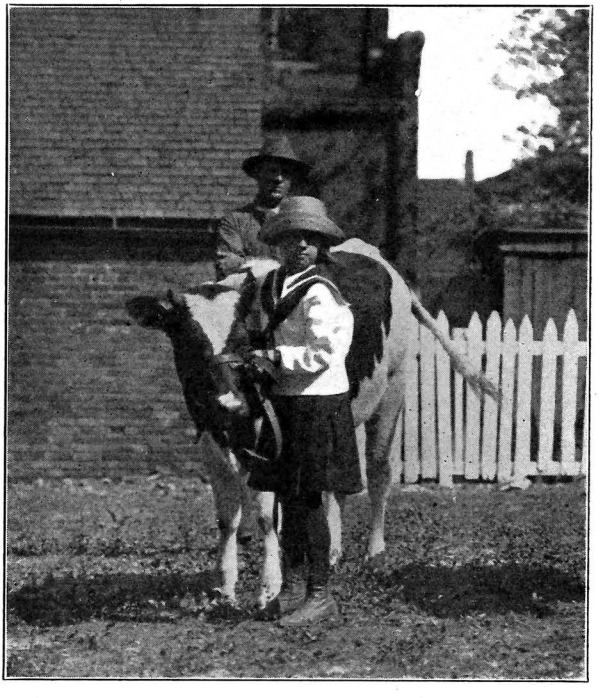
Dairy Calf Clubs
I, II and III

Boys' and Girls' Club Circular 12

COUMBIA, MO. MARCH, 1924



COOPERATIVE EXTENSION WORK IN
AGRICULTURE AND HOME ECONOMICS
UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE AND THE UNITED
STATES DEPARTMENT OF AGRICULTURE COOPERATING
A. J. MEYER, Director, Agricultural Extension Service
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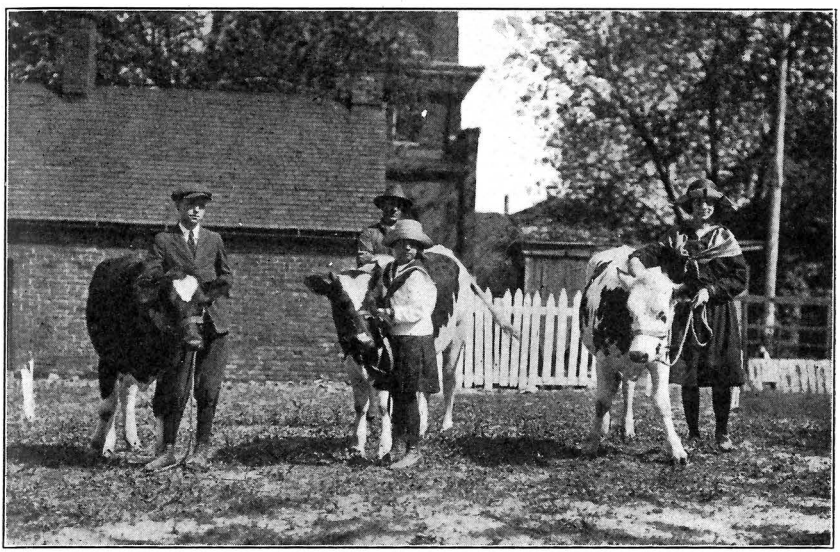


Fig. 2.—Three Missouri Dairy Club winners with their leader, John Hellenkamp of Cottleville.

The dairy calf club is a project for groups of five or more boys and girls between the ages of ten and twenty-one years, who desire to own, feed, and develop a heifer calf of one of the dairy breeds. The calves may be either grade or purebred but they should always be sired by purebred bulls and from good, high producing cows and should be good individuals. The project is organized by the Agricultural Extension Service into three distinct phases each covering a period of one year. The purpose of this is to give the club members a chance to study certain phases of dairy management for a year. Then, if the members desire, they may go ahead with the balance of the dairy calf club work as outlined. This club work may start with any one of the three years of work. The three phases of dairy club work are:

Note.—Prepared by E. M. Harmon, Dairy Extension Specialist, in collaboration with Theodore T. Martin, State Club Agent.

The Junior Calf Club should start with calves under six months of age. It includes the feeding, care and management of the heifer calf for a period of one year, keeping a record and making a report of the same, attending club meetings, making a club tour and taking part in the club round-up and show.

The Bred Heifer Club should start about the time the heifers reach the breeding age. It includes the feeding, care and management of the heifer through the first calving period; keeping a record and making a report of the same, attending club meetings, making a club tour, and taking part in the club round-up and show.

The Cow Testing Club may start at any time after the heifer has freshened and continues for a period of one year. It includes the feeding, care and management of the cow for one year. It also includes milking and keeping record and making a report of the production of milk and butterfat, feed consumed, value of each, and the profit or loss together with the attending of club meetings, making a club tour, and taking part in the club round-up and show.

PLANNING THE PROGRAM FOR THE DAIRY CLUB

If the dairy club is to be most successful, its activities must be definitely planned from the start. Also the responsibility for the carrying on of each activity of the club must be arranged for. If we were to start into a year of school work without having that year of work definitely outlined in advance, we would not accomplish very much. Neither can we get the most out of club work unless we plan definitely in advance to do those things and learn those things which will mean the most to us in the future.

The club members must of course plan to do those things that are outlined for their year of club work. This must be done if the members are to get the most good out of club work and certainly every boy and girl wants to get all possible benefit from this club work. Then the local leaders and the county leaders as well as the state specialists must each assume certain responsibilities in order to carry through the club work effectively. When tabulated the responsibilities of those different persons are about as shown on the opposite page.

THE YEAR'S PROGRAM

A standard club is required to hold a least six meetings a year. It is often desirable to hold more meetings than this for real business. Then in addition to this, the club member should always arrange some picnics

Responsibilities of the Different Persons in Club Work

Event in year's program	Time and Place	Duties of: Local Leaders of Community	Duties of: County Leaders and Assistant County Leader	Duties of: Specialist in organization methods and Specialist in subject matter.
County Leaders' school or conference	County Leader's Office	Attend	Arrange. Notify Local Leaders. Attend.	Furnish Specialist on organization and methods.
Enroll members to do club work	Any time	See boys and girls and their parents. Present and explain club work through public meetings and newspapers. Send enrollments to County Leaders	Present club work at public meetings and in newspapers. Furnish enrollment cards and leaders report blanks. Send enrollments to State Club Office.	
Organization	To be decided by leaders	Arrange meeting. Attend. Direct work. Explain work of club.	Attend and assist with explanations of record forms, programs and lessons.	Furnish record books, programs for meetings and subject matter material for use in club work.
Hold 6 to 12 meetings, depending on kind of club.	To be decided by leader and club	Arrange. Attend. Instruct.	Send lessons to local leaders. Attend at least one meeting in addition to the tour and show.	Furnish lessons and programs.
Public demonstrations	Spring and early summer.	Arrange. Attend. Direct.	Attend.	
Club tour and judging school	All day, spring or summer	Arrange. Attend. Assist in selecting club teams.	Attend. Assist in selecting club teams.	Subject Matter Specialist.—Attend and coach in judging and demonstrations.
County club contests	Early summer	Arrange to have judging and demonstration teams in contest.	Arrange and supervise. Secure judges.	
State Fair	August	Arrange locally for sending teams and exhibits.	Attend with teams and exhibits.	Arrange for judges and superintend contests.
Club round-up and show.	September or October just before county show	Arrange. Attend. Direct. Secure prizes	Attend.	Subject Matter Specialist.—Attend and judge.
County round-up and show	September or October.	Arrange locally for exhibits	Arrange. Attend. Direct. Secure prizes.	Subject matter Specialist.—Attend and judge.
Achievement exercises	At close of year's work	Arrange. Attend. Direct. Collect record books from every club member and make report later to County Club Leader.	Attend and present achievement buttons. Furnish summary of reports to specialists.	Organize subject matter and approve reports.

or other meetings for pleasure. To be most successful, it is essential that a club decide on a definite series of meetings and subjects to be studied for the year. In order to encourage the members to continue from one year to another, this work should be so arranged that there

will be no duplication during the different years. The outline of meetings given for each year will be helpful in arranging the program, but it should be remembered that this outline is merely a suggestion. The order of these meetings may be changed or the club members may substitute an entirely different meeting for any of those suggested. If starting with the Bred Heifer or Cow Testing Club the club members can get some good suggestions for business meetings by referring to the programs for Junior Calf Club Members. By this time the members are ready to start their second year of the club work they should be able to arrange programs for business meetings.

