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FEEDING FOR MILK PRODUCTION

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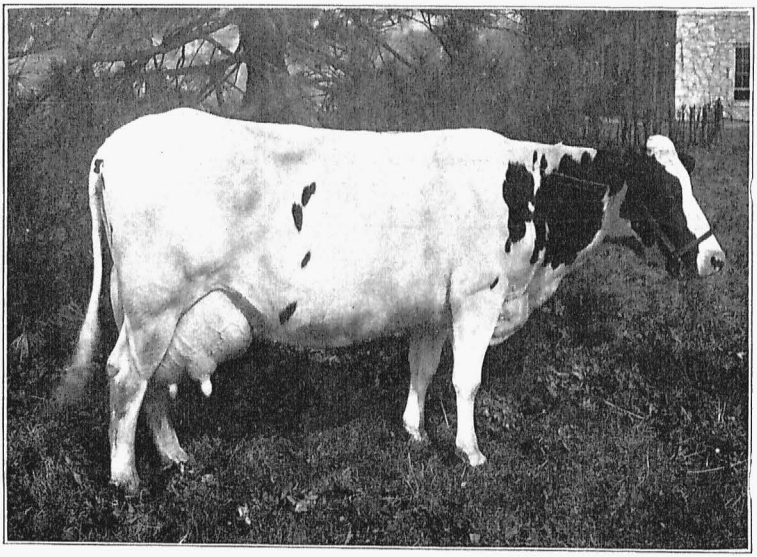
There are two factors which largely control the economical production of milk. One is the adaptability of the cow used for this purpose and depends upon her individual and breed characteristics. The other is the amount and kind of food eaten. The problem confronting the dairyman is the production of the largest amount of milk and



MISSOURI CHIEF JOSEPHINE. A MEMBER OF THE COLLEGE DAIRY HERD.

This cow holds the world's record for milk production in a continuous period of six months. During the six months ending July 17th, 1910, she produced 17,008 pounds of milk, an average of 93.4 pounds per day, 44 quarts, or 11 gallons per day, for 182 days.

butter at the least expense. In order that this may be realized, both the important factors mentioned must receive careful attention.

In most cases the largest direct expense is for feed. Every one familiar with the prevailing conditions knows a large amount of feed is used without producing the returns it should. It would be safe 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.

It is not the intention to give results of new experimental work nor to lay down fixed rules for feeding, but to make some suggestions adapted to Missouri conditions, these suggestions being based on the facts developed by the practice of the best dairymen and by scientific experiments.

Turning on Pasture in the 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 connected with winter feeding done away with, but each cow is expected to give the best results of the year on grass. In changing from dry feed to grass, it is best to go somewhat slowly, especially with heavy milking cows. The young, immature grass, such as we have in early spring, contains a large amount of water and a small amount of dry matter, and it is almost impossible for a heavy milking cow to eat enough of such feed to supply the necessary amount of nutrients. Wheat and rye pastures are of the same nature. Another reason for putting cattle on pasture gradually rather than suddenly, is the effect on the taste of milk. When a cow is changed at once from a grain ration to grass a very marked taste is developed in the milk, while if this change in feed is made gradually and not suddenly the change in the taste of the milk is scarcely noticed.

Summer Conditions to be Maintained as Near as Possible Throughout the Year.—Soon after the cows are on pasture, usually the latter part of May or the first part of June, they reach the maximum production of milk for the year. This suggests that what the dairyman must do in order that the production of milk may be the largest, is to imitate these summer conditions as far as possible throughout the remainder of the year. This is what the careful dairyman and skilled feeder does, and the results correspond closely to the success with which these summer conditions are maintained. The summer conditions which bring about the maximum production and which are to be maintained as far as possible through the year, are described in the following statement:

1. *An abundance of palatable food.*
2. *A balanced ration.*
3. *Succulent feed.*
4. *Moderate temperature.*
5. *Comfortable surroundings.*

How these conditions may be maintained will be discussed in detail further on.

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. The cow that gives a small average quantity of milk will produce but little more, if fed grain while on pasture. However, with the heavy producing cow the case is quite different and it is necessary that she be fed grain or she will not continue on the high level of production long. The necessity of feeding grain to the high producing cow arises, from the fact that she cannot secure a sufficient amount of nutrients from the grass alone, and must have some concentrated feed in the form of grain in order to continue to produce large quantities of milk.

