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- I.—Feeding and Managing Dairy Cattle.
II.—Feed and Care of the Calf.
III.—The Bull.
IV.—Silos and Silage.

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INTRODUCTION.

Alabama consumes a much larger quantity of dairy products than she produces, yet no other state has more natural advantages for a profitable dairy industry. Instead of having to import butter, milk and cream, she should produce a surplus of these commodities. Excellent local markets are found in nearly all sections of the state, whole milk usually selling for 25 to 40 cents per gallon, cream for \$1.00 to \$2.00 (depending on the per cent of butter fat it contains), buttermilk for 10 to 20 cents, and butter for 25 to 40 cents per pound.

There is no other phase of the live stock industry which gives as great returns and yet removes as little of the plant food from the soil as does the dairy industry. The dairy cow, though not a scavenger, consumes a large amount of feed which would otherwise be wasted. There is a double profit derived from the purchased concentrates, since the cow not only produces products more valuable than the purchased feed, but also leaves on the farm, in the form of manure, from 80 to 90 per cent of the plant food contained in the feed eaten. Dr. Thorne, of the Ohio station, found that the addition of eight tons of live stock manure per acre increased the crop production, at market price, \$2.95 per ton of manure, and that the plant food contained in this manure is as valuable as that in commercial fertilizer. Live stock manure improves the soil by the addition of organic matter (a much needed substance in the South), by inducing chemical action in the soil, by introducing beneficial bacteria, and by improving the physical condition of the soil.

Part I.

Feeding and Managing the Cow.

CONFORMATION.

Since the heavy producing dairy cow is the hardest worked of our domestic animals, the selection of an individual which will produce milk economically is of prime importance. She should be of a general angular form and wedge shape, possessing good constitution, capacity and a well developed udder, which is typical of our highest producers. She should also have a general lean appearance, which indicates that the food consumed above the amount required to maintain her body will be converted into milk rather than surplus fat.

In addition to producing milk, the cow is called upon to reproduce her kind. It has been found that in order to be able to transmit her qualities to her offspring she should possess a feminine or motherly look in addition to other qualities. Those which fail in this respect are generally lacking in productive power as well as in breeding ability.

In order to endure the severe strain of production and reproduction, a cow should have a strong constitution. It is also important that she be a vigorous animal so as to impress her good qualities upon her offspring. A strong constitution is indicated by a large heart girth and thoracic cavity, as the vital organs are located in this region. The dairy animal receives her constitutional capacity mainly through depth of chest, rather than by width, as in the beef animal. However, extreme narrowness is undesirable. A large, distended nostril and a large windpipe go hand in hand with vitality, as they control the amount of air which passes into the lungs and therefore the amount of oxygen available for purifying the blood.

The heavy producer, in order to consume and assimilate the amount of feed required for her work, must have a large digestive capacity. This is shown by a deep abdominal cavity, long barrel, and well sprung ribs. In examining a cow's capacity attention should be given to the depth as viewed from the side and width as seen from the rear, since an animal may possess sufficient depth and yet lack capacity on account of extreme narrowness. From 50 to 60 per cent of the amount of feed a milking cow consumes is used for maintenance. Therefore, it is easily seen that the larger the capacity the smaller is the per cent of feed used for maintenance. One possessing capacity and lacking efficiency for utilizing her feed is also unsatisfactory. As the hide and the digestive tract are developed from the same

source, the condition and character of the hide is the best possible indicator of the quality of the digestive organs.

As the process of secreting milk takes place in the udder, this is one of the most important parts of a dairy cow. The desirable udder is one attached high behind and well to the front, with even developed quarters, teats of good size and placed well apart so that the cow may be easily milked. The size and shape of the udder are not sufficient indications of the amount of milk a cow will produce, as the udder may be filled with fatty tissue rather than secreting cells. However, it should decrease considerably in size during the process of milking, thus showing that it does not contain a large amount of surplus fat. The size and shape of the udder can not be accurately judged in heifers and dry cows as with one in milk, but this can be judged fairly accurately by the length and levelness of the rump, according to some authorities, who hold that a short, drooping rump indicates a poorly shaped udder and a long level rump indicates a large, well-formed one.

In order to be converted into milk, the feed must be first assimilated and the nutrients pass into the circulatory system, and thus be carried to the udder. Therefore, the veins passing from the udder toward the forelegs should be large and branching, showing that there is an ample supply of blood passing through the udder. An udder attached as described above gives a larger area to come in contact with the large arteries and more space for small ones to branch off. For these reasons more blood comes in contact with the udder and larger amounts of nutrients will be given off to the working cells.

In addition to possessing a desirable conformation, the cow should be a persistent milker. Some cows are heavy producers for a short time after calving, but soon decrease considerably in the amount of milk they produce. In order to be profitable, it is not sufficient that she produce heavily for a short time, but she must be a persistent milker also. If she produces a large amount of butter, the cow must give milk rich in butterfat, as well as a large quantity. The quality of the milk can be determined most satisfactorily by use of the Babcock Tester.

NERVOUS SYSTEM.

There is another feature of the physiology of a dairy cow which is equally as important as the organs of digestion and secretion, viz., the nervous system. The nervous system includes the brain, spinal cord and its numerous branches which control the action of most of the organs of the body and determine to a large degree the amount of work they do. A nervous tempera-

ment in a dairy cow is very much desired. By this it is not meant that she be irritable and excitable as is sometimes erroneously supposed; irritableness really indicates a lack of control. A nervous temperament is indicated by great width between the eyes, and length between the eyes and the poll of the head, giving ample room for brain development; prominent, open-jointed spinal column, indicating a well-developed spinal cord and a general lean appearance throughout, showing that the tendency is to use all feed consumed above maintenance for milk production and not for surplus fat.

The lymphatic temperament is sought in beef cattle and is indicated by sluggishness, lack of interest in surroundings and a tendency to lay on fat. This beef temperament is very undesirable in dairy cows.

FEEDING THE COW.

The first use which the cow makes of her feed is the maintenance of her body. Unless the animal's body be preserved and kept in good working order, she can not satisfactorily do the work which falls to her lot. Portions of the tissue are constantly wearing out and must be rebuilt. The strongest tendency for the utilization of feed is for this purpose, and must be supplied before other calls for feed are responded to.

Until the cow has reached maturity, she is constantly building new tissues in the process of body development. After maintenance, the feed which the young cow consumes is used for developing those parts or organs which have not yet reached maturity. Therefore, she must be supplied with feed for development as well as maintenance, if best results are to be realized.

Next, and of equal importance, comes the feed required for milk production. If a cow requires 30 pounds of a certain mixture of feeds for maintenance and receives 40 pounds daily, she has 10 pounds available for milk production. If she receives only 35 pounds daily she has only 5 pounds available for milk production, or only half as much as when 40 pounds are fed. It can readily be seen then that liberal feeding is really economical feeding. However, it is possible to over-feed, especially the cows that do not give much milk. If the dairy cow is fed a balanced ration and fed all she will consume without gaining but very little in weight, it will be found that she is producing milk most economically. Milk can be produced more economically with a cow that produces four gallons a day than with one which produces only two gallons. In the first case, one cow is maintained for each four gallons, while in the second, two cows are maintained to secure the same amount of milk.

Where the largest returns are received from dairy cattle,

they are bred so as to be dry only six to eight weeks before dropping the next calf. When the cow is pregnant she is called upon to furnish feed for the nourishment of a foetus, maintenance and milk production. All of these demands are being made on her supply of feed at the same time, and the dairyman can not afford to overlook any one of them. Lack of a bounteous supply of feed will necessarily cause a lack of nourishment in one or more ways, and first in the supply for milk production.