The Junior Calf Club

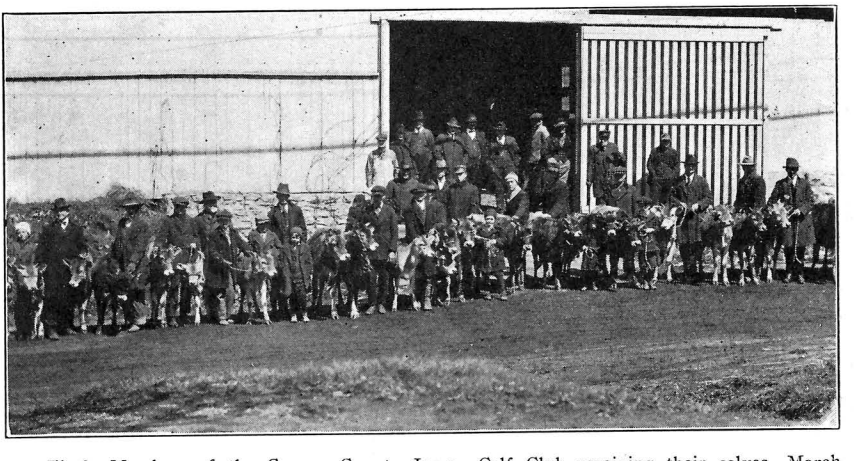


Fig.3—Members of the Greene County Jersey Calf Club receiving their calves, March 29, 1921.

SUGGESTIONS FOR MEETINGS

I. Organization.—The business meeting.

(1) Election of officers.
(2) Discussion of Standard Club requirements.
(3) Distribution of club literature and explanation of bulletins and club record book to be used.
(4) Suggested work to be completed before the next meeting.
(5) Discussion of time and place for future meetings.
(6) Appointment of committees on club motto, club goal, club name, etc.
(7) Adjournment.

II. Feeding the Young Calf to Six Months.—A. The business meeting.

(1) The club meeting called to order by the chairman, all rising and repeating the 4-H club pledge as follows: "*I pledge my head to clearer thinking, my heart to greater loyalty, my hands to larger service, and my health to better living, for my club, my community, and my country.*"

(2) Roll call by the secretary, the club members responding by making a progress report on the home project work.

(3) Reading and adoption by the club of minutes of the last meeting.

(4) Old business; report of the committee on club motto, club goal, club name, etc.

(5) New business; appointment of a committee on club cheers and songs.

(6) Adjournment for work.

B. Instruction and demonstration.

(1) Subject for discussion; "Feeding the Young Calf to Six Months." See page 10.

(2) Suggested demonstration; feeding the calf. Equipment necessary; a calf under six months of age with feed troughs and all of the different feeds necessary to make up one of the rations recommended in the reference for this meeting.

(3) Suggested work to be completed before the next meeting.

III. Dehorning the Calf.—Diseases and Parasites. A. The business meeting.

(1) Meeting called to order. The 4-H club pledges.

(2) Roll call, the members respond by making progress reports on home project work.

(3) Reading of the minutes of the last meeting.

(4) Old business; report of the committee on club cheers and songs.

(5) New business; selection of a cheer and song leader.

(6) Adjournment for work.

B. Instruction and Demonstration.

(1) Subject for discussion, "Dehorning the Calf.—Diseases and Parasites". See page 11.

(2) Suggested demonstration; dehorning the baby calf. Equipment necessary; a young calf on which the

small, buttonlike horns have just appeared; a stick of caustic potash with which to burn off the horns and a small amount of grease to smear around the base of the horns to protect the flesh from the caustic potash.

(3) Discussion of plans for the Calf Club Tour.

IV. The Calf Club Tour.—All-day visit to some of the different members as well as one or two dairy herds. Practice in judging and giving demonstrations. Dairy specialist present.

Fig. 4.—A typical Calf Club round-up in St. Charles County.

Noon-day meeting.

(1) Called to order.
(2) Roll call.
(3) Reading the minutes of the last meeting.
(4) Old business.
(5) New business.
(6) Talk by the County Extension Agent on the "Extension Service."
(7) Talk by the Dairy Specialist.
(8) Practice in judging and demonstrating.
(9) Spirited club cheers and songs.
(10) Adjournment.

V. Quarters and Stanchions for Calves.—A. The business meeting.

(1) Called to order with the 4-H club pledge.
(2) Roll call; response, "What I learned on the Calf Club Tour".
(3) Reading of minutes of the last meeting.
(4) Old business.
(5) New business.
(6) Club cheers and songs.
(7) Adjournment for work.

B. Instruction and Demonstration.

(1) Subject for discussion, "Quarters and Stanchions for Calves". See page 14.
(2) Suggestion for demonstration; constructing stanchions as outlined in reference for this meeting. Equipment necessary; hammer, handsaw, hatchet, nails and lumber.
(3) Suggestions on finishing up Record Books and getting ready for the Club Round-up and Show.

VI. Feeding the Calf from Six Months to One Year.—A. The business meeting.

(1) Called to order with the 4-H club pledge.
(2) Roll call; response, each member exhibiting an up-to-date Record Book.
(3) Reading of minutes of the last meeting.
(4) Old business.
(5) New business.
(6) Cheers and songs
(7) Adjournment for work.

B. Instruction and Demonstration.

(1) Subject for discussion, "Feeding the Calf from Six Months to One Year of Age" and "Fitting for the Club Show". See page 15.
(2) Definite plans for closing up work for the year and discussion of next year's plans.
(3) Definite plans for the Club Round-up and Show.

VII. The Club Round-up and Show.

(1) The club show.
(2) The judging contest.
(3) The public program.
   a. Club cheers and songs.
   b. Short talk on history of the club.
   c. Demonstrations.
   d. Presentation of all awards.

The awards should be made on approximately the following basis:

A. Individuality and condition of animal 40%
B. Methods of feeding; rations selected and amounts fed 20
C. Records and written story of meetings 20
D. Attendance Record 20

Instruction and Demonstrations

I. ORGANIZATION

The first meeting of the Club will be taken up almost entirely with the business of organization. The Club Leader will preside while the officers are being elected. These should include a president, vice-president and a secretary. The club literature should be distributed and explained and the place of holding future meetings should be decided upon or discussed. Committees may be appointed at this first meeting.

II. FEEDING THE YOUNG CALF TO SIX MONTHS.

The most particular time in caring for the calf is during the first few months. If the calf is stunted and poorly cared for at this time it will be a great deal more trouble to raise and is likely to be permanently affected as a milk cow. Proper care probably pays better at this time than at any other period in the life of the animal.

It is always best to raise the calf by hand. Letting the calf run with the cow is bad for the cow and does not do the calf any good. Two pounds of corn meal is about as good as one pound of butterfat for the calf, so it is cheaper to take the calf away and feed skimmilk.

It is best to take the calf away from its mother as soon as it is dropped, but it should be given its mother's milk for the first few days at least. When the calf is first taken from its mother, let it go without milk for 12 to 24 hours. Then it will be hungry and will learn to drink a good deal easier. Then take about 3 pounds of fresh warm milk, back the calf into a corner and straddle its neck. Hold the milk pail in one hand and with the other put two fingers into the calf's mouth and force its head into the pail. After repeating this two or three times the calf will learn to drink of its own accord. It is best to start feeding 8 to 9 pounds of milk a day and feed three times a day. In about two weeks this may be reduced to twice a day and 12 pounds of milk a day. Always make changes in feed as gradual as possible.

In case of strong calves you may begin to change to skimmilk when the calf is about two weeks old by adding 1 pound of skimmilk and taking away 1 pound of whole milk each day till the calf is entirely on skimmilk. If the calf is not strong it is best to wait a few days longer

before starting the change. The skimmilk may then gradually be increased to 16 pounds a day at 3 months of age. If there is plenty of skimmilk it is well to let the calf have it till it is about 6 months old, taking it away gradually. *Always see that the milk is warm and sweet.*

The calf will begin to eat a little hay and grain at 2 to 3 weeks of age. A good way to start the calf eating grain is to put a handful of corn meal in its mouth a few times just after feeding the milk. Then keep a small box of grain in its stall for a few days and it will soon learn to eat. After that feed it regularly and do not give it any more than it will clean up.

Give the calf all of the fine legume hay such as alfalfa, soybean, or clover hay that it will clean up till it goes on pasture. If the calf has real good pasture, there is no need of any other roughage but it is not best to turn the calves on pasture until they are past two months old.