Experiments made by the Cornell Experiment Station, covering four years, showed that while an increase of milk yield was secured from grain feeding, it was not economical to produce it in this way. They secured only about an additional pound of milk for each pound of grain fed. In these experiments the pastures produced an abundance of nutritious grasses. They observed, however, that the cows fed grain during the summer gave better results after the grazing period was over, than those not having received grain. This is also a matter of common observation, and should be taken into account in considering the advisability of feeding grain. The point is that the cows fed grain stored a considerable quantity of surplus nutrients on their body which were afterwards available for the production of milk. A Jersey cow that is giving as much as 20 pounds or 10 quarts per day, or a Holstein or Shorthorn giving 25 pounds or more daily should be given some grain. Our practice in regard to feeding on pasture is about as follows:

Jersey cow producing—

20 lbs. milk daily	3 lbs. grain.
25 lbs. milk daily	4 lbs. grain.
30 lbs. milk daily	6 lbs. grain.
35 lbs. milk daily	8 lbs. grain.
40 lbs. milk daily	10 lbs. grain.

Holstein, Shorthorn or Ayrshire producing—

25 lbs. milk daily	3 lbs. grain.
30 lbs. milk daily	5 lbs. grain.
35 lbs. milk daily	7 lbs. grain.
40 lbs. milk daily	9 lbs. grain.
50 lbs. milk daily	10 lbs. grain.

It must be kept in mind that this applies only when pastures are abundant. Where a small amount of grain is fed to a cow on pasture corn is as well adapted as anything else where it is cheaper than other feeds, since on account of the comparative narrow nutritive value of the grass the corn does not unbalance the ration. However, in case of feeding large quantities of grain, for example 5 pounds per day or above, other feeds containing more protein should be used in part, such as; bran, gluten meal, oats or cottonseed meal.

Providing for Periods of Short Pasture.—As long as fresh pasture grasses are abundant, the ordinary cow is about as well provided for as she can be to produce milk economically. Unfortunately the season of abundant pasturage is often short. In many localities, a dry period, often of several weeks, occurs during the middle or latter part of the summer and the pastures become short and insufficient to maintain a full flow of milk. This season is often the critical time of the year for the dairy cow. It is probable that as much loss occurs one year with another by lack of feed at this time as occurs from improper feeding during the winter season. When the season of dry feeding arrives, 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 the field work is pressing, the tendency is to let the cows get along the best way they can.

Under average conditions in this State cows are fresh in the spring, give a good flow of milk while the pastures are good, but when hot weather and short pastures come, the flow drops one-half or two-thirds, and the cows are almost dry at the beginning of winter. It is almost impossible to restore the flow of milk to the original amount after it is once allowed to run down from lack of feed. To make large returns from the cow a large yearly production must be had, and to do this, the flow of milk must be kept up ten or eleven months in the year.

It is possible to hold up the milk flow by heavy grain feeding but this is unnecessarily expensive. Provision should always be made to have green crops on hand that may be cut and fed when needed or to have silage available. It is the nature of blue grass to grow freely in the spring then to rest until fall. This leaves a period in the summer from about the middle of July to the middle of September when the pasture is apt to be short.

Corn is in many ways the best crop for summer soiling. The main difficulty is it does not come on early enough. Even the early varieties are hardly mature enough to feed before August 1, and something is often needed earlier. Sweet corn is a good feed but does not yield heavily. Second growth clover, millet, or alfalfa can be used if

available. After August 1, in the corn belt, corn and sorghum are the best crops for supplementing pastures.

Sorghum yields immense crops and if a surplus is on hand it may be made into hay profitably. A yield of from 15 to 25 tons of green sorghum per acre is not unusual on good land.

Green crops fed as a supplement to pasture may be fed in the pasture or in the barn lot but as a rule are fed most economically in the barn. The cows remain inside long enough at milking time to eat their portions.

As a rule the most economical method of supplying feed to help out the short pastures of midsummer and fall is to feed corn silage. Silage will keep in good condition for summer feeding with no loss except on the surface. If it is not needed during the summer, it may be covered with the new silage and kept until wanted. Corn furnishes a larger yield of dry matter per acre than any crop that can be ordinarily grown for summer feeding, and has the further advantage, of being on hand as early as wanted.