It is not possible to fatten a heavy producing cow while she is in full flow of milk, and it is not desirable to have one which converts her food into fat rather than into milk. On the other hand, it is advisable to feed so that she will fatten during her dry period and thus be in a vigorous condition at the birth of her calf. For a short period after the birth of the calf a cow is not in condition to consume the large amount of feed which she requires. During this time she makes use of the small amount of surplus body fat.

NUTRIENTS OF FEEDS.

The nutrients found in feedstuffs are divided into five classes—protein, carbohydrates, fats, mineral matter, and water. Protein is the only class of nutrients which contains nitrogen, and is absolutely necessary for building the muscles, bones, blood, hoofs and hair for milk production, and may be used to a small extent for supplying the body with heat or energy. The carbohydrates and fats furnish heat and energy, assist in producing butterfat and at times are stored as fats in the body. The mineral portion of feeds plays a necessary part in the building up of the bones, blood, lean tissues, hoofs, hair, etc., and in milk production. Water enters into all of the tissues of the animal body and forms about 87 per cent of milk. Therefore, its importance as a nutrient can readily be seen.

All of these nutrients are found in the common feedstuffs, but in widely varying proportions and amounts. Practically the only feed which furnishes nutrients in suitable proportions is green grass. For this reason it is usually necessary to feed a combination of several feeds in order to furnish the nutrients in the proper proportions. The dairy cow requires one pound of protein to about 5.5 pounds of carbohydrates and fats (one pound of fats being equivalent in feeding value to 2.25 pounds of carbohydrates). To a limited extent, carbohydrates and fats may take the place one of the other if one is lacking. No other nutrient can take the place of protein, however, as it is the only one that contains nitrogen. And since a relatively large amount

of protein is required by dairy cattle, this nutrient is often lacking in many sections. But in the South cottonseed meal and leguminous hays are so largely used that as a rule too much protein is fed instead of too little.

No other animal produces human food as economically as does the dairy cow, provided she is properly fed. Yet all feeds we have are not suited to her needs. We can not get a satisfactory flow of milk by feeding Johnson grass hay and corn. Why? Because they are deficient in two essentials for milk production—protein and ash. Such a mixture would not make a very palatable ration and best results could not be secured from it on this account, even if all the required nutrients were present in sufficient quantities.

FEEDING IN DIFFERENT SEASONS OF THE YEAR.

Every dairyman realizes that best results are obtained when the cow receives an abundance of grass during the summer. This is due to the fact that she has pleasant surroundings, is receiving; first, an abundance of palatable feed; second, a properly balanced ration; and third, a succulent feed—all of which it is possible to furnish her twelve months in the year. The first duty of the dairyman is to make the cow feel it is summer *all the time* in Alabama.

The question naturally arises, shall we feed on pasture? This is a question upon which there is a great difference of opinion, but it is the opinion of the authors that on the average pasture in this State it will pay to feed a light grain ration to the heaviest producers and to the young cows that are not fully matured. If the pasture is a good one, it will not pay usually to supplement it with grain except for the two classes of cows mentioned above. Very heavy producers and young cows not fully developed can not consume enough grass to furnish the nutrients which they require, and should have a small feed of grain to supplement the grass. At the Cornell Station it was found that the flow of milk could be increased by feeding grain on a good pasture, but increased without profit. The pasture used in this experiment was much better than our average Alabama pastures, but no better than every farmer in Alabama could have if he would go to work and make a good pasture.

In Winter. As before stated, the first thing to do is to imitate summer as nearly as possible. An abundance of palatable feeds should be supplied, as good hays, winter pasture, silage and such concentrated feeds as shorts, corn and cottonseed meal. A succulent feed, as winter pasture and silage, can be supplied throughout all of the winter months. A balanced ration—that is, one which will furnish the cow feed for building muscles,

bone, hair and for producing milk—should also be provided. Feeds may well be divided into two classes: those rich in protein, as cottonseed meal, shorts, clover, alfalfa, soy beans and peavine hay, and those rich in carbohydrates and fats, as corn, corn silage, timothy and Johnson grass hay. A milking cow should not be fed exclusively on feeds from either of these classes, but should have some from each.

There is no justifiable reason why the dairymen in Alabama should not have either green feed or silage for his cows at all times during the year. During the fall when pastures are failing, soiling crops should be used or some temporary grazing crop, in order to reach the winter pasture. Corn and sorghum are two of the most satisfactory crops for soiling purposes (cutting and feeding in the green state). In those sections where melilotus grows, melilotus and Johnson grass mixed make an excellent soiling crop. In the southern part of the State, velvet beans make an excellent grazing crop. They can be grazed green until frost, and after frost falls on them they will lie in the fields and furnish good grazing all winter. In first turning cattle in on velvet beans, care should be exercised to avoid bloat. The cattle should be turned in for a short time just after feeding, and they will not eat enough to hurt them, as they will not be hungry. This practice should be kept up for a few days, until the cattle become accustomed to their feed. After frost falls the cattle should be kept off of the velvet beans for two or three weeks, as it is dangerous for cattle to eat them just at that stage.

Below is given a system which will provide green feed the year round and will prove satisfactory in practically all sections of the State:

CROP.	GRAZING SEASON.
Permanent pasture	(Bur clover)
	(Bermuda)
	(Lespedeza)
	Feb. 1 to May 15
	May 15 to Oct. 1
Silage	Oct. 1 to April 1
Oats or rye	Dec. 1 to Mar. 1

There are other crops that could be used satisfactorily, the above merely showing a good system that will furnish green feed the year round.

AMOUNT TO FEED.

It is a very difficult matter to overfeed a good dairy cow, and a very easy matter to overfeed a poor one. For this reason it is advisable for the feeder to use some other guide rather than the size of the cow in determining the amount to feed. Prob-

bly the best rule to govern this is the one given by Prof. Eckles in "Dairy Cattle and Milk Production," and is as follows: 1.—Feed all the roughness the cows will eat up clean at all times. 2.—Feed one pound of grain per day for each pound of butter fat produced per week, or one pound of grain daily for each three pounds of milk. 3.—Feed all the cows will take without gaining in weight.

The roughness should be composed mainly of some good leguminous hay; if a sufficient supply of leguminous hays can not be secured, grains rich in protein should be used rather freely. Where the cow has been bred some time before she is dried up, she should gain sufficiently in weight to offset the increase in weight of the foetus.

Remembering that part of the cow's feed is used for maintenance and part for the work she is performing, one can see why she should have an abundance of feed in order that neither call be unanswered. The cow uses feed first for maintenance, and then for milk production, and when the supply is not sufficient for both, milk production is the one which suffers.

Where silage is fed, some other roughness should be fed along with it, as there is danger of scouring where silage forms the sole roughness. The amount of silage a cow should receive daily depends on a number of things, as the size of the cow, the amount of milk she is giving, the amount and kinds of other feeds she receives, etc. Ordinarily though, a cow should have from 25 to 35 pounds per day. Very large, heavy producing cows may even profitably be fed 40 pounds per day, but the average cow should receive from 25 to 30 pounds.

The amount of grain that should be fed daily will also vary with the size of cow, the amount of milk she gives, etc. From 4 to 12 or 14 pounds per day will represent the range for cows in milk. It will rarely be found profitable to feed over 12 or 14 pounds of grain daily unless the cow is a large one and a very heavy producer. Cottonseed meal should not be fed in quantities larger than 4 to 5 pounds daily, as it is such a concentrated feed it deranges the digestive system if fed in larger quantities, especially if fed for long periods.

SUGGESTIVE RATIONS.