Some good grain rations for young calves:

(1) Three parts cracked corn and one part wheat bran.
(2) Three parts cracked corn and one part wheat bran and one part ground oats.
(3) Three parts cracked corn, one part wheat bran, one part ground oats, and one part oil meal.
(4) Three parts cracked corn, one part wheat bran, one part ground oats, and one part blood meal.

III. DEHORNING THE CALF. DISEASES AND PARASITES

Dehorning.—It is always wise to dehorn the calves while they are young. It causes less pain then and is less likely to injure them. It is also less work and avoids the danger which horns always have for other stock and for people working around them. To dehorn the calf take it when it is 5 to 10 days old and when the soft stubby growth of horn has just begun to appear. Get a stick of caustic potash at any drug store and, after rubbing grease or vaseline around the stubby growth of horn, rub the horn thoroughly with caustic potash. Wrap a cloth around the stick to avoid burning the hand. However, if this is not done and it is desirable to dehorn later, it is best to run them in a chute and take the horns off with either a pair of dehorning shears or a saw. The horns should be taken off as close to the head as possible without giving a flesh wound. Care should be taken to select a cool time in either spring or fall when there is no danger of the animal taking cold and when the flies do not bother. If there is danger from flies it is well to smear a little tar over the wound.

Scours.—This is the most common calf ailment and probably causes more loss both in death of calves and in calves permantly stunted than any other one thing. In almost every case it is possible to avoid it. It may result from exposure or from improper feeding. Too much milk, sudden changes in feed, cold milk, a change to sour milk or dirty buckets are a number of things which may cause scours.

To treat scours cut the feed to one-half and if it is severe drench with ⅓ ounce of castor oil administered in the milk. Keep the feed down to, one-half for three or four feeds and then gradually work back to full feed. A few raw eggs substituted for feeds of milk after drenching is an excellent tonic.

White Scours.—This is a deadly form of diarrhea which affects the newborn calf. It is caused by a germ which thrives in dirty barns and stalls. It can be distinguished by the whitish yellow bowel discharge. It enters through the calf's navel. To prevent it clean out the barn and calving stall thoroughly. Sprinkle the floor thoroughly with a preparation of 1 pint coal tar to 5 gallons water. Bed liberally with good clean bedding and then make several applications of tincture of iodine to the navel of the newborn calf.

Pneumonia.—Pneumonia is caused by exposure and cold, wet, draughty barns. Get the calf into a warm clean stall with plenty of clean bedding and ventilation but no draughts. Keep it warm and well blanketed and give a little warm milk or water frequently. If it gives any indication of constipation, a good drenching with castor oil is advisable.

Lice.—There are three kinds of lice, all of which are very detrimental to the stock. Their presence may be suspected by the animals rubbing their necks and shoulders against posts, trees, etc. To kill them use a dip of one pint coal tar preparation to 4 gallons of water. A second application ten days later will be necessary as the eggs will be hatched out by then. If the barn is infested with lice it should be sprayed thoroughly with the same solution.

Another good remedy for lice is to dissolve ½ pound of hard soap in 1 gallon of boiling water (use soft water). Then add 2 gallons of kerosene and pump the mixture till an emulsion forms. Add 20 gallons of water and apply the mixture with a spray, pump or a brush.

Blackleg.—This is a very common and fatal disease and all calf club members should vaccinate against it. The first indications are dullness and loss of appetite, lameness and a swelling in the shoulder or hindquarter. At first there is a high fever but later it falls below normal. The calf usually dies within 12 to 24 hours after it is affected.

Vaccination is simple and easy; any veterinarian can do it.

IV. THE CALF CLUB TOUR

The following score card should be used during the Club Tour to assist in an intelligent inspection of the calves.

Score Card for Dairy Cows

Scale of Points	Per Cent	1	2	3	4
INDICATING EFFICIENCY OF MILK SECRETING SYSTEM—FORTY POINTS:					
Udder—large, evenly quartered, well held up, not meaty, attachments long, teats squarely placed and of convenient size	30				
Milk Veins—capacious, entering a few large wells or numerous small ones	10				
	40				
INDICATING CAPACITY—TWENTY FIVE POINTS:					
Muzzle—wide	1				
Jaw—wide in angle, strong	1				
Barrel—deep, wide, long, well held up with ribs broad, long, far apart, slanting, well sprung	23				
	25				
INDICATING CONSTITUTIONAL STRENGTH AND VIGOR—FIFTEEN POINTS:					
Nostril—large, expanded	1				
Eye—prominent, bright, intelligent	1				
Chest—wide, deep	4				
Skeleton—developed for strength, of good quality; roomy, long and level at pelvis	5				
Skin—loose and mellow showing good circulation and secretion	2				
Carriage—energetic, prompt, alert	2				
	15				
INDICATING DAIRY TEMPERAMENT—TEN POINTS:					
Body—wedge shape. **General appearance**—angular and lean, yet clean cut and neat in every part	10				
BREED TYPE—TEN POINTS					
Points characteristic of the particular breed such as size, color, temperament, ruggedness of build, etc.	10				
Name	Cut				
Date Class	Score				

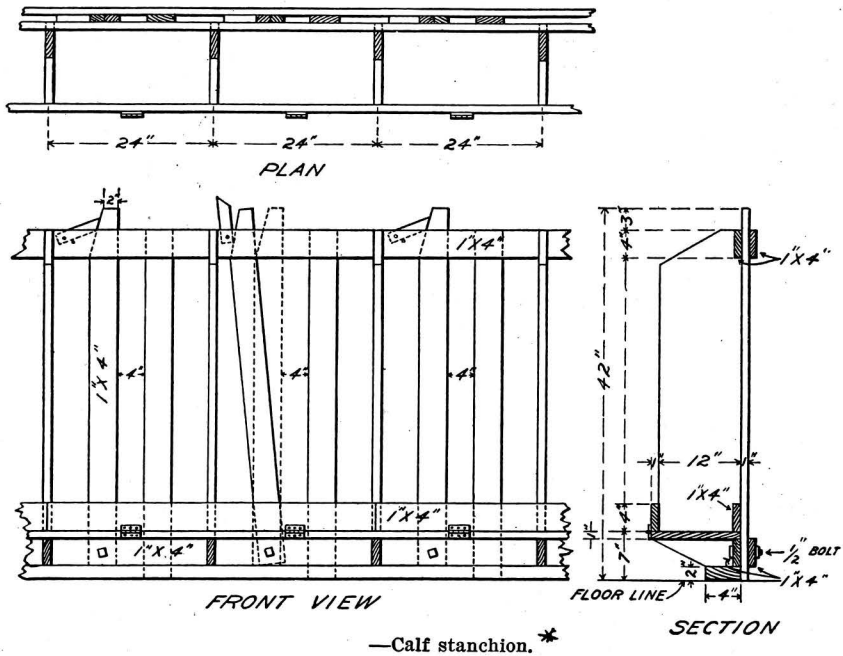
V. QUARTERS AND STANCHIONS FOR CALVES

It is best to keep calves by themselves for the first two or three weeks. Real young calves should never be bumped and jostled about and the only way to prevent this is to have small individual pens for them. These pens should always be dry and well bedded. By the time the calf is two or three weeks old it is well to turn it in with other calves in a large pen. These large pens should always have stanchions fixed on one side so that the calves can be shut in and you can be sure that each calf gets its share of the feed.

It is almost impossible to feed calves right where they are kept in a large pen unless they are fastened at feeding time. They are likely to spill the feed and the larger calves take feed from the smaller ones. Also, to prevent calves from sucking one another, it is well to keep them in these stanchions for a while after feeding them.

A simple calf stanchion can be made from scrap lumber in very little time and with little expense. In the long run it will save a great deal of time in feeding calves and will enable one to raise better calves because they will all get just what feed is coming to them and no more.

The accompanying picture will be of assistance in making stanchions.



—Calf stanchion.

Fig. 5.—Diagram showing how to make a calf stanchion. (Courtesy U. S. Department of Agriculture.)

It is of very great importance that the quarters for calves be light and dry. Plenty of bedding should be furnished and changed often enough to keep the pens dry all of the time. After the calves are a few weeks old, they can stand quite a bit of cold if they are dry. Darkness or dampness or both are very likely to cause any one of numerous calf diseases.

The calves should have a lot to exercise in. They should be turned out at least once every day except on the most stormy days.

