Dairy Husbandry: A Manual for 4-H Dairy Club Members

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Dairy Husbandry
A Manual for 4-H Dairy Club Members

A dairy herd developed through 4-H Club work

South Dakota State College Extension Service
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The history of the dairy industry in South Dakota is one of continued progress. Dairy cows accompanied the covered wagons of the early settlers and have gained in numbers and importance with each succeeding year. Dairying makes up a large part of the income on most South Dakota farms.

Successful dairying depends not only upon good cattle but upon good care and feed as well. It has been demonstrated that this work can be done very well by young people, that they like this type of work and that they can make some profit for themselves in connection with it. Boys who undertake 4-H dairy club work at this time are not only developing good herds of cattle for themselves, but are also learning the principles of good dairy practices.

This manual has been prepared to serve as a guide for 4-H dairy club members in the selection, care, feeding and management of dairy cattle and the marketing of their products. A program and record book suggests topics for study each month. The suggestions and information included in this manual are in line with the methods of practical dairymen and the findings of experimental work conducted by agricultural experiment stations and the U. S. Department of Agriculture. This is by no means a complete treatise on dairy husbandry. Therefore, references are given in order that 4-H club members and leaders may have access to further information on the subjects discussed.

Credit is due T. M. Olson, Professor of Dairy Husbandry, for making many valuable suggestions and reviewing the manuscript; Clarence Shanley, Extension Specialist in Dairy Marketing, for the section on marketing of dairy products; and Dr. G. S. Weaver, Extension Veterinarian, for the section on diseases of dairy cattle.
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Dairy Husbandry

A Manual for 4-H Dairy Club Members

Prepared by Extension Specialists

I. Choosing a Dairy Breed

One of the very first problems to be considered by members of a 4-H dairy club is the choosing of a breed. While the success of a club does not depend entirely upon the breed, the matter should be given careful thought.

The individual should not allow his personal preference for a breed to dominate all other considerations. If his father owns a good herd of a dairy breed, the club member will probably be more successful, all things considered, if he obtains a calf of the same breed. Club members living on farms on which no definite dairy breed is maintained will do well to select that breed of cattle which is most common in the community. The advantage to the dairymen of keeping the same breed as his neighbors is of greater importance than is his own preference.

It is desirable, though not essential, that all members of one club select calves of the same breed, especially when all of their fathers have the same breed. There is much to be gained in this way along lines of purchasing sires, exchanging sires, showing at fairs, selling breeding stock, and other cooperative endeavors.

The Dairy Breeds

The major dairy breeds are Ayrshire, Brown Swiss, Guernsey, Holstein and Jersey. Each of these breeds has certain characteristics in which it excels the others, but no one of these breeds is superior to the others in all respects. The best decision will be made when it is clearly recognized that there is no best breed under all conditions and that there is much greater difference between individual cows within a breed than there is between breeds as a whole.

Comparison of Breeds

It may be helpful to classify the breeds roughly according to certain characteristics. Holsteins as a breed produce more milk than any other breed. The Jersey breed ranks highest in the percentage of butterfat in the milk. Then follow approximately in order Guernsey, Brown Swiss, Ayrshire and Holstein. With respect to the yellow color of the product, the breeds may be ranked as follows: Guernsey, Jersey, Brown Swiss, Ayrshire and Holstein.

While no dairy cow is able to withstand severe exposure to weather and produce at maximum efficiency and profit, the dairy breeds do vary somewhat in their ability to undergo adverse conditions. With respect to hardiness the Ayrshire and Brown Swiss breeds are usually ranked first,
followed by Holsteins, Guernseys and Jerseys, though there is but slight
difference between the last three breeds. In size, the Holstein and Brown
Swiss breeds are largest, Jerseys are smallest and Ayrshires and Guern­
seys are on the middle ground. A ranking of breeds on the basis of early
maturity would be something like this: Jersey, Guernsey, Ayrshire, Hol­
stein, Brown Swiss. The Brown Swiss and Holstein breeds give birth to
the largest calves and Jersey calves are smaller than Ayrshires and
Guernseys.

The above comparisons apply to the breed as a whole and not to indi­
vidual cows. Furthermore, exceptions can be found to the above state­
ments by comparing cows of one breed with those of another in certain
communities. However, attention is called to the fact that each breed is
ranked first in one or more characteristics.

Chief Points to Consider

In summarizing briefly the points to consider in choosing a breed, the
following may be listed: (1) Consider the same breed that is being raised
on the home farm. (2) Consider the breed that is most numerous in the
locality. (3) Consider the products that are going to be sold or used on
the farm, whether they be milk, cream, cheese, butter, skimmed milk, veal
calves, breeding stock or beef. (4) Lastly, consider personal choice.

When the selection has been made it is of importance to select good
foundation stock and to continue with that breed consistently. Success in
dairying is not achieved by changing from one breed to another or by
crossing breeds. There is greater danger of making errors in the breeding
and management of dairy cattle after a choice of the breed has been made
than in making a choice among breeds.
II. Selecting Dairy Animals

The necessity for using good judgment and caution in selecting dairy animals cannot be given too much emphasis. The calves and cows purchased become the foundation for future herds and all foundations should be laid carefully. It is neither fair nor profitable to club members for anyone to allow them to secure ordinary calves, much less inferior ones.

There are at least four important factors to consider carefully in selecting dairy cattle. They are: (1) conformation (2) ancestors, especially the sire and the dam; (3) other offspring of the sire and dam, that is, the brothers and sisters and half-brothers and half-sisters, and (4) health and absence of disease in the herd in which the animals were raised. It is not always possible to select a young heifer that will develop into a cow of good type and profitable production. However, careful use of these four principles will materially reduce the number of errors made in selecting dairy heifers.

Dairy Conformation

Conformation refers to the appearance, type, or build of the animal. To the experienced eye many qualities or characteristics are revealed by careful observation. The points of dairy conformation are feed capacity, constitution, dairy character, milk organs, general appearance and breed type.

Capacity

Feed capacity refers to the ability to consume and digest large quantities of feed. It is indicated by a long, deep, wide body or barrel; by well-
The teats should be squarely placed, quite uniform in size and should be placed some distance apart. It is preferable for the calf to have only four teats. In the mature cow milk veins should be prominent, large, long, crooked and elastic; milk wells should be large and numerous with prominent veining on the udder. In calves the veins and wells are frequently not developed to a point where they can be noticed. However, their early development is desired and the milk veins should be traceable well forward at an early age.

General Appearance

General appearance relates to symmetry of form, beauty and style. Good general appearance is indicated by a straight topline; by a level, long, wide rump; by a smooth, level tail setting; by absence of coarseness; by balance and a smooth blending of different parts; by straight legs; by a stylish carriage; by a sure, active, well balanced walk; and by a feminine appearance. Under this heading is included a correlation of parts which results in an animal that combines beauty and efficient producing ability. Recognition of this quality comes from much association with dairy cattle.
Breed Type

Breed type refers to the standard of conformation for each breed, or to those desirable characteristics that are peculiar to each breed. The heifer calf should have all of the desirable characteristics of the breed it represents, such as shape of head, shape of udder, color, markings, size, and so forth. Type differs from breed to breed. Because a certain characteristic may constitute desirable type in one breed, but undesirable type in another, it is necessary to learn what the standards are for each breed, or at least to have clearly in mind the type standard for the breed of one’s choice. This can best be accomplished by close observation of the best cows in the breed and by careful study of true type models and pictures and of photographs of show ring winners.
Judging Dairy Cattle

Members of dairy clubs have a splendid opportunity to learn the fundamental principles of judging dairy cattle. The art of judging is a valuable asset for the dairy farmer or breeder. The large amount of practice required in learning to judge cattle is splendid mental training. It develops the ability to think clearly, to make careful observations, and to use good judgment. It fosters ability to make logical decisions and to express thoughts in a concise and forceful manner.

The first step in learning to judge is that of thoroughly mastering the names of the various parts of the animal. Study the chart until any part of the animal pointed to can be named accurately without a moment's hesitation. The next step is to learn dairy type and breed type by studying bulletins on judging, score cards, and pictures of animals of the various breeds that approach perfection. The third step is to get as much judging practice as possible and to use every opportunity to be a close observer at the ringside at shows and fairs. As ability to judge is being perfected, it is essential to develop a vocabulary of descriptive words and phrases that are necessary in explaining decisions in a clear and effective way. It requires patience and much practice to become a good judge of dairy cattle.

The Sire and Dam

After the calf has been examined carefully and her individual conformation approved, it is well to consider her sire and dam and see them if possible. If the animal to be purchased is a grade, it is not so necessary to require that her parents approach perfection in type and conformation. However, she should be from a registered sire and a dam having a production record of not less than 300 pounds of butterfat in a year. On the other hand, if one is purchasing a registered heifer, he should be more particular as to the type of her immediate parents and their producing ability.

The Brothers and Sisters

In the case of the purebred it is of even greater importance to consider the sons and daughters of the parents of the heifer than the parents themselves. If the daughters of the sire and dam are uniformly good producers and are of desirable type, there is good reason to believe that they have the ability to pass on these characteristics to all of their offspring, and, consequently, it is reasonable to expect that the heifer in question has also inherited the same qualities and will compare favorably with her sisters and brothers. This is one of the best means to employ in reducing the element of chance in buying heifers because it is an additional assurance that they will develop into good cows.

Freedom from Disease

Several infectious and contagious diseases may be carried from one herd to another through the purchase of cows, calves, and heifers. Cautious breeders do not select cattle from herds until it has been definitely established through reliable herd tests, that such herds are entirely free from tuberculosis and infectious abortion. Other ailments such as udder diseases and scours are communicable and should be guarded against. One cannot be too careful in looking into the health condition of any herd out of which he proposes to make purchases.
III. Fitting and Showing Dairy Animals

Livestock shows and fairs are educational institutions. They serve to encourage the use of improved livestock and the adoption of better methods of herd management. They demonstrate improved methods of feeding. They clarify the breeder's ideas of what constitutes good type. They are a means of advertising and selling breeding stock. They serve as a medium for the exchange of theories and practices among animal husbandmen.

