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Feeding Dairy Cattle

T.M. Olson

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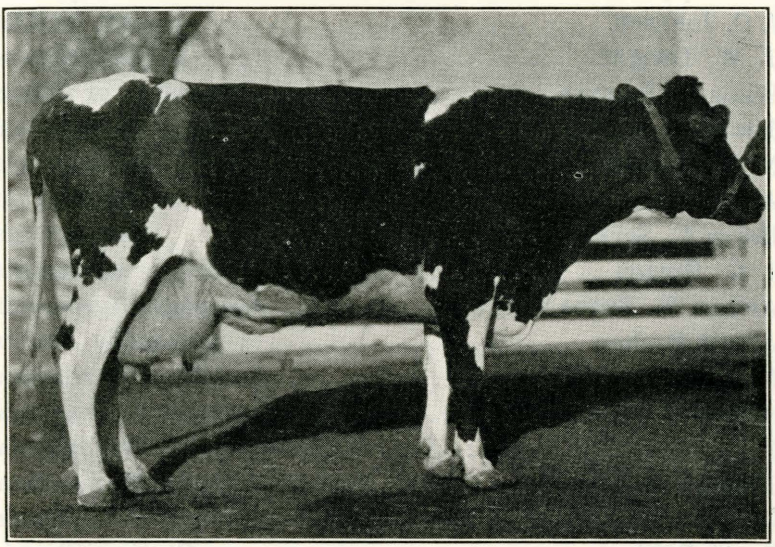

COLLEGE BELLE WAYNE SECOND 154817

The only cow of any breed in South Dakota to produce in one year, 1145.6 pounds of butter and 27,896.1 pounds of milk, beginning her test at 9 years, 18 days of age.

Dairy Husbandry Department

AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS

Brookings, South Dakota

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FEEDING DAIRY CATTLE

By
THOMAS M. OLSON

INTRODUCTION

It is the purpose of the writer to give in this bulletin a few practical suggestions on the feeding of dairy cattle, particularly applicable to South Dakota conditions. The suggestions are based on scientific experiments in feeding, and such practices as have been developed by feeders.

There are two basic factors in economical milk production—one the cow, the other the feed. The characteristics which make one cow a heavy producer when fed the proper amount and kind of feed, and the other a light producer under similar conditions, are inherited, and cannot be altered by feeding. It is safe to assert, however, that the production of the average cow on farms in South Dakota could be increased considerably by more liberal feeding of the proper feeds.

The largest single expense in the production of milk is the cost of feed. It is apparent, therefore, that the farmer who is engaged in dairy farming or contemplates dairying, must give careful consideration and attention to the feeding of his herd.

IMPORTANCE OF DAIRYING

The dairy cow, of all domestic animals, is the most efficient producer of human food. From 100 pounds of digestible nutrients the dairy cow returns 18 pounds of edible food solids. From an equal number of pounds of digestible nutrients the hog produces 15.6 pounds, the steer 2.8 pounds, and the sheep 2.6 pounds of edible food. Dean Henry says in this connection, "Not only is dairying the leading industry of our country at the present time, but so it must continue indefinitely for the reason that the dairy cow is a more economical producer of human food than is the ox or pig."

As agriculture becomes more intensive it is necessary to give consideration to economy of production, and as the dairy cow has proven herself to be the most efficient of domestic animals she will triumph wherever agricultural progress is the greatest.

The dairy cow is also the most efficient animal to convert grass, hay, straw and mill by-products such as bran, gluten meal, etc., into human food. In European countries where the population is dense, the grain that is grown is

needed largely for human food, and only such animals as can utilize mill by-products and roughages for a large portion of their ration are kept. We find that the dairy cow is in favor in those countries.

The dairy cow is also an important factor in maintaining soil fertility. Practice has clearly indicated that in regions where dairy cows are kept, the soil is being maintained in a higher state of fertility than where other lines of farming are pursued. Dairymen who purchase mill feeds and other high protein feeds may even add more fertility to the soil through the manure than is taken out by the crops.