VI. FEEDING THE CALF FROM SIX MONTHS TO ONE YEAR

Fig. 6.—A Guernsey Calf Club in Cape Girardeau County, Missouri.

By the time the calf is 6 months old it is old enough to be weaned from milk. If this is during the summer season and there is plenty of grass pasture it likely will need little or no other feed. If, however, pasture is short and the calf is not doing the best possible, it will probably pay to force it along with a little grain. And it always pays to have some good green forage crop such as cane or oats and Canada field peas coming on to feed during the drough periods in the summer. During such times the calves need more feed than they can get on short pastures.

Through the winter season for calves of this age it will pay to give them about 2 pounds a day of a good grain mixture such as those men-

tioned in Meeting II. In addition they should have what corn silage they will clean up, usually 5 to 10 pounds a day, and all the legume hay they will eat. Keep them in good condition—not too fat—and making a good uniform growth. It is better to feed with this object in view than to feed with any set rule in mind.

Always see to it that the calf has access to fresh, clean water (warmed if possible in winter) and salt, and that the quarters are kept clean.

FITTING FOR THE CLUB SHOW.—While the average club member does not want to become a professional showman, yet there are a few simple rules that the members should observe in getting the calves ready for the show club. Some of these are:

1. Calves should always show a large body capacity without being "pot bellied". In order to accomplish this, they should be fed all the roughage they will consume all the time.

2. Calves should be sleek and show a good quality of skin and hair. There are two good methods of accomplishing this. One is to keep the calf up with a blanket over it for a while before the show and the other is to add a little extra laxative feed like oil meal or wheat bran to the grain ration for a month or so before the show. Currying well at least once a day will help too.

3. The animals should have a neat and clean-cut appearance, especially about the head and ears. Sometimes clipping the long hair will help the appearance of a heifer remarkably.

4. The heifer should be broken to lead before the show and should be led in with a neat halter. It is possible to make a very nice looking halter out of an ordinary small rope.

5. If the horns have been allowed to grow and the horns and hoofs are rough, sometimes it is well to smooth them off with a little sandpaper.

6. Especial care should be taken to keep the heifers in good physical condition especially just before the show.

7. Clean your heifer thoroughly before leading her into the show ring. No judge can place an animal up if it is covered with dirt and filth. Besides that, any good club member would be ashamed of his animal in that condition. A little time with a bucket of water and a brush will be well spent.

The Bred Heifer Club

SUGGESTED OUTLINE FOR MEETINGS

The following outline is suggested for use in conducting a typical club meeting.

The Business Meeting.

(1) Chairman calls the meeting to order.
(2) Secretary calls the roll. The members respond by giving progress reports.
(3) Reading of the minutes.
(4) Old business; reports of committees, etc.
(5) New business; appointment of committees, such as a program committee for each meeting, committee on constitution and by-laws, etc.
(6) Adjournment for work.

Instruction and Demonstration.

(1) Subject for discussion.
(2) Suggested demonstration; equipment necessary for the demonstration.

I. Organization.

(1) The Business Meeting.
(2) Organization, explanation of records and bulletins to be used.

II. Breeding.

(1) The business meeting.
(2) Subjects for discussion, "Age to Breed" and "Selection of the Bull". See page 18.

III. Feeding the Heifer from One to Two Years of Age.

(1) The business meeting.
(2) Subjects for discussion. "Directions for Feeding from One to Two Years of Age". See page 20.
(3) Suggested Demonstration, feeding the heifer. Equipment needed; a heifer, feed troughs and all feeds necessary to make up one of the rations recommended.

IV. The Club Tour. (1) Calf Club Tour. All day, visit some of the members and one or two dairy herds. Practice in judging and giving demonstrations. Dairy specialist present. (2) Noon-day business meeting.

V. Treating Indigestion and Wounds.

(1) The business meeting.

(2) Subject for discussion, "Treating Indigestion and Wounds". See page 20.

VI. Care of Heifer at Calving Time.

(1) The business meeting.

(2) Subject for discussion, "Care at Calving Time". See page 21.

VII. Round-up and Show.

(1) Round-up and show all day. Demonstration and judging. Dairy specialist present.

(2) Noon-day meeting.

The awards should be made on approximately the following basis:

Individuality and condition of animal	40%
Methods of feeding; rations selected and amounts fed	15%
Individuality and breeding of bull to which calf was bred	10%
Records and written story of meetings	15%
Attendance Record	20%

Instruction and Demonstrations

I. ORGANIZATION

The first meeting of the club, under the direction of the Club Leader, should include the election of officers, appointment of committees, distribution of literature, and the discussion of future meeting places.

II. BREEDING

The age at which it is best to breed the heifer depends somewhat upon the breed and upon the development of your particular heifer. If bred too young the development of the heifer is retarded and she will never make as large an animal nor as heavy a producer as she would otherwise have been. On the other hand nothing is gained by waiting too long. In such cases the heifer usually develops into a bigger, coarser cow but is not a heavier producer and that much time is simply lost from her producing period.

As a rule a Jersey should be bred at 15 to 16 months of age. At this age they should weigh about 600 pounds. A Holstein should usually be bred at 18 to 19 months and should weigh about 800 to 850 pounds at

that age. The Guernsey is a little larger than the Jersey and should possibly be bred just a little later. Do not get discouraged if your heifer is a little smaller than the average for the breed at this age. Some cows develop more slowly than others and it is the nature of some cows to be small. That does not meal they will not show up just as well and be just as good producers.

The club member should be especially careful in selecting the bull to which the heifer is to be bred. Do not be satisfied with anything but a registered bull of the same breed as the heifer. Use a bull of that kind if you have to go several miles to him. If possible breed to a bull with a

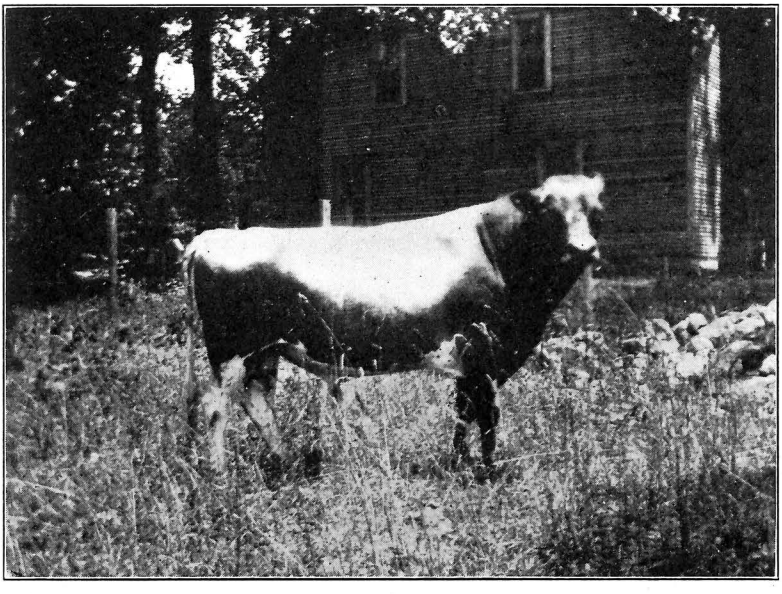


Fig. 7.—A purebred bull whose dam and two granddams averaged 642 pounds of butter a year.

good pedigree behind him—one whose dam made an official record and whose other ancestors show good breeding. Then you will get a calf from your heifer that will be worth a good many times what a calf from a "scrub" bull would be worth. After you have had your heifer bred keep her shut up in a boxstall or small lot by herself for the rest of the day.

Make it a practice from the start to keep a record of breeding dates. Then you will know what time the heifer will calve.

III. FEEDING THE HEIFER FROM ONE TO TWO YEARS OF AGE

In feeding calves from one to two years old a good ration of roughness will usually be sufficient. Feed them all the corn silage and good legume hay they will clean up and they will thrive on it. A liberal ration of good roughness is desirable at this time for two reasons. First, it is desirable to develop an animal of good size and plenty of capacity for handling food for milk production later. Second, a good, well balanced roughness of this kind is practically as good for the dairy calf at this age as grain, and the food supplied in the roughage is much cheaper.

As a rule more harm results from underfeeding in the summer than in the winter. As long as pastures are good in summer the calves will usually fare all right, but when the summer droughts come and the pastures begin to get short the calves suffer. Always plan to have a little good green forage to feed the heifers at such times. A little patch of cane and Canada field peas or some good forage will prove a money maker.