A "Pot-Bellied" Calf, the Result of Improper Feeding
(Courtesy Minnesota Experiment Station)

A distinct advantage of dairy club work is the opportunity it affords the member of exhibiting his animals. If the judge conducts his work in an instructive manner, each member has an opportunity of learning a great deal about the desirable and undesirable features of each animal exhibited. Alert club members profit by the experience and training which they receive in showing their cattle and put the training into practice when they return home. Winning is of less importance than the valuable lessons learned.

In some instances the matter of fitting and showing calves has been given more emphasis than it merits. A dairy club project should involve much more than the mere practice of buying a calf of good type, of fitting and showing her for one or two years and of letting it go at that. The member whose heifer has not been typey enough to win ribbons, but who has done a good job of rearing his heifer and who has laid the foundation for a profitable herd may take comfort in this—that he has profited by his experience as a club member far more than has the member who happened to be fortunate enough to secure a good calf but did not use his opportunities to improve himself or the herd at home.
Feeding and Rations

Fitting, to be well done, should start three or four months before the fair. It is not an easy task to secure the proper condition and flesh in the case of calves. While they should carry sufficient condition to appear healthy and sleek and have bloom, they should by no means be too fat, because highly fitted heifers may become shy breeders or low producers. Therefore, the ration should be one that stimulates growth rather than fattening. Feed a good quality of roughage. Various concentrate mixtures for fitting are in use. Some use a mixture consisting of 100 pounds ground oats, 100 pounds ground barley, 100 pounds wheat bran, and 100 pounds linseed meal. Another consists of 500 pounds wheat bran, 300 pounds ground oats, 100 pounds ground corn, and 100 pounds linseed meal. The condition of the calf should govern the amount to be fed. Ordinarily a calf should get from four to eight pounds daily, a yearling from six to twelve pounds, and an older animal from ten to twenty pounds. Because no rule will fit all animals good judgment must be used in determining how much to feed. Decrease the amount of feed immediately if reduced appetite or digestive disturbance appears.

In the case of calves there is no great danger that they will be fitted to an excessively fat condition. Yearlings and especially those carrying a calf, however, can easily be fed in a manner that will result in too much conditioning. If fattening is carried to a point which results in thickness about the neck, coarseness at the withers, and roughness or patchiness over the rump, it defeats its own purpose, namely, to give the heifer a smooth, pleasing appearance. Furthermore, over-fitting is likely to take its toll in subsequent irregular breeding or sterility. Heifers that have a tendency to fatten easily should be fed grain in a cautious manner and the mixture should contain large portions of feeds such as wheat bran and ground oats and but little corn and similar feeds.

Care and Management

Best results will be secured by keeping the calf off of pasture and by feeding it in the barn. Another system that gives fair results is to keep the calf indoors during the day and on pasture at night. It is difficult to fit a calf well when it runs on pasture at all times. Groom the calf every day with a brush of medium stiff bristles. This removes the dirt from the hair, causes the hair to be smooth and glossy and softens the hide by bringing out the oil. After a thorough brushing rub the hair with a soft cloth that has been slightly dampened in sweet oil or give the calf a rubdown with the palms of the hands. This makes the hair sleek and softens and mellows the hide.

Most yearlings are, and probably should be, pastured during the spring and summer preceding the fair, which is not so frequently the case with calves. The hide and coat of the heifer may need additional attention. To make the best showing possible, it is necessary to keep the heifer indoors 6 to 8 weeks before showing, at least during the day time. If given a cool, well-bedded stall and if blanketed, she will show in much better condition than if left in the pasture. In either case, grain feeding plus linseed meal will improve her appearance considerably.
Training to Lead

It is different to show a poorly trained calf. One wild, unruly calf in the ring is a nuisance to all others showing in that class. Training should start when the calf is a month or two old. The first step is to fit a halter on the calf, tie her in her pen and let her pull. Continue this until the calf has learned that the halter must be obeyed. Then lead her each day and train her so she responds quickly to a slight pull on the strap. If this training is postponed until the heifer is strong enough to break away from the leader, it will require far more training to bring her under control. She should be handled from the start so that she knows her owner is master. Train her to stand squarely on all four feet with head erect and top-line straight. Showmen lead with the strap neatly coiled in the right hand. After the calf has been brought to a stop and posed, the strap is transferred to the left hand and the showman faces the calf standing slightly to her left and in front of her where he can watch her feet and top-line. Posing in this manner should be practiced when she is led out for exercise.

If the heifer is well trained as a calf and if she was led and handled regularly since that time, it should be fully as easy to show her as it was the previous year. If this is not the case she will be far more difficult to handle than she would as a calf because she is larger and stronger. Heifers that are well along in their gestation period must be handled, loaded, and transported with care on the show circuit in order to prevent any accident which might result in injury.

Blanketing

Skilled showmen put blankets on their calves several weeks before the first show. Blankets keep animals clean, protect them from flies, cause
old hair to be shed, make the coat glossy and smooth, and sweat the hide which makes it soft and loose. It is a good practice to remove the blanket each day while grooming the calf to give the hide and hair an airing. Satisfactory blankets may be made from heavy burlap sacks. Sew them together to fit the body of the calf and tie them on at the brisket, underneath the body behind the front legs, and high up around each hind leg. A purchased blanket, or one made from canvas of light weight, may be kept in reserve for use at the shows where it is desirable to have a clean, attractive blanket.

Clipping

It is best to care for the animal in a manner that will require a minimum amount of clipping. With good feeding, regular grooming, and blanketing, it should be necessary to clip only her head and tail. Clip the tail from a point several inches above the switch to the tail setting. If the tail setting is high, the hair should be clipped off and the margin blended.

A good method of clipping the head is to start at the outside corner of the nostril and clip in a straight line to the lower corner of the eye. Do this on both sides. Then continue from the upper corner of the eye, under the base of the ear, behind the ear and the poll directly across to the other ear. Repeat this on the other side and clip the space within this circle, namely, the face, forehead, poll, and ears. Clip the inside of the ears in all breeds except Brown Swiss. In the case of a ewe neck, do not clip it. If
the neck is level and covered with long hair it may improve the appearance to clip a narrow strip across the top of the neck and blend the margins carefully. Unless a smooth job of clipping is done throughout, the calf will appear better unclipped than clipped.

Many yearlings show clearly refined milk veins. It is desirable therefore, to clip the belly of the heifer in a manner that will reveal the veins, especially so if the coat is such that it obscures the milk veins completely. Furthermore, a shapely udder, with high rear attachment and carried well forward in front, and with squarely placed teats can be far more apparent and striking by clipping the udder, the inner thighs, and the escutcheon.

Polishing Horns

The condition of the horns may add to or detract from the appearance of a calf. If the horns are badly out of shape or do not curve properly, horn trainers will correct this condition but they should be used early and carefully. The shape of horns can also be improved somewhat with a jack knife and rasp. After the horns are shaped properly, polishing may be started a day or two before the fair. A rasp may be used first to remove the roughness. Apply it to the horn in a direction away from the base and toward the tip. A rasp with an oval or rounded side is preferred. Then scrape with a piece of freshly broken glass and rub with sand paper and emery cloth. A smooth surface is required to take a good polish. Then apply a thick paste of pumice-stone and sweet oil and rub it on the horn until it gets warm. Follow with a vigorous rubbing, or see-saw with a woolen rag. After a high state of polish is secured, apply a small amount of metal polish with a clean woolen rag. Talcum powder may be used in place of metal polish, but it will not keep the horn in a high state of polish for so long a period as metal polish will.

Trimming Hoofs

Calves feet as a rule do not need as much trimming as do those of older cattle. It is essential, however, that their toes be kept short so they will stand squarely on them instead of their heels. If trimming is required, throw the calf and use a pair of hoof pinchers for the job. Pinchers with one sharp edge and one blunt block are safest to use. With a farrier's knife, cut a slight groove down the middle of the sole of each toe from tip to heel. Place the sharp edge of the pinchers in the grooves, place the block on the outside wall and cut the sole away at the proper thickness. Keep the sole level, trim down the side walls and see that the toes are of uniform length and fairly short. A rasp may be used to smooth up the job. Polishing may be done in the same manner as in the case of the horns. When the calf is led out in the ring be sure that her feet are clean. More attention to the feet and hoofs is required as cattle grow older. Toes may become excessively long and cause the heifer to assume an awkward action when walking or an undesirable position when posed. The safest method is that of keeping them short by trimming them.

Washing

As in the case of clipping, washing may not be necessary if the calf has been cared for properly. If done too frequently the skin will lose its oil and become harsh and dry and the coat will lose its lustre. One or two
washings will be sufficient to remove dirt and stains that grooming has failed to remove. In washing, wet the animal thoroughly, use tar soap, work up a good lather, rub vigorously with the hands or a soft brush, and when the dirt is loose, rinse out all the soap carefully. Soap left in the hair makes it rough and sticky. Remove the water with the edge of a short, thin stick, and dry with a large, clean cloth.

The switch should be thoroughly washed the day before showing. While still wet, braid it tightly into several small braids without allowing the hair to pull at the base of the tail. Tie each braid and wrap them all up in a rag to keep them clean over night. An hour before showing take off the rag, unbraid each braid, and comb and fluff out the switch. This practice results in a clean, large, fluffy switch of striking appearance.

Showing

When the class is called be ready to show. Lead the calf into the ring punctually and show from the time of entering till the last ribbon is placed. Forget everything but the calf and the judge. Showing must be done consistently so that any glance the judge makes will find the heifer appearing at her best. Be alert to all questions and directions from the judge. Don't be fussy with the calf; when she is posed properly, let her stand. There is a great deal of satisfaction in winning, but the educational value of competing in the show ring is of far greater value than the prize money, provided each one enters the contest with the desire to learn as much as he can as well as to win fairly.