HOW FEEDS ARE USED BY THE DAIRY COW

The first purpose for which the dairy cow uses feed is to maintain herself. Before feed nutrients can be used for any other purpose, as for instance to produce milk, that part of the feed nutrients necessary for maintenance must be provided. The maintenance requirement of a given cow remains about the same whether she is producing at her maximum or is dry. That is, if it takes 10 pounds of roughage, and 8 pounds of grain mixture to maintain a given cow when dry, about the same amount of roughage and grain would be required for maintenance if she were producing 40 pounds of milk per day. It is obvious, therefore, that the dairyman gets returns only on that feed which a cow consumes over and above what is required for maintenance. When a cow is not given enough feed to furnish the nutrients necessary for maximum milk production and maintenance, she must necessarily either decrease in milk production or deny her body the nutrients necessary for maintenance. Nature steps in at this point, and provides that first the cow must maintain her own body. Whatever is fed in excess of this requirement will be used for milk production (a wise provision—if it were not so, cows would have become extinct long ago). Some cows have the milk producing tendency so highly developed that they thwart the laws of nature, and steal nutrients which should be used for maintaining their bodies, to produce milk. Obviously this cannot continue very long before the physical condition of the cow suffers materially.

Suppose the ration of the cow were reduced one-fourth. The part of the ration which is required for maintenance remains the same. The reduction, therefore, must come from that part of the ration which is used for producing milk, hence a corresponding reduction in milk production must follow such a system of feeding.

The fallacy of underfeeding seems too apparent to require discussion, yet it is safe to say that it is one of the greatest loadstones of the dairy industry. Too many farmers just feed sufficiently to maintain their cows, thus leaving nothing from which to produce milk.

A dairy cow requires feed for other purposes in addition to milk production and maintenance. If she is still immature, sufficient feed of the proper kind should be allowed to grow the bone, muscles and other tissues. The pregnant animal needs feed nutrients to develop the fetus. This is an added requirement upon the cow, and provision must be made by increasing her feed allowance.

AVOID OVERFEEDING

"The eye of the master fattens his cattle" can be paraphrased to read, "The eye of the master produces milk economically." If the dairyman could be assured of the most economical milk production by liberal feeding, the problem would be solved. But it is not so simple as that. Some cows do not have the milk producing function developed. When these cows are fed a liberal ration, the amount over and above what is required for maintenance must be utilized for some purpose, and as such cows cannot convert the feed nutrients into milk, the excess feed is used for storing fat. If a cow is being fed for milk production she should not store fat. Furthermore the kind of feed which should be fed for milk production is not economical feed from which to build fat, neither is the dairy cow an economical meat producer.

The increase in weight is a good indication that the cow is utilizing the feed to store fat on her own body rather than increasing her milk flow. The observing feeder will detect this increase in weight, and accordingly decrease the amount of feed. In this way he will regulate the amount of feed each cow receives, making due allowance for a cow which is nearing the end of her lactation period, when we expect and want her to put on fat preparatory to calving. A heavy producer will probably lose in flesh for the first month after freshening. This indicates that she is drawing on her own body to furnish the nutrients needed for the milk. However, if the cow is in good flesh before calving there is no cause for alarm if she loses a little in weight. After this period has passed, the cow should remain constant in weight throughout her lactation period, increasing somewhat during the last month or so of the milking period.

In this connection it is well to point out the fallacy of feeding all the cows in a herd the same amount of feed,

whether they are producing 5 gallons or 1 gallon of milk per day. The 5 gallon cow may not be receiving what she should have, and the 1 gallon cow, if she is fed the same amount as the 5 gallon cow, is receiving too much. In either event the greatest economy of milk production is not attained. Cows must be studied, and fed according to their production, giving to the heavy producers all the feed they will eat and convert into milk, and giving the light producers no more feed than they can utilize for milk production.

WHAT TO FEED

All feeds are composed of feed nutrients, each of which when taken into the animal body is used for certain purposes. The nutrients with which the feeder is vitally concerned are protein, carbohydrates, fats and ash.

Protein is used in the animal body to build bones, muscle, hair and skin, as well as to build the curd or protein substance of milk, of which there is 3.5 percent in average cow's milk. No other food nutrient can take the place of protein, therefore it is necessary to furnish feeds which contain protein in sufficient amounts to meet the requirements of the individual cows. Protein is found in almost all feeds, but in large quantities in oilmeal, cottonseed meal, gluten meal, soybean meal, bran, milk, and such roughages as alfalfa hay, clover hay, and soybean hay. These feeds form an important and necessary part of the ration of every dairy cow, as well as being the most expensive feed fed to dairy animals. Therefore the farmers of South Dakota who are engaged in the dairy business should plan to grow as much of these feeds as are needed.

