Teaching Dairy-Cattle Selection

Circular 495

UNIVERSITY OF ILLINOIS   . . .  COLLEGE OF AGRICULTURE
Agricultural Experiment Station and Extension Service in Agriculture and Home Economics
This manual of teaching methods is prepared for leaders of 4-H club dairy projects, as a supplement to Illinois Circular 486, Selecting Dairy Cattle.
Teaching Dairy-Cattle Selection

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If the hundreds of boys and girls enrolled in dairy projects in 4-H clubs in Illinois are to develop desirable skills in selecting dairy animals, they must receive carefully planned and well-presented courses of instruction in the fundamentals of dairy-cattle selection. For whatever purpose the instruction may be intended—whether for training club members for the selection of animals to be used in dairy projects, or preparing future farmers for the choosing of foundation animals for the farm herds, or training teams for judging contests—the skills to be developed and the methods of instruction are largely the same.

Good teaching methods are of course fully as essential in teaching the selection of dairy cattle as in teaching other subjects. They must be directed toward two different but closely connected objectives: the imparting of knowledge and the development of skill. The ability to be developed thru the teaching of dairy cattle selection—that of choosing a good dairy animal from among poorer ones on the basis of both external appearances and production records—depends first upon knowledge of the essential characteristics of dairy animals and secondly upon skill in perceiving and comparing the outward signs of those characteristics. The necessary knowledge will be acquired thru the study of materials—either the animals themselves or photographs and drawings of them, production records, pedigrees, charts, and descriptions. But skill in making comparisons and arriving at decisions will come thru practice in applying the knowledge. The twofold nature of this sort of instruction, must be kept constantly in mind by club leaders.1

The various steps in the process of teaching dairy-cattle selection therefore are logically the following:

1. Identification and study of the characteristics of the different breeds of dairy cattle.
2. Study and use of the score card for rating dairy cattle.
3. Practice in the comparative selection of dairy cattle on the basis of score-card ratings, and in the preparation of well-organized reasons for the selection.

1In this discussion of teaching methods the term “club leader” is used interchangeably with “teacher” and “4-H club member” with “student.”
4. Study of production records and pedigrees—how they are made, and their value and use in the selection of dairy cattle.

5. The use of production records and pedigrees in making selections of animals, and the combining of the use of these records and pedigrees with the selection of animals on the basis of type.

Each of these steps is highly desirable in an adequate course of training for selecting dairy animals. In the following paragraphs each is discussed briefly and methods and devices for teaching are suggested.

**IDENTIFICATION OF BREEDS**

*Use pictures and descriptions of typical animals of the five most important dairy-cattle breeds.*

Only by constant reference and comparison can club members learn to recognize readily the distinguishing features of the different breeds and the characteristics of "true-type" dairy animals. Tho they may be able to tell at a glance which animal is a Jersey and which a Guernsey or Holstein, they may nevertheless be practically ignorant of many of the less obvious distinguishing traits. And inasmuch as the animals themselves are not always conveniently at hand, pictures (preferably in color) and accurate descriptions should be used.

Suitable pictures and descriptions may usually be found in textbooks, in bulletins and circulars of the extension services of the state agricultural colleges, in breeders' association journals and circulars, and in sales catalogs.

*Have club members keep notebooks listing the distinguishing features of the different breeds.*

Finding information for himself and organizing it in his notebook will help a boy to retain the necessary facts about the different breeds and will furnish a ready source of reference. In a one-page table the different traits of each of the five breeds may be listed:

- Weight of mature bulls
- Weight of mature cows
- Weight of calves at birth
- Color of coat, including such special features as color of switch, topline, etc.
- Shape of horns
- Disposition or temperament
- Other distinguishing features (such as color of muzzle)
- Average production of milk (pounds)
- Average percentage of butterfat
- Names of some of the outstanding families or bloodlines
Pictures and drawings of typical animals of the different breeds should also be included in the notebook. Each boy should trace an outline diagram of a true-type animal of each breed and should fill in with crayons the appropriate colors and patterns.