A great many dairymen in Alabama would find it very easy to increase their profits by using more home-grown feeds, thus cutting down the cost of production. Cottonseed meal is one of the cheapest and best feeds, and could profitably form a part of practically every ration for dairy cattle in this State. If the dairyman raises his own corn, as he should, corn or corn-and-cob

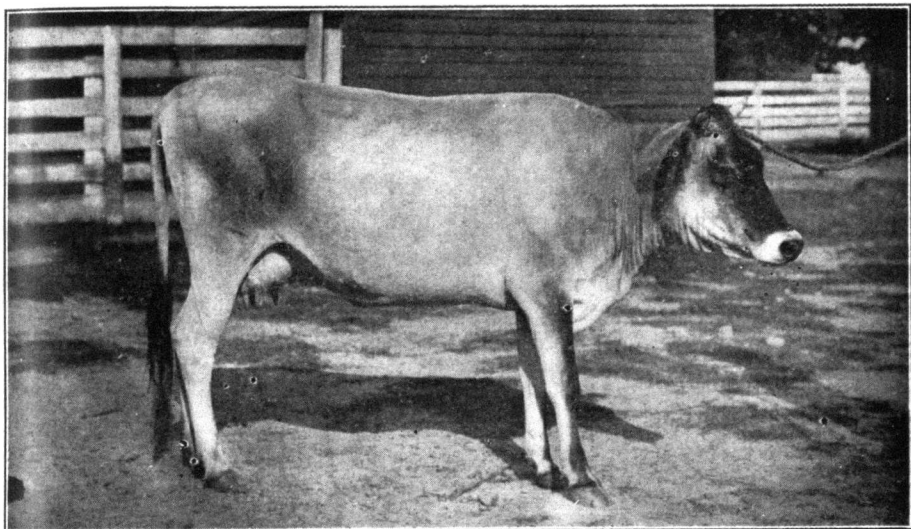


FIGURE No. 1

This is a pure bred Jersey heifer not quite three years old. Note the lack of dairy conformation, cylindrical body and beefiness thoroughout. She lacks quality, which is indicated by a large bone, a large, plain head and lack of refinement. This heifer when fresh produced 548 pounds of milk in one month while the one in Fig. No. 2 produced 811 pounds in one month when she was fresh.

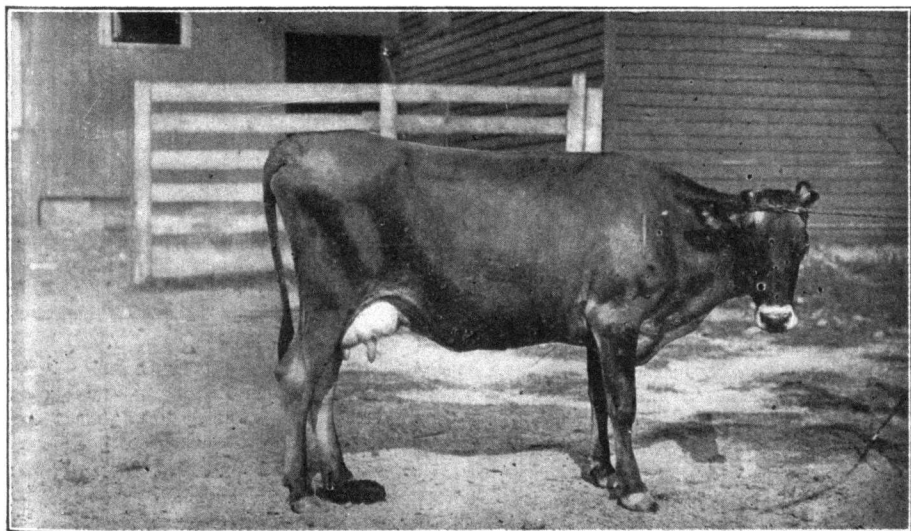


FIG. No. 2

This is also a pure bred Jersey heifer practically the same age as the one in Fig. No. 1. Note the lean appearance, more typical dairy form, lean neck and head and large barrel. Though a smaller animal than the other heifer she has a larger barrel and is a better producer.

meal will prove about the cheapest and most satisfactory concentrate to mix with the cottonseed meal. When cottonseed can be obtained for \$20.00 per ton or less they can economically be used. Wheat bran, shorts and the mixed concentrates on the market are good, but unless they can be bought for \$25.00 per ton or less many dairymen can not afford to buy them.

Cottonseed hulls and grass hays are two other classes of feeds that the majority of dairymen cannot afford to buy unless they can be bought very much cheaper than present prices. Leguminous hays are much better than grass hays for dairy cattle and should be raised and used liberally by all dairymen. Home-grown corn stover will be found much cheaper and practically as good as cottonseed hulls. If a man has as many as ten cows he can hardly afford to do without a silo. Corn silage makes a very cheap and palatable feed and gives splendid results.

It is impossible to take any feed as a standard and say just how much other feeds are worth when compared with it, as there are a number of variable factors which must be considered, as the feeds with which it is fed, the age and condition of the animals to which it is fed, etc. The following table shows fairly accurately the comparative value of the different feeds, taking cornmeal at \$25.00 per ton as a basis:

FEED	Lbs. of digestible protein in 1 ton	Lbs. of digestible carbohydrates in 1 ton	Lbs. of digestible ether extract in 1 ton	Lbs. of digestible non-nitrogenous nutrients in 1 ton (expressed as carbohydrates)	Value of nitrogenous nutrients at 3c per pound	Value of non-nitrogenous nutrients at 11-3c per pound	Total value of 1 ton of feed
Corn meal	158	1334	86	1517.5	\$ 4.74	\$20.23	\$24.97
Cottonseed meal	744	338	244	887.0	22.32	11.83	34.15
Cottonseed	250	600	346	1378.5	7.50	18.38	25.88
Shorts	244	1000	76	1171.0	7.32	15.61	22.93
Wheat bran	244	784	54	905.5	7.32	12.07	19.39
Alfalfa hay	220	792	24	846.0	6.60	11.28	17.88
Soybean hay	216	774	30	841.5	6.48	11.22	17.70
Cowpea hay	216	772	22	821.5	6.48	10.95	17.43
Crimson clover hay	210	698	24	752.0	6.30	10.03	16.33
Johnson-grass hay	58	912	16	948.0	1.74	12.64	14.38
Corn silage	18	226	14	257.5	.54	3.43	3.97
Corn stover	34	648	14	679.5	1.02	9.06	*10.08
Cottonseed hulls	6	662	34	738.5	.18	9.85	*10.03

*Cottonseed hulls and corn stover are probably not worth over one-half the amount shown in the table, as they contain a very large amount of crude fibre and are not very palatable.

A few suggestive rations are given below. The proportions in which the feeds should be fed are not given, as this depends very largely upon the price of the various feeds. Prices vary so from year to year and in different localities that it is impossible to say just what proportions would be best. That is a question each man must solve according to his own local conditions:

1 { Cottonseed meal
Corn
Shorts
Cowpea hay

2 { Cottonseed meal
Corn
Cottonseed hulls
Corn silage

3 { Cottonseed meal
Corn
Johnson-grass hay

4 { Cottonseed meal
Corn
Oat straw
Silage

5 { Cottonseed meal
Corn or corn-and-cob meal
Leguminous hay

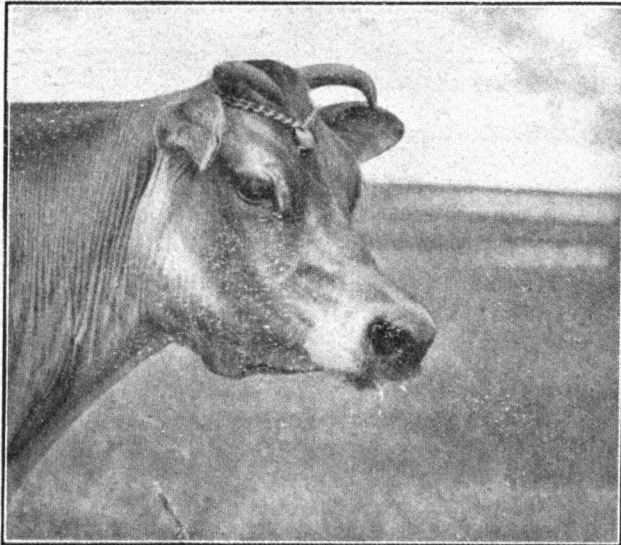
6 { Cottonseed
Corn
Cottonseed hulls
Silage

7 { Cottonseed
Corn
Leguminous hay

8 { Cottonseed
Corn
Silage
Leguminous hay

9 { Cottonseed meal
Shorts
Corn silage
Grass hay

10 { Cottonseed
Shorts
Silage
Grass hay



A Jersey head showing excellent breed and dairy type.
(Courtesy of The Breeder's Gazette.)