IV. Feeding Calves and Heifers

The future herd depends to a large extent upon the care and feeding of the growing animals. They must be well fed and well managed in order to have the size, and development which are required for efficient production as mature cows.

Hand-Feeding Milk

The calf should be allowed to nurse its mother for the first day or two. Then remove it to a stall by itself and feed the mother's milk for a few more days. After that it is not so necessary that the calf get the mother's milk. It is well to skip one feeding before attempting to teach the calf to drink.

In teaching the calf to drink, take a small amount of warm milk from the mother, back the calf into a corner, hold its head between the knees, let it suck the fingers of one hand and slowly lead its muzzle into the milk. A hungry calf will soon learn that the warm fresh milk is in the bottom of the pail. It is a good practice to milk the cow three times daily so that the calf may have three meals. During the first week the calf should get from 5 to 8 pounds of whole milk per day. This is about three quarts and it is best if one quart is fed three times daily. The milk should be as near body temperature as possible. As the calf grows, the allowance per day may be increased slowly but there is no advantage in feeding more than 15 to 18 pounds of milk per day to a large, thrifty calf.
Changing to Skimmed Milk

When the calf is about a month old, part of the whole milk may be replaced by skimmed milk. If one wishes to show the calf it is best to continue the feeding of whole milk for a little longer period. The change should be made gradually by slightly reducing the whole milk each day and by making a corresponding increase in the amount of skimmed milk, taking about a week in which to make the change.

When the change to skimmed milk has been completed, the amount may be increased gradually up to about 16 pounds or 2 gallons per day which is enough to insure good growth. This amount should not be exceeded until the calf is about six weeks old and it is doubtful if there is any advantage in feeding more than 20 pounds per day at any age. More calves suffer from over feeding of skimmed milk than from under feeding. The lack of butter fat in the milk cannot be made up by feeding a larger quantity. Calf feeders govern the amount fed by the size of the calf, the condition of the bowels and the appetite. A good rule is to weigh out each feeding carefully, and to watch the calf closely.

Cold milk is not good for young calves. A good plan is to separate the milk shortly after milking and feed the calves immediately. Clean pails are necessary. Mangers and feed boxes should be cleaned each day and all refuse removed.

Hay and Grain

Hay and grain should be fed as soon as the calves have an appetite for them. This appetite usually appears at about two or three weeks of age and can be hastened by rubbing some feed on the calf's nose just after feeding milk. Calves seem to prefer whole grain and may eat as much as one pound per day of shelled corn or oats, at two months of age. This amount may be increased gradually until at six months of age the calf may be given as much as three pounds of grain daily and as much hay as it will eat. After the age of about nine months calves seem to do better on cracked or ground grain.

The following table gives a general idea of the amount of milk and grain to feed at various ages:
### Age

<table>
<thead>
<tr>
<th></th>
<th>Milk</th>
<th>Grain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 week</td>
<td>5 to 8 pounds whole milk daily</td>
<td>Start feeding</td>
</tr>
<tr>
<td>2 to 3 weeks</td>
<td>8 to 12 pounds whole milk daily</td>
<td>Whole grain—1 lb. daily</td>
</tr>
<tr>
<td>4 to 5 weeks</td>
<td>Change to skimmed milk gradually</td>
<td>Gradually increase</td>
</tr>
<tr>
<td>5 to 12 weeks</td>
<td>12 to 15 pounds skimmed milk</td>
<td>3 pounds daily</td>
</tr>
<tr>
<td>4 to 6 months</td>
<td>18 pounds skimmed milk</td>
<td>Cracked grain—3 lbs. daily</td>
</tr>
<tr>
<td>6 to 9 months</td>
<td>Gradually eliminate milk</td>
<td>Cracked grain—3 lbs. daily</td>
</tr>
<tr>
<td>9 to 12 months</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Good grain mixtures for the growing calf, the numbers indicating parts by weight, are:

<table>
<thead>
<tr>
<th></th>
<th>Oats</th>
<th>Corn</th>
<th>Oats</th>
<th>Barley</th>
<th>Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oats</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Roughage may be before the calf at all times. Alfalfa may be used but most dairymen prefer some prairie hay or blue grass with it. Alfalfa may cause young calves to scour if fed alone. After about six months of age, alfalfa can usually be fed as the only roughage with good results.

#### Pasture

The advisability of pasturing heifers under one year old depends upon local conditions. If pasturing results in exposure to flies, to the hot sun, to extremes of temperature, to cold rains and a tendency to neglect the calves, it is best not to depend too much upon pasturing. On the other hand, if these factors do not present difficulties, pasturing may be a good thing. Blue grass or native grass furnish very satisfactory pasture from the feed standpoint. A small pasture apart from the rest of the herd is desirable and makes it easier to give young calves proper attention.

Calves born in late winter and spring are better off when kept in the barn during their first summer. Early fall calves are developed to a point by the following summer so that the usual objections to pasturing do not apply. It is all right to have them on pasture. Calves that are kept off of pasture and under favorable conditions indoors, make more growth and have more quality than those that have relied too much on pasture.

Yearling heifers do very well on pasture and if the quality is good, they will grow and do well with no other feed during the summer season. If they are being fitted for show or if they are about to freshen, a little grain feeding is advisable.

#### Water and Salt

Calves need water even while they are still receiving milk. It is a good thing to have clean, fresh water before them at all times or offer them water at least once or twice daily. The container should be kept just as clean as it is for feeding milk. Cattle of all kinds show the effects of lack of water before they do the lack of feed.

Common salt is a mineral which all calves and growing heifers require. A clean supply of it in a small box placed well up from the floor is a good way to feed it. If the calf shows by lack of vigor, that other
minerals may be lacking, it is all right to give free access to steamed bone meal. It is not likely that any supplementary minerals will be needed if the calves are receiving alfalfa or clover hay and some grain.

Winter Rations for Heifers

The liberal use of roughages is a good method for growing out heifers. This is usually the cheapest feed. There is also some basis for the belief that large amounts of roughages cause the heifers to develop more capacity in the organs of digestion, which is desired in the producing cow. A good winter ration includes alfalfa or clover hay, corn silage and farm grains.

The ration should consist largely of alfalfa or clover because these feeds are palatable, rich in protein and mineral matter and are essential for growth and development. Silage is a good feed because it gives succulence to the ration and is the best known substitute for pasture grass. Oats, barley and corn are generally the best grains to feed. A mixture of two pounds daily will usually be enough but this may be increased or decreased according to the condition of the heifer, her rate of growth and the amount and quality of roughage eaten.
V. Feeding for Milk Production

Dairy cows usually cannot produce economically on only one kind of feed. The substances which go to make up milk, flesh, fat, bone and hair require a variety of feed. In general it might be stated that muscle, milk and hair depend largely upon a substance called protein. The body fat and butter fat of the milk and the heat and energy used by the cow are derived mostly from the carbohydrates (starches and sugars) and fats contained in the feed. It has been found that a definite ratio between these two groups of substances is most economical and gives the best results.

For instance, corn, corn fodder and prairie hay are relatively high in their content of starch and fat. Alfalfa hay, wheat bran and oil meal are examples of feeds high in protein or body building substances. Therefore, it is readily seen that a selection of feeds containing some of each of these classes best meets the requirements of the dairy cow in production.

Balanced Rations

The purpose of feeding balanced rations is to provide these various classes of feeds in proper amounts and proportions. A balanced ration is the feed or combination of feeds supplying the several nutrients—protein, carbohydrates and fat—in such proportion and amount as will properly nourish a given animal for 24 hours. Most rations are more likely to be deficient in protein than carbohydrates and fat.

Ordinary farm feeds arranged in order of the amount of digestible protein or body building material which they have are as follows:

<table>
<thead>
<tr>
<th>Hay or Roughage</th>
<th>Grain or Concentrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa hay</td>
<td>Cottonseed meal</td>
</tr>
<tr>
<td>Sweet clover hay</td>
<td>Linseed meal</td>
</tr>
<tr>
<td>Red clover hay</td>
<td>Wheat bran</td>
</tr>
<tr>
<td>Oat hay</td>
<td>Oats</td>
</tr>
<tr>
<td>Corn fodder</td>
<td>Rye</td>
</tr>
<tr>
<td>Prairie hay</td>
<td>Wheat</td>
</tr>
<tr>
<td>Timothy hay</td>
<td>Barley</td>
</tr>
<tr>
<td>Oat straw</td>
<td>Corn</td>
</tr>
</tbody>
</table>

If the roughages used are rich in protein, grains of a low protein content may be used. On the other hand, if roughages with a small amount of protein are used, then it is necessary to use high protein concentrates in order to balance the ration. For instance, if alfalfa and clover are fed as roughages, a ration could be balanced by using such feeds as barley, oats and corn. If the dairyman must rely on corn fodder and prairie hay for roughage, it would be necessary for him to use such feeds as oil meal and bran in order to balance the ration.

Desirable Features of a Dairy Ration

A balanced ration does not solve all of the problems in connection with the feeding of dairy cattle. Quality of feeds will vary and the protein content may not always be the same. Experience may show that amounts should be increased or decreased for best results. A cow cannot get enough feed substances from roughage to reach her maximum in milk produc-
tion. She should be given all the roughage she will eat supplemented by grain enough to supply the requirements for her milk production. Cows need both roughages and concentrates.

Dairy rations should be palatable, that is, they should be of such nature that the cow likes the feed. It is usually unprofitable to force a cow to eat feeds which she does not like. Some unpalatable feeds may be used by mixing them with others which the cow likes. It may be practical to give the milking herd the more palatable feeds and give the lower quality feeds to those animals not in production.

The ideal ration contains some succulent feed such as silage, beet pulp or roots. Any feed which contains the natural juices of the plant is referred to as succulent. These feeds are juicy, laxative and palatable, hence they whet the appetite, promote health and increase production. Pasture is the best succulent feed but since it is available for only a few months of the year, effort should be made to provide succulence through corn silage or root crops the other seasons of the year.

