Selecting Dairy Cattle

Circular 486

UNIVERSITY OF ILLINOIS - COLLEGE OF AGRICULTURE
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Selecting Dairy Cattle

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The selection of good cows and heifers for foundation stock or for replacing older or unprofitable cows in established herds, and the selection of sires capable of building up or maintaining high quality in a herd, are among the knottiest problems facing dairy farmers today. If the quality of a herd is to be constantly improved, ability to judge good type and to interpret production records and pedigrees is essential. Thousands of cows, heifers, and bulls are bought and sold for dairy purposes each year; and other thousands are selected by farmers from among the animals in their own herds to be retained or discarded. Many of the animals selected are worthy—they are good producers capable of transmitting to their offspring a similar capacity for satisfactory production. Others are not, and disappointments are not at all uncommon, especially in the selection of sires. As a matter of course, disappointments are most frequent among purchasers who are inexperienced or untrained in the fundamental principles underlying the selection of dairy cattle.

A skill to be acquired

Competence in selecting dairy animals, if it is gained at all, usually comes after long experience in seeing how various animals live up to the estimates made of them at the time they are selected. But, as is true of most skills, the time required to become proficient may be greatly reduced by careful training under the guidance of competent leaders. For example, 4-H dairy clubs, by combining such training with actual experience in care and management of cattle, afford one of the best ways for a boy or girl to learn how to select dairy cattle. Older farmers who have not had the benefits of such training must perforce pick up the knowledge in other ways. It is the purpose of this circular to point out the fundamental principles of dairy cattle selection, and to offer suggestions, both to 4-H club members and to older dairy farmers, as to the ways in which these principles may be put into practical use.

For owners or managers of purebred herds in which a substantial part of the income is derived from the sale of breeding stock, familiarity with the current ideas of other breeders concerning the
Fig. 1.—Dairy breeds differ in type and characteristics

Of the five major breeds of dairy cattle the Jersey excels in symmetry and development of the udder. The Jersey cow in the upper illustration shows the extreme dairy tendency, quality and refinement that are characteristic of the breed. The lower illustration shows a Brown Swiss cow having large size, large feeding capacity, strong constitution, and ruggedness characteristic of the breed. (For production records of the cows shown in Figs. 1-4, 5, 7, 10, 12, 13, and 17, see page 61.)
The Guernsey cow pictured above illustrates the characteristics desired in this breed, such as good dairy type and refinement. These qualities are somewhat less pronounced, however, than in the Jersey breed. The large size, together with the great capacity for feed and milk production characteristic of the Holstein, is shown in the lower illustration. Brown Swiss and Holstein cows weigh from 200 to 300 pounds more than cows of the Jersey and Guernsey breeds.

accepted type of the breeds (Figs. 1, 2, and 3) in which they are interested is very necessary. Such owners and managers should also be familiar with the pedigrees of their own cattle and with the popular bloodlines and families of the breed. The great improvements in pro-
Fig. 3.—The Ayrshire is distinctive in its breed characteristics

The Ayrshire breed is easily identified by its upturned horns, red and white color markings, good top lines, and well developed udders. In size the Ayrshire ranks midway between the Jersey and Holstein breeds.

Production and refinement in type which have brought dairy breeds to their present high levels of efficiency are due largely to the cooperative efforts of breeders who have been striving toward definite ideals.

Success for the individual breeder is partly dependent on his familiarity with the standards and ideals of the breed and on his ability to recognize how closely his own cattle approach the ideal. Particularly the breeder who shows his stock at fairs should be familiar with such standards and ideals. It has often happened that an owner had better animals at home than those he selected and led into the exhibition ring.

TWO BASES FOR SELECTING DAIRY STOCK

Most of the dairy animals bought and sold are selected entirely on the basis of type; that is, on the evidence which their external appearance gives of their ability to produce milk. Some, however, are selected solely because they or their dams have excellent records of production and good pedigrees, regardless of their conformity to certain ideals of dairy type. But in a practical program of herd improvement both these
bases of selection should be used—pedigrees and records of production to assure high productive capacity in the herd, and conformity to type to assure ruggedness and strength of body necessary to maintain high production over a long period of years. Simple and effective methods of measuring the milk yields and feed costs of cows are in use, so that a dairyman can readily determine whether a cow is producing milk profitably; and there are several agencies for making tests and keeping records of dairy cattle. The parts of a cow's body can be measured also, but no guides or charts have as yet been devised which give reliable information about the shape and size that each part must be in order that a cow can be an efficient producer. Long experience and observations of dairymen, however, together with the results of several scientific studies, indicate that there is a fairly well defined relationship between production of milk and butterfat and the form and proportionate size of certain parts of the cow.