**TEACHING SELECTION BY TYPE**

**Fixing in Mind an Ideal of Type**

*Use true-type sketches to test members' knowledge of characteristics of the breeds and of names of the parts of a cow's body.*

A copy of the sketch of a true-type dairy cow on page 28 may be made by using carbon paper and good quality letter paper and tracing with a pencil. Additional copies may then be made by a mimeograph or other duplicating machine, or, if such a machine is not available, the students may trace from the carbon copy. These tracings should be used for drill and for testing the ability of the students to point out the distinguishing features of the different breeds, and for practice in naming the parts of a cow's body (see Illinois Circular 486, Fig. 9, page 28). Continue such drill until each student can fill in the diagram completely and accurately *from memory.*

*Use true-type sketches and pictures of true-type animals as standards in studying the conformation of individual animals.*

Ability to give an animal an accurate rating according to a numerical scoring system depends upon the ability to compare the animal with an ideal form or type held in the mind. One must be able to visualize the true-type animal of each breed. Use pictures of true-type animals (these may be obtained from the different breed associations) and the true-type sketches to teach careful observation of the ways in which individual animals depart from the ideal form. Give the boys practice in comparing with the true-type pictures and sketches the other pictures obtained from breeders' journals or elsewhere. For example, ask them to indicate on the sketches the faults of rump, topline, or udder of one of the cows pictured.

*Check with living animals the identifying characters that are taught.*

After the boys have made a thorough study of the distinguishing features of the different breeds, the next step is to visit farms where the animals themselves may be seen and the different features and variations pointed out. Each boy should take with him the sketches of true-type dairy cows for comparisons.
True-type Holstein cow

True-type Brown Swiss cow
True-type Ayrshire cow

True-type Guernsey cow
Study and Use of the Score Card

The dairy-cattle score card (Circular 486, pages 32 and 33) is a numerical evaluation of the true-type dairy animal. It is a general-purpose score card based on the best features of all dairy-cattle breeds; and the scorer is expected to be able to visualize the true-type animal of the breed represented.

The purpose of utilizing the score card in this way is to direct the member’s close attention to each important feature of the animal, so that he will learn to analyze each feature and assign a numerical value to it on the basis of the extent to which it departs from the ideal. Without the score card the beginner in dairy-cattle selection is likely to observe only a few of the more prominent features, such as the size of the animal, the feeding capacity, and the size of the udder, and to overlook the rest of the fourteen important features listed.

Encourage members to commit to memory the main headings, subheadings, and numerical values assigned on the score card.

A thorough understanding, on the part of each boy, of the purpose and use of the score card is essential, for the material there outlined eventually becomes the conscious or unconscious background upon which he will draw in formulating the reasons for his selections. The group or class should consequently be drilled in reproducing the main
portions of the score card from memory and in explaining the mean­nings of the headings and subheadings. The descriptive material under the subheadings need not be memorized.

**Use pictures of animals for practice scoring.**

The practice exercises (page 5) in comparing pictures of animals with the true-type pictures and sketches should now be carried one step further—the observations should be recorded on the score cards (see Circular 486, pages 32 and 33).

**Provide practice in scoring living animals.**

After the boys have had some practice in scoring animals from pictures, they should be given practice in scoring living animals. The first animals scored should not be too nearly alike: they should be of the same breed, but one should be the best animal available and the other markedly inferior.

Scoring exercises should be continued until the students have become proficient in the use of the score card. Do not underestimate the value of practice in scoring. One who is skilful in scoring is usually skilful also in comparative selection; but one who does not understand the score card or lacks proficiency in its use will acquire skill in comparative selection more slowly and will probably be poor in formulating the reasons for his placings.

**Comparative Selection on Basis of Type**

**Make gradual shift from scoring to comparative selection.**

Scoring with the score card and making comparative selections are not separate and unrelated activities, and it is a serious mistake to consider them so in teaching. Tho “ranking” of one animal higher than another is what comes to the fore in comparative selection, there must be reasons for the ranking, and scoring forms the basis for such ranking, whether or not there is a conscious assigning of numerical values to the different characteristics.

**Start comparative selection by comparing photographs.**

Photographs and lantern slides, particularly photographs, lend themselves admirably to use in beginning the study of comparative selection. Good photographs of a dozen different animals in each breed may be used time after time by choosing different combinations for comparison. If hung by clips from a wire or molding, they may be placed in close proximity and the order may be quickly changed.
The photographs may be scored in the same manner as living animals. On the basis of the total scores, one animal will be rated first and another second.

At first, in order to build up the confidence of a boy in his own judgment, the animals for comparison should show distinct differences which can be readily evaluated. Attempting to place animals that are very similar is confusing to the beginner and tends to weaken or destroy any skill already acquired. This principle should be followed also in beginning comparative selection of living animals, discussed below.