A variety of feeds in the dairy ration is desirable. This enables the cow to eat more and relish her feed better. Ordinarily two kinds of roughages and three kinds of concentrates provide the necessary variety.

Some feeds have an adverse effect on the animal. Timothy hay may be good for work horses but is not a good feed for dairy cattle because it is low in protein, minerals and palatability. Cottonseed meal is a good protein supplement but is best fed in small amounts and with a ration which is quite laxative. When the ration is not otherwise laxative, linseed meal is preferable. Heavy allowances of soy beans may cause soft butter. Rye mixed with other feeds gives good results but if fed in large amounts, produces butter that is hard and dry. Feeds with tainted odors and flavors may give rise to the same condition in the milk and are therefore unsatisfactory.
Economy is the most important requirement of all. It would be folly to devise rations which had balance, succulence and all these other good points only to find that it was too expensive to yield a profit. The dairyman who can grow such crops as to supply all, or nearly all, of the feed requirements on the farm is likely to have a ration of the lowest possible cost. There are times when it pays to buy commercial feeds. A great deal depends upon the price and to what extent they are needed. In periods of feed shortage, it will usually be found profitable to purchase those feeds necessary for the milking herd, selecting them carefully on the basis of their feeding value and how well they supplement the feeds already on hand.

**Profitable Dairying Requires High Production**

The experience of cow-testing associations positively shows that feed brings much greater returns when fed to high-producing cows. These high-producing cows, even though they require a great deal more feed, yield a greater net income than their lower-producing stable mates. In general it may be said that as a cow's production doubles her profits treble. This statement is borne out by the following table including the records of 7000 cows in South Dakota divided into groups according to the amount they produced.

<table>
<thead>
<tr>
<th>Yearly Fat Production</th>
<th>Income Over Feed Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 pounds</td>
<td>$14</td>
</tr>
<tr>
<td>200 pounds</td>
<td>$49</td>
</tr>
<tr>
<td>300 pounds</td>
<td>$80</td>
</tr>
<tr>
<td>400 pounds</td>
<td>$110</td>
</tr>
<tr>
<td>500 pounds</td>
<td>$135</td>
</tr>
</tbody>
</table>

High-producing cows return greater profit than low-producers. Each increase of 100 pounds in annual fat production is accompanied by an increase of approximately $30 in income over feed cost.

**Feeding According to Production**

When fed properly, a dairy cow uses about half of her feed for milk production. When fed a three-fourths ration she can use only one-third of her feed for producing milk. This is another way of saying that a 25 per cent reduction in feed below the proper amount results in a 50 per cent reduction in milk production. When fed a half-ration, she needs all of it to maintain her body. It is false economy to practice skimpy feeding in the
case of good cows. A poor milk cow or a beef cow that is fed a liberal ration will turn part of her surplus feed into milk and part of it into body fat.

**Use of Feed by a Dairy Cow**

| Ration            | Use of Feed | Body | Milk | Gain in Weight |
|-------------------|-------------|------|------|               |
| Economical Ration | Maintenance |      |      |               |
| Deficient Ration  |             |      |      |               |
| Excessive Ration  |             |      |      |               |

In many herds it is the practice to feed all cows the same amount regardless of production or condition. In such cases, if the feeder feeds liberally, he is likely wasting feed on all but the best cows in the herd; if he feeds scanty rations, he is under-feeding all but the poorest cows; and if he is an average feeder, he is over-feeding the poor producers and under-feeding the best ones in the herd. In the last case, if he would reduce the allowance of the poorest cows and increase the allowance of the best, the same amount of feed given the herd would result in securing greater production from the herd because the best cows would gain in milk flow while the poorest would not decline as they still would receive an ample ration.

**General Rules for Feeding Milk Cows**

Feed each cow all of the roughage she desires. This may be done in 2 or 3 feeds per day. If only dry roughage is fed, the average cow will consume daily about 2 pounds of it for every 100 pounds of body weight. If both dry and succulent roughage are fed, it is customary to feed 1 pound of dry roughage and 3 pounds of succulent roughage per 100 pounds of body weight each day. If one of these classes of roughages is scarce or expensive and the other is cheap and plentiful, it may be profitable to vary these proportions somewhat.

The amount of roughage fed is largely determined by the size of the cow but this is not true in respect to feeding concentrates. The amount of concentrates to feed should be determined largely by the daily milk and fat production of each individual cow with some consideration also as to her condition. In the case of the Holstein, Ayrshire and Brown Swiss breeds, it is customary to feed 1 pound of grain to every 4 pounds of milk if the roughage is of good kind and quality or 1 pound grain to 3 of milk if the roughage is of poor quality such as stover and grass hay. Because the milk of Jerseys and Guernseys is higher in fat content, they are usually fed at a rate of 1 pound grain to 3 pounds milk with roughage of good quality and 1 pound grain to 2 of milk with inferior roughage. As a rule it is profitable to grind all farm grains for dairy cows. When roughages are of good quality and plentiful, it does not appear to be profitable to grind them. While these rules are general and cannot be followed to the letter in all cases, they serve as excellent guides in the majority of herds.
Grain Mixtures to Feed with Various Roughages

Because the kind of roughage fed should determine to quite an extent what the concentrate mixture should be, a number of mixtures are given under each of four general types of roughage rations. If these rations are fed with the type of roughage as indicated, they should prove satisfactory for cows that produce approximately 250 to 400 pounds of butter fat per year.

The grain mixtures below may be fed when the roughage ration consists of one or more of the following: Wild hay, prairie hay, timothy hay, corn stover, corn fodder, millet, sudan, cane fodder. In these rations, ground speltz may be substituted for the oats or the barley, ground rye for the wheat or half of the corn, and barley and corn may replace each other if only one is included.

1. Ground corn, 400 lbs.
   Ground oats, 300 lbs.
   Linseed meal, 300 lbs.

2. Ground corn, 400 lbs.
   Wheat bran, 300 lbs.
   Linseed meal, 300 lbs.

3. Ground barley, 200 lbs.
   Ground oats, 300 lbs.
   Linseed meal, 200 lbs.

4. Ground oats, 250 lbs.
   Ground barley, 250 lbs.
   Ground wheat, 200 lbs.
   Linseed meal, 300 lbs.

5. Ground corn, 290 lbs.
   Ground barley, 300 lbs.
   Linseed meal, 300 lbs.
   Wheat bran, 200 lbs.

6. Ground corn, 400 lbs.
   Wheat bran, 300 lbs.
   Linseed meal, 200 lbs.
   Cottonseed meal, 100 lbs.

When some legume is fed with other dry, non-legume forage, one of the mixtures below may be fed. In these mixtures ground speltz may replace either the oats or the barley and ground rye may substitute for wheat or for corn up to 200 pounds.

1. Ground corn, 250 lbs.
   Ground oats, 300 lbs.
   Wheat bran, 250 lbs.
   Linseed meal, 200 lbs.

2. Ground barley, 400 lbs.
   Ground corn, 200 lbs.
   Ground oats, 100 lbs.
   Linseed meal, 300 lbs.

3. Ground barley, 200 lbs.
   Ground oats, 300 lbs.
   Ground wheat, 300 lbs.
   Linseed meal, 200 lbs.

4. Ground corn, 200 lbs.
   Ground oats, 400 lbs.
   Ground barley, 200 lbs.
   Linseed meal, 100 lbs.
   Cottonseed meal, 100 lbs.

5. Ground corn, 350 lbs.
   Ground oats, 350 lbs.
   Linseed meal, 300 lbs.

6. Ground corn, 400 lbs.
   Wheat bran, 400 lbs.
   Linseed meal, 200 lbs.

When the roughage consists of approximately 25 per cent of legume hay and 75 per cent of corn silage, the grain mixtures below are satisfactory. In these rations cottonseed meal may be substituted for linseed meal, oats or barley may be replaced by ground speltz in amounts up to 300 pounds, and ground rye may be fed in place of wheat.
When alfalfa hay of good quality is the only roughage fed, a grain mixture similar to those below will give good results. Several of these grain mixtures contain no high-protein supplement because the alfalfa hay provides enough for an average cow.

**Feeding Cows on Pasture**

It is a rather common experience among dairymen in this state to have their cows in better condition in late winter than in late summer and this is evidence that their cows have not had sufficient feed during the period of July to September. This can be overcome to a considerable extent by following several practices the first of which is to refrain from turning cows on pasture until grass has made considerable growth. If grazing is plentiful, other roughages will not need to be fed but it is well to continue grain feeding to all cows that produce above 1 pound of fat daily. It is common to feed such cows at a rate of 1 pound of grain for every 6 to 8 pounds of milk. During the first half of the pasture season when grass is rich in protein, a mixture of farm grains will suffice. As grass matures, however, it is well to add protein feeds to the grain. As summer advances, pastures become shorter and less palatable and then it becomes necessary to increase the allowance of grain or to feed roughage also. Hay, green corn or other crops do very nicely, but silage is very satisfactory and convenient to feed at this time of year when field work is at its height. Dairymen in South Dakota, who provide sufficient silage for summer as well as winter feeding, have found it a profitable practice.
VI. Some Details of Care

All dairy animals respond favorably to good care and treatment. Shelter and good care are even more important in the case of the dairy cow than of any other farm animal. Regularity is the watchword of all good dairymen. Cows are creatures of habit and any change in routine is almost sure to cause a decrease in milk production. By nature, dairy animals are of a nervous temperament and are easily excited by any extraordinary activity. Cows should be milked at about the same time each day, preferably by the same person, and fed in about the same manner.

Cleanliness and Sanitation

In the dairy industry we are dealing with a human food. Cleanliness and sanitation are important both from the standpoint of a good finished product as well as the health of the cows.

The barn in which the milk cows are kept should be cleaned every day, and the stalls or pens for the calves and young stock, at least every two or three days. Sprinkling the floor with lime after cleaning is a good practice. In building or remodeling barns, the new construction should be such as to make cleaning easy.