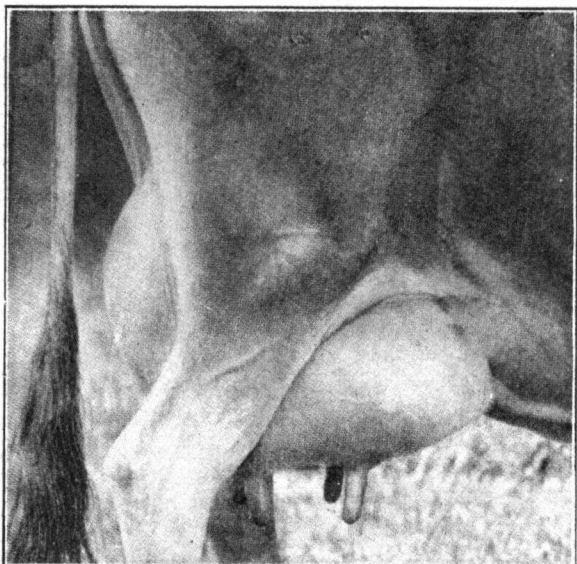


Fig. 3.—A desirable udder showing capacity, quality and well developed mammary veins. (Courtesy of Breeder's Gazette.)

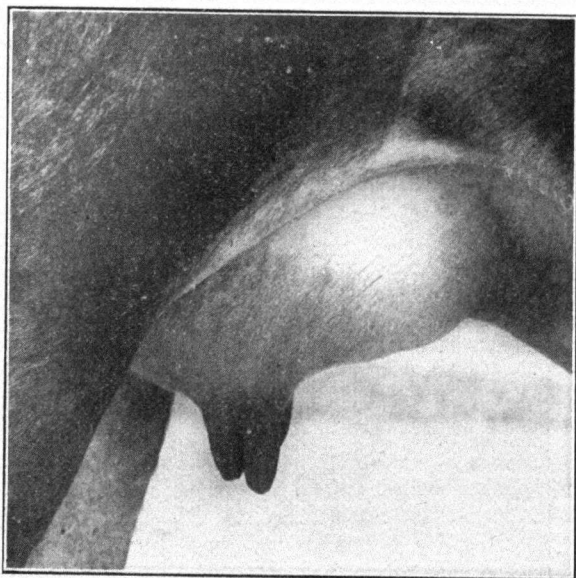


Fig. 4.—An udder which is lacking in capacity, has a poorly developed fore quarter and improperly placed teats.

Part II.

Raising the Calf.

The success of the dairyman in improving his herd and in increasing his profits depends to a large extent upon the proper care and handling of the calves produced in his herd. The wide-awake dairyman does not only see the possibility of replacing an old cow by raising a heifer calf, but also a possibility of replacing her with a better cow. This can be easily done where the right kind of a bull is used and the calf is properly cared for.

The practice of destroying the calves and depending upon buying cows to replace those which have passed their usefulness is a double source of loss. In the first place, high producing cows are seldom found on the market and when found cost more than the average dairyman can afford to pay for them, because he can produce such cows cheaper at home. The practice of depending on buying cows is very objectionable and especially where "springers" (cows which are heavy with calf) are purchased and kept through only one milking period, then fattened and sold for beef. Such a practice invariably results in a low producing herd and a small profit.

Like many other things, a good beginning is very important in the life and welfare of a calf. The care of the calf should begin before it is born, in order that it may begin life in a strong, vigorous condition. This can be accomplished by giving the cow proper care before the calf is born. Since the first milk given by a cow (colostrum) has a medicinal effect upon the calf, it is best that it remain with the cow about 24 hours in order to get this milk. After that time, it should be removed and kept away from the cow, as it can be taught to drink milk much easier than when left with her for several days. If a cow's udder remains hard, lumpy and feverish, it is often well to leave the calf with her until this condition can be overcome.

After removing the calf, let it remain alone without feed until it becomes hungry, then it should be given about 8 pounds of its mother's milk each day, in two feeds of 4 pounds each. Large calves, as Holstein-Friesians, may require 5 pounds or more each feed. After the calf is two weeks old, gradually replace the whole milk with skim milk, taking two weeks to complete the change. For instance, if the calf is receiving 12

pounds of milk a day, replace 1-2 pound in each feed with an equal amount of skim milk. The second day substitute one pound of skim milk in each feed for one pound of whole milk, and continue to increase the amount substituted until in about two weeks the calf is receiving skim milk only. It is not necessary to feed the calf more than 16 to 18 pounds a day at any time before it is weaned.

Most dairymen seem to think that where calves are being fed on skim milk it is necessary to feed more than would be required if whole milk were being fed. However, this is not true. What is needed is something to take the place of the fat which has been removed. This can be very satisfactorily done with such feeds as cornmeal, shorts, and ground oats. After the calf is several weeks old shelled corn and shorts (equal parts) make an excellent substitute for this fat which has been removed. When only about one week old, the calf will usually eat a small amount of grain if it is placed in the trough just after feeding the milk, or, if necessary, rub dry grain in its mouth after feeding the milk. This is the time to teach calves to eat grain and prepare them for the skim milk which is soon to be substituted for whole milk. The grain may be left before them all the time for a few days until they begin to eat it readily, after which time they should have just what they will clean up readily twice a day, which will be about 1-2 pound per day up to one month old. Gradually increase this amount until they are eating 2 pounds daily, at the age of two months, which is sufficient (except with very large calves) until they are weaned. Other grains may be fed along with the corn and shorts if they are available, but it is not necessary.

The calf will usually commence eating hay when about three weeks old, and should be supplied with all it will consume. It is best to feed a grass hay (crab, Johnson grass, etc.) if it is available, for the first few weeks, as the calf is more apt to eat too much of the more palatable hays, thus going off feed. Such hays as clover and alfalfa also have a laxative effect and may assist in giving the calf scours. Where a good pasture is available no other roughage will be necessary. However, the calf should be fed just before going on the pasture in order to prevent it from eating too much grass, and thereby going off feed. For the first month and a half to two months it is as well to keep the calves off of the pasture, unless there is very little extra trouble and labor required in pasturing them.

When dairy products are as valuable as they are in Alabama and when there is a ready market for them, such as we have here, the dairyman can not afford to feed calves until wean-

ing time on whole milk. Then too, the poor results so often attributed to skim milk feeding are usually due to the treatment and care of the calf. Prof. Eckles, of the University of Missouri, says: "Some have seen unhealthy and undersized calves that have been fed skim milk, and have considered them the necessary results of feeding skim milk. Such calves are the unfortunate victims of their owners' ignorance or carelessness. The skim milk calf raised according to modern methods differs little, if any, in size, quality and thrift and value from the same animal when raised by the cow."