After the boys become skilled in the use of the complete score card, the comparative scoring may be simplified by using cards having only the four main divisions of the score card and without the assignment of numerical scores. For example, the cow designated 1 may be given first place on body form, first place on constitution, and first place on mammary development; whereas 2 is scored first on feeding capacity, and second on body form, constitution, and mammary development. 1 therefore ranks above 2. In the same way three animals (1, 2, and 3) may be compared, and finally four animals.

The use of the score card in comparative selection should be continued until the students have formed the habit of analyzing each of the main features of each animal and of giving it a rating, so that the final rankings will be based upon scores.

Begin comparison of live animals by comparing other animals with the best available representative of the breed being studied.

The animals to be compared should not be too nearly alike, as was pointed out in the discussion of the comparison of photographs. The best animal available should be used as a basis upon which the merits of the others may be estimated.

Preferably all the animals of a group for comparison should be about the same age, and in the same stages of lactation or gestation. When they are not comparable in these respects, that fact should be pointed out to the club members and instructions should be given to make allowance for the differences. For example, in a group comprising one three-year-old and three mature cows, the boys should be instructed to evaluate all on the basis of mature cows, visualizing the three-year-old as she will be when she is mature. To do this sort of comparing well requires of course considerable experience and knowledge of dairy animals—qualifications which club members are not expected to have in any high degree.
Identify the animals by numbers.

Animals for comparison should be identified by numbers. When facing in the same direction as the animals, designate the animal farthest to the right as 1, the next 2, and so on.

Do not let the boys talk to each other while they are placing a ring and preparing reasons.

Accepting suggestions from others tends to make a student vacillate in his opinions and prevents him from establishing a firm judgment. Ability in selection will be developed much more rapidly if he forms his opinions independently, gives his reasons for them, and then modifies them only after receiving explanations from the leader.

Allow definite amount of time for ranking the animals and preparing the reasons.

The time usually allotted for placing a ring of four animals is 15 minutes, with 15 to 20 minutes more for writing the reasons. When the reasons are given orally the time usually allotted is 2 minutes per boy. After hearing the oral reasons the leader should discuss with the group his own placing and reasons, and then offer suggestions concerning the observations made by the members. Finally he should discuss briefly the entire ring, pointing out the extent to which the animals conform to ideal dairy type and standards for the breed, and whether as a group they have superior merit or are poor in quality.

Judge reasons as critically as placings, for the reasons are fully as important.

Members should be discouraged from attempting to work out a set of reasons to bolster up a haphazard placing. Do not permit snap judgments, even tho they happen to be right. Anyone can select animals by guesswork, and occasionally one entirely unfamiliar with the principles involved may guess the correct placing. But if sound and logical reasons are required, snap judgments will be discouraged.

A set of reasons should be judged upon its accuracy of analysis, correct emphasis, organization, and clearness and conciseness of statement. These are of course the features that should be stressed in guiding the preparation of reasons.

Directing the Preparation of Reasons

Formulation of a set of reasons is a natural outgrowth of the use of the score card. A student who has mastered the use of the card and who uses the main features of it as a basis for his placings
in comparative selection will automatically bring together his evaluations of each main feature of each pair of animals as part of a set of reasons. The placing of the animals and the reasons for that placing cannot be separated, for they originate together.

**Require a definite form of organization.**

Have the boys, in developing their reasons for placements, take the animals up in definite order and follow a systematic plan of discussion. A simple and direct comparison of only two animals at a time is the method usually followed. For example, when a boy states the reasons for placing four animals in the order 1, 2, 3, and 4, see that he first makes a comparison between 1 and 2, bringing out in detail the superiority of 1 over 2 and also any respects in which 2 may be superior to 1. And then, in the following order, 2 should be compared with 3 in the same manner, and 3 with 4, and 4 should be discussed as an individual, the chief faults of 4 being pointed out and rated with respect to the other animals in the group.

In order to avoid monotony and to give the boy an opportunity to demonstrate that he has analyzed the individual animals carefully, the form of organization may be varied somewhat. In comparing 1 and 2, he may list all the major points in which 1 is superior to 2 and discuss each in detail. Then in discussing the next pair, 2 and 3, he may take up each main point and discuss it completely before mentioning the next major point. The sample sets of reasons given on pages 14 to 16 illustrate these methods of presentation.