It is most convenient to have the milking herd in stanchions. If these are flexible so that the cows may move their heads freely, so much the
better. Stanchions may be used for calves and young stock but it is less expensive and usually just as well to have them loose in pens or box stalls except at feeding time.

The length and width of stalls depend upon the breed and size of the cows or heifers. The largest stall is required by the Holstein with the width ranging from 3 feet 6 inches to 4 feet and the length from 4 feet 8 inches to 5 feet 6 inches. The Jersey requires the least space and should have a stall from 3 feet 4 inches to 3 feet 6 inches wide and 4 feet 4 inches to 4 feet 8 inches in length. The other breeds range in between these extremes.

Summer Care

There are many temptations to neglect the dairy animals during the summer months. With a rush of farm work and a feeling that the animals are doing well on pasture there is a danger that the dairy herd may be slighted. Great care should be taken to prevent this. Flies, hot weather, short pastures, and lack of grain lower the production of the dairy herd and retard the growth of the younger animals.

These difficulties may be overcome by providing some shade from the hot sun, having plenty of fresh water convenient at all times, and supplementing the pasture by cutting some of the green forage, or adding grain to the ration. With a little attention at this critical time production of the herd may be maintained and the younger animals kept in good growing condition.

Care must be taken to prevent the heifer from being bred to an inferior sire that may head the herd or break into the yard or pasture. Breed to the best purebred bull available in the community, even though it may be necessary to take the heifer several miles to secure the service of a good bull.

The Breeding Age

The age at which to mate a heifer is determined by the breed and by her size and development. Growthy heifers are ready at a younger age than poorly grown and under-sized heifers. In general, the proper age for all breeds ranges between 15 and 20 months. The best age for Jerseys is 15 to 17 months; Guernseys 16 to 18 months; Ayrshires 17 to 19 months; Holstein and Brown Swiss 18 to 20 months.

These ages are lower than some breeders practice but the recommendations assume that the heifers are well grown. Club heifers, due to the fact that they usually have received good care, grow and develop more rapidly than average heifers. Some members are at a disadvantage in that their heifers run with the herd. Under these conditions, every precaution must be taken to prevent mating at a premature age.

Some breeders believe that the tendency to produce heavily will be intensified if the heifer freshens at an early age, but investigators have found that the highest milk production is usually secured from heifers that are well grown before freshening. Gestation has but little effect upon the rate of growth of heifers but growth is materially checked when milk production begins. Hence, heifers that are fed scanty rations and calve early are likely to be stunted.
A cow cannot produce milk continuously without a drain on her system. It is found that cows will have a higher production and more years of usefulness if they are given a rest period between lactations. Most authorities agree that this period should be about two months. This is particularly important in the case of a heifer with her first calf. She should not be bred for at least three months after calving and it may be better to let her go for four or five months if she is not well grown.

Care at Calving Time

Calving time is always a critical period especially in the case of a heifer with her first calf. There is probably no other time in the life of a dairy cow when good care is so essential. Alertness to details at this time will return big dividends.

Cows and heifers should be in good physical condition at least a month before calving in order to meet the heavy demands of the lactation period, to give birth to a strong calf, and in the case of heifers, to allow for additional growth while milking.

For a month or two prior to freshening, legume hay and corn silage are the most desirable feeds. It will pay to feed some grain at this time also. For two or three weeks before calving the grain ration may be reduced and include only such feeds as ground oats, wheat bran and linseed meal which will keep the digestive system in good condition. It is best to use no corn or barley at this time. Freedom from udder trouble and illness depends upon the feed and care just before and after freshening. One pound of epsom salts or one quart of raw linseed oil may be necessary to keep the bowels in order.

Calving should take place in a clean, well ventilated box stall or pen where the cow may lie down in comfort alone. Check the breeding date closely in order to know on about what day the cow may be expected to calve. If any form of disease has been present, clean the pen thoroughly and disinfect it before placing the cow in it. Keep her quiet and do not permit dogs, strangers or loud noises to worry or add to the strain upon her.

Do not disturb the mother during calving unless assistance is required. It is best to be present when the calf is born so that proper assistance
may be secured if necessary. The normal presentation of a calf is for the head and fore-feet to come first. When the calf is dropped it is well to remove the phlegm which may cover the nostrils as calves have been known to strangle at birth from this cause. It is a good practice to dip the navel cord in an antiseptic solution. The calf should always receive the colostrum or first milk from the mother. It is needed as a stimulant to the calf's digestive system. Allow the calf to suck the cow for a day or two, then separate them permanently.

Blanket the cow immediately after calving if the weather is chilly. Give her a pail of water with the chill removed at intervals throughout the day. Soon after the calf is born the mother should be given a warm mash. This is made by pouring boiling water over 3 or 4 quarts of wheat bran, allow to stand several minutes, and add sufficient water to make 3 gallons of mash. Feed no other grain for several days and give her limited amounts of silage and hay until it is certain that she is normal.

A Purebred Herd in Lawrence County

After the calf has had a fill of the first milk, milk the cow three times daily. Many dairymen do not milk the cow dry for 48 hours after calving in order to reduce any tendency for her to come down with milk fever. If the udder is very hard and feverish, milk the heifer four or more times daily and massage the udder for a considerable period of time after each milking. Keep her in a laxative condition. Do not feed her grain of any kind except wheat bran or bran mashes. Do not feed corn or barley until the swelling and hardness has largely disappeared.

Even when the cow is normal she should not be started on grain until three days after calving and then very slowly. Heavy grain feeding at this time stimulates production before the udder and digestive system are in shape to function at full capacity, and the result is that cows go off feed, or develop hard, inflamed udders that may result in the loss of one or more quarters. A cow is not ready to go on full feed until she is entirely normal. It is preferable to have heifers produce rather lightly at the start, to increase slowly and to reach the height of production during the second month of lactation.
VII. Keeping Records of Production and Costs

Records of production of individual cows are necessary for determining costs and profits and to serve as a guide in the feeding of dairy cattle. Reliable records are the only basis that we have for improvement of the dairy herd from generation to generation. Testing enables the dairyman to eliminate his inferior cows and to retain the best ones for the future dairy herd.

Methods of Securing Records

There are many methods of securing accurate records at small cost and without great effort. A little attention from time to time is all that is required.

Dairymen may do their own weighing and testing. Monthly milk sheets are used to record the weight of milk at every milking for each cow. The amount of milk is totaled at the end of the month. Samples of all milkings are taken for one day some time between the tenth and the twentieth of each month. This sample may be tested for butterfat, either at home or at a local creamery or cream station.

Knowing the amount of milk each month and the test, it is comparatively easy for one to summarize the production of each month and for the year. For example take a cow producing 800 pounds of milk in a month for which the test was found to be 3.8 per cent butter fat. Multiplying 800 by 3.8 we find that she has produced 30.4 pounds of butter fat. It is not surprising to find considerable variation in the test from month to month.

Many dairymen find it to their advantage to join a cow-testing association. The association employs a tester who spends one day per month at the farm of each member, weighs the milk of each cow, tests it for butter fat and records it in a book which is left with the member for reference. Club members whose fathers are members of cow-testing associations are thus able to secure records on their cows or heifers at no additional cost. It is possible for a local 4-H dairy club to take out one membership in the cow-testing association, take their own samples, have them brought
to a central point and let the official tester test them and calculate production.

Official testing is conducted only on registered cows and for the purpose of admitting them to the advanced register of their breed. Under this plan an official tester from the college dairy department weighs and tests the milk from each milking during the official test period. Under the semi-official plan, the tester spends two days per month at the farm, weighing and testing the milk of each cow on test for that period. Breed associations maintain what is termed a herd test. This has been developed to meet a popular demand among small breeders of purebreds. The methods are similar to those used in cow-testing associations but include some of the features of official testing and this test is recognized officially by breed associations.

The Benefits of Intelligent Culling

Intelligent culling can be done only when one of the above forms of testing is employed continuously and when the information contained in the records is used in culling the herd. Records show that approximately one-sixth of the cows return no profit to their owner. By disposing of these individuals, the dairyman raises the average production and the profit of his herd.

A survey of the records of 1452 mature cows in South Dakota cow-testing associations show that they produced an average of 292 pounds of butter fat and $91 income over feed cost. By eliminating twenty per cent of the lowest records, it was found that the upper four-fifths would have averaged 320 pounds of butter fat and yielded $101 income over feed cost. Thus, by the simple process of intelligent culling, the production per cow would be increased 28 pounds per year and the profit $10 per cow per year. The total amount of butter fat would be less and yet the profit per cow would be more. With improved care and feeding for the better cows, the difference might be even greater.

Calculating Costs and Profits

Mere production figures are not a sufficient guide in themselves. It is not always the highest yielder that produces most economically, although this is usually the case. Record books should reveal the cost of feed, labor, shelter and miscellaneous items. A 4-H club record book or a good farm account book contains forms for such records with instructions for making entries and summarizing them.

Profits depend upon costs. It is found that some dairymen are producing butter fat at a cost as low as 12 cents per pound. Others have been known to have a cost of 50 cents per pound or more. Good management, good cows, intelligent culling, feeding each cow according to production, and keeping an accurate record on each cow enables one to cut the cost of production to the minimum and increase the profits accordingly.
VIII. Breeding Dairy Cattle

Dairymen strive to raise cows that will produce large amounts of milk and butter fat efficiently. The aim is to have all cows in the herd produce more than their mothers did. For hundreds of years the dairy cow has been one of the best friends of the human race, and she is being developed to a higher state of efficiency with each succeeding generation. Experience has shown that herd improvement can be accomplished with greater certainty and speed by the use of good breeding practices rather than by the purchase of cows to replace the old ones in the herd. It is a matter of raising better cows, not buying them.

A Sire of Proven Merit. Sir Aggie Colantha Korndyke was used in the herd at South Dakota State college. He was grand champion at the Waterloo Dairy Cattle Congress in 1925 and his daughters excelled their dams in type. Nine daughters averaged 625 pounds of fat, 27 per cent more than their dams.