The following table from bulletin 126 Kansas Experiment Station shows the cost of producing calves on whole and on skim milk:

RATION	Number of Calves	Days fed	Average gain per head	Cost per hundred pounds gain
Skim milk	10	154	233	\$2.26
Whole milk.....	10	154	287	7.06
Running with dam	22	140	248	4.41

It has been found by experiments conducted at the Nebraska and other stations that the whole milk calf will very probably weigh more at weaning time and look a little more promising than the skim milk calf, but that this is not true at one year old or later. The whole milk calf shrinks more at weaning time than does the one on skim milk, thereby giving the latter the advantage at this time. By the time they have reached the age of eighteen months there will be no appreciable difference in them. Where calves are raised according to improved methods of feeding, it is not necessary to feed more than 180 pounds of whole milk to each calf. This amount of milk at 10 cents per quart is worth \$7.00, and in addition to this about 1500 pounds of skim milk are required, which, at 30 cents per hundred, is worth \$4.50, or a total cost of \$13.50 for the value of the milk required for a skim milk calf up to weaning time (four and a half months old). A calf fed the same amount of whole milk will consume 1680 pounds, which, at 10 cents per quart, is worth \$84.00, making a difference of \$70.50 in favor of the skim milk calf where milk is worth 10 cents per quart. The calf fed on skim milk will require a little more grain, probably costing \$1.50, than the whole milk calf, which still leaves nearly \$70.00 difference. When butter is sold, the difference is not so great as in the above case, yet it is too much to be over-

looked. The whole milk calf consumes 1500 pounds more whole milk than does the skim milk calf; this milk would probably test 4 per cent butter fat, thus giving 60 pounds of butter fat, or about 70 pounds of butter. Where butter sells for 30 cents a pound this amount is worth \$21.00. This amount of butter fat can be replaced with approximately \$1.50 worth of grain and \$4.50 worth of skim milk. Then why feed butter fat to calves?

METHOD OF FEEDING.

Far too many calves are improperly handled at meal time; many dairymen attempt to feed them all in a long trough or guess at the amount of milk each one drinks. The first method results in having a part of the calves overfed and the others stunted from lack of feed, since some calves drink much more rapidly than others. The second method of feeding gives the same result on account of the lack of ability of the feeder to accurately judge how much milk each calf consumes. Not only this, but those receiving too much are apt to be troubled with scours. The only satisfactory way to feed calves is to have stanchions to place them in and weigh or measure each calf's feed. Then, by having a trough in front of the row of stanchions, they can be given the grain ration which will keep them satisfied until the milk has dried from their lips and thus the undesirable habit of sucking the other calf's ears be avoided. With young calves, this is the best time to teach them to eat grain, since they are apparently very hungry immediately after receiving a feed of milk and will eat almost any feed placed before them.

FEEDING AFTER WEANING.

When the calf reaches the age of four and a half or five months, it is time to wean it, as the skim milk can be more profitably fed to younger calves or to pigs. If the calf has been properly handled there should be no stunting at weaning time. The amount of milk fed should be gradually cut down and the amount of other feeds increased. A well developed dairy calf should weigh from 250 to 300 pounds at five months old. Before weaning the calf will probably be eating 16 to 18 pounds of skim milk and 1 to 2 pounds of grain daily. If on pasture, or if fed a leguminous hay, as cowpeas, soy bean, clover or alfalfa, the grain ration should be cut in half.

After weaning the calf there are few difficulties met with in feeding the heifer until she begins to give milk, provided a good pasture is available. The best and cheapest feed can be secured from a good pasture at this age of the animal. How-

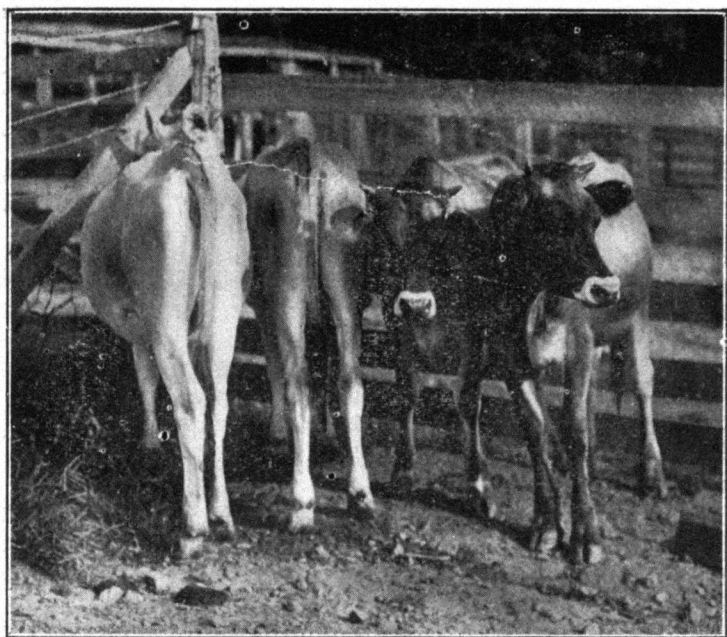


Fig. 5.—Skim milk calves at weaning time. These calves were raised on skim milk as outlined in this circular.

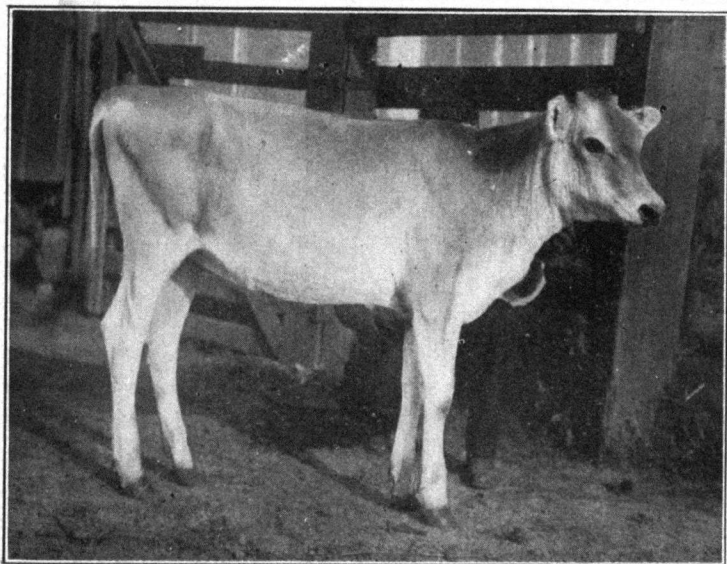


Fig. 6.—Skim milk calf before weaning. This calf is being raised as outlined in this circular and running on a bermnda pasture.

ever, during the winter she should be given more careful attention. It is not advisable to feed her at this time so that she will become excessively fat, but she should receive a small grain ration along with an abundance of good roughage. Experienced dairy-men favor feeding the heifer abundantly on roughage, as it is believed that this develops her digestive organs to the best advantage. This should be a leguminous roughage such as cowpea or clover hay, in order to furnish protein and ash for body development. The cheapest source of winter feed comes from roughage or winter pasture, and for this reason as much as possible of the nutrients should be secured in this way. The development of a foetus is a great strain on a heifer, and as a rule she does not develop during the latter part of her pregnant period, thus showing the importance of late breeding and liberal feeding.