It is handled more economically also than soiling crops since it is cut all at once and not every day as is necessary with soiling crops.

WINTER FEEDING.

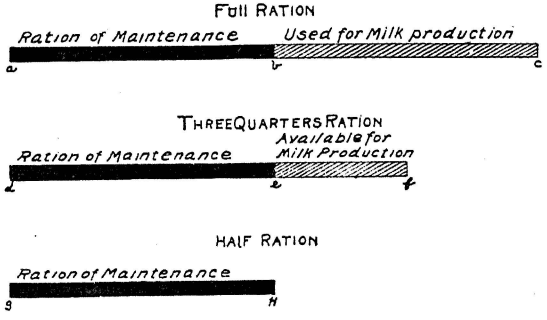
Fortunately, the period of winter feeding in Missouri is shorter than in most of the dairy states. By pasturing wheat and having a blue grass pasture which has not been eaten down, to turn into late in the fall, the pasturing season can be greatly prolonged. The great problem in winter feeding, as already stated, is in general, to maintain summer conditions. It is entirely feasible to maintain practically these summer conditions throughout the entire winter on any farm when the subject is properly understood and the necessary arrangements made. In order to point out how these summer conditions may best be maintained during the winter, the statements already given will be discussed in detail.

Amount of Feed.—The first condition given as typical of the summer feeding is an abundance of palatable food, and on this point is made one of the most common mistakes in feeding cows. In producing milk, the cow may be looked upon in a way as a milk producing machine which we supply with a certain amount of raw material in the form of feed, and this raw material is manufactured into milk. The same rule holds in running the milk manufacturing plant as would hold in the running of any other manufacturing plant; it is run most economically near its full capacity. Every one who feeds animals should thoroughly comprehend that, first of all, the animal must use a certain proportion of its food to maintain the body. This is the first

requirement of the animal and it is the first use to which it puts its food. This we call the ration of maintenance, and it is practically a fixed feed. That is, it is practically the same whether the animal is being utilized for maximum production, or if the animal is being merely kept without producing any milk at all.

In the case of an ordinary dairy cow this ration of maintenance amounts to about 60 per cent of the ration that she is giving. In the case of a heavier producing animal, for example, one producing 1 pound to 1¾ pounds of butter fat per day, this ration of maintenance amounts to about one-half the total feed of the animal. It should be clear that, after going to the expense of giving the animal the necessary amount to keep her alive, it is the poorest economy to refuse to furnish the other 40 or 50 per cent which she would utilize exclusively for milk production. On the average farm this is one of the most common mistakes made. The importance of liberal feeding for economical production can be easily understood from the following illustration:

Cows of high productive capacity liable to be underfed.



The first illustrates the proper feeding of a heavy producing cow, which is the one usually underfed. The line a—c represents the total capacity of the animal for food, or a full ration. The first half from a to b represents the amount of food required to maintain the animal's body, or the ration of maintenance. The second half, that portion from b to c, represents the proportion of the food used for the production of milk. In this case there is no fat being produced on the animal's body and the cow is supposed to be of such dairy quality that all the feed she can eat in excess of that required for maintenance is used for milk production.

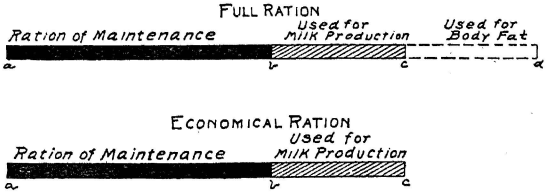
The line below represents what would happen if the feed of this animal is reduced one-fourth. The ration of maintenance remains practically the same as in the first case. The amount represented by the line d to e is the amount required to maintain the animal's body,

which is the same quantity as in the first case; however, the cut of one-fourth in the ration will be seen to come entirely on that available for milk production and reduces that amount one-half.

