything necessary to produce milk, but with poor results. It may be that on account of the nature of the feeds they are not relished, and for that reason not enough is eaten to produce the proper

amount of milk. This may occur from feeding spoiled hay or that cut from grasses past the proper stage, or in fact anything that detracts from the relish with which food is eaten. Several conditions occur very similar to this in effect. It is found in cold climates that water may be so cold in winter that cows will not drink a sufficient amount to produce the largest flow of milk. Filthy drinking tanks or feed troughs undoubtedly have the same effect. During the hot weather when tormented with flies, cows need to be at pasture at night as they will not eat a sufficient amount if let out only during the day.

Succulence. In order to secure the best results, it is generally considered that some food having that quality known as succulence is necessary. When on pasture the cow as a rule does her best, and to make the best of winter conditions something must be provided that has some of the properties of grass. Two methods are used to supply this necessary quality; by the use of root crops; by the use of silage. When attention is given to winter dairying, silage should by all means be provided as it is undoubtedly the cheapest food for this purpose.

The Silo. There is no way by which the corn crop can be used to better advantage than by putting it in a silo. Probably more feeding value can be secured from an acre of corn put into the silo, than from an equal area utilized in any other way. Silage is always relished by cows and furnishes a large part of the roughness required in a cheap and palatable form. The number of silos in use is constantly increasing, especially in the dairy sections. Silage is also growing in favor as a summer feed to supplement pastures. The advantages of silage as compared with field cured fodder have been summed up by Prof. H. J. Waters, as follows:

"The practice of preserving the green corn plant in the

silo has grown rapidly in favor, especially with the dairy farmer.

It commends itself on the ground that:

1. A large quantity of material may be stored in a comparatively small space.

2. Green and succulent food is thereby provided for the winter months.

3. The green plant is more palatable, the coarser parts of the stalk being much more completely consumed when made into silage.

4. The harvesting is done during the pleasant weather in the early fall, and the drudgery of handling dry stover in winter is obviated.

5. It is cheaper on the whole than to be at the expense of husking and grinding the ears and cutting and shredding the stover. It does not appear to affect the digestibility of the material favorably or unfavorably."

How much to feed. If a herd is fed with the proper kind of ration and with the degree of liberality which goes with economy, the next thing is to study the individual animal and find out how much each will use with profit. Here is where good judgment on the part of the feeder must decide. It is well to have a cow in fairly good flesh at calving time, but if a good milker she will lose much of this fat within a few weeks. It is not expected, and in fact it is impossible, to keep a good milk cow fat while in full flow. If a cow begins to lay on fat before reaching the latter part of her milking period, when fed liberally, one of two things is the matter. The cow is not adapted by nature for producing milk, but beef, or is being fed too liberally. A cow with the natural disposition to produce a large flow of milk, will consume all the feed she can digest without getting fat, provided it is properly balanced. The cows that are most likely

to be overfed are those which are not producing much milk, either from being far along in the milking period, or on account of being poor dairy animals. The cow that is generally underfed is the cow giving or capable of giving a large flow of milk. In many herds all the cows are fed the same amount of feed which is a serious mistake. When a cow already on liberal feed begins to decline in milk yield, the feed may be reduced gradually without affecting the milk flow. While a cow is in the early stage of her milking period, the feed can be gradually increased, watching the milk yield to see how far she responds. To feed to the best advantage, it is necessary to make a record of the yield of milk from each cow. It would be well for all dairymen to keep in mind that the time to feed a cow liberally is when she is fresh and giving a good flow of milk, and not to wait until the yield begins to drop before giving the liberal feed.

BUYING CONCENTRATED FEEDS.

It is quite a problem with dairymen to decide when and in what quantities to buy bran, cottonseed meal, gluten meal, or linseed meal, and which one furnishes them the most value for the money. No rule can be made to cover these cases. The whole subject of feeding and composition of feeds must be well understood in order to work to the best advantage.

If timothy, millet or sorghum hay or corn fodder is the rough feed to be used, and corn the chief grain on hand, it will pay to buy bran and cottonseed meal even if some of the corn has to be sold. When cowpea, alfalfa or clover hay is used extensively, the necessity of using these expensive feeds is largely done away with and only small quantities at most will be needed.

Linseed meal, cottonseed meal, and the best grades of gluten meal now manufactured, are of about equal feeding value for cows, pound for pound. This class contains the largest amount of protein of any of the common feeds, and for that reason the most valuable. Gluten feeds as now sold rank about midway between this group and bran in feeding value. Bran and oats rank close together in feeding value, the oats probably being a little more valuable pound for pound. When oats are worth twenty-five cents per bushel, bran would be worth about $14 per ton.

GRINDING FEED.

While there is considerable difference of opinion as to the advisability of grinding grain for some farm animals, it is generally conceded that it pays to grind for the dairy cow. A cow giving a large flow of milk needs all her energy to secrete the milk and to digest the large amount of feed which must be used for that purpose. It is for this reason important to make the process of digestion as easy and rapid as possible. A good grinder with suitable power to run it, should be part of the equipment of every well conducted dairy farm.