After weaning, the calf should receive from 1 1-2 to 2 1-2 pounds of grain daily and have all the leguminous hay it will eat if not on pasture. If a good pasture is provided the grain ration can profitably be reduced to one pound per head daily. Pasturage is much cheaper than commercial feeds, and if the calf is to make satisfactory and economical gains after weaning, it is essential that plenty of pasture be available. A great majority of the dairy cattle of Alabama are undersized, and if this defect is to be overcome it must be done the first year of the heifer's life. An animal that is not well nourished the first year of its life never attains its maximum development, no matter how well cared for later. Grass, legumes, and silage are the cheapest feeds we have, and should occupy a much more prominent place in our system of agriculture than they do at the present time.

When the heifer is about fifteen months old she should be bred. If bred before this time she is likely to be stunted, as the majority of farmers do not feed heavily enough to properly nourish both the heifer and the unborn calf. After having been bred the heifer's ration should be increased, as she has the foetus to nourish, as well as herself. The amount of grain that should be fed from 15 to 20 months old will vary with the amount of pasturage and other feeds available. If the heifer is on a good pasture or if she is fed silage and leguminous hays, 1 to 2 pounds of grain per day will produce satisfactory growth. On the other hand, if pasture is short and the hay and silage are lacking or are poor in quality, the grain ration can be profitably increased to 3 or 4 pounds per day.

When the heifer has reached the fifth or sixth month of pregnancy, she should be put in the producing herd and receive the same treatment as the cows in milk. She should be fed from

3 to 5 pounds of grain daily, depending on the amount and character of pasture and hays available. The character of the grain ration at this time depends upon the amount and character of pasture and hays the heifer receives. If the pasture has clover, lespedeza, or any of the legumes in it or if a legume hay is fed the grain ration might well consist of cottonseed meal 1 part and corn, or corn-and-cob-meal 4 parts, or cottonseed meal 1 part, wheat bran or shorts 2 parts, and corn, or corn-and-cob meal 7 parts. If the pasture is poor, or only grass hays are used, the protein part of the grain ration should be increased. Either of the following mixtures could be fed satisfactorily; cottonseed meal 2 parts and corn or corn-and-cob-meal 2 parts, or cottonseed meal 2 parts, wheat bran or shorts 2 parts, and corn or corn-and-cob-meal 4 parts. At the present price of mill feeds many dairymen can not afford to buy anything but cottonseed meal or cottonseed cake, and for this reason it is very important that he raise his own products. Cottonseed meal should not be fed to heifers in amounts larger than 1 1-2 pounds per head daily, as it is a very concentrated feed and leads to derangement of the digestive organs if fed in large quantities. Where cottonseed can be obtained for \$20.00 a ton or less they make a very economical feed and can profitably replace part of the cottonseed meal, wheat bran, or shorts. Like cottonseed meal, though, cottonseed should not be fed in very large quantities. From 1 to 1 1-2 pounds per head daily is as much as should be fed.

SCOURS.

One of the greatest problems which confronts the average dairyman in raising calves is "Calf Scours." In a number of dairies a large per cent, and in some cases all of the calves are victims of this disease. In most cases the trouble can be traced to either carelessness on the part of the feeder or lack of sanitation.

Some of the ways by which the feeder paves the way for this disease is by feeding the calf at irregular hours, overfeeding, feeding milk at irregular temperature and especially cold milk, feeding the calf from a dirty bucket, and feeding sour milk. The calf is often considered an animal with a digestive tract which is not easily deranged, but such is not the case. The calf's digestive organs are of such a nature that they may be easily upset by what seems to be very little imprudence on the part of its master.

Where scours have developed they should be treated at once since they weaken the calf rapidly and will be difficult to cure if not treated promptly.

TREATMENT.

If the calf is still strong and has a good appetite, it is not usually necessary to cut the feed down, but if it has a stubborn case of scours the feed should be reduced to half and other treatment as follows resorted to. Mix one-half ounce of formalin with 15 1-2 ounces of water and give one teaspoonful of this mixture with each pound of milk. This treatment is recommended by Dr. Klein, formerly of Clemson College, and has given good results at this Station. In case the calf becomes very weak or the scours continues for more than three or four days, from three to six raw eggs should be fed with the milk daily.

A treatment which was tried at this Station during the spring is apparently very satisfactory,* though it has not been used long enough to be recommended stronger than as a suggestion. It is as follows: Dissolve one "Sulpho Carbonated tablet" in the milk at each feed, and in stubborn cases cut the feed down 50 per cent. If the calf becomes very weak, give raw eggs as recommended above.

Where the calf is properly housed during bad weather and treated as outlined above, the disease should be checked within three to five days.

*Suggested by Drs. Cary and McAdory, of Auburn.

Part III.

The Bull.

In the dairy industry, satisfactory returns are always received from money invested in a good bull. All dairymen have no doubt often heard it stated that the bull is 50 per cent of the herd, yet there are a large number of them who do not appreciate the fact as they should. The best breeders usually appreciate the value of a good sire and give the selection of one careful attention. There are many, however, who are still using grades or inferior pure bred in an effort to be economical. Such mistaken economy is extremely costly to the dairymen, especially, since the heavy milking quality of the dairy cow is an artificial characteristic and must be constantly kept in the mind of the breeder in order that the herd not degenerate rather than improve. Though this quality is dormant in the bull, still he transmits such qualities to his daughters with surprising results.

Nothing except a pure bred bull from a strong milking line of cows should be kept even though the females be grades. If he is used on a grade herd, the calves will prove to be more satisfactory milkers than were their mothers. A bull should not be tolerated in a herd unless his daughters are equally as good in case of heavy producers, and better, in case of light producers, than were their mothers at the same age.

By keeping a bull which will decrease the average production of the herd 1,000 pounds a year (which is not uncommon), the production from thirty cows will be reduced 30,000 pounds or 3,750 gallons. At ten cents per quart this is a loss of \$1,500.00 annually. With a bull which would increase the average production 1,000 pounds there would be a difference of \$3,000.00 annually in the value of the products from thirty daughters of each of these bulls. Lorne of Merridale produced 12 daughters in the herd at the University of Missouri which averaged 1,410 pounds more milk per year than their dams. This increase was secured in a Jersey herd.* Where then, is the profit in keeping an inferior sire and losing more each year than a good one would cost?

It is not possible to tell from his general appearance what kind of milking qualities the bull will transmit to his offspring. However, the records of his immediate ancestors for at least

*Dairy Cattle and Milk Production, Page 158.

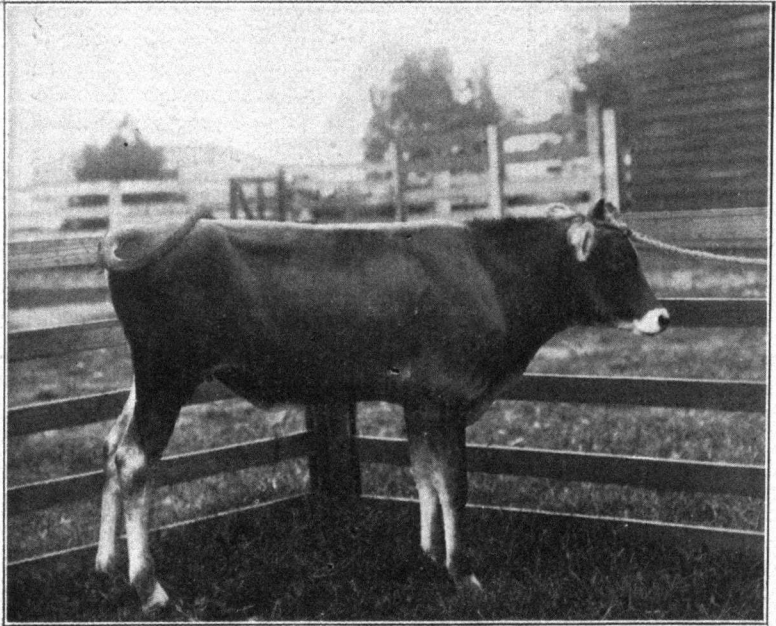


Fig. 7. Note lack of capacity as shown by shallow body and high cut flanks. He also has a short pointed rump and is long legged. Though the same age as the one shown in Fig. 9, he is much more lacking in conformation and capacity. If "like begets like," what about the capacity of his daughters?