The Importance of the Sire

While the present herd can be improved by eliminating the low and inefficient producers, the next generation of cows can be improved only by a sire which comes from high producing strains. The higher the average production of the herd, the more important it is to give careful attention to the selection of a sire which may increase still further the efficiency of the future herd.

It is generally agreed that the male and female contribute equally to the inheritance of the calves. However, the sire is more important than any of the cows because his characteristics make up one-half of the influence on the calves, whereas the entire female herd makes up the other half. It has been said that a good sire is half of the herd. The use of a good sire will maintain or increase the production of the herd but a poor sire is likely to lower it.
Systems of Breeding

In ordinary dairy herds no special system of breeding is followed. The principal thing to keep in mind is to use a sire coming from ancestry known to be high producing. These high producing strains are originated and developed by various means. Some high producing individuals appear by accident but most of them come as a result of skillful breeding.

Inbreeding is the practice of mating closely related individuals such as brother and sister, sire and daughter or son and dam. It is used to intensify desirable qualities but it is a dangerous method for all except the most skillful breeders, as undesirable qualities may be intensified as well.

Line breeding is the mating of related individuals whose ancestors are from 25 to 50 per cent of the same breeding. The mating of first cousins would be an example of line breeding. Another illustration is when the ancestry can be traced back to the same individual several times in the third or fourth generation. Line breeding is a popular system but there is sometimes a tendency to pay too much attention to pedigrees and not enough to the qualities of the individuals.

Outcrossing is the mating of entirely unrelated animals or those that carry less than 25 per cent of the same ancestry. It is usually followed by the dairy farmer and the small breeder. It is a safe system and will bring satisfactory results if the sires are carefully selected. Breeders who use unrelated sires that have proved their ability to improve production and type, are following a system of outcrossing which ordinarily will result in rapid improvement.

Cross breeding is the mating of individuals of different breeds. There is little to be gained and a great deal to be lost when a dairyman experiments with cross breeding. The dairyman who makes progress is the one who seeks to improve the individuals within the breed of his choice rather than to attempt any crossing of the breeds.

Pedigrees

A pedigree is a chart containing the names and records of the ancestors of an animal for one or more generations. An extended pedigree is one which records the ancestry for three or more generations. Complete pedigrees include official records of milk and butter fat production for all female ancestors that have such records and of the daughters of all animals in the pedigree. Placings at shows and fairs may be included. Production and show ring records are usually written in red.

The use of the pedigree is based upon the theory that like begets like. If a pedigree shows that the ancestors were good in producing ability and type, there is reason to believe that some of these characteristics have been inherited and that they may be passed on to future generations. Therefore, a pedigree is an indication of the breeding ability of an animal.

It must be realized, however, that like does not always beget like and that the promise of the pedigree is not always fulfilled. Some animals with excellent pedigrees have failed to pass these characteristics on to their offspring. It is unwise to rely entirely upon the pedigree in determining the value of an animal. Other things to consider are conformation, type and producing ability of the ancestors, the brothers and sisters, and the offspring. By far the most important is the type and ability of the offspring. Unfortunately this cannot be done in the case of young animals.
Animals that hold great promise in this respect should be retained in the herd until the producing ability of their daughters is known.

One must study a pedigree carefully in order to determine its true value. A good pedigree shows high producing ability by all of the immediate female ancestors and by the daughters of both male and female ancestors. Poor pedigrees are those which rely on the records of great grand parents, or the records made by the daughters of half sisters of one of the ancestors, or some equally distant relationship which has little value. All pedigrees should be examined with great care. When a satisfactory one is found, inspect the animal and as many of its close relatives as possible.

Selection of the Sire

Various dairymen use different standards in the selection of their herd sire. At one extreme we have the dairyman whose only object in keeping a sire is to cause the cows to freshen. At the other extreme we find the dairyman who has a high producing herd and who can improve his herd still further only by the most careful selection of proven sires—sires that have demonstrated their ability, when mated with good cows, to make still further improvement. Ranging between these extremes are all classes of dairymen with various required standards but all of them seeking a sire which will at least increase the production of his daughters over that of their dams.

The safest and surest opportunity for herd improvement lies in the introduction of better blood through the sire. The sire should be selected and purchased well in advance of the time when he will be needed to head the herd. The selection requires mature thought rather than snap judgment or hasty decision.

Satisfactory sires can usually be purchased nearby. If satisfactory bulls are available locally, they should be given first consideration as this gives the buyer an opportunity to inspect the sire, his ancestry and his offspring, and to see under what conditions the production records have been made. Usually there is little to be gained by trying to locate a good sire in a distant state. Fit the sire to the herd and make every effort to select one whose use on the herd will result in continuous improvement.

Cooperative Ownership of Sires

In many cases a group of farmers or a local 4-H club may cooperate in the purchase of a sire. In this way it is possible to secure the service of a good sire at a reasonable cost to much better advantage than for each individual to purchase a sire of his own. One bull may serve from 40 to
50 cows unless it is necessary to have most of them freshen at about the same time. Thus it would be possible for one sire to meet the needs of three or four average herds as well as a large 4-H club.

Certain precautions must be observed in cooperative ownership of dairy sires. Great care must be exercised in selecting a purebred sire of good type backed by good production records. The cost of the sire should be borne equally by members of the organization. A reliable man centrally located, should be designated to keep the animal at a specified price per year and the sire should be kept on this farm until sold. A service fee should be charged which will cover the cost of keeping the sire and of building up a sinking fund for the purchase of another animal. A safety bull pen should be built by the members of the organization with the keeper of the sire paying for the material. The number of cows served should be limited according to the age of the sire. It is necessary that extreme caution be taken to prevent the spread of disease.

Feeding and Care of the Dairy-Sire

The bull calf should be given the same care as heifers. Because size is desired, it is well to continue the feeding of skimmed milk until he is 9 to 12 months old and to feed him somewhat more grain than heifers until he is two years old. The grain mixture used for the herd is satisfactory for the bull. Limit the silage to 10 or 15 pounds daily and feed high quality hay in addition. Keep him in average condition, neither poor nor fat. Old bulls that are paunchy and fat and slow in breeding should receive no silage and but limited amounts of other roughages in order to reduce paunchiness and weight and to increase their activity.

A bull needs water once a day in winter and twice a day in summer. It is a serious error to neglect the care of a well bred sire. Regular daily exercise is a good thing. This may be provided by keeping two bulls together, by fighting flies in summer, by having a strong barrel in the yard to play with, by hanging a heavy block of wood from an over-head cross bar, by using a tread power or by leading about as frequently as possible if this is safe. It is best to have a yard for the bull, so constructed that he may go in and out of doors at will much of the time.

Dairy bulls are dangerous to handle and it is always well to keep them in a safety bull pen equipped with a safety breeding stall. The use of the safety bull pen reduces the danger in handling the animal and permits his use for many more years than would otherwise be the case. Dehorning at an early age is a wise precaution. It is a poor practice to allow the bull to run with the cows.

At about 10 months of age it is a good plan to put a ring in the bull's nose. After the soreness is gone, teach him to lead by the ring so that he will respond to it without flinching or objecting. At the age of one and one-half years place a heavy gunmetal ring above the first one and continue to lead him enough so that he will always handle well. After he is a year old he never should be led with anything except a safe, strong staff, no matter how gentle he may be. Never trust a bull. A supposedly gentle bull may turn on his attendant at any time.

Raising and Selling Purebred Cattle

There will always be a need for herds of superior purebred dairy cattle, for the purpose of supplying sires to other herds. Purebred cattle are
those whose ancestors, without exception, trace back to animals that were bred in the locality in which that breed originated. A purebred animal is one that is registered or eligible to registry, in the herd book of the breed.

The advantages of purebred cattle are that their offspring usually approach a more or less definite standard as to appearance and performance. There is less variation in characteristics among purebred cattle than there is among grade or ordinary cattle. Purebred cows, as a rule, are higher producers and give birth to calves of more uniformity and higher production than do grade cows.

A South Dakota Safety Bull Pen.

Not all purebreds are good animals. They should be culled just as closely as any other class of cattle. A registration certificate is not a guarantee of performance. An inferior purebred may not be as valuable as a good grade. Purebred cows as a class, however, excel over any other class. The purebred cows in South Dakota cow-testing associations averaged 326 pounds of butter fat per year while the grades averaged only 287 pounds during the same period.

The farmer who is interested only in the production of milk, cream or butter fat, will find it of no particular advantage to develop a herd of purebred females. Nevertheless, he finds it well to use good purebred sires of his chosen breed in continuing to grade up his herd.

The man who makes a success as a purebred breeder is a lover of good cows and likes the work involved in giving them good care. He must be a liberal but economical feeder, a good judge of type, and a student of the principles of breeding and pedigrees. This business calls for good management, system and the keeping of records.

Accurate records are necessary in the purebred business. The work of registering and transferring the cattle that are sold is made easier by keeping breeding records, production records, identification records, etc., in a systematic way. The breed associations and some dairy journals publish forms and loose leaf record books which are convenient and useful in this connection. Some system of marking all animals in the herd has many advantages. The owner is not safe in depending upon his memory. Every
calf should be given a herd number at birth and this number recorded along with the identification mark used. Drawings of color markings are a good identification for broken-color cattle. Tattoo marks or numbers in the ears are excellent for breeds having light-colored skins. A strap around the neck with the herd number attached is fine for calves and will do for cows under some conditions. Ear tags are used but are frequently torn out. A system of notching the ears is satisfactory but disfigures the animal.

Progressive breeders keep themselves informed on matters pertaining to the breed. There is no better means of doing this than by reading the paper or journal that is published by or for the breeders. These papers include breed information on official records, fairs and shows, sales, and methods used by successful breeders in managing their herds. Every breeder finds it to his advantage to read a breed paper and a general dairy paper.