It is seldom that the calf will need grain at this age. However, the calf should be kept in reasonably good flesh and in good growing condition. If it becomes necessary to feed grain in order to do this, a mixture of equal parts crushed corn and crushed oats will be found a good economical ration.

Always give the calf free access to plenty of good fresh water and salt. The importance of this point cannot be over emphasized.

IV. THE CLUB TOUR

Visit the homes of several members of the Club. Compare their heifers, using the score card as printed on page 13.

V. TREATING INDIGESTION AND WOUNDS

Indigestion in cattle is generally caused by eating damaged feed, or changing quickly from one kind of feed to another. It may also be caused by the animal not getting enough water or from drinking very cold water. It is indicated by loss of appetite, bad odors or a dull sluggish action. One should immediately take away all feed except good silage, roots or grass and a little bran or similar laxative feed. Then give one pound of glauber's or epsom salts dissolved in two quarts of warm water. If necessary repeat the dose in a day or two.

Inflammations.—For inflammations or serious bruises of any kind frequent applications of Antiphlogistine or "Denver Mud" as it is commonly called will give relief. This is especially true of "caked" or inflammed udders just after calving. In the case of caked udders it is often well to leave the calf with the cow for a day or two just after calving.

Frequent milking and cutting down the grain ration or changing to a ration of light palatable feed such as bran and oil meal, will also give relief.

Sore Feet, Cuts, Open Wounds, etc.—The best policy with such troubles is to clean out the sores or wounds; keep them clean and disinfect them. A 3% to 4% solution of carbolic acid makes a good disinfectant. Sore feet are often caused by the heifers having to stand in a filthy barnyard. In such cases there is no hope of healing the feet until they are taken out of the filth and kept clean. Clean the feet well and disinfect them and turn the heifers in a clean lot or pasture. Or if it is

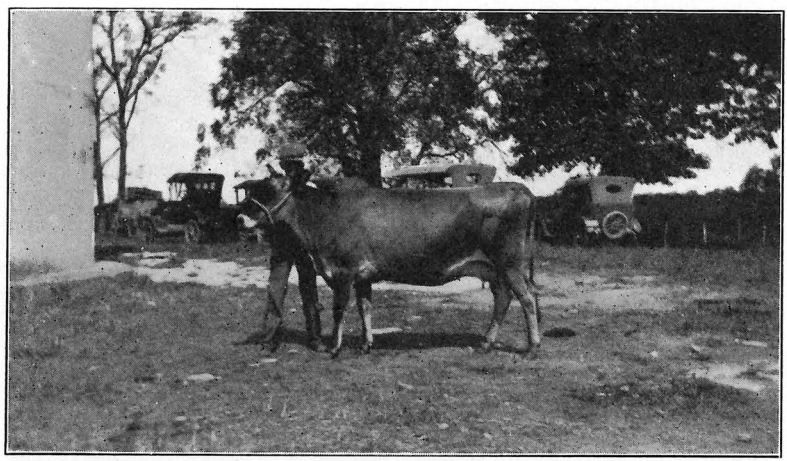


Fig. 8.—Ralph Hopper and his Jersey heifer—a Greene County Club champion.

winter and impossible to do this give the heifer a good clean, roomy box stall in the barn. Keep her there; keep the stall clean and give her lots of bedding. Clean the sore out and disinfect it every few days till it is well.

Nervous Heifers.—Some heifers are naturally inclined to be timid and more or less wild. Such heifers, if allowed to follow their natural inclination will usually become more wild and before long will be jumping fences. On the other hand, with a little special petting now and then they may become the tamest animals on the place. If your heifer seems a little timid at times give her a little special notice; an extra handful of grain or something of the sort to make her feel that she is one of the herd.

VI. CARE OF HEIFER AT CALVING TIME

Some time before calving, the heifer should be moved to the barn and to the stall where she is to be kept permanently. The cow is very

nervous at the time of calving and will be less excitable then if she has become somewhat accustomed to her permanent quarters. You should have a breeding record so that you will know just when your cow is due to calve. A few days before this she should be removed to a good large box stall. Keep the stall clean and supplied with plenty of clean bedding.

Just at this time the cow is very low in vitality and should be given especial care. If it is cold weather she should have a good warm stall free from all draughts. It is well to warm her water for a few days at least and she should have only a light palatable ration. A good allowance of bran or beet pulp in the ration is advisable to see that the cow's bowels are in good shape. One should be especially careful not to let the cow become constipated at this time.

Fig. 9.—Dairy Calf Club members learning to use the score card. (See pages 13, 20 and 28.)

Just at the time of calving the cow may need help, especially in the case of the heifer. In case of improper presentation of the calf, it is best to call a veterinarian at once. However, the calf may be properly presented and still the cow not be able to deliver it. The calf should be presented front feet first with the head between the feet. In this case it is well to help the cow yourself by pulling the calf from her.

It is almost always best to take the calf away from the cow as soon as it is dropped. If the cow's udder is very badly caked it may be well to let the calf run with the cow for two or three days. It is usually best, however, to take the calf away and milk the cow three or four times a day till the inflammation is gone from the udder. Feed mostly light feed till the inflammation is out of the udder and she has regained her normal strength.

The Cow Testing Club

SUGGESTED MEETINGS

I. Organization. Explanation of records and bulletins to be used. Suggested demonstration; testing milk and entering records. Equipment needed; milk samples, commercial sulphuric acid and testing apparatus.

II. Testing Milk and Keeping Records.

(1) The business meeting.

(2) Subjects for discussion, "Kind of Records to Keep" and "Testing Milk for Butterfat". See page 24.

III. Feed Constituents.

(1) The business meeting.

(2) Subject for discussion, "Feed Constituents". See page 27.

IV. The Club Tour.

(1) Calf Club Tour, all day. Visit to some of the members and one or more dairy herds. Practice in judging and giving demonstrations. Dairy Specialist present.

(2) The Noon-day meeting.

V. Mineral Feeds for Cows.

(1) The business meeting.

(2) Subject for discussion, "Mineral Feeds for Cows". See page 28.

VI. Protein Feeds.

(1) The business meeting.

(2) Subject for discussion, "Protein Feeds". See page 29.

VII. Energy Feeds.

(1) The business meeting.

(2) Subject for discussion, "Energy Feeds". See page 30.

VIII. Requirements of a Dairy Ration.

(1) The business meeting.

(2) Subject for discussion, "Requirements of a Dairy Ration". See page 31.

IX. Selecting Rations for Milk Cows.

(1) The business meeting.

(2) Subject for discussion, "Selecting Rations for Milk Cows". See page 33.

(3) Suggested demonstration, balancing and mixing an ideal dairy ration. Equipment necessary; a mixing trough, a scoop shovel, and those feeds which the members feel constitutes the best dairy ration for their conditions.

X. Feeding Recommendations.

(1) The business meeting.

(2) Subject for discussion, "Feeding Recommendations". See page 36.

XI. Comparison of Records.

(1) The business meeting.

(2) Subject for discussion, "Comparison of Records Made by the Cows of Different Members with Special Reference to the Results of Different Methods of Feeding."

XII. Round-up and Show.

(1) The public meeting.

(2) Round-up and show. Demonstration and judging. Dairy specialist present.

The awards should be on approximately the following basis.

Individuality and condition of animal	30%
Methods of feeding; rations selected and amounts fed	15%
Production of milk and butterfat	20%
Record and written story of meetings	15%
Attendance Record	20%

Instruction and Demonstrations

I. ORGANIZATION

At the first meeting the Club Leader will preside while the officers are elected, including a president, vice-president and secretary. Committees should be appointed, literature distributed and meeting places discussed.

II. KIND OF RECORDS TO KEEP—TESTING MILK FOR BUTTERFAT

Breeding and Calving Records.—It is always advisable to keep records on the breeding of all cows as well as the dates of calving. If you have the breeding dates in hand you will know just when to expect each cow to calve and will often be saved the loss of a calf, and will also often be aided materially in the sale of calves. The records are an item which it is very little trouble to keep but which may mean quite a little to the dairyman. Breeding dates and calving dates are required before you can register any animal.

Feed and Other Cost Records.—One advantage in keeping feed and other cost records on your cow is that you know at the end of the year just what your cow has cost you. Then by checking up with your production records you know just what your profit or loss is and whether or not it will pay you to keep her. Another advantage which feed records have is that you then have a way of knowing just what you have fed and

Fig. 10.—The cow tester is the dairyman's detective. Records of production and feed cost show what each cow is actually worth.

what effect certain feeds have had upon the production of your animal. In this way you will soon find what feeds are best to give your cow and what is the best way of handling her.