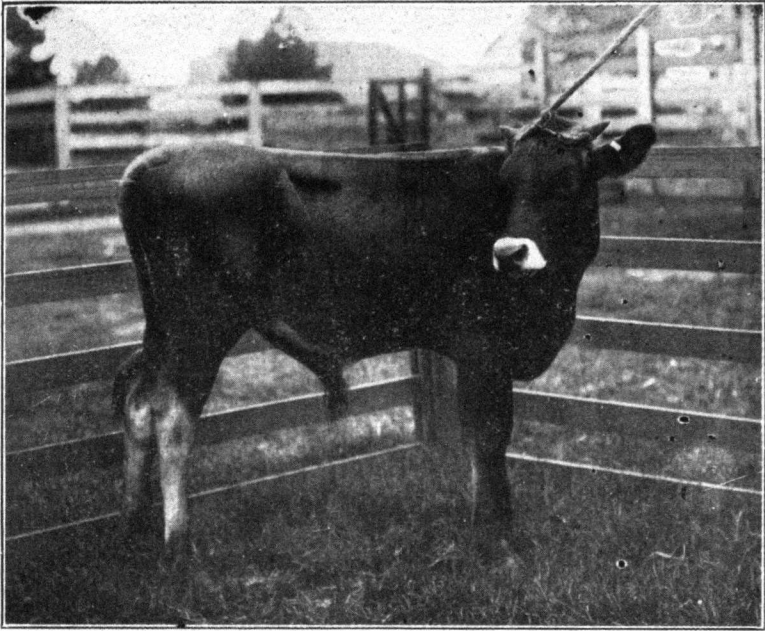


Fig. 8.—A bull with good capacity and conformation, yet having a “steerish” or “feminine” head.

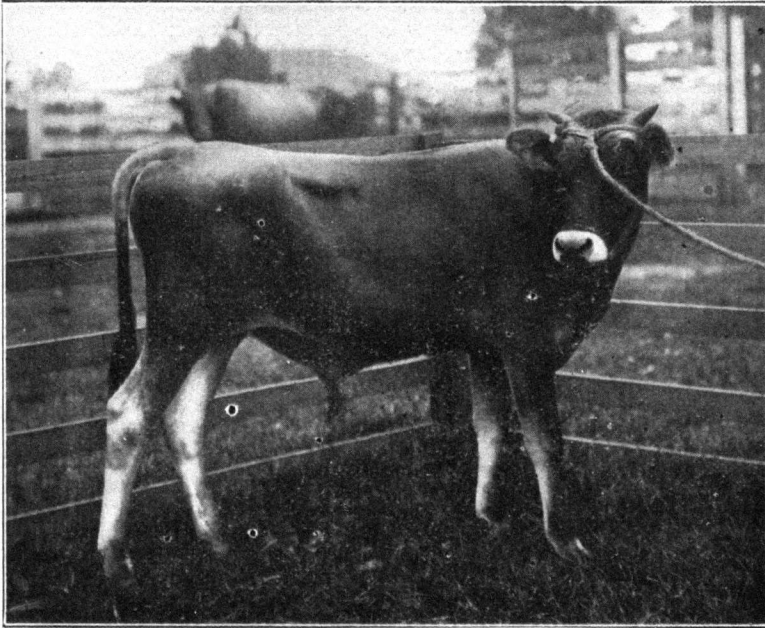


Fig. 9.—The type of bull we should have. Note his capacity, conformation, length and levelness of rump, good constitution and masculine head. A bull of this type transmits his characters to his offsprings more satisfactorily than one with a “steerish” or “feminine” head.

two generations back will show what he is most likely to do in this respect. If the dams have been heavy producers and the sires getters of heavy producers, the bull may be expected to himself be a getter of heavy producers. If his sires and dams have been only ordinary performers the bull will most likely be only an ordinary sire.

The conformation of the bull should be considered as well as his pedigree. In buying a bull of any age, he should be true to type, strong in constitution, have good capacity, well developed rudimentary teats, long level rump, be of good size for his age, and have a masculine lock.

A bull with long legs, small cylindrical body, short drooping rump, and showing a lack of masculinity almost invariably proves a sire of inferior producers. (See figs. 7 and 9.)

CHANGING BULLS.

Many breeders make the mistake of selling an old bull which has been a satisfactory breeder and replacing him with a young one. Under such circumstances it is not possible to tell what the young bull will do before practically three years after he enters the herd. By this time, if he is an unsatisfactory breeder, he has already been a source of a greater loss than would have been the cost of a good bull. Where it is possible, the most satisfactory method is to buy a tried bull, or in other words one which has been used as long as is advisable in some other herd and which has proved to be a satisfactory breeder.

If it is necessary to take a young bull to replace an old and good one, the old one should be retained until some calves have been secured from several old cows and the young bull. In this way it is possible to get a fairly good index to what the young one will do as a breeder. Where the herd is of sufficient size to make it profitable to keep two bulls, the old one should be retained and bred to all the cows which are not closely related to him. A second bull should be secured to breed to the cows related to the first bull and later to take the place of the old one.

MANAGEMENT.

An improperly managed bull soon develops into the most troublesome animal on a farm, while one carefully handled should be very little more trouble than one of the females. Under no consideration should he be placed in a paddock or pasture where there is not a very substantial fence. Such treatment only leads to further trouble. When he has once broken through this weak fence it will be much harder to control him than before he had such an experience. A small pasture is the best

place for the bull as it cuts down the feed bill and also enables him to take exercise. Care should be taken to see that it is well fenced, however. If no small pasture is available the next best place for the bull is a substantial pen near or adjoining the lot in which the cows are kept. In this way the bull will take considerable exercise passing along the fence, and it is also easier to locate those females which are in season. Where more than one bull is kept, it is best to keep them in the same pen unless they prove extremely hostile towards each other.

A breeding crate built in one edge of the pen is of great assistance in mating the animals. This crate should open from the outside and also into the "bull pen." With such a crate, the cow can be placed in it and then the bull admitted from the opposite side.

Many breeders have the idea that most bulls are over-fed. This is usually not the case; they are more often under-fed. He should be fed liberally on a rather high protein ration for a mature animal, since he requires more protein than does a fattening animal. Where such is available, he should be given some good succulent feed, pasture during the summer and winter pasture, silage or some feed of this character during winter. Keep him in a good vigorous condition in order that he may transmit his qualities to his offspring to best advantage.

Part IV

Silos and Silage.

THE SILO.

In days past, farmers often considered the cow as an animal suited to consume all of the spoiled hay and what little pasture might be at hand, converting them into valuable dairy products. Along with other advancements he has, or should have, changed this opinion of the cow. There is no other animal on the farm which deserves better feed and treatment or which gives greater returns for the feed she receives than does a good cow. She has conformed to man's requirements in milk production and when asked what she most desires, and given an opportunity to demonstrate her answer, replies—"Silage when pasturage is short."

The silo is no longer a feature of dairying to be experimented with; it is a practical part of the dairy farm. Cottonseed were originally dumped in rivers and are now converted into valuable feed for cattle. Corn stalks were burned in days past, but now it is possible to convert them, with their other parts, into a valuable supplement to the cottonseed products. A silo for an average herd of dairy cattle in the South can be built for less than \$200.00 and in many instances will pay for itself the first year. The silo need not be excessively large and costly since they hold a large amount of feed for the space they apparently possess.