**Insist upon accuracy in description of the animals.**

Accuracy of analysis is the first and most important attribute of a good set of reasons. No matter how elaborate and detailed the reasons may be, if they describe the animals incorrectly they are valueless. *Good reasons* are possible only when the animals have first been evaluated correctly.

Careful reading of written reasons, or critical attention to oral reasons, is the leader's best guide to the particular points in which a member is weak. Sometimes the parts of an animal are not named correctly, or because of faulty knowledge of the score card too high a numerical value may be given to a minor feature. It is very common also for members to fail to fix in their minds the features of the ideal type. If any of these faults are evident, the member should be directed to review the parts of the work in which he is deficient.

Accuracy in rating—giving major emphasis to important features and less emphasis to minor features—is a particularly important skill
Encourage clearness and conciseness in the statement of reasons.

Reasons that are given orally within a period of two minutes, or that are composed and written within a period of 15 to 20 minutes, must necessarily be expressed in clear, simple language and must be direct and to the point if they are to be adequate and complete. Members will acquire this ability only when they are thoroughly familiar with the score card, have had much practice in scoring animals and are confident in their judgments, and have had the opportunity to hear well-formulated reasons presented by capable leaders. Skilful leaders will therefore lose no opportunity to point out how comparisons can be made more simply and directly and to give examples of how the reasons should be stated.

Hold frequent practice sessions.

Proficiency in the preparation of written reasons or in the giving of oral reasons can be acquired only thru consistent practice in making placings and preparing or giving reasons. After a member has given all the sets of reasons, any weaknesses in his reasons should be pointed out and methods of improvement suggested.

In the giving of oral reasons, a competition or debate between two or more members concerning their reasons for different placings is a means of maintaining interest.

Sample Set of Reasons Based on Drawings

The following set of reasons, on pages 14 and 15, has been prepared to explain the placing of the ring of cows represented by the four drawings on those pages. The placing and discussion of this ring is obviously limited because only two dimensions, length and depth, of the animals can be examined. Other factors, such as width of body, spring of ribs, quality of hide, and width and quality of udder, cannot be determined from the drawings.
Reasons for placings:

I placed this ring of mature dairy cows 3-2-1-4. I placed 3 over 2 because she excels in body form and mammary development. In body form 3 more nearly resembles the ideal type of dairy cow. She is nicely balanced with a long level topline, a beautiful udder, and a barrel that is long, deep, and well proportioned. In mammary development 3 is superior because her udder is attached higher in the rear; it is more nearly level on the floor; it has a more uniform placement of teats; and it is attached more neatly in front.

I placed 2 over 1 on constitution. 2 shows much more strength and stability than does 1. Because she is deeper in forebarrel and heart girth, she has more chest and lung capacity. 2 is superior to 1 also in mammary development, altho the udder of 2 is not perfect. 1's udder is undesirable.
Revised for placings (concluded):

because it appears to be breaking away in its front attachment. The udder is tending to become pendulous and the teats are placed too close together.

I placed 1 over 4 on feeding capacity, body form, and mammary development. In feeding capacity 1 excels 4 because she has a much deeper barrel. In body form 1 is better because she is a larger, more rugged animal. She has a longer, more nearly level rump and better conformation at the tail setting. In mammary development 1 is superior to 4 because her udder is larger, better attached, and shows evidence of greater productiveness.

4 is easily placed last in this ring. She lacks the feeding capacity essential in a good dairy cow, and her small udder lacks evidence of productive ability. Because of these deficiencies she cannot place higher in this ring.
Sample Set of Reasons Based on Real Animals

The next discussion involves a more detailed set of reasons, such as might arise if the four cows viewed in the drawings could be seen in real life. Actually the drawings were made from living animals, and the following set of reasons is based on the animals represented in the drawings. Many of the details cannot, of course, be checked accurately with the drawings; but the detailed set of reasons is given as an example of the fuller comparisons that may be made when living animals, instead of drawings, are compared. Note also the somewhat different order of development, as compared with the foregoing set of reasons.