Milk and Butterfat Records.—The importance of keeping production records cannot be over emphasized. Many people think they haven't time to do it. It is not a question of time. Very little time is required; it is simply a question of making up your mind to do it. If you don't do anything but find one cow in a whole herd that is not paying her feed bill you are well paid for all the time it takes. The chances are you will find several such cows. All that is necessary is to hang a pair of scales in the barn just back of the cow's stanchion and tack a monthly milk

sheet up on the wall. Then each time after you get through milking your cow, weigh the milk and record the weight. Sometime during the month take a sample of night's milk and a sample of morning's milk, mix the two and test it. This will give you a fair average test for the month. At the end of the month take down your milk sheet, total it and apply your test to the total of milk to get the pounds of butterfat for that month. Then by taking the average price of butterfat produced for the month you can determine the value of the fat produced by your cow during the month. Add the value of the skimmilk to the value of the fat to find what your cow was actually worth that month. Keep this up for a year and with your feed records you know just what your cow is capable of doing and you know what she is worth. Cows are coming more and more to be bought and sold on the basis of what they actually produce.

Another point in favor of keeping records is that you have something by which to gauge your feeding. Many cows could profitably be fed more while others are being given more feed than they have any need for. If you are keeping records you can feed accordingly and avoid this loss. Also if a cow is going "off feed" or is sick from any other causes she almost invariably shows it in her milk flow. If you are weighing the milk you will notice this much more readily than otherwise and in that way can "head off" any trouble that may be coming on.

Sampling.—For ordinary testing work it is usually customary to take a sample of night's and morning's milk; mix the two and test the composite. In taking a sample stir the milk well with a dipper and fill a one-half pint bottle one-third full. Then for the next milking repeat the operation filling the sample bottle about another one-third full.

Testing.—Warm (or cool) the milk and acid to about 60° F. (if you get it much warmer it will charr when the acid is added). Mix the milk well by pouring from one bottle to the other. Then by suction, draw 17.6 cc. (cubic centimeters) of milk into a pipette (up to the mark on the neck) and insert it into a milk test bottle. Measure out 17.6 cc. of sulphuric acid in a measure and pour it down the neck of the test bottle. Shake the bottle with a whirling motion till the whole solution takes on a coffee colored appearance. Put it in an ordinary milk tester and turn it at the rate of about 80 turns per minute for five minutes. This gives about 1,080 revolutions per minute inside the tester. Add water at 130° to 140° F. up to the neck of the bottle and turn for two minutes longer. Then add water up nearly to the top of the graduated part of the bottle and turn for one minute longer. Take the bottle out and set it in a hot water bath at 130° to 140° F. being careful that the water comes as high

as the top of the fat column along the graduated neck of the bottle Always read from the top of the meniscus, at the top of the fat column.

The acid added to the milk breaks or burns up the fibrin in the milk and releases the fat globules. Then the whirling centrifugal motion brings the lighter fat globules to the top and the heavier parts sink to the bottom of the solution.

Always keep the utensils clean. Cleanliness is essential to accurate testing.

III. FEED CONSTITUENTS

In studying the ways to feed cows and the kinds of feeds to give them in order to make the most profit from them, we should remember first that feeds contain a number of different types of constituents. Among these are water, mineral matter, protein and energy feeds or carbohydrates and fats.

The cow's body is also made up of these four constituents and she must have a certain amount of each to keep her alive. The water is found in the blood and throughout the entire body. The mineral is mostly lime and phosphorus and is found in the bones, hoofs, hair, skin and to some extent in the blood. Protein is found mostly in the muscles, bones, skin and hair while the fats are found largely in the fatty portions of the body. Milk also contains a certain amount of each of these four constituents though they are all in solution and we cannot separate them except by chemical analysis.

Now it happens that some dairy cow feeds are very high in one of these constituents but are low in others. Some may contain a lot of two kinds of constituents but no cow feeds contain just the right amount of all of them. For instance, corn contains a great deal of energy feed like carbohydrates and fats but contains very little mineral and protein. On the other hand, soybean hay contains a great deal of both protein and mineral matter. It is absolutely impossible for the cow to make any one of these take the place of another. If we feed too much of one and not enough of another then the surplus of one will go to waste because we didn't have our feeds balanced and besides we will not get as much production and profit from the cow as we should. Then what we want to learn is which feeds serve each purpose and how much of each to feed. In order to do this, we will take up each of these constituents as we have named then.

The Water Supply.—It seems strange that it should be necessary to mention this since a liberal supply of pure fresh water is available with little or no effort or cost on the average farm. Yet it is a fact that

the profits from cows are very materially reduced on a great many farms simply because cows do not get enough pure water. Since 56 per cent of the cow's body is made up of water and 87 per cent of her milk is water, we should readily see that she needs to consume large quantities of it. An ordinary cow will drink about 12 gallons of water a day and a real high producing cow needs more.

A cow should have all of the water she wants and should have it as often as she wants it. This water should be clean from a running stream or spring or direct from a well. A stagnant pond is not only a source of filth but is likely to be dangerous as a disease spreader at any time.

This water should be at a reasonable temperature. No cow can drink enough ice water to maintain her body and produce a reasonable flow of milk. If the cows are being watered from a tank in the winter time, it will always be found economical to arrange a tank heater or other means of bringing the water up to at least the temperature at which it comes from the well before watering them.

Fig. 11.—A Missouri Dairy Club on a judging tour.

IV. THE CLUB TOUR

In visiting the homes of the club members the score card as printed on page 13 should be used in comparing their cows.

V. MINERAL FEEDS FOR COWS

As was mentioned in the last lesson, the cow needs feeds that contain mineral matter to keep up her bones, teeth, and muscular tissues as well as to make milk. Milk contains a great deal of mineral and especially lime. A quart of milk contains as much lime as 30 pounds of beef or 23

pounds of potatoes or 11 loaves of white bread. Milk contains a great deal more lime and mineral matter than any other common human food. We need this lime to make teeth, bones and muscles and most people who drink plenty of milk from infancy are strong and have good teeth for this reason.

But the cow must be provided with feeds that contain lots of mineral matter if she is to have them to make milk from. The most important mineral is lime. The following table shows the approximate number of pounds of lime in each ton of the different feeds.

THE AMOUNT OF LIME IN DIFFERENT FEEDS

Kind of Feed	Pounds of Lime per Ton of Feed
Alfalfa hay	39 Pounds
Soybean hay	35 Pounds
Red clover hay	32 Pounds
Corn stover	13 Pounds
Wheat straw	6 Pounds
Millet	6 Pounds
Timothy	5 Pounds

From this we will see at a glance the importance of alfalfa, soybeans and clover as a source of mineral matter for the cow. The cows should always have all of one of these kinds of hay that she will clean up once a day during the entire feeding season.

Salt is another mineral which should be mentioned. A cow should always have all of the salt that she wants. For a cow in milk this will vary from one to two ounces a day. She may be given free access to it or it may be mixed in the grain ration at the rate of one pound of salt to every 100 pounds of the grain mixture.

VI. PROTEIN FEEDS

These are the kinds of feed that go mostly to build up muscles and lean meat. Quite a bit of protein is also found in the bones, hair, skin and other parts of the body. Milk also contains very large quantities of protein which is another reason why it is such a good human food.

A cow must have a liberal supply of feeds that contain protein in order to be a good milk producer. It takes seven-tenths of a pound of protein a day just to keep a 1,000-pound cow alive. In addition to that she needs about half a pound of protein for each gallon of milk she produces. So we should know just what feeds are highest in protein and should furnish her with enough of them. Some common feeds with the amounts of protein they contain are shown at the top of page 30.

From this we see very readily that among roughage feeds, alfalfa, soybeans, and clover are our very best sources of protein. Also our grain feeds, soybean oil meal, cottonseed meal and linseed oil meal are our best sources of protein.

AMOUNT OF PROTEIN IN DIFFERENT FEEDS

Kind of Feed	Pounds of Protein in Each Hundred Pounds of Feed
Soybean hay	11.7 Pounds
Alfalfa hay	10.6 Pounds
Clover hay	7.6 Pounds
Orchard grass	4.7 Pounds
Timothy hay	3.0 Pounds
Corn stover	2.1 Pounds
Corn silage	1.1 Pounds
Wheat straw	0.7 Pounds
Soybean oil meal	39.7 Pounds
Cottonseed meal	37.0 Pounds
Linseed oil meal	30.2 Pounds
Wheat bran	12.5 Pounds
Ground oats	9.7 Pounds
Ground corn	7.1 Pounds
Corn and cob meal	6.1 Pounds

It is worth while to mention here that protein and mineral matter are the two kinds of feed of which we are short on nearly all Missouri farms. These are feeds that can be supplied very cheaply through home grown soybeans, clover or alfalfa, and if grown and fed will very greatly increase the profits from the average herd. Any club boy who does not have some one of these hay crops at home, will do well to raise a little of one of them along with his calf club project.