The carbohydrates and fats supply heat for the body, fat in milk, fat stored as body fat, and energy to keep up the functions of the body. The carbohydrates are found in large quantities in such grains as corn, barley, wheat, oats, corn fodder, timothy hay, sorghum and sugar beets.

The fats are found in small quantities in most all grains, and differ from carbohydrates in their concentration.

We find that all of these nutrients are present in varying quantities in all feeds. We also have noted that an animal requires all these nutrients in varying quantities to grow and have all its organs function properly. If the cow is secreting milk, we find a further demand made upon these nutrients. In 100 pounds of average milk we find about 3½ pounds protein in the form of casein and albumen, 5 pounds of carbohydrates in the form of milk sugar, and 3½ pounds of fat in the form of butterfat. These solids are present in the milk in about the same proportion at all times. Since they are

necessary to milk production it is obvious that these nutrients should be furnished in the feed in such amounts and proportions that the cow will have sufficient of each for maintenance and for maximum milk production. If the ration is deficient in protein, for instance, proteins will be limiting factors in milk production. That is if the feed contains enough carbohydrates and fat to produce 60 pounds of milk, and only enough protein to produce 30 pounds of milk the production will be limited to 30 pounds. The surplus carbohydrates and fats which were in the ration will be used to store body fat, or thrown off in the excreta.

We see, therefore, that it is not only necessary to feed liberally but feeds which meet the requirements of the cow must be chosen, and these fed in such amounts and proportions so that there will not be a deficiency or too great a surplus of any of the nutrients. Efficient feeding requires knowledge of the amount of nutrients in the feeds used, as well as the nutrients required for maintenance and for production of milk.

SILAGE

In sections of the country where dairying is the chief and only industry, a silo and the use of silage as a feed, is considered as necessary as the dairy barn. Silage can be fed to every class of livestock with good results, but for dairy cows it is well nigh indispensable. Silage is classed as a succulent feed. It has a cooling effect on the digestive system of the cow, and produces a sappy condition in the tissues resulting in a pliant skin and glossy coat, all of which is an indication of the desired physical condition without which maximum production is impossible.

Analysis of silage made from corn in the proper stage of maturity is as follows: Digestible protein 1.25 percent, digestible carbohydrates 14.2 percent, digestible fat .7 percent. That is, in 100 pounds of corn silage the cow will get 1.25 pounds of digestible protein, 14.2 pounds of digestible carbohydrates and .7 of a pound of digestible fat. One ton of silage would, therefore, contain 25 pounds of digestible protein, 284 pounds of digestible carbohydrates and 1.4 pounds of digestible fat. An average yield of 8 tons of silage to the acre would mean 200 pounds of digestible protein, 2,272 pounds of digestible carbohydrates and 11.2 pounds of digestible fat from one acre. Silage is therefore a nutritious feed as well as being highly valuable for dairy cattle from a physiological standpoint.

Corn ensiled is a more economical way of storing the corn crop than husking and feeding the corn grain and corn

stover. In the latter method of feeding the succulent value is lost, which as previously indicated is necessary to maximum milk production. No matter how well corn is cured and how well it is handled there is some waste. Leaves are broken off and left on the field. During the curing stage, more or less of the corn is rendered unfit for feed. Fodder is not eaten completely, and much of it will find its way into the manure. The palatability and succulence of silage enables the dairy cow to consume more feed nutrients than if it were fed as fodder.

WHAT FEEDS TO GROW

Perhaps one reason why the average farmer does not feed a balanced ration is that he does not grow crops which are rich in protein. The crops grown in South Dakota such as corn, barley, oats, timothy and prairie hay are high in carbohydrates and fat, but deficient in protein. It would be folly to feed a dairy cow on such grains and roughages alone and expect maximum milk production. When farmers feed corn stover and prairie hay for roughage and practically no grain except a little corn for the grain part of the ration, they must not expect much milk return.

Every farmer should make a special effort to grow a legume for roughage. If alfalfa can be grown without too great an initial cost in getting a stand it is to be preferred. Alfalfa is high in protein, and furnishes a palatable, nutritious roughage that is unequaled for cows in milk.

Clover is a close second choice, and when harvested and cured in good condition furnishes a most excellent feed for roughage. If neither of these can be grown successfully perhaps cowpeas or soybean hay can be used to furnish the home grown roughage.