Suppose that the ration of such a cow be still further reduced to one-half of the full ration, or that required for maintenance alone, as represented by the third line. In this case the cutting down of the ration one-half would remove all available feed for milk production. However, the animal would not cease producing milk at once. This is a point of great importance in feeding cows, and a lack of such knowledge leads to serious errors in feeding. The milk producing function is so strong that the cow will continue to produce milk for sometime, even when the feed is insufficient, utilizing the reserve material which has been accumulated in the body in the past. This always happens in the case of a heavy milking cow during the first few weeks after the birth of the calf. At this time, it is not generally possible and not desirable on account of the condition of the animal to feed her a sufficient quantity of feed to supply the nutrients necessary to produce the milk, and even if the feed was offered, the appetite is not usually strong enough to cause the necessary amount of feed to be taken to prevent loss in weight. As a rule, all heavy milking cows decline in weight for the first two or three weeks, and occasionally for ten weeks, after calving, which means that milk production has been in excess of the feed supplied for that purpose. The same thing happens in the case of the cow that is not fed a sufficient ration for the amount of milk that she is producing. She may continue to produce considerable milk for a while by drawing on the reserve material of the body, but as soon as this is exhausted the production of milk must come down to the amount available for this purpose, above the ration of maintenance. When the feed is in excess, the cow begins to store reserve material on her body. If the amount of milk produced by a cow varied directly with the feed, and she did not store up nutrients at one time and draw on reserve material at another, it would simplify the problem of feeding very much and result in more economical feeding at all times.

How to Avoid Over-Feeding.—While the statement and illustration given apply to one class of dairy cows, there is another class to which it does not apply, and with which it would lead to a serious mistake in feeding from an economical standpoint. This group includes those of lower productive capacity which are liable to be over-fed, especially when they are in the herds of dairy men, who realize the necessity of liberal feeding. The proper feeding of this group of animals can perhaps be made clearer by the following illustration:

Cow of lower productive capacity liable to be overfed.



The line a to d represents the amount of feed that an animal of this class will consume; a to b represents the ration of maintenance as before. In this case, however, the capacity for making milk is not equal to the capacity of the animal for utilizing feed in excess of that required to maintain the body. The amount which the animal is capable of utilizing for milk production is represented by that portion of the line b to c, while the animal's appetite is equal to the total line ad. This gives a surplus, c to d, which is not utilized for milk production but which will be used for storing fat on the animal's body and we will have the cow gaining in weight while she is producing milk. This gain in weight will be of no service as far as milk production is concerned, except that it is of some value as a reserve material to be drawn upon at some other time when feed is not supplied in sufficient amounts, but it is not economical nor desirable to fatten dairy animals with the expensive feeds which are fed dairy cows. That portion of the feed represented by the line, cd, should be taken from the ration. This means reducing her feed to take off the amount used for storing fat on the body; in other words, to feed her only what she will utilize for milk production. This means feeding enough to maintain a practically uniform body weight. In every large herd where the amount fed is not carefully regulated, we find errors made in both these classes. We find the heavy producing cows being under-fed, and we find the light producing cows being over-fed and allowed to accumulate fat.

Relation of Live Weight to Proper Feeding.—The live weight of a cow is a good index of whether the cow is being fed a proper amount or not, but good judgment must be used in regulating the ration by observing this condition. We must expect that a cow will lose weight in the first few weeks of her milking period, but after this period is past there is no reason why she need to change much in weight for several months, and this is the period when the greater part of the milk production is secured. It will not mean, of course, that the animal should not be allowed to gain in weight during the latter end of the milking period. This is necessary on account of the development of the foetus, and since it is natural for the animal to carry some fat on her body at calving time.

It does not mean, however, that in order to feed a herd of cows economically it will not do to feed them all the same quantity of grain whether they are giving a gallon of milk a day or whether they are giving four gallons, and it means that when a cow in the middle of her lactation period is putting on weight that she is being fed more than she needs and will give just as much milk if the feed is cut down somewhat. It also means that if a certain animal is losing in weight that sufficient feed is not being given, and if the deficiency is not supplied it will not be long before the milk production will come down to correspond with the amount of feed available.

Feeding as Individuals.—In connection with this subject of the amount to feed cows it needs to be pointed out that it is only possible to feed a bunch of cows economically when they are fed as individuals, and not as a herd. A too common practice, even in the otherwise well conducted herds, is for all animals to be fed the same amount of grain regardless of the time they have been in milk or the quantity of milk individual cows are producing. Such feeding always lacks economy, as the high producing cow does not get enough, and while she may milk very well for a short time, she soon comes down to a lower level, while the lighter producing cow usually gets too much and accumulates fat.