VII. ENERGY FEEDS

The last constituent to which we referred in Meeting III was the carbohydrates and fats or energy feeds. These are usually referred to as energy foods because they furnish energy and heat for the body. They include feeds which contain lots of fat, starch and sugar. They are needed to maintain the fatty portions which are found to a greater or less extent throughout the body. Milk also contains a great deal of fat as well as lots of milk sugar. These feeds are needed to furnish the fat and the milk sugar to go in milk.

A cow weighing 1,000 pounds needs about 7 therms of energy feeds just to keep her alive. Then she needs about 2½ therms more for each gallon of milk she produces.

Some common feeds with the amount of energy in each 100 pounds are:

THERMS OF ENERGY IN DIFFERENT FEEDS

Kind of Feed	Therms of Energy in Each 100 pounds of Feed
Soybean hay	41.9 Therms
Alfalfa hay	41.0 Therms
Clover hay	43.3 Therms
Orchard grass	44.7 Therms
Timothy hay	45.5 Therms
Corn stover	44.0 Therms
Corn silage	16.6 Therms
Wheat straw	36.2 Therms
Soybean oil meal	44.8 Therms
Cottonseed meal	41.2 Therms
Linseed oil meal	47.7 Therms
Wheat bran	48.4 Therms
Ground oats	60.7 Therms
Corn	74.6 Therms
Corn-and-cob meal	72.0 Therms

From this it is seen that so far as the grain ration is concerned, corn chop or corn-and-cob meal is usually our best source of energy feeds There isn't much difference between the composition of the different roughages but it is better for the animals to have them depend on getting their protein and mineral feeds from a legume hay like clover, alfalfa or soybeans and their energy feed from corn silage, corn stover cane or kafir.

VIII. REQUIREMENTS OF A DAIRY RATION

Now that we have found out the composition of different feeds, we have taken our first step towards learning how to select a ration that will get the most results at least cost. Before we take up our lesson on selecting rations, however, there are some other things we should consider about the different feeds and their effects on the animal. A ration might be balanced and contain just what the cow needs to make milk and yet not be good for the cow because there is something about it to make it unhealthy.

So that in addition to the four chief constituents of a ration which we have studied we should keep in mind the following six factors whenever we start to select a ration:

A succulent feed when given with other roughages and grains render them more palatable and aids in their digestion. For instance: June grass pasture is Nature's best feed for the dairy cow, although it contains 80 per cent water. Corn silage is perhaps our best and most economical succulent feed, since roots and soiling crops, though capable of serving the same purpose, are usually more expensive. Beet pulp and molasses are not succulent feeds, but where there is no succulent feed either make a desirable addition to the ration since both exert a beneficial effect on the bowels.

Palatability is important, for it is essential that a cow's feed appeal to her appetite. Make the feed palatable by keeping the mangers clean and by feeding three or more different grains. Greatest returns may be expected only when the cow enjoys her feed.

Variety in the ration means palatability and gives greater assurance of sufficient mineral matter in the ration. While variety is not so essential for low producing cows, it is desirable to have at least four plants represented in the entire ration including both roughage and grain feeds.

Bulk is necessary because a cow's stomach is especially adapted to handle bulky feeds. A ration deficient in roughage does not seem to satisfy the cow regardless of the amount of grain she receives. Bulk is closely associated with palatability. Therefore in choosing bulky feeds dry roughages such as hay are usually not sufficient but some succulence such as silage or roots seems necessary to bring about an ideal condition.

Economy in feed selection often means the difference between profit and loss. Home grown feeds usually furnish nutrients more cheaply than they can be purchased. Usually, therefore, every dairyman should grow all the feed possible and when necessary to purchase feeding stuffs select those which furnish the nutrients desired most economically.

Low costs of nutrients rather than low price per hundred-weight is the proper measure of the relative economy of feeding stuff. Dividing the cost of 100 pounds of feeding stuff by the pounds of digestible protein which it contains gives the cost of a pound of protein in that particular feed. In like manner dividing the cost of 100 pounds of a feed by the amount of energy gives the cost per pound of total nutrients.

For example, it is desired to determine whether cottonseed meal or linseed oil meal is the more economical when either can be bought for $50 per ton or $2.50 per hundred-weight. One hundred pounds of cottonseed meal contains 37 pounds of digestible crude protein. Dividing $2.50 by 37 we get 6¾ cents as the cost of 1 pound of digestible crude protein. In like manner, 100 pounds of linseed meal contains 30.2 pounds

of digestible crude protein. Dividing $2.50 by 30.2 we find that the protein supplied by linseed oil meal costs 8¼ cents a pound. The relative cost of energy feeds is determined in a similar manner. The figures thus obtained are worthy of consideration by every feeder as they denote the relative cost of the really useful, growth-promoting, milk-stimulating, food nutrients.

It must be remembered, however, that the best rations cannot be computed on the basis of costs alone, but consideration must be given to balance of nutrients, succulence, palatability, variety, and bulk. As a fundamental principle, however, it is well to determine the cost per pound of nutrients in available feeding stuffs. The feeder is then in a position to select those feeds which mixed together will furnish all the requirements of a good ration. It must also be borne in mind that this method of studying the comparative economy of feeding stuffs, while fairly accurate when feeds of similar composition and general characteristics are compared, is not altogether applicable when feeding stuffs of widely varying composition and characteristics are considered.

Balance of Nutrients is essential. If we are to get maximum profits from our cows, we must supply nutrients in such quantities and of such quality as to keep them at their maximum production. In other words we must furnish our cows, water, mineral matter, protein and energy feeds in the amounts needed or our production will be reduced and much of our feed wasted.

IX. SELECTING RATIONS FOR MILK COWS

The first thing to consider in selecting a ration is the feeds available, especially the kinds of roughage, and with particular reference to whether a leguminous hay and a succulent feed are available. The second step is to select a grain mixture that, with the roughages available, is best suited for general use and then to feed it to the whole milking herd according to the individual requirements of the cows.

Every dairy farmer welcomes the time when he can turn his cattle out to pasture, for experience has taught him that it is late spring or early summer when the cows are on luxuriant pasture that the dairy herd normally reaches the maximum production of the year. Pasture grass furnishes the choicest feed for dairy cattle; for not only is the supply of nutrients liberal but also the feed is palatable and succulent, and good pasture is rich in protein, mineral matter, and vitamines.

Combinations of hay, silage or roots, and suitable grain make desirable and profitable rations for dairy cows when all other conditions

relating to care and management are satisfactory. Good alfalfa, clover, soybean, or cowpea hay, together with good corn silage, and a well selected concentrate mixture, provides a ration that is approximately equal to good pasture. The better the hay and silage which constitute the roughage, the simpler the grain mixture can be. When silage or roots and legume hays are not available, more expensive grain mixtures and and more liberal feeding of them is necessary.

We are now ready for the thing that we have been preparing for ever since we started this series of lessons on feeding. We are ready to select the best ration for our cows To start with we want to consider what kind of roughage we have, and then select grain rations to go with the feed we now have on hand. We have already learned in Meetings V and VI that there are two distinct kinds of roughages. One of these is

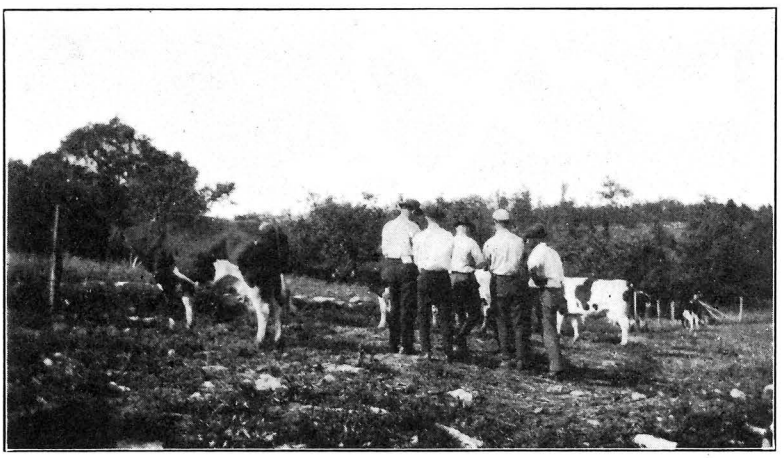


Fig. 12.—A Missouri Dairy Club in training for the state contest.

that which contains lots of protein and mineral matter. We usually refer to this group as legume hays. It includes alfalfa, soybeans, clover and cowpeas. The other group contains quite a bit of energy food but little protein or mineral matter. It includes corn silage, corn stover, kafir, sorghum hay, orchard grass, timothy, oat hay, and millet.