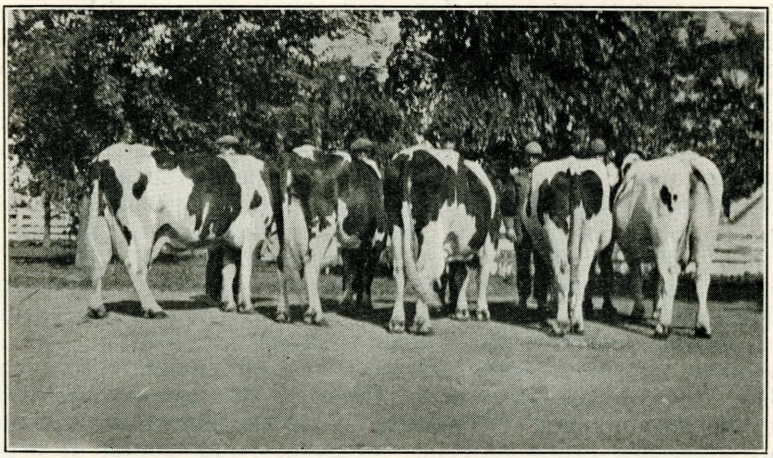
Corn silage should be grown wherever there is sufficient moisture and a sufficient acreage of an early maturing variety of corn for husking, as well as a sufficient acreage of oats to supply the need for the grain part of the ration.

WHAT FEEDS TO BUY

Where maximum milk production is sought, it is necessary to purchase high protein feeds to supplement the home grown grains. It is possible that the greatest economy of milk production can be obtained by feeding a ration of such home grown roughages as good alfalfa hay and corn silage, supplemented with oats and corn as grain. This is especially true when the high protein feeds, such as oilmeal, bran or gluten meal, are high in price as compared to the home grown feeds. The local price of the various feeds must be

known to determine which feeds to buy. It goes without saying that farmers in South Dakota should not buy feeds that they can grow on their own farms, for the reason that these feeds can be grown for less money on their own farms than on farms in other sections of the country and shipped in. That leaves the high protein feeds such as oilmeal, bran, gluten meal and cottonseed meal to be purchased. These feeds are fed largely for their high protein content, hence the price should be based on the relative amount of protein in them. The analysis usually appears on the sack but if it does not, ask the seller for the protein analysis. With this information and the price of the feed per ton one can readily determine which is the cheapest source of protein. For instance if oilmeal costs $40 per ton 100 pounds would cost $2. The average analysis of oilmeal is 30.2 percent digestible crude protein. Or in 100 pounds of oilmeal there is 30.2 pounds of digestible crude protein. Therefore, one pound of crude protein would cost 6 2-3 cents per pound. Wheat bran at $20 per ton costs $1 per hundred pounds. Wheat bran contains 12.5 pounds of digestible crude protein in 100 pounds. Likewise 1 pound of digestible crude protein in bran costs 16 cents per pound. From the chemical analysis alone it is apparent that oilmeal at $40 per ton is a much cheaper source of protein than wheat bran at $20 per ton. However, there are other properties of feeds which must be considered, chief among which are their physiological effects. Bran is a light, bulky feed, and has a cooling effect upon the digestive system of the cow. Its laxative property also adds to the value, especially when fed with feeds which are more or less constipating. Although bran may be relatively high in price, when viewed from the chemical properties alone its value in toning up the digestive system of the cow more than offsets its higher price. Where high records are being made or even when maximum production is sought, bran forms an invaluable part of the ration. Good wheat bran is also very palatable and for that reason can be fed to cows immediately after freshening or to cows which go off feed, with good results.

Oilmeal usually forms one of the best sources of protein. In addition to being high in digestible nutrients it has a cooling, laxative effect upon the cow. Its use is soon apparent in the pliable skin and sleek, oily coat. No other feed quite equals oilmeal for conditioning animals for shows, and for animals which are run-down generally. Oilmeal like bran has a favorable physiological effect and like it should be used where cows are forced in production, even though the cost is relatively high. When considerable dry roughage like corn



Five cows in the college herd with average production as follows:

7 days: 651.48 pounds milk; 31.49 pounds butter.
30 days: 2,937.7 pounds milk; 128.4 pounds butter.
365 days: 23,471.8 pounds milk; 943.07 pounds butter.

From left to right: College Belle Wayne, College Belle Wayne Second, Leda Cornucopia, Leda Cornucopia Second, College Cornucopia Second. These cows were bred and raised by State College, and all carry the blood lines of College Belle Wayne.

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stover and timothy hay are used, oilmeal can be used with profit with light producing cows.