One of the difficult problems which confronts the practical feeder is how to adjust the quantity of feed to meet these individual requirements. It can be done fairly well even in the large herds by observing how much milk the cow is producing, and whether she is gaining or losing in body weight.

Amount of Grain and Roughness to Feed.—The cow being adapted by nature for consuming bulky feeds does not feel satisfied unless she has sufficient bulk to the ration given at all times. An animal that is fed too much grain in proportion to the amount of roughness may seem hungry, while she really has a sufficient amount of nutrients, but so concentrated that it does not have sufficient bulk. The cow should be fed practically all the roughness she will eat up clean, and the difference in rations fed to different animals should not be so much in the amount fed as in varying amounts given:

1. *Feed all the roughness they will eat up clean at all times.*
2. *Feed one pound of grain per day for each pound butter fat produced per week, or one pound grain daily for each three pounds of milk*
3. *Feed all the cows will take without gaining in weight.*

The rule regarding the amount of grain to feed per day to each cow applies only when good roughness such as corn silage, and clover, cowpeas, or alfalfa hay is used.

The second part of the rule in regard to feeding one pound of grain for three pounds of milk would not work out in all cases, for a heavy milking Holstein cow this gives a little too large a quantity of grain, and with a Jersey cow giving very rich milk it is a little too low. It applies best to cows producing milk of about average composition.

If the roughness be timothy hay or corn fodder considerable more grain must be fed in proportion to the amount of milk produced. The rule based upon the butter fat produced per week is the best as it applies to any breed.

REASONS FOR FEEDING BALANCED RATIONS.

The second statement regarding the summer conditions which are to be maintained throughout the year is that the animals are receiving a balanced ration. The ordinary pasture grasses, especially blue grass, when in the growing state, contains the proper proportion of nutrients to enable a dairy cow to produce the maximum amount of milk of which she is capable. The winter ration, on the other hand, is liable to have these nutrients out of proportion. This is one point wherein common practice fall far short of continuing the summer conditions throughout the winter. The feeding of a ration not properly balanced is one of the most common mistakes made on the average farm in the corn belt, on account of the usual abundance and cheapness of corn, corn fodder, and timothy hay.

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

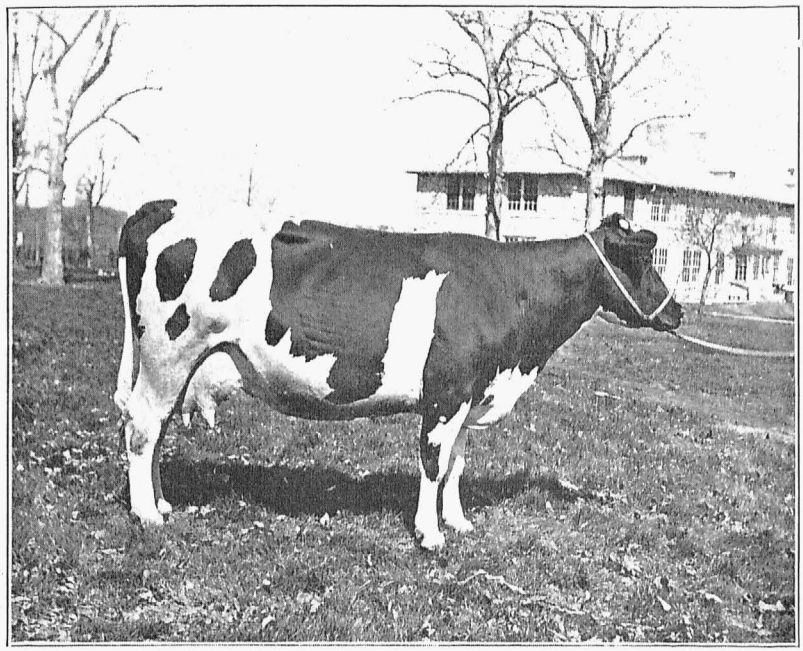
First. Certain substances known as protein which build up muscle, bone and hair, and also supply the material from which is made the curd of the milk. Protein is found in almost all food but in especially large quantities in alfalfa, clover and cow pea hay, bran, cottonseed, linseed and gluten meal; 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 and in nearly all grains such as corn, wheat and barley, and in corn fodder and timothy hay in the form of starch. In other plants, such as sorghum and sugar beets, it is found in the form of sugars. The fats are found in varying quantities in all common 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 (curd) and albumen, five pounds of carbohydrates in form of milk sugar and four pounds of fat in the 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



PRINCESS SALATINE CARLOTTA
Owned by University of Missouri.
Produced 18,405 Pounds of Milk and 721 Pounds of Butter in One Year.