In actual practice a competent judge of dairy animals usually goes about the selection of good animals from among others in the following way, whether he is selecting from his own herd or for purchase from another. First, if he is selecting mature cows, he appraises them all, setting apart either actually or in his own mind, those sufficiently good in type to meet his requirements. He then asks for production records and pedigrees of those that are satisfactory in type, and on the basis of the records he makes further eliminations, leaving only those that are acceptable to him on all three counts—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 bred, and price.

Thus in the hands of a competent herdsman these two bases for selecting cattle, records and conformity to type, are used so as to supplement each other. Neither is entirely reliable when used without consideration of the other; but when both are wisely used they reduce disappointments to a minimum.

**Production Records Only Direct Evidence of Productive Capacity**

When records are kept of the number of pounds of milk and of butterfat produced they furnish the most accurate indication of the productive capacity of a cow and a very reliable basis for selection. Records of the dam, sisters, and granddams and other near relatives are likewise very reliable indications of the productive capacity of heifers and young bulls, or cows which have no production records themselves.

Taking production records into consideration in the selection of
dairy cows is particularly advantageous because even a person who is very skilful in judging dairy cattle cannot estimate productive capacity as closely as is desirable. Records show that altho few cows displaying good dairy type are poor producers, many fall much below what might be expected of them, owing chiefly to their lack of persistence of lactation. They may produce 50 or 60 pounds of milk a day for a few weeks after freshening, and then decline in production rapidly and remain dry for 10 to 12 weeks. Other cows having no better form may produce an equal amount when fresh but sustain that production fairly well through the production period and be dry only 6 to 8 weeks. The two cows may differ in annual milk production by as much as 3,000 to 4,000 pounds or more, yet in type or form they may be so nearly alike that even a person experienced in the selection of dairy cattle could not have distinguished between them so far as producing ability is concerned.

An experienced person is usually able to distinguish readily between cows capable of producing only 150 pounds of fat annually and those producing 400 pounds or more. Cows that produce no more than 150 pounds of butterfat each are usually of mixed dairy and beef breeding or definitely inferior cows of the dairy breeds; but those that yield 400 pounds or more usually possess good dairy characteristics. Very few persons, however, can distinguish between cows capable of yielding 400 pounds of butterfat and those capable of producing 600 pounds or more, for both classes of cows in all probability possess similar external evidences of good dairy type. Practical evidence of the importance which buyers attach to production records is found in the fact that good cows with records (either grade or purebred) usually sell at considerably higher prices than apparently good cows without records.

It is in the selection of bulls for breeding purposes that the most serious mistakes are likely to be made—most serious because a mistake here is apt to affect at least one entire generation of the herd. Too often the appearance of the animal is the deciding factor in a choice. Bulls of good type, it is true, tend to transmit good type to their offspring; but there is no certainty when good type is the only guide that the daughters will be good milk producers. In fact, records show definitely that daughters of certain bulls having good dairy type have yielded less milk and butterfat than their dams (page 20).
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Why Conformity to Type Must Also Be Considered

Type only basis if records are lacking. Unfortunately, records of milk and butterfat production are available for only a relatively few of the dairy cows throughout the country. The great majority can be appraised only on the basis of body form, or type. Less than 2 percent of the dairy cows in the United States are included in herd improvement association work, and a still smaller percentage are under test by the breed associations. Records are kept also by a few owners or their employees, but only rarely are these records as carefully kept as are those of the associations (page 12). Thus a conservative estimate of the proportion of all dairy cows in the United States for which production records are available is 3 percent. In the best dairy sections the proportion may be as much as 4 or even 6 percent. This means that if one were to go to a dairy section of the country to buy dairy cows with production records he would be limited to 4 to 6 herds out of 100, or to 6 out of every 100 cows.

Body form inherited independently of dairy tendency. But even where records are available it is advisable, as already mentioned, to take into consideration the type of the animal in making selections. One reason is that milk production is not in itself a wholly reliable indication of the value of an animal in a dairy herd, strange as such a statement may at first seem. The characters that determine milk production (dairy tendency) are inherited independently of the characters that determine body form (dairy type). Thus a cow may have an inherited tendency to produce milk out of proportion to the inherited strength and capacity of her body to support such production. Over a period of years such a cow is not likely to produce as much as another cow that has inherited a similar tendency to produce milk and at the same time has a body capable of standing up under the strain. Dairy type and dairy tendency should consequently always be considered together in selecting stock to build up a dairy herd (Figs. 4 and 5). It would be futile to continue breeding for high production year after year without giving proper attention to the selection of body form which would assure maintenance of that production.