Other high protein feeds, such as gluten meal and cottonseed meal, are frequently used for cows which are on official test. These are used to add variety to the ration, and to furnish protein from different sources. Perhaps the average dairyman would not be so much interested in the purchase of these protein feeds. Cottonseed meal often is one of the cheapest sources of protein but it has a constipating effect and therefore should be fed only when such laxative feeds as oilmeal and bran are used. It should be fed in limited amounts not to exceed 4 pounds per day, and that is too much before the animals become used to it. Cottonseed meal should never be fed to young calves, or cows about to freshen, as its constipating effect will prove harmful. It may, when fed in large quantities to animals not accustomed to eating it, prove fatal.

Gluten meal is a by-product of corn, and is very high in crude protein. It is a heavy feed and should be fed with a bulky, laxative feed like bran.

The kind of feeds to buy would have to be governed by

many factors. If good alfalfa hay, corn silage, oats and corn are grown on the farm perhaps only limited amounts of oilmeal and bran should be purchased and fed only to high producing cows. In herds where cows are fed for official records, a greater variety of feeds is necessary to tempt the appetites of the cows. In these cases other high protein feeds such as cottonseed meal, gluten meal, distillery and brewery by-products may be fed in limited amounts with increased production.

SUMMER FEEDING

The pasture season is usually the time when dairymen expect the greatest milk flow with the least labor and feed. When the pastures are good the average cow is probably getting sufficient feed nutrients, but when the pastures dry up or are eaten down too close the pasture must be supplemented with other feeds. Silage has been found to be the most economical feed to supplement the short pastures during midsummer.

The college herd is fed silage during the entire year. The amount is decreased when the cows are on pasture to about one half of what is fed during the winter. The silage keeps in good condition for summer feeding if sufficient is fed each day. With a smaller herd perhaps a small amount would spoil on the surface during the hot weather. This could be avoided by keeping the silage covered to prevent too rapid evaporation.

The college herd is also fed grain while on pasture. A small amount of oats or corn is fed on the silage. Oilmeal is fed to the high producers in addition to the corn and oats.

Feeding grain on pasture will no doubt tend to increase the milk flow, but from the standpoint of economy of milk production there seems to be some question whether the increase in milk flow is sufficient to warrant grain feeding on pasture.

Cornell Experiment Station carried on a series of experiments in this connection, the results of which seemed to indicate that grain feeding on good pasture was not profitable from the standpoint of increased milk flow, but the residual or after effects, which lasted for a year or more, made the feeding of grain on pasture often advisable. It was found that cows which were receiving grain while on pasture stored the surplus nutrients, and as a result produced more milk during the following winter.

Perhaps the average dairy farmer of South Dakota can omit grain feeding while the cows are on good pasture. But in no wise should dairy cows be allowed to become thin because of lack of sufficient feed. Cows which come off from

the pasture in thin condition will not milk as much during the winter from the same amount of feed as cows which have been kept in good condition during the pasture season. A good dairyman never allows his cows to become thin from lack of sufficient feed.

FEEDING THE CALF

The raising of dairy calves is an important part of the dairy business. Calves later fill the places of cows which have been sold or otherwise disposed of. It is important, therefore, that the calves be given every opportunity to grow and develop.

The new-born calf should be left with its mother from 3 to 5 days depending on its vigor, unless the dam has a disease which might be transmitted to the calf. In the latter case the calf should be separated from its mother immediately after birth.

It is well that the calf should receive the first or colostrum milk. This milk is laxative in action and serves to put the digestive tract of the calf in condition for handling its feed.

After the third or fourth day the calf should be taken from its mother and hand-fed its mother's milk. The calf should receive from 2 to 3 quarts of milk twice a day. This should be increased until the calf is receiving from 3 to 4 quarts twice a day, at the end of the third or fourth week. If the calf is thrifty, a part of the whole milk can be replaced by skimmilk when the calf is from 3 to 4 weeks old. It is best to make the change from whole milk to skimmilk very gradually, adding a little more skimmilk each day and decreasing the whole milk by approximately the same amount. This gradual substitution should be continued until the calf is receiving all skimmilk at the end of the sixth or seventh week. As the calf grows the skimmilk should be increased but at no time should it receive more than 10 quarts per day. Skimmilk should be fed until the calf is at least 6 months old, and if it can be had at a reasonable price it is well to feed skimmilk longer.