COMPUTING RATIONS.

A great deal of attention has been given by those investigating feeding questions to determine how much of the three classes of food material, protein, carbohydrates and fat is needed by animals under certain conditions. It is evident that if it be possible to determine just how much of each of the three classes of nutrients is needed and it be known how much various feeding stuffs contain, the problem of what and how much to feed would be much simplified. Work along this line has been of great value to the feeder, although the matter has not yet been reduced to that exact basis which will enable

us to lay down fixed rules for feeding. In making these calculations of rations, the three classes of food materials already mentioned are considered:

Protein, which builds up muscle and is necessary for the production of growth in the animal body, and milk.

Carbohydrates, which produce heat and fat in the body or in the milk.

Fat, which serves the same general purpose as the carbohydrates. Fat is found to be worth $2\frac{1}{4}$ as much in food value as an equal amount of carbohydrates. In calculating rations it is multiplied by $2\frac{1}{4}$ and added to the carbohydrates.

Water and Mineral Matter. In addition to these three classes, all feeding stuffs contain more or less water and some mineral matter. In calculating rations, this water is not considered as being of any value, and the dry matter alone is considered. The amount of water may vary from about ninety pounds to the hundred in root crops to only eight to twelve in grains. The mineral matter, the part that would remain if the material be burned, although absolutely necessary in the feed, is generally present in sufficient amounts so it is not usually considered in making up rations.

Digestible Matter. The dry part of the various feeds is not all digestible. The extent to which a feed is digested is determined by actual trial with an animal. Chemists have made these trials with all of the common feeding stuffs and have prepared tables showing their contents of digestible protein, carbohydrates and fat.

Now if it is known how much of these elements is needed by an animal under certain conditions, it is not a difficult problem to select a combination of feeds that will give the proper amount of protein, carbohydrates and fat.

Feeding Standards. Various investigators have made

up what are called feeding standards. These show what has been found by experience and investigation to be the proper proportion and amounts of protein, carbohydrates and fat in a ration in order to give good results. These standards, while not to be followed blindly, are of great value to the feeder. Experience may have shown a certain feeder that a ration consisting of corn eight pounds, bran three to four pounds, clover hay twenty pounds, gives good results. Another time he or others want to make use of that experience but find part of the clover hay must be replaced with corn fodder and some of the corn with oats. By the use of tables of composition of feeds, and the feeding standards, a combination of these latter feeds can be made which will furnish the same amount of the necessary nutrients as was contained in the first.

The feeding standard most widely used was made up by Dr. Wolff, a German investigator, and later modified by Dr. Lehmann. It probably is as well suited for our conditions as any, and has the advantage of varying with the production of milk.

WOLFF-LEHMANN FEEDING STANDARD.*

Milch Cows When Yielding.	Per Day 1,000 lbs. Live Weight.			Nutritive Ratio.
	Digestible Protein.	Digestible Carbohydrates.	Digestible Fat.	
11. lbs. milk daily	1.6	10.	.3	1:6.7
16.6 " " "	2.	11.	.4	1:6
22. " " "	2.5	13.	.5	1:5.7
27.5 " " "	3.3	13.	.8	1:4.5

*Henry's "Feed and Feeding," page 636.

Nutritive Ratio. This term is used to show the relation between the digestible protein on one side and the digestible

carbohydrates and fat on the other, the fat being multiplied by $2\frac{1}{4}$ and added to the carbohydrates. A ratio written 1:5 means that for every pound of digestible protein in a ration, there are five pounds of digestible carbohydrates and fat, the fat being multiplied by $2\frac{1}{4}$ and added to the carbohydrates. A nutritive ratio is said to be wide when there is a large amount of carbohydrates and fat in proportion to the protein. A ration of 1:7.5 or above would be called wide for a dairy cow. A ration with a large amount of protein in proportion to the carbohydrates and fat is said to be narrow. A ration of 1:5 or less would be called narrow for a cow.

USE OF THE FEEDING STANDARDS.

To show how the table of compostion of feeds and feeding standards are used, an example will be given. Take a ration similar to one used on many farms in Missouri, timothy hay 15 pounds, corn 6 pounds, corn fodder 10 pounds, oats 2 pounds, per day. By multiplying the number of pounds of each fed, by the digestible material in one pound, as shown in the table, we have the following:

DIGESTIBLE NUTRIENTS.