The cow may be likened to a traveling manufacturing machine which is propelled under its own power. For greatest returns on the investment, the machine must be so strongly constructed (constitution and health in the cow) that it will continue to perform well over many years. Capacity to use large amounts of the cheapest or most economical fuel (roughage, for the cow) is desired. For greatest efficiency, no more weight than is necessary (surplus fat in the cow).
The two Guernsey cows illustrated above have comparable production records. Which one would you select as a foundation animal for your herd? In order to assure maintenance of production, selection must be made not only on the basis of production records but also with proper attention to good body form.

should be carried. The manufacturing mechanism, which is the delicate part of the machine (the udder of the cow), must have good capacity and not break down after two or three years' use.

Unlike other machines the cow, during a part of the time she is
In order to maintain high production year after year, a dairy cow must possess rugged constitution and physical stability and substance. The two cows shown above are exceptionally good producers. The upper one is constituted to withstand many years of production, while physical instability may limit the years of the second one’s usefulness. This cow is in good health, as indicated by her fine, glossy hair and alert appearance. Her thin condition is caused by her inability to consume sufficient feed to supply nutrients equivalent to her inherited capacity for milk production.
manufacturing milk, is also performing another valuable function, that of reproduction. This function requires a suitable form and capacity of the pelvic region of the body.

Because measurements cannot be applied directly to a cow's body to determine whether it is fitted for performing these functions efficiently for many years, the best substitute is the use of visual estimates based on careful observations of many cows over a period of years.

**Uniformity and beauty in foundation animals.** Another reason for taking type into consideration in selecting replacement or foundation animals for a herd is that *uniformity* in a herd can be attained only by such means. If, in founding a herd, cows are selected merely on the basis of production records they are likely to differ widely in type, and their offspring to differ still more widely. In such herds there is greater likelihood of disappointment in the milk production of the daughters than in herds combining high production with uniformity of type. In establishing a herd of registered cattle, particularly, it is desirable to choose animals similar in type and so far as possible of closely related bloodlines. Then by selecting a sire of similar type and breeding it is possible to make rapid progress in building up a uniform herd. Furthermore, efficiency of production and beauty of form can be combined in the same animal. The person who understands the principles of breeding and who knows good type can direct the production of animals which are beautiful as well as useful. This combination adds greatly to the pleasure of keeping and breeding livestock.

**SELECTION BY PRODUCTION RECORDS AND PEDIGREES**

To be able to use production records and pedigrees to best advantage in selecting dairy animals one must know: (1) the kinds of records kept; (2) the different factors (such as age of cow, number of milkings daily, etc.) responsible for normal differences in production and consequently in the records themselves; and (3) the relative importance of the two ordinary measures of productive capacity—milk yield and percentage of butterfat.

**Several Kinds of Records**

The records of any sort are kept on only a small proportion of all the dairy cattle in the country (page 9), those that are available are of several kinds, as noted below.

**Private records.** Some dairymen keep records without outside assistance or supervision. Such records usually include the number of
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pounds of milk produced by each cow on one or more days each month. They may or may not include the percentage of fat (the "test") of the milk. Sometimes a partial or a complete record of feed is kept, as a basis for estimating the cost of production. The reliability of such records depends entirely, of course, upon the conscientiousness and carefulness of the herdsman or breeder.

Improvement association records. Records kept by cooperative herd-improvement associations are based upon a one-day record each month taken by a trained tester employed by the association. The records are kept on both grade and registered cattle. They include the amounts and value of milk and butterfat produced and of feed consumed by each cow, and the identity and relationships of the cattle in a herd. These records over a period of years thus give reliable indications of the ability of the sires and dams to transmit productive qualities to their offspring. Dairy herd improvement associations in Illinois are supervised by the Agricultural Extension Service of the University of Illinois, the U. S. Department of Agriculture, and the county farm bureaus.

Breed association records. The various dairy-cattle breed associations, with the aid of the state agricultural colleges, conduct "advanced registry" and "herd improvement registry" tests of production. These tests are open to all cattle registered in the herd books of the breed associations. An advanced registry test may be made of only one or of more of the cows in a herd; but under the herd-improvement registry plan all cows in the herd must be included in the test. Advanced registry tests are based on one-day records each month (some of the breed associations permit two-day records each month) taken by testers sent out by the state supervisor of official testing at the state university. Tests for herd-improvement registry may be taken by the official testers, or, when the herd is enrolled in a herd-improvement association, by the association tester, provided the rules governing the supervision of tests for herd-improvement registry are followed. Duplicates of these tests may then be used for the herd-improvement association records.

For purebred cattle registered in the herd books of the breed associations pedigrees may also be obtained, which, in connection with production records, enable fairly reliable estimates of transmitting ability to be made.