It is important that the calf be taught to eat grain and hay early in life. A handful of hay placed in the calf manger will usually be all that is necessary to get the young calf started eating hay. If a handful of ground oats or corn is placed in the pail after the calf has finished drinking its milk, the calf will soon cultivate a desire for grain. A small amount (couple of handfuls) of grain should be put in a suitable place so the calf can eat at will. A grain mixture composed of ground oats, ground corn, bran, and a small amount of oilmeal will be very satisfactory. If the bran and

oilmeal are not available corn and oats will suffice. Grain should never be left in the feed boxes. Feed only such amounts of grain as the calf will eat up clean every day.

As the calf gets older more roughage should be fed. Alfalfa, which is high in nutrients needed for growth, is to be preferred. However, it will sometimes cause digestive troubles, especially if the calves eat very much of it. It is the practice in the college herd to feed alfalfa hay to the calves in the morning, and a mixed hay such as timothy and red clover in the evening.

The raising of calves cannot be discussed without emphasizing the importance of cleanliness. Pails, troughs, mangers, pens and everything connected with calf raising must be kept clean. Dirty feeding utensils and wet, dirty pens contribute a great deal to scours in calves, which frequently result in stunted growth and otherwise unthrifty calves. If the calf pens can be located in a part of the barn which is well lighted, well ventilated and sunny it will go a long way in keeping the calves in good health. An occasional coat of whitewash makes the pens lighter and more sanitary, as well as improving the appearance of the calf barn.

KEEP THE HEIFER IN GOOD GROWING CONDITION

It is important that the young heifer be fed so that she will grow at her maximum. It is not necessary that she be fat but she should receive such feeds as will furnish nutrients for the building of bone and body tissue, and keep her system in the best of condition.

Good alfalfa hay will furnish a large portion of the nutrients necessary for growth, and good silage will do the rest. The yearling heifers in the college herd receive alfalfa hay and silage for their winter ration. The under-sized or otherwise unthrifty heifer is given a little oats and corn, in addition to the alfalfa hay and silage. This same treatment is given the heifers the second year, until 3 or 4 months previous to calving when oats and corn, bran and a little oilmeal is fed.

It is good herd management to have the heifer, and also the aged cow, in good flesh at the time of freshening. She will then have reserve material to draw upon after freshening. The heavy producing cow will lose in weight after freshening for a month or more, even with liberal feeding.

If the cow is being grained preparatory to calving, the ration should be reduced and more of the laxative feeds such as oilmeal and bran added 4 to 5 days before she is due to calve. If the cow is in good physical condition she will have less trouble in calving and will not be so subject to retention of the afterbirth. When the cow is in good physical condi-

tion the afterbirth is usually expelled within 3 to 6 hours. If it is not expelled it must be removed within the first 24 hours. When this becomes necessary the cow usually gets thin and decreases considerably in milk flow. It is, therefore, very necessary to watch the feeding and physical condition of the cow previous to calving.

After freshening the cow should receive lukewarm water for 2 or 3 days. A bran mash (bran on which boiling water has been poured) is excellent for cooling the system and keeping the bowels open. She can be allowed alfalfa hay, and about 10 to 15 pounds of silage. After the fourth day other feeds can be added and the ration increased. She should not receive her full ration until the third or fourth week.

FEEDING THE COW IN MILK

The feeding of a cow in milk will depend a great deal on what is expected of her. If she is on official test and maximum production is sought, the feeder must study the individual cow and tempt her appetite by feeding a mixture made up from many different feeds. An attempt is also made in this case to have the cow eat as much grain as she can handle without throwing her off feed. The cow may not be producing milk at a profit under such forced feeding, but usually profitable milk production is a secondary consideration when high milk and butterfat records are being made.

When good corn silage and alfalfa hay are available the feeding problem is largely solved. Many successful dairy farmers feed only alfalfa hay, silage and such home grown feeds as oats and corn. No doubt the milk production can be increased by feeding high protein feeds, but it is an open question whether the net profit will be correspondingly increased.

Practical dairymen and experimental results agree that corn silage and alfalfa hay are two well-nigh indispensible feeds for dairy cattle, for both economical and maximum milk production. Therefore these feeds should form the basis of the ration for the dairy cow, supplemented with such grains as meet the demands made upon the cow.

FEEDING THE BULL

Up to 6 months of age the young bulls will in most instances be running with the heifers. Their feed and care need not differ from the heifers.