I placed this ring of mature dairy cows 3-2-1-4. I placed 3 over 2 on body form and mammary development. In body form I considered 3 the outstanding cow in the ring. She is cleanly cut about the head and neck, neatly blended at the shoulders, and carries out straight and strong in topline. She is stronger in her back and loin and has a more perfect rump than 2. The rump of 3 is long and level from hook to pin bones, wide at the thurls, and has a very neat tail setting. In mammary development 3 is also far superior to 2. Her udder is attached higher and wider in the rear; it is more nearly level on the floor, and is attached more snugly in front. The udder is of such quality that there is little danger of its breaking from the body at either of its attachments. The teat placement of 3 excels that of 2. The teats are placed squarely on the udder, are nicely spaced, and are of uniform size.

I placed 2 over 1 on mammary development. Altho the udder of 2 is not perfect, it is not so faulty as the udder of 1. 2's udder excels in its attachments, both fore and rear, and is more nearly level on the floor, with a more desirable placement of teats. The udder of 1 is very poor in shape and lacks quality. The lack of quality is indicated by the heavy, meaty front udder, and the evidence of breaking away from the body at the fore attachment. 2 excels 1 also in feeding capacity. The greater capacity of 2 may be seen in comparing the underlines of the two cows. The underline of 2 is uniform, indicating a greater depth of forebarrel and greater heart girth. 1 is shallow in forebarrel, narrow in heart girth, and pinched back of the elbow.

I placed 4 last in this ring and considered it a very easy placing. In body form she is small in size, poor in quality, and lacking in refinement. She is especially faulty in rump and tail setting, the rump being rough and the tail attaching too high up on the rump. 4 is likewise very faulty in udder. Both the fore and rear attachments are deficient and the udder lacks quality. Altho 1 has been criticized for lack of feeding capacity, she is better in this respect than 4. 4 is extremely shallow in barrel, and this characteristic together with her very small udder indicates that she lacks the producing ability of the other three cows in the ring.
Selection of dairy heifers on the basis of type alone will now and then be distinctly disappointing, because some good-type heifers do not develop into good producers. It is much more difficult to select a good heifer (one that will become a high-producing cow) on the basis of type alone than to select a cow that is already a high producer. The reason is of course that some of the traits which appear promising in a heifer may change during growth so as to become undesirable. Thus it is especially important that the calves and heifers for 4-H club projects be selected upon a basis of production records and pedigrees as well as upon type. If a boy takes home to a grade herd a good-type registered heifer, and then a year or two later when the heifer freshens finds that she produces less than some of the grade cows of the same age, he is likely to be greatly disappointed and to gain the impression that purebreds are not as good as grades. Such disappointments may be largely prevented if production records and pedigrees, as well as type, are taken into consideration when the selection is made. Because of the uncertainty that must still remain as to the productive capacity of a heifer when she matures, and also because of the possibility of losing the heifer before she freshens and the returns from sale of milk begin to offset the original cost, club members should be discouraged from paying more than moderate prices for heifers.

Too often the training given to dairy club members in selecting dairy cattle is pointed directly toward participation in a judging contest. The training period for such participation is likely to be short and the preparation superficial. When selection is "taught" in this manner, the aftereffects may be very unfavorable, because the losers in the contest (90 to 95 percent of all who take part) are likely to feel that their time and efforts have been wasted. On the other hand, training in selection that is pointed to more than mere participation in judging contests, that includes a thorough study of type, production records, and pedigrees, is likely to be of lasting value to the club member. It will not only train him to participate creditably in contests, but also will prepare him for capable selection of animals for his herd, including both those purchased and those raised. Sound teaching of dairy-cattle selection thus requires that training be given in the use of production records and pedigrees, as well as in the study of type.
Procedure in Teaching Use of Records and Pedigrees

Plan a definite program of study periods and visits to herds.

As is true of the teaching of any other subject, the leader should know exactly where he is going and the route by which he will get there. It is suggested that he employ both study meetings and field trips in teaching the use of records and pedigrees. The field trips should consist mainly of visits to herds of dairy cattle upon which production records have been kept and also to herds (usually a smaller number) for which the owner has written pedigrees.

See that the club members know beforehand what is to be attained by each visit to a herd.

Before proceeding to an inspection of a herd, it is well to devote one or more meetings to a discussion of the various kinds of records in use, how these records are made, and the advantages and disadvantages of each. Information of this kind can be obtained from textbooks, circulars, and breed journals (see references, page 27).