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 as far as the practical feeder is concerned the proportion of butter fat in cow's milk cannot be changed appreciably by the kind of feed given. The richness of a cow's milk is a natural characteristic.

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 degrees of economy.

As an aid in properly balancing the rations, it is useful to divide our common feeds into two classes. Class 1. Including those feeds which contain a large amount of fat producing material (carbohydrates and fat) but which are notably deficient in protein, one of the essential substances required for producing milk and growth in young animals. In this class we have:

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

Class 2. This class contains a much larger proportion of protein, the essential growth and milk producing elements, and smaller quantities of the fat making materials. It includes:

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

A properly balanced ration will, therefore, include some of the feeds from each of these two lists.

Home Grown Balanced Rations.—One reason why the average farmer makes a mistake of feeding his cows rations that are not properly balanced is that it is easier, or he thinks it is, to grow feeds that are excessively rich in carbohydrates and lacking in protein. This comes about principally by the large amount of corn grown and used. Many Missouri farmers have corn fodder and timothy hay for roughness and practically nothing in the way of grain but corn. From such feeds it is impossible to make a ration that supplies the necessary nutrients to produce much milk. It is possible to make a fairly good ration using

these feeds for roughness, but it is only possible to do so by buying large quantities of mill feeds that are rich in protein. The thing for the farmer to do is to raise the feeds he requires on his own farm, as far as possible, and it is possible to produce practically all that is needed to make a balanced ration. The place to begin in considering the feeding of an animal always is with the roughness, since the character of the roughness determines to a large extent the kind of grain it is advisable to feed.

The cheapest source of protein is in leguminous hays, including clover, alfalfa and cowpea hay. If an abundance of any one of these hays are on hand, the problem of making an economical balanced ration is very much simplified. The use of these hays makes it unnecessary to buy any large quantities of bran, oil meal or cottonseed meal for ordinary dairy cows, and makes it possible that that the principal grain used be corn, which usually is our cheapest grain. Even cow pea or alfalfa hay alone, with corn for grain, makes a fairly good ration for an ordinary dairy cow, and such a ration could be substituted with good results for that of timothy hay and corn fodder. When hay is purchased, it is always best to purchase one of the kinds mentioned, as the price is about the same, or lower than that of timothy, which is far inferior as a milk producing food. If any hay is to be sold from the farm it should be timothy hay and not clover or cow pea hay.

What to Feed with Timothy Hay and Corn Fodder.—While the preceding states what the farmer should grow to feed the cow in milk, many will read this who do not have silage on hand or even clover, cow pea or alfalfa hay. Many Missouri farmers have only corn fodder and timothy hay on hand and want to know what to feed with these until they can arrange to get the proper rations on hand. In the first place to get results in any way satisfactory in feeding timothy hay and corn fodder it must be expected to feed grain liberally.

It is not possible to feed a good home grown grain ration with such roughness. Mill feeds must be purchased and will pay well. The things to buy are those rich in protein, such as cottonseed meal, bran and linseed meal. It will pay if necessary to sell some of the corn to get some of these feeds. The addition of two pounds of cottonseed meal mixed with one pound of bran to the daily ration of each cow will add surprisingly to the milk produced.

SUCCULENT FEEDS.

The third summer condition, which we desire to continue throughout the winter is that of a supply of succulent feed. By the term succulent feed is meant feed having that property possessed by green grass. Such feed has a value outside of the actual nutrients it con-

tains on account of its favorable effect upon the digestion of the animal. There are two methods in use for supplying this succulent feed during the winter season. One is the use of root crops and the other the use of silage. In some parts of the world the use of root crops is almost universal, and is the solution of the problem. In this State the use of silage is far more practical, however, than the use of root crops, and for that reason it is recommended exclusively 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 the silo. Probably more feeding value can be secured from an acre of corn utilized in this way than from an equal amount used for any other purpose. Silage is always relished, and furnishes a part of the roughness 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. In feeding silage it must not be expected that it will serve as the only roughness. Hay should be fed in addition and the hay which naturally goes with corn silage is clover, cow pea or alfalfa hay. From 30 to 45 pounds per day is counted a reasonable feed of corn silage. It can be fed successfully, not only to cows producing milk, but to young stock and, in fact, almost all farm animals.