At 6 months of age the bulls should be separated from the heifers and if they are not well grown, continue feeding them skimmilk. Their grain rations should consist of ground oats, ground corn, bran, and oilmeal. When skimmilk is fed

the bran and oilmeal can be omitted. The bull must be kept growing until matured. A matured bull in light service will not need very much grain. A mixture of 4 parts of oats and 2 parts of corn should keep him in good condition, with alfalfa hay and not to exceed 10 pounds of silage per day as roughage. If too much silage is fed the bull gets too paunchy and slow for breeding.

A bull in heavy service should receive more grain and no silage. A grain mixture of 4 parts of ground oats, 2 parts of ground corn, 2 parts oilmeal, and 2 parts of bran should keep him in good breeding condition. Feed from 8 to 16 pounds of this mixture per day, depending upon the size and condition of the bull. A breeding bull should not be allowed to get fat, neither should he be in a thin condition for best results.

The exercise of the herd bull is often a difficult problem. He should not be allowed to run with the herd, and yet he must be exercised. A large paddock or bull pasture sometimes furnishes sufficient exercise. If the paddock is small, a block of wood suspended from an arm on a pole set in the center of the paddock, will furnish means for the bull to exercise. If no paddock is available a convenient and safe way to exercise the bull is to stretch a heavy wire between two posts a convenient distance apart. The bull can be tied by his ring to this wire, allowing the rope to slide on the wire by means of a ring. This will allow the bull considerable freedom to walk, and yet keep him from becoming a nuisance.

RULES AND RATIONS

1. Never underfeed a good cow.
2. Avoid overfeeding the poor producer.
3. Feed all the legume hay and silage the cow will eat up clean.
4. Feed grain according to milk production. That is, feed about 1 pound of grain to every 3 pounds (about 1½ qts.) of milk produced.
5. Weigh and test the milk from each cow. This is the only way to find out what the individual cows are producing.
6. Give the cows all the clean water they want to drink, of suitable temperature and in comfortable surroundings.
7. Allow the cows to lick salt at will.
8. Be systematic and punctual in all the work. Have a definite order and time for feeding silage and grain, and milking, and follow that order faithfully.

For the busy dairyman it is probably more convenient to mix the grains, and feed a given number of pounds of the mixture to each cow, rather than to feed each grain separately. Accordingly a number of suitable mixtures are given.

GRAIN MIXTURE FOR YOUNG BULLS IN LIGHT SERVICE

400 pounds of ground oats.
300 pounds of ground corn.
100 pounds of oilmeal.
100 pounds of bran.

Feed from 6 to 10 pounds of this mixture per day, with 10 to 12 pounds of alfalfa hay, and 5 pounds of silage.

MIXTURE FOR MATURE BULL IN HEAVY SERVICE

400 pounds of ground oats.
200 pounds of ground corn.
200 pounds of oilmeal.
200 pounds of bran.

Feed from 8 to 16 pounds per day depending on size and condition of bull, in addition to 10 to 12 pounds of alfalfa hay.

MIXTURE FOR DRY COWS PREVIOUS TO CALVING, IN GOOD CONDITION AND NOT ON PASTURE

200 pounds of ground oats.
400 pounds of bran.
400 pounds of oilmeal.

Feed from 6 to 8 pounds of this mixture per day, increasing it until 10 to 14 pounds are being fed. Feed 8 to 10 pounds of hay, and 20 to 30 pounds of silage.

MIXTURE FOR COWS IN MILK

600 pounds of oats.
400 pounds of ground corn.
300 pounds of oilmeal.
300 pounds of wheat bran.

Feed 1 pound of this mixture to every 3 pounds of milk which the cow produces, in addition to all the silage and good alfalfa hay she will eat up clean.

MIXTURE FOR COWS IN MILK WHEN NO SILAGE BUT PRAIRIE HAY IS FED

600 pounds of ground oats.
600 pounds of ground corn.
400 pounds of oilmeal.
400 pounds of wheat bran.

Feed 1 pound of this mixture to every 3 pounds of milk which the cow produces. Best results can not be expected in winter unless some succulent feed is fed. If silage is not available, roots (mangel-wurzels) should be grown. Beet pulp when soaked in clear water, or molasses water, is a good succulent feed. The foregoing mixtures are merely guides for feeding dairy cows of average production and will not suffice for cows on official test which are being forced for high production records. The feeds suggested are such as can be readily obtained by South Dakota dairymen.