Advertising

The breeder who desires a ready market for his stock must keep production records on his herd. Good records are news and are readily published by papers. This gives the owner some good advertising. Exhibiting cattle at fairs is another way of advertising the herd and making sales. Breeders of high class purebred cattle usually advertise in the breed journals and in the general dairy and agricultural papers. Well worded roadside signs at the farm entrance or on the farm buildings help to make contact with purchasers. Attractive stationery and prompt attention to all correspondence are points which help in putting over a sale.

The purebred breeder must develop and use his ability to sell cattle. This can be acquired only by experience over a long period of years and includes gaining the confidence of patrons through ethical methods of salesmanship. The farm, buildings and cattle should always present an attractive appearance. The successful breeder is honest in all respects. With these qualities and the patience to await results, there are many opportunities for the breeder of high class purebreds in all breeds.

The developing of a good purebred dairy herd is a long process. It is a life's work and it is always well if it can be made perpetual through a father and son partnership. This provides the interest and continuity so necessary for developing a herd which may become better with each succeeding year and each succeeding generation.
IX. Diseases of Dairy Cattle

By Dr. G. S. Weaver, Extension Veterinarian

It will be impossible to discuss all of the ailments of a dairy cow in this brief outline of diseases but some of the important facts are given with an idea of helping the reader to use his best judgment. See Extension Circular 138, "Farm Sanitation," for further information regarding the common diseases. In cases of important diseases and abnormal conditions, the securing of the services of a veterinarian is by far the best procedure and whenever there is any question in regard to the case it is best solved by professional help.

Sanitation

Since most diseases and abnormal conditions are caused by some pathogenic organisms commonly called germs it is well always to guard against such infection. The first principle in the control of any disease is the isolation of the sick animal. Any animal sick with a contagious disease should be quarantined—civil, voluntary or otherwise—but quarantined. Treatment and recovery are more satisfactory when the sick animal is kept to herself. Many germs are found in barns and barn lots and are only awaiting a time when the animal's resistance is lowered to get into action. Therefore, the cleaner the surroundings under which the animal is kept the less infection will take place. The common disinfectants should be used generously wherever infectious germs are likely to be. The barns and lots should be kept clean and free from manure and dirt. Sunshine should be allowed to do its share in killing germs as it is the best disinfectant known.

Transmissible Diseases

Actinomycosis (Lumpy Jaw).—This disease occurs in several different forms and in different organs, such as abscesses in the region of the throat, in the tongue, in the muscles, in the bones of the jaw and in some instances in the internal organs such as the lungs and the liver. Therefore, lumpy jaw is not a good or correct name for the disease.

It is caused by a fungus and not a germ. This fungus lives on plants such as wild barley. When an animal is affected with this disease and distributes pus which contains the fungi, on plants, this fungus lives over the year and when cattle eat these plants the following year they become exposed to the disease. The disease does not go directly from one animal to another.

The most common form that a dairy cow would have is the cold abscess that occurs in the region of the throat. The abscess varies in size up to the size of a man's fist. At first the abscess is a hard swelling, later becoming soft and generally breaking and discharging pus. The abscess is loose in the skin and not fast on the bone. When the abscess form develops and the swelling is small and soft, it may be opened with a sharp knife and tincture of iodine injected. Other cases are surgical and require the services of a veterinarian.

Hemorrhagic Septicemia.—A disease of a semi-contagious nature affecting cattle after their resistance has been lowered by some other con-
dition. It is common in calves during the winter months. The disease is caused by a germ that is common in all barn lots—in fact it may be found in many normal animals. When an animal's resistance is lowered by shipping, by lack of feed, by improper housing or running in stalk fields in bad weather, he becomes a fit subject for hemorrhagic septicemia. A most important predisposing cause is damp quarters. If the bedding is not changed frequently it will become foul and damp. If the barn is drafty and the wind blows over the cattle they will lose their resistance.

A cow affected with hemorrhagic septicemia may develop a fever. Usually there is a loss of appetite. An inflammation of the lungs or pneumonia may develop and this will produce a cough and difficult breathing. The digestion is upset and this may produce a diarrhea. Frequently blood is passed in connection with the diarrhea. The sick animal may die quickly or linger along for some time, possibly getting well.

Treatment is largely a preventive problem. If the resistance can be kept up by proper feeding, housing, care and management, there will be little cause for hemorrhagic septicemia. A cow or calf affected with this disease should be blanketed. A light diet such as a mash made of low grade flour and bran should be fed. All feeding utensils should be sterilized by scalding. The sick cow should be placed by herself. All the well cattle should be vaccinated with hemorrhagic septicemia aggressin. The services of a veterinarian are advised in the treatment of the sick cattle.

Infectious Abortion.—A contagious disease caused by the bacillus of Bang characterized by the premature birth of the calf. The germ that causes abortion disease is very resistant to weather conditions and will live a year or more if kept away from sunlight. It is readily killed by sunlight and disinfectants. The germs are thrown off by the affected cow through the dead calf, afterbirth, all discharges and secretions including the milk.

Most abortions occur in the young animals just before they are to freshen the first time. Most cows abort only once and then build up an immunity against the disease. A retained afterbirth in connection with abortion is a symptom of contagious or infectious abortion. Some of the cows will be hard to get with calf after aborting. The course of the disease in a herd is usually three or four years.

Abortion disease is spread very largely through contaminated feed, just the same as other diseases, such as hog cholera and tuberculosis. While the possibilities of the spread of the disease through breeding operations should not be disregarded, this method of spread is much less important than that through contaminated feed and water.

All cows affected with this disease should be isolated if it is possible to do so. When a cow shows symptoms of abortion she should be put by herself and kept there until all symptoms disappear. The stall or pen should be thoroughly cleaned and disinfected. All dead calves and afterbirth should be burned. Cows which abort should not be bred for 60 days after aborting.

When abortion disease is suspected in a herd it is advisable to have the herd tested in order to diagnose definitely the disease and to pick out the animals which are infected. Of course this test should be done by a veterinarian. In fact, his advice should be relied upon whenever this disease breaks out in a herd.
Pink Eye.—A distinctly contagious disease affecting the eyes. It is brought into the herd by new infected animals. It affects old and young alike. It is seldom seen during winter months, but may persist during summer months for several years. This disease is characterized by a discharge from the eyes and a swelling of the eyelids. In many cases the animals temporarily go blind, a fever develops and this is accompanied by a loss of appetite, partial loss of milk and separation from the herd. It is evident from the character of the disease that prevention means the isolation of sick animals and avoiding introducing sick animals into the herd. The sick animal should be put in a dark, cool stable, with plenty of fresh water supplied and only a light diet provided. The eyes may be washed with a weak solution of boric acid.

Tuberculosis.—A contagious disease caused by a germ and affecting cattle, hogs, poultry and people. In South Dakota about one to two per cent of the cattle are infected. This disease is spread from cattle to hogs and human beings. People, especially children, contract this disease by drinking raw milk from tuberculous cows.

The germ that causes tuberculosis in cattle is resistant to weather conditions, but readily killed by sunlight and disinfectants. The germs are thrown off from diseased cattle through the dung, urine and milk. Hogs contract the disease by following the diseased cattle in the feed lot and by drinking skimmed milk from the infected cows.

The symptoms of tuberculosis are very hard to describe, in fact, there are no symptoms in the early stages of the disease. The disease may get a good start and many animals in the herd may get infected before any symptoms are noticed. The best way to diagnose tuberculosis in the living animal is by the use of tuberculin test.

There should be no question about the advisability of having the herd tested. The test is required for show and shipment purposes. Most cities require it for the sale of milk. Those not in an accredited county or who can not get an accredited herd test may have their cattle tested by the local veterinarian.

White Scours in Calves.—A contagious disease of calves caused by a germ, the main symptom evident from the name of the disease, usually ending in death of the calves. A violent and deadly form of diarrhea appears soon after birth. Bowel discharges are profuse, yellowish white, and have a very offensive odor. Death usually occurs in 24 to 36 hours. On infected premises practically every calf dropped develops the disease year after year, unless vigorous sanitary measures are used. Treatment is of little or no avail. Clean and disinfect the stables and utensils. Provide separate and sanitary stalls and equipment at calving time. Tie off and disinfect the naval of the calf immediately after birth. Wash parts with a strong antiseptic solution. Consult a veterinarian about vaccination.

Parasitic Diseases

Ring Worm.—An affection of the skin caused by a vegetable parasite. It is highly contagious and spread by contact. It is most common in calves during the winter. It forms circular patches on the skin especially on the head, which soon become bare of hair and is attended with more or less itching. It is communicable to man. To control ring worm remove all crusts by washing with soap and water. Apply sulphur ointment or tinc-
ture of iodine once a day. Cleanse the stable and whitewash it to destroy the spores scattered by the crusts.

**Warbles or Grubs.**—Swellings about one inch in diameter develop on the backs of cattle caused by the warble. The adult of this warble is the heel fly. The heel fly lays eggs on the hairs of the legs of cattle. When the eggs hatch into small grubs they burrow into the skin and finally lodge in the back. A hole is cut in the skin by the grub for breathing purposes. After the grub is fully developed it crawls out through this hole falling to the ground where it hatches into the heel fly. These warbles or grubs are common in the backs of cattle during early spring. The grubs should be squeezed out of the cattle during the early spring and destroyed. An ointment made of one part of iodoform and 5 parts vaseline will destroy grubs if a small portion is rubbed into the holes of the skin where the grubs have developed.

**Other Abnormal Conditions**

**Pneumonia.**—A common condition affecting young cattle during the winter months. It is especially prevalent during cold, damp weather and among calves that are subjected to considerable exposure because of poor housing. The characteristic symptoms are a fever, difficult breathing and a pounding pulse. One or both lungs may be affected. The animal shows little disposition to lie down. Frequently there is a running at the nose. Treatment should be prescribed by a veterinarian. Keep the animal quiet, covered with heavy blankets and absolutely free from drafts. If it is possible to put the animal in a heated building, it should be done.