BUYING CONCENTRATED FEEDS.

It is quite a problem with dairymen 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, sorghum hay or corn fodder is the roughness 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 cow pea, 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.

Some Suitable Rations.—The following rations are suggestions for the farmer rather than for the expert dairyman. They supply the necessary material to produce milk economically. If the cow will not give a good flow of milk in the early part of the milking period and when fed a liberal amount of one of these rations, it indicates she is not adapted by nature to be used as a dairy cow and should be disposed of. The amounts given are considered about right for the cow giving from 20 to 25 pounds of milk a day. For heavy milking cows these rations would have to be increased, especially in the grain, and for light milking cows the grain should be decreased. In making up these rations it is designed that the cow be given all the roughness she will eat and sufficient amount of grain to furnish the proper amount of digestible material. It is not designed that these rations should be sufficient or the best adapted for cows of unusual dairy capacity or cows that are being fed for making records where a very maximum production is desired.

The figures given are per day. It is expected the grain ration will be mixed in quantities and the animals fed from the mixture.

SOME GOOD DAIRY RATIONS.

Ration 1.	
Corn silage	25 lbs.
Clover hay	10 lbs.
Corn	4 lbs.
Bran	4 lbs.

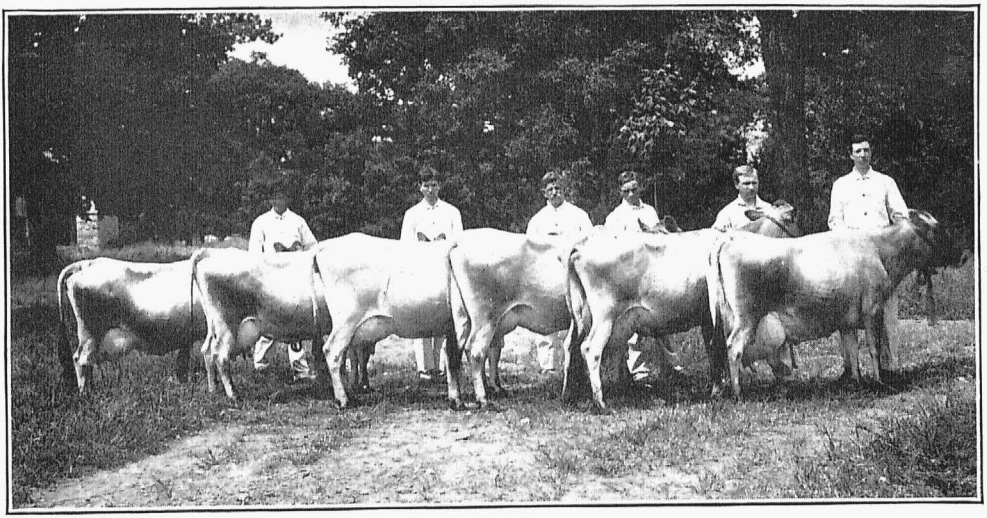
Ration 2.	
Corn silage	30 lbs.
Alfalfa or cowpea hay	10 lbs.
Corn	6 lbs.
Bran	2 lbs.

Ration 3.	
Clover hay	20 lbs.
Corn	4 to 5 lbs.
Bran or oats	2 to 4 lbs.

Ration 4.	
Clover hay	20 lbs.
Corn and cob meal	5 to 7 lbs.
Gluten or cottonseed meal	2 lbs.

Ration 5.	
Alfalfa or cowpea hay	10 lbs.
Corn fodder	10 lbs.
Corn	5 to 7 lbs.
Bran	2 lbs.

Ration 6.	
Alfalfa or cowpea hay	15-20 lbs.
Corn	8-10 lbs.



These Six Cows, Bred and Owned by University of Missouri, Produced 4254 Pounds of Butter in One Year, or an Average of 709 Pounds Each.