Naturally on any farm, we have either (1) a roughage or combination of roughages that is high in protein, or (2) a roughage or group of roughages that is low in protein, or (3) a roughage that is high in protein and one that is low in protein. Keeping this in mind, all we need to do is to find out what kind of rough feed we have and pick out a suitable grain ration to go with it. In the following rations it will be seen that we use a

greater proportion of high protein grain feed where we do not have a legume hay.

Medium Protein Roughages.—Silage, roots or other non-legumes when fed in approximately equivalent portions with alfalfa, clover, cowpea, soybean, or other leguminous roughages, give the best results. The following types of grain mixtures are well suited to this type of roughage.

1.	2.
400 lbs. ground corn	400 lbs. ground corn
200 lbs. wheat bran	200 lbs. wheat bran
100 lbs. cottonseed meal or	200 lbs. ground oats
100 lbs. cracked soybeans	100 lbs. cottonseed meal
	100 lbs. linseed oil meal

Low Protein Roughages.—Silage, roots, timothy hay, corn stover, mixed hay and other non-legumes or any combination of these roughages in order to give satisfactory results should be fed with grain mixtures such are listed below.

1.	2.
100 lbs. ground corn	200 lbs. ground corn
100 lbs. wheat bran	100 lbs. wheat bran
100 lbs. cottonseed meal or	100 lbs. ground oats
100 lbs. cracked soybeans	100 lbs. cottonseed meal
	100 lbs. linseed oil meal

High Protein Roughages.—Alfalfa, clover, cowpea, soybean or other legumes, singly or in any combination gives good results with such grain mixtures as are here suggested.

1.	2.
300 lbs. ground corn	400 lbs. ground corn
100 lbs. wheat bran	200 lbs. ground oats
50 lbs. cottonseed meal or	100 lbs. wheat bran
50 lbs. cracked soybeans	50 lbs. cottonseed meal
	50 lbs. linseed oil meal

Under usual herd practice, ground corn, hominy feed, corn-and-cob meal, ground barley, ground wheat, and similar feeds may be regarded as of practically equal feeding value and any one or any combination of two or more may be substituted for any other pound for pound. In like manner wheat bran, and ground oats may be substituted one for the other and in a similar manner cottonseed meal, linseed oil meal, gluten feed and cracked soybeans may be substituted pound for pound for each other.

X. FEEDING RECOMMENDATIONS

We have now learned about the constituents of different feeds and the purpose of each. We have also learned the requirements of a dairy ration and how to select a ration to fit our needs. Our next and last step is to learn how much of this feed to give to different cows under different conditions and at different seasons.

For the Winter Ration*.—(1) Feed all the roughage the cow will clean up. This will be approximately 3 pounds corn silage and 1 pound of hay, or 5 to 6 pounds of roots and 1 pound of hay, or 1 pound of dried beet pulp soaked 12 to 24 hours before feeding and 1 pound of hay, or 2 pounds of legume hay or other dried roughage, for each 100 pounds of live weight. Where at all possible it is desirable that both a succulent feed and a leguminous hay be used in the roughage portion of the ration. The most economical production of milk is not ordinarily otherwise possible.

(2) Feed the grain mixture according to the amount of milk produced. This means about 1 pound of concentrates for each 3 to 3½ pounds of milk produced in the case of a Jersey or Guernsey, or for each 3½ to 4 pounds of milk produced when feeding an Ayrshire, Brown Swiss, or Holstein.

For the Cow on Pasture.—Many farmers make the mistake of turning their cattle on pasture too early in the spring. This not only reduces the amount of grass for the rest of the season but is apt to cause a fall in the milk yield of the cow, for this early pasturage is so watery that the cows cannot consume enough of it to maintain their production. It is best to wait until the grass is more mature and also to continue giving the cows some hay and silage and some grain in the barn for a time after they are turned on pasture. Some good rules for summer feeding follow.

When on good pasture it is not usually economical to feed grain to cows producing small to average quantities of milk; but heavy producers require more nutrients than they can get from the grass alone. One point of importance that has been observed in connection with feeding of grain on pasture is that cows receiving grain produce better after the pasture season is over and this should be taken into account in considering the advisability of feeding grain.

The grain mixtures suggested for winter feeding are equally suitable for summer feeding excepting: (a) it is often desirable to reduce the proportions of heating feeds such as corn and of laxative feeds such as oil

*From Missouri Experiment Station Circular No. 115 by Prof. A. C. Ragsdale

meal, and (b) the proportion of high protein feeds such as cottonseed meal, gluten feed, or linseed oil meal may usually be reduced about one-fourth to one-third with economy.

A Jersey or Guernsey cow producing as much as 20 pounds of milk daily should receive while on pasture about 3 pounds of grain and in the case of heavier producers one additional pound for each 3½ pounds of milk up to 30 pounds. For a production of more than 30 pounds of milk an extra pound of the grain mixture should be given for each additional 2½ to 3 pounds of milk produced. A cow producing 40 pounds of milk daily will thus receive about 10 pounds of the grain mixture and about 14 pounds for a production of 50 pounds. In the case of a Holstein, Brown Swiss, or Ayrshire, feed 3 pounds of the grain mixture if the daily milk production is as much as 25 pounds. Feed an extra pound for each additional 3½ pounds of milk produced up to 50 pounds. A cow producing 50 pounds of milk daily would thus receive approximately 10 pounds of the grain mixture. For a production above 50 pounds it will usually require an extra pound of grain for each additional 3 pounds of milk produced.

During the periods when the pastures are short, supplement them with silage or some green feed in addition to the grain mixture. If this is not done cows will drop in milk flow and run down in flesh so that they cannot be brought back to a satisfactory milk flow during the following winter. If soiling crops are used it is necessary to feed 40 to 50 pounds or more to supply as much dry matter as 30 pounds of silage or 10 pounds of hay. Under Missouri conditions silage is usually more economical than soiling crops for supplementing short pastures.

General Consideration.—The particular order of feeding grain and roughage is not one of importance for when grain and hay are eaten separately they are thoroughly mixed in the paunch of the cow. It may be said, however, that in most instances the cow seems better satisfied when the grain is given first, and with it out of the way, she fills up on the roughages before her. Hay and other dry roughages also fill the air with dust if fed before milking. Silage, turnips, or other feeds with a marked odor should be given only after milking.

The live weight of a cow is a good index to whether she is being fed a proper amount, but good judgment must be used in regulating the ration by observing this condition. It is expected that a cow will lose weight during the first few weeks of her lactation period, and that she will gain in weight toward the end of the milking period.

Heifers in milk will naturally require somewhat more feed than mature cows yielding the same amount of milk because they require

some nutrients for growth as well as for maintenance and milk production. Liberal feeding of the heifers results not only in larger immediate production but makes greater profits possible throughout the life of the heifer.

FEEDING DRY COWS

Largest profit during the milking period may be expected only from cows that have been put in good condition during the dry period. Cows that are thin at calving time never have an opportunity to do their best.

Silage and a legume hay are the best foundation of a ration for the heifer or dry cow. The fitting ration should be fed liberally (from 7 to 12 pounds a day) for a period of four to six weeks before calving, excepting that within a week or ten days of calving it is best to change to a lighter and mildly laxative ration. Equal parts of corn or hominy feed, wheat bran, ground oats, and from 10 to 25 per cent of linseed oil meal approaches the ideal as a grain mixture for the preparation period. A week or ten days before calving time materially reduce or eliminate the corn from the grain mixture and reduce the amount of grain given to from 3 to 7 pounds per day. For the first few days after calving a bran mash or the same grain mixture that was used the week before calving is very satisfactory. If everything goes right the change to the milking ration may be begun three or four days after calving. The feed will then be increased to the limit of the cow's appetite. Experience indicates that this increase should not be more than 1 pound per day excepting in rare cases where the feeder knows his individual cow.