In the meetings preceding visits to herds, club members should answer as fully as possible the questions included in the outline given on pages 21 to 26. Some of the questions, of course, can be answered only after consultation with dairy farmers during farm visits. Working over these questions previous to herd inspection will, however, stimulate the group to be on the alert to obtain needed information in a much more usable and exact form than if the subject were not carefully studied prior to the farm visits.

Have members canvass the community to discover for which herds production records and written pedigrees are available.

In a dairy community some of the members of a dairy-project club are likely to come from farms where production records are kept in a dairy herd improvement association or where advanced registry, or herd-improvement registry tests are being made. It is suggested that such members bring to meetings, for the study period, record books or copies of records from their own herds which will show the form of records being kept and which may be used as samples for group study. Owners of registered dairy cattle usually keep tabulated pedigrees of their herd sires and of the best cows in the herd, and sometimes of all their registered animals. Some members of the study group may be asked to make copies of these pedigrees and to bring the copies to the study sessions for the use of the entire group.

Valuable information for the study of pedigrees may also be obtained from breed journals and sale catalogs.
At farm visits require club members to record in their notebooks the answers to specific questions on production records and pedigrees and the relation between these and type in determining the value of an animal in a herd.

After a thorough study of the questions outlined on pages 21 to 26, all of the unanswered questions, together with those on which the answers are incomplete or not wholly satisfactory, should be copied into notebooks, leaving space for the answers. Each member of the group should be assigned the responsibility of asking for the answers to specified questions at each farm visited. All members should write the answers in their notebooks.

After the herd inspections discuss in study periods the various practices observed and information obtained.

In study periods following the visits to farm herds, the information obtained should be discussed and analyzed, conclusions should be drawn with regard to the desirability of the practices observed, and a special effort should be made to summarize the bearing of the points learned on the place of production records and pedigrees in dairy-cattle selection.

COMBINING SELECTION BY RECORDS WITH SELECTION BY TYPE

The exercises suggested in this section are planned along the lines of the procedure a buyer would logically follow on his first visit to a herd for the purpose of buying female breeding stock.

First a prospective buyer makes a mental appraisal of the cows, classifying part of them as having type sufficiently good to meet his requirements and others as definitely below his standards and to be given no further consideration. Then he asks for production records and pedigrees of those cows whose type is satisfactory; and on the basis of the records he makes further eliminations, leaving only those acceptable to him on the basis of type, production records, and pedigrees. From among this group, any of which is basically acceptable, the final selection would of course depend upon such considerations as age, nearness to calving, sire to which the cow is bred, and price.

Heifers are inspected in much the same manner as cows. After selecting the heifers of acceptable type, a buyer inquires about the dam of each, compares daughter and dam, and notes the dam’s record. After making further eliminations on this basis, he studies the individuality and pedigree of the sire of the heifers and also the type and production records (if any) of others of his daughters.
Plan for practice in checking comparative selection on basis of type by comparison of records.

On the assumption that breeders do have or should have definite standards for both type and production, some interesting exercises may be carried out to illustrate the combining of the two standards. The leader should select a herd of 10 to 15 cows for which production records are available. He should obtain the production record of each cow (including age at which record was made, number of milkings per day, kind of rations, etc.) but this information should not be given to the club members until after they have rated the herd on the basis of type.

Have members group the animals first on the basis of type.

Assuming that the herd contains 12 cows, the members, working individually, will choose three cows (one-fourth of the herd) having the best type and three having the poorest type. Or they may divide the herd into two groups, one composed of all the cows they think are acceptable on the basis of type for a high-class dairy herd, and a second group composed of all cows unacceptable even tho they might have suitable production records. The members will then list the cows in each group by number.

Have members select cows having acceptable production records.

After the members have made their selections on the basis of type, give them the production records for all cows in the herd, and also a figure to be used as a desirable herd average—for example, 350 pounds of butterfat annually. The figure assigned should of course be as high or higher than the average of the herd being studied.

In deciding whether a cow is acceptable for a herd having an average production of 350 pounds, some minimum value must be set. Probably a cow with a record of less than 250 pounds annually (mature age basis) would be rejected. For higher herd averages the minimum production allowed should of course be higher.

Members should now list all cows that are acceptable on both bases.

Answers to the following questions should be included in the notebooks: What proportion of the herd has qualified as acceptable? Do all the best-type cows have satisfactory records? Are some of the poor-type cows satisfactory from the production standpoint?
Use same procedure in selecting heifers.