	Digestible Nutrients.			
	Protein.	Carbohydrates.	Fat.	Nutritive Ratio.
Timothy hay, 15 lbs.	.42	6.51	.21	
Corn, 6 lbs.... ...	.474	4.	.258	
Corn fodder, 10 lbs.	.25	3.46	.012	
Oats, 2 lbs.....	.184	.946	.084	
Total.....	1.328	14.916	.564	1:12
Standard for cow giving 22 lbs. milk	2.5	13.	.5	1:5.7

To find the nutritive ratio multiply the digestible fat (.564) by $2\frac{1}{4}$ as previously explained, and add the result (1.269) to the digestible carbohydrates (14.916). The sum of these (16.8) is divided by the digestible protein (1.328) and the result (12) shows the nutritive ration to be 1:12. This ration is far from meeting the standard as the protein is altogether too low. The carbohydrates and fat are not far from the standard. To improve it, suppose clover hay is substituted for timothy and four pounds of bran for the oats. We would then have:

DIGESTIBLE NUTRIENTS.

	Digestible Nutrients.			
	Protein.	Carbohydrates.	Fat.	Nutritive Ratio.
Clover hay, 15 lbs..	1.02	5.37	.258	
Corn, 6 lbs	.474	4.	.258	
Corn fodder, 10 lbs.	.25	3.46	.12	
Bran, 4 lbs.....	.488	1.56	.108	
Total	2.232	14.39	.744	1:7.2
Standard	2.50	.13	.5	1.57

The ration, while much nearer the standard for a cow yielding twenty-two pounds of milk per day is still a little low in protein and high in carbohydrates. By replacing one pound of bran with same amount of cottonseed meal, the ration would come very close to the standard.

The question will always be raised regarding the economy of one combination compared with another, especially when it is necessary to buy some feeds to balance those raised on

the farm. This important question is answered best by making up rations, using each of the feeds under consideration. The cost of each combination may be easily found by taking the sum of the market values represented in each separate feed. The following table taken from "Feeds and Feeding" by Prof. Henry shows the average per cent of digestible nutrients in common feeding stuffs:

Digestible Nutrients in 100 pounds.

	Protein	Carbo-hydrates	Fat
	lbs.	lbs.	lbs.
Concentrates:			
Corn	7.9	66.7	4.3
Corn and cob meal	4.4	60.	2.9
Gluten meal	25.8	43.3	11.
Wheat	10.2	69.2	1.7
Wheat bran	12.2	39.2	2.7
Wheat shorts	12.2	50.	3.8
Rye	9.9	67.6	1.1
Rye bran	11.5	50.3	2.
Barley	8.7	65.6	1.6
Malt shorts	18.6	37.1	1.7
Brewers grain—dry	15.7	36.3	5.1
Oats	9.2	47.3	4.2
Oat feed or shorts	12.5	46.9	2.8
Buckwheat	7.7	49.2	1.8
Sorghum seed	7.	52.1	3.1
Kafir corn	7.8	57.1	2.7
Flax seed	20.6	17.1	29.0
Linseed meal	28.2	40.1	2.8
Cottonseed	12.5	30.	17.3
Cottonseed meal	37.2	16.9	12.2
Peas	16.8	51.8	.7
Soy Bean	29.6	22.3	14.4
Fodder Corn:			
Fodder corn, green	1.	11.6	.4
Fodder corn, field cured	2.5	34.6	1.2
Corn stover	1.7	32.4	.7
Fresh Grasses:			
Mixed grasses	2.5	10.2	.5
Bluegrass	3.	19.8	.8
Sorghum	.6	12.2	.4
Hay:			
Timothy	2.8	43.4	1.4
Bluegrass	4.8	37.3	2.
Hungarian grass	4.5	51.7	1.3
Mixed grasses	5.9	40.9	1.2
Oat hay	4.3	46.4	1.5

	Protein	Carbo-hydrates	Fat
	lbs.	lbs.	lbs.
Straw:			
Wheat	.4	36.3	.4
Oat	1.2	38.6	.8
Barley	.7	41.2	6
Fresh Legumes:			
Red Clover	2.9	14.8	.7
Alfalfa	3.9	12.7	.5
Cowpea	1.8	8.7	.2
Legume Hay:			
Red Clover	6.8	35.8	1.7
White Clover	11.5	42.2	1.5
Alfalfa	11.	39.6	1.2
Cowpea	10.8	38.6	1.1
Silage:			
Corn	.9	11.3	.7
Clover	2.	13.5	1.0
Sorghum	.6	14.9	.2
Cowpea vine	1.5	8.6	.9
Roots:			
Potato	.9	16.3	.1
Sugar beet	1.1	10.2	.1
Mangel beet	1.1	5.4	.1
Turnip	1.0	7.2	.2
Carrot	.8	7.8	.2
Artichokes	2.	16.8	.2
Miscellaneous:			
Cabbage	1.8	8.2	4
Pumpkins	1.	5.8	.3
Rape	1.5	8.1	.2
Dried Blood	52.3	.0	2.5
Beet pulp	.6	7.3	
Cow's milk	3.6	4.9	3.7
Skim milk, gravity	3.1	4.7	.8
Skim milk, separator	2.9	5.2	.3
Buttermilk	3.9	4.	1.1
Whey	.8	4.7	.3