In the "Progressive Farmer" of May 28, 1912, Dr. Tait Butler gives a striking example of the cow's opinion of silage. The test was conducted by the Mississippi Experiment Station under farm conditions. To quote Dr. Butler; "When winter came the value of the silo became apparent. The seven herds without silage averaged 240.4 pounds of milk per cow per month, while the herd with silage averaged 355.9 pounds of milk per cow per month, or a gain of 36.81 per cent for the silage-fed cows.

"In a herd of 20 cows this same rate of gain due to the silo, would amount to 1,029 gallons of milk in five months. At 20 cents a gallon this makes a gain of \$205.80, due to silage for five months or during the winter with a herd of 20 cows.'

Where milk sells for 10 cents a quart, as it does in many parts of Alabama, this increase of products would have amounted to \$411.60 for the 20 cows during the winter. A silo that would hold sufficient silage for these 20 cows can be built for \$200, which is much less than the returns from the increase of products for the first year. Not only this, but the cost of feeding the cows in the test referred to above was less where they received

silage, costing \$3.00 per cow less for the five months, making an additional profit to be credited to the silage.

CROPS FOR SILAGE.

There are several crops as corn, sorghum cowpeas, and soy beans which may be used for silage, though it is doubted by the writers whether it is advisable to use all of these except where it is not possible to utilize them in any other way.

CORN. Apparently there is no other crop which can satisfactorily take the place of corn for making silage. It is not uncommon to produce five tons or more of green corn on an acre which is one thing in favor of corn. Furthermore, corn does not contain as much sugar as sorghum, thus not making as sour a product as is the case with sorghum. The practice of removing the ears and putting only the stalks and leaves into the silo is not desirable for several reasons. First, the corn is still green and will not make a desirable product to be fed as ear corn to other animals, nor can it be easily cured; second, when the ears are removed the silage is not so valuable as a feed and more supplementary grain will be required; third, the grain contained in silage is practically as valuable as where it is preserved as ear corn. The small amount which is dropped on the ground, or which passes through the animals as whole corn, may be consumed by hogs. Taking all things into consideration it is surely an undesirable practice to pull the ears from silage corn, except where there is a ready market for "roasting ears" and a part of the corn is removed for this purpose.

SORGHUM. Sorghum furnishes a large amount of valuable green feed for cows at a time when pastures are short, but is probably most satisfactorily fed as a soiling crop (cut and fed green). When made into silage it furnishes a large amount of sugar to be converted into acid and therefore is very apt to be too sour, and may be of a slimy nature. Many farmers, however, are using it for silage purposes with marked success.

COWPEAS AND SOYBEANS. Leguminous crops, such as these, furnish our most valuable hay and are almost totally consumed by stock as such. For this reason it is best to make these into hay where such is possible. If the season is a very wet one and it is not possible to convert these crops into hay they may be advantageously used for silage. Where it is possible, though, it seems to be the best farm practice to make these crops into hay and use corn to fill the silo.

The following table shows the actual cost of producing silage on Alabama farms.

*Cost of Producing Silage on Alabama Farms.**

COUNTY	Acres of corn	Yield per acre. Tons	Cost per acre	Cost per ton filling silo	Total cost of silage per ton
Pike.....	25.0	3.12	\$5.00	\$0.88	\$2.49
Jefferson.....	6.0	5.80	4.00	.91	1.59
Chilton.....	14.0	4.00	4.87	.89	2.10
Chilton.....	4.75	5.49	8.03	1.13	2.59
Jefferson.....	8.5	7.64	7.50	.91	1.89
Montgomery.....	20.0	10.00	7.00	.86	1.55
Baldwin.....	5.0	9.30	16.20	.75	2.77
Bibb.....	5.0	7.56	8.95	1.01	2.40
Baldwin.....	4.0	7.5	17.00	.48	3.57

*Data collected by the Animal Industry Department at Auburn in cooperation with the Dairy Division of the Bureau of Animal Industry, United States Department of Agriculture.

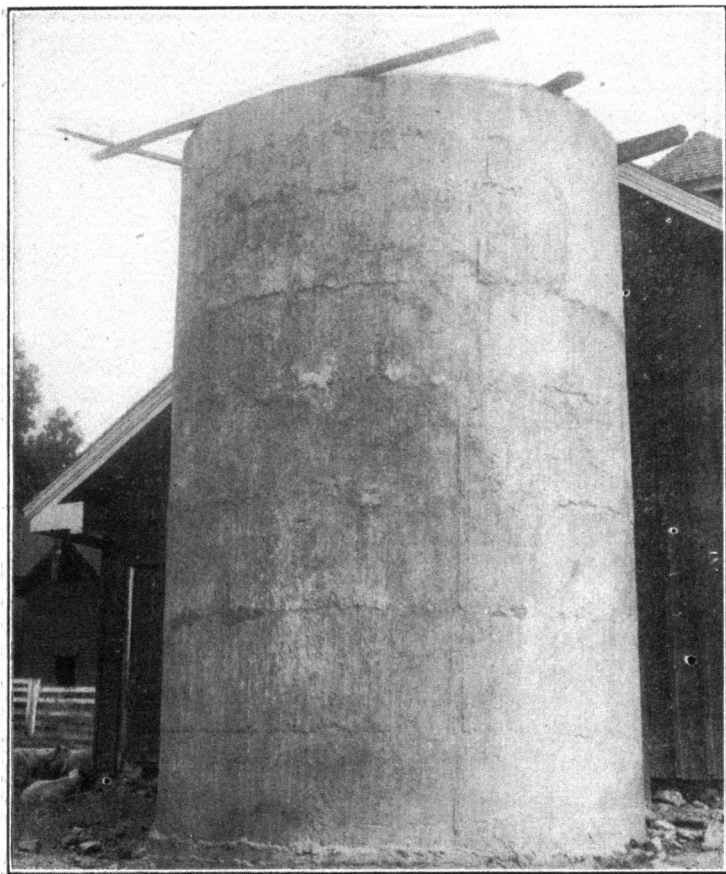


Fig. 10.—Silo at Alabama Experiment Station.

The silo shown in fig. 10 is the one in use at the Experiment Station at Auburn. It has been in use three years giving perfect satisfaction. It is 12 feet in diameter, 26 feet high and has a capacity of 60 tons. This is a concrete silo with walls 5 inches thick, re-enforced with hog wire fencing and was built at a cost of \$138.00. One the size of this is sufficient for a 20-cow dairy and also furnish silage for the bull and what heifers and calves are on hand.

Supposing that the cows receive 25 pounds each day for five months, they would consume 32 1-2 tons leaving over 25 tons to be used for other animals as the bull and heifers and to offset the small amount which will spoil. This silo shown above gives a cost of \$2.30 per ton investment for the silo. Where the silo is larger the investment per ton is less.

The time when silage should be fed is usually given as during the winter, but in the South where it is possible to have good winter pastures there is another time when silage is worth just as much to the dairyman as during the winter, and that is in tiding over the period between the time when summer pastures fail and the time winter pastures come in. This period is usually from about Oct. 1 to Dec. 1 to 15. Oats or rye will be ready to graze in December and will furnish grazing all winter. About the first of February bur clover will begin to furnish grazing also.

Winter crops sometimes fail however, and there are times when the land is too wet to be pastured and silage is necessary to keep up the milk flow. For these reasons the dairyman should always have silage on hand and during the winter he will find it profitable to feed some silage even though his cows have green crops to graze. In fact, some dairymen feed it the year round profitably. There are frequently dry spells during the summer and the pastures get short, and in such cases silage is a wonderful help in keeping up the productiveness of the herd.