The study may next be extended to the heifers in the same herd. Selection should be made on the basis of both type and dams' records. In case all the heifers are not from the same sire, the study may well include pedigrees of the herd sires and perhaps also production records of both the dams and granddams of the sires.

SUGGESTED OUTLINE AND QUESTIONS FOR STUDY

Below are given suggested study outlines for use by the leader, followed by suggested study questions and topics to be assigned to the club members.

I. Production records form a more reliable index of productivity than type.

A. Study outline:
   1. Cows of good type may differ in persistency of production and hence in yearly yields.
   2. Cows classed as high producers are usually much alike in type, yet one cow may produce 50 percent more than another of similar appearance; for example, one may yield 350 pounds of butterfat and another 525 pounds.
   3. Cows differ in capacity to transmit productive ability to their offspring. Herd sires also differ in this respect.

B. Study questions:
   1. What two general bases may be used as guides in the selection of dairy cattle?
   2. Which of these is the more reliable? Why?
   3. Do cows differ in persistency of lactation? If so, to what extent? Study the yearly record of a dairy herd, and tabulate the number of days each cow was milked. How great were the differences?
   4. Is it true that most high-producing cows are very much alike in type? If this is true, how can one distinguish, on the basis of type, between two cows where one cow produces 400 pounds of butterfat and another produces 550 pounds of butterfat?
   5. Do cows and herd sires differ in transmitting ability? How is transmitting ability determined? (Eckles, Dairy Cattle and Milk Production, ch. 14, offers interesting reading in this connection; also Circular 486, pages 17 and 20.)
II. A knowledge of both type and production is essential.

A. Study outline:
   1. Less than 2 percent of all the dairy cows of the United States are enrolled in D.H.I.A. work; and in dairy sections not more than 10 percent have production records.
   2. A cow needs a strong body in order to continue in production year after year.
   3. Unless careful attention is given to type in purchasing foundation animals, the retention of heifers from them is likely to produce, in the long run, a herd greatly lacking in constitution, in uniformity, and in sales appeal.

B. Study questions:
   1. Is it desirable to select cows and other dairy cattle on the basis of type as well as on production records? Why?
   2. For how many cows in the United States are production records available? What is your estimate with regard to the percentage of herds in your community which keep production records?
   3. Is there any relation between the strength of a cow's body and her ability to produce over a period of many years? Have you observed any cows in your herd or other herds which have been so constituted that they are unable to stand the strain of high milk production?
   4. Would the selection of herd sires and heifers being kept for herd replacement entirely upon the basis of production records be likely to result in the building up of a high-class dairy herd? What objections would there be to this method of selection?

III. Several different types of production records are in use.

A. Study outline:
   1. Private records may be kept by a farmer.
   2. Dairy herd improvement associations (or cow-testing associations) are in operation in most states.
   3. Advanced registry records are sponsored by the dairy-cattle breed associations and are limited to registered cows only.
   4. Herd-improvement registry records include production records of all registered cows in a herd, and may be combined with the herd-improvement-association plan.

B. Study questions:
   1. What kinds of production records are in use in dairy herds?
   2. Do any dairymen in your community keep private production records on their dairy herds? If so, do these records consist of weights of milk only, or do they include also the test of the milk? How often is the milk weighed? What method is used for calculating the yearly yield of each cow?
3. Are there any dairy herd improvement associations in op­era­tion in your community? How many farmers in your com­munity are members of such an association? Ask the opinion of some of the members as to the advantages and dis­advantages of membership in the association. What advan­tages do they list? Would they be willing to do without the services of the association? What disadvantages do they find?

4. Are any dairy-herd owners in your community doing advanced registry testing? If so, obtain their opinions as to its advantages and disadvantages. What proportion of the cows in these herds have advanced registry records? What use is made of these records?

5. Are any dairy-herd owners in your community doing herd-improvement registry testing? If so, obtain their opinions as to its advantages and disadvantages. How does herd improvement registry differ from advanced registry testing? What proportion of the cows in the herd have herd-improve­ment registry records? What use is made of these records?

IV. Production records are not comparable unless they were made under similar conditions.

A. Study outline:
   1. Conditions of feed and care differ widely. Some cows are kept in box stalls and fed very high quality feeds, while some others have ordinary farm care.
   2. Pastures are much better in some years than others.
   3. Milking three times a day increases production about one-sixth over milking twice a day.
   4. Some records are for 305 days and others for 365 days.
   5. A cow's production increases up to maturity and then declines.