**Bloat.**—An excessive amount of gas in the paunch brought about by some digestive disorder. The immediate cause is often the eating of a large quantity of easily fermentable feed such as fresh clover, alfalfa pasture, green corn or even alfalfa hay or clover hay. If cattle are pastured on wet clover or alfalfa, bloating is likely to take place. Alfalfa pasture is not safe for cattle at any time. Bloat is easily recognized by a pronounced swelling on the left side. The animal usually recovers without treatment but should be watched closely. If the animal becomes distressed or breathes hard then some emergency treatment must be given or death may result. Two ounces of aromatic spirits of ammonia in a pint of cold water may be given as a drench. If this is not available, turpentine may be used in the same proportion. Exercising the animal may help. The placing of a bit in the mouth may start the animal belching. In extreme cases it is necessary to tap the animal on the left side. This is done by inserting a trocar in the center of the triangle formed by the last rib, backbone and hip bone.

**Diseases of the Udder**

**Milk Fever.**—A condition causing paralysis of the animal usually occurring shortly after calving. The condition may cause death if treatment is not given. The exact cause of the disease is unknown. The symptoms of milk fever should be easily recognized. Soon after calving the cow becomes restless and excited. Colicky symptoms may develop. The cow gets a staggering gait and is especially weak in the hind legs. Finally she gets down, holds her head around to her side and may become unconscious. Death may occur in two or three days. Treatment consists of inflating the udder with sterile air. Each quarter is inflated and the teats are tied
with bandages to retain the air. Should one treatment fail to give results it should be repeated.

**Bloody Milk.**—This is a symptom of some disease, injury or improper feeding. It is first necessary to determine the cause before any very definite treatment can be given. Completely milk out the udder at least four times a day. Bathe the udder with cold water, then dry and apply camphorated oil to the quarter with gentle massage. Give one-half ounce of saltpeter dissolved in water to form a drench once each day for three or four days.

**Ropy Milk.**—Evidently due to fungi that enter the milk shortly after milking or may be due to contaminated feed or water. It is possible for these fungi to pass through the blood into the udder and contaminate the milk. Look carefully to the feeding and watering of the cow. Stall-feed the cow until the condition is stopped. The cow may receive a daily drench of 2 ounces of Epsom Salts and 2 drams of bisulphite of soda in one quart of water.

**Warts.**—Long warts may be removed from the teats by tying a silk thread tightly around the base of each wart. The application of caster oil each day will be found helpful.

**Chapped Teats.**—Caused by sudden chilling, calf sucking, wet milking
or other exposure. The condition is relieved by removing the cause, washing with an antiseptic and then applying once daily a mixture of 1 part tincture of iodine and 4 parts of glycerine.

**Cow Pox.**—An acute contagious disease accompanied by a slight fever and a typical eruption on the udder and teats. The cow so affected should be isolated and milked last. The udder should be bathed twice daily with a 3 per cent solution of granular hyposulphite of soda.

**Maastitis (Garget).**—An inflammation of the udder causing swelling and in some instances pus formation and sloughing of the quarter. This is by far the most important disease of the udder. It is caused by exposure, blows, kicks, bruises, improper feeding, infrequent or irregular milking, infection or dirty milk tubes.

The symptoms are many and varied. Among the most conspicuous are a rough coat, dull eyes, loss of appetite, indigestion and a fever. The cow stands in an awkward straddling position and moves reluctantly. The udder is sore, hot and tense. The milk may be lumpy or stringy. Yellowish clots may be present in the milk. In very bad cases, abscesses may form and destroy that part of the udder.

Treatment consists of making the animal comfortable and giving local treatment to the udder. Give the cow warm water to drink and put a blanket on her. Milk out the udder every two hours. Bathe the udder twice a day with hot water. Dry the udder and apply camphorated oil by gentle massage. It is necessary to secure the services of a veterinarian in case pus develops in order that he may provide the proper drainage.

**X. Marketing of Dairy Products**

By Clarence Shanley

Extension Specialist in Dairy Marketing

There are four principal outlets for the products of the dairy farm. They are: (1) selling whole milk retail, by distributing it from house to house in the city, (2) selling whole milk wholesale to a creamery or milk plant, (3) selling sweet cream to milk plants or ice cream factories, and (4) selling cream, sweet or sour, to the local creamery or cream station. It is of course for each individual to decide which method of marketing is the most practicable and profitable in his own case.

**Comparison of Markets**

If one lives far from town, selling milk at retail is of course impractical. In any case, the matter of distributing milk from house to house is not as profitable an outlet as it appears at first thought. It means considerable extra time and labor. Poor collections and other losses often-times more than offset the higher price received for the milk.

Selling milk wholesale to a milk plant probably involves the least labor at the farm. The loss of the skimmed milk for feeding young stock should be considered carefully in figuring the merits of this method of marketing. This skimmed milk may be worth more as feed than the extra price received above the selling of sweet or sour cream. If one happens to live near a large city there is usually a good market for sweet cream at milk plants or ice cream factories. Such a market is usually very profit-
able as the farmer gets paid for the extra quality of his cream and has the skimmed milk for feeding.

The fourth method, selling sour cream, probably takes in most of the cream that is sold in this state. Such cream is delivered or shipped direct to a creamery or it may be sold to a cream buying station. If one hopes to get any benefit of good quality, the cream should be sold direct to a creamery. This is especially true when marketed through a cooperative creamery as the profits or dividends paid back to the stockholders of a cooperative depend almost entirely upon the quality of cream the farmers deliver to the plant.

**Quality is Important**

There are three important reasons for producing milk and cream of good quality. It is a more healthful food, increases consumption, and raises the selling price of the product where it is purchased on grade.

Care of dairy utensils is one of the most important factors with reference to the production of dairy products of high quality. Pails, cans, and the cream separator must be smoothly soldered and free from rust and crevices. Use hot water, a stiff brush, and alkali washing powder for washing. Dry them by scalding with boiling water and exposing them to the sun in a place free from dust. This procedure must be followed after each use if a quality product is to be produced consistently.

A second factor of great importance is the care given the milk and cream before it is sold. Refrain from feeding and bedding cows for at least an hour before milking. Clip the cows' flanks and udders. Carry the milk from the barn as soon as possible after it is drawn. If market milk is sold, strain it through cotton filters and cool it immediately. If cream is sold, separate the milk while still warm, and cool the cream at once. Keep the product cool and deliver it to market as frequently as possible.

It is more important that barns be clean, sunny and well ventilated than that they be modern in every respect. Clean barns permit a minimum amount of dirt to get into the milk. Sunlight kills germs and prevents dampness and odors. Ventilation removes odors and moisture from the barn, and promotes the health of the herd. Stanchions, gutters and concrete floors are essential. Walls and ceilings should be tight and free from obstructions that readily harbor dirt and dust. They should be white-washed at least once each year.

A properly constructed milk house is a great aid in producing quality dairy products. It is desirable to equip it with a cement floor, a drain, windows of ample size and number, and doors and windows that are dust tight and screened in summer. Cooling tanks, washing vats, and facilities for heating water are also very desirable features. The best location for a milk house is near the well and not far from the barn.

Every farmer should feel some individual responsibility toward the progress of the dairy industry by producing milk and cream that will raise the average quality of dairy products over the state. By so doing the farmers of South Dakota would substantially increase the annual income from their dairy products.
XI. Information for Dairy Club Members

Dairy Cattle Record Associations and Secretaries

American Jersey Cattle Club, L. W. Morley, 324 West 23rd Street, New York City.
Ayrshire Breeders Association, C. T. Conklin, Brandon, Vermont.
Brown Swiss Breeders' Association, Ira Inman, Beloit, Wisconsin.
Holstein-Friesian Association of America, H. Seaverns, Brattleboro, Vermont.

Dairy Breed and Dairy Farm Publications

The Jersey Bulletin, Indianapolis, Indiana.
The Ayrshire Digest, Brandon, Vermont.
Hoard's Dairyman, Fort Atkinson, Wisconsin.

Books on Dairy Subjects

Dairy Farming, by W. J. Fraser, John Wiley and Sons, Inc., New York City.
Testing Milk and Its Products, by Farrington and Woll, Mendota Book Co., Madison, Wis.
Diseases of Cattle, by Bureau of Animal Industry, Supt. of Documents, Washington, D. C.
Dairy Cattle Selection, Feeding and Management by Yapp and Nevens, John Wiley and Sons, Inc., New York City.
The Guernsey Breed, by Chas. L. Hill, Chas. L. Hill, Rosendale, Wisconsin.
Holstein-Friesian History, by Prescott and Price, Holstein-Friesian World, Inc., Lacona, N. Y.

South Dakota Extension Service Circulars

31 Farm Building Ventilation.
32 A Serviceable Farm Barn.
138 Farm Sanitation.
264 Pit and Trench Soils.

South Dakota Experiment Station Bulletins

175 The Role of Water in the Dairy Cow's Ration.
197 Milk Testing in Practice.
206 Purebred Dairy Sires.
215 Soybeans for Dairy Cows.
231 Profitable Feeding of the Dairy Cow.
236 Self Feeders in Dairy Calf Feeding.
252 The Value of Grinding Roughages for Livestock.
264 Emmer (Speltz) for Dairy Cows.
265 Alfalfa, Clover and Sudan Pastures for Dairy Cows.
Farmers' Bulletins, U. S. Department of Agriculture

1167 Essentials of Animal Breeding.
1214 Farm Dairy Houses.
1342 Dairy Barn Construction.
1393 Dairy Barn Ventilation.
1412 Care and Management of Dairy Bulls.
1422 Udder Diseases of Dairy Cows.
1443 Dairy Cattle Breeds.
1470 Care and Management of Dairy Cows.
1473 Sterilizing Milk Utensils.
1532 Dairy Herd Improvement.
1573 Legume Hays for Milk Production.
1604 Dairy Herd Improvement Associations.
1610 Dairy Farming for Beginners.
1626 Feeding Dairy Cows.
Miscellaneous Circular 99, Judging Dairy Cattle.