B. Study questions:
   1. Are the production records made in one herd comparable to the records made in other herds?
   2. Are conditions of feeding and care exactly the same in all the dairy herds in your community? Are some cows kept in box stalls and given special care? Are some herds given only "farm" care?
   3. Do all farmers have the same kinds of pastures and are the pastures equally productive? How does the amount of feed obtained from pasture affect production records? Do the yields of pastures change from year to year, depending upon weather conditions?
   4. Do all farmers milk their cows the same number of times a day? How does milking a cow three or four times a day affect production as compared with milking twice a day?
5. When cows calve at yearly intervals, is the amount of production the same as when they calve at 15- to 18-month intervals?

6. Can the production record of a cow calving at less than mature age be compared fairly with the production record of a cow calving at mature age? If so, how is such a comparison made? (The leader here may make up a number of problems, using production records of cows ranging in age from two to six years, and may ask the members of the group to convert these records to a mature-age basis by means of the conversion factors given in Circular 486, pages 13 to 15, or in Henderson, Dairy Cattle Feeding and Management.) May the production record of a cow calving at two years of age be used as a reliable index of her productive ability? (See Eckles, Dairy Cattle and Milk Production, pages 181-182.) What relation does this have to the desirability of continuing the keeping of production records year after year, particularly in order to obtain records on all cows during their first lactations?

7. Is a knowledge of the milk yield of a cow of less importance, equal importance, or greater importance than a knowledge of the test of the milk of that cow? (It is suggested that the leader furnish the group with the actual records of milk yields of each of the cows in a herd and ask the members to compute the yields of butterfat, using the average test for the breed represented. Then compare these computed yields of butterfat with the actual yields.) How far wrong would the owner of the herd be in his estimate of the value of the cow had he used the average test for the breed rather than the actual test? Would the test alone be a reliable index to the value of the cow?

V. Production records are studied in the selection of dairy cows and heifers in order to obtain information on three important matters.

A. Study outline:
1. Production records are the best evidence of productive capacity.
2. The ability to transmit productive capacity to the offspring is estimated by comparing the production records of the dam with those of the offspring.
3. Length of the productive life of a dairy cow is very important and is best measured by recorded productions. A lifetime production of 3,000 pounds of butterfat by a cow has been suggested as a standard for the measurement of satisfactory longevity.

B. Study questions:
1. What are the main features to be considered in the selection of dairy cows and heifers by production records?
2. Do members of dairy herd improvement associations find that production records increase the sale value of their cows? If so, to what extent is the sale price increased in terms of dollars? In terms of percentage? Do heifer calves from cows having production records bring higher sale prices than heifers from untested cows? If so, how much higher?

3. What is meant by "transmitting ability" of an animal? How is the transmitting ability of a cow estimated? Transmitting ability of a sire? When the daughters of a cow or the daughters of a sire have records that are not comparable with regard to length, number of milkings, and percentage of fat, how can these records be averaged or compared?

4. What is meant by longevity? Are there any standards for longevity, such as minimum number of lactations or a minimum production record expressed in terms of pounds of milk or pounds of butterfat? (For a discussion of longevity in dairy cows and in dairy sires, see Circular 486, pages 17 to 20, and Fraser, Dairy Farming, ch. 5 to 10 inclusive.)

VI. Production records are even more important in the selection of dairy sires than in the selection of dairy cows and heifers.

A. Study outline:

1. The most reliable index of a sire's value for use in a dairy herd is obtained by "proving" the sire—that is, obtaining production records of not less than five of his daughters and their dams.

2. Sires are usually not less than five years of age when proved.

3. The proportion of sires that improve the production of a herd is startlingly small. Whether improvement is made depends, of course, partly on the level of production of the herd.

4. The production records of full sisters, half-sisters, dam, and other near relatives are important (in the order named) in the selection of a young sire.

5. Longevity of sires is as important as longevity of cows, but difficulties in herd management have resulted in the slaughter of a large number of sires before they are proved.

B. Study questions:

1. Why is it important to select sires on the basis of production records?

2. What is meant by a "proved" sire? Is a sire which has been shown to have decreased the production of his daughters as compared with that of their dams a proved sire? What is the minimum number of dam-daughter comparisons considered necessary in determining the transmitting ability of a sire?
Sketch of true-type animal for carbon tracing