Where records can be obtained or examined. These records of individual cows in Illinois herds enrolled in the registry tests or in the herd-improvement associations constitute a most valuable source of
information for buyers of breeding stock who wish to do a thorough job of selection. Records of the individual cows in herds are of course available at the farms enrolled. Lists of the herds in one association are on file at the farm bureau office of the county in which the association is located, and at the Department of Dairy Husbandry of the University of Illinois. Furthermore, lists of proved sires in the herds enrolled in herd-improvement associations are published by the U. S. Department of Agriculture, and may be obtained from the Office of Information, U. S. Department of Agriculture, Washington, D. C.

Evaluating Records Made on Different Bases

Production records of different cows, or of the same cow during different lactations, should not be directly compared unless the conditions of production during the testing periods were similar. It is important to know: (1) the age of the cow; (2) the number of times a day she was milked while the record was being made; (3) the quality of feeding and of other care and management to which she was subjected; and (4) the length of interval between calves. Moreover, inasmuch as many records, especially published records, are given in "corrected" form, one should inquire also whether a record states actual production or is corrected for age or for number of milkings daily.

Effect of times milked daily. A cow that, for example, produces 400 pounds of butterfat when milked twice a day during a 10-month lactation period, calving at yearly intervals, must have a much greater productive capacity than another cow of the same age that produces the same amount of butterfat during the same period when milked three times a day. Cows milked twice a day produce only about five-sixths as much during a ten-month lactation period as they do when milked three times a day throughout the period, or four times a day for the first five or six months and three times a day thereafter.¹

Effect of feed and care. Differences in kinds and amounts of feed fed during the lactation period, in care and management, and in length of period between calves are responsible for even greater differences between records of cows having similar productive abilities. Advanced registry records are sometimes made with the object of having a few of the best cows in the herd produce the maximum amount of which they are capable. In order to obtain a high record for continuous milking

¹According to conversion factors in use by the Division of Dairy Herd Improvement Investigations, U. S. Dept. of Agriculture.
for 365 days, cows are bred to calve at 15- to 18-month intervals. A high condition of flesh at calving time is obtained by liberal feeding during the dry period; and throughout the year high-quality feeds are fed in as great abundance as the cows can be made to consume. Milking is done three or four times daily. In addition, the very best practices in care and management are followed. Under such conditions production for 365 days often runs from 50 to 100 percent higher than that of cows of equal productive capacity that calve at yearly intervals, are milked only twice daily, and are given only ordinary care.

Age of cow. The other factor to be considered in evaluating production records is the age of the cow at the time her record was made. Cows as a rule show an increase in milk and butterfat production until they are about 6 years old; and at about 8 years they begin to decline slightly. A cow calving when she is 2 years old normally produces about 77 percent as much as she will when she is 6 or 7 years old. Likewise cows calving at 3 years of age, at 4 years, and 5 years produce respectively about 87, 94, and 98 percent as much as they will when fully mature. By using these average percentages (conversion factors), which have been worked out from the records of many cows, the production record of an immature cow can readily be converted to a mature basis. If, for example, a cow calving at 3 years of age produces 360 pounds of butterfat during the year, her productive capacity when she becomes fully mature would probably be above 400 pounds (360 ÷ .87 = 413.7). After maturity is passed, decline in production takes place slowly. Cows calving at 8 years, at 9, at 10, at 11, and at 12 produce respectively about 99, 98, 96, 94, and 91 percent as much as they do when they are 6 years old.

These percentages or conversion factors are average values worked out from large numbers of records, and they indicate the general production trends of dairy cattle. Nevertheless the production of an individual cow from year to year may not conform very closely to these estimates, because of differences in quality and amount of feed, particularly of pastures, and in seasonal conditions. Extremely hot weather tends to lower production, and, under most farm conditions, cows calving in the fall have higher annual productions than cows calving in the spring or summer. Thus, because of variations in these respects, the production record during any one lactation period may not be an entirely accurate measure of productive capacity. It is consequently very desirable that production records be kept year after year in order to obtain complete information for the entire life span of all cows in the herd.
Relative Importance of Yield and Test of Milk

Tho accurate knowledge of the productive capacity of a cow can be had only when both the yield and the test of milk are known, as well as the conditions under which the records were made, a fairly reliable estimate can be formed from a knowledge of milk yields alone. When for any reason it is not feasible for a dairy farmer to obtain records both of the yield and of the test of milk produced by his cows, a carefully made record of the number of pounds of milk produced by each cow throughout the year will alone form a fairly reliable basis for herd improvement. The reason for this is that the cows of a breed vary greatly in the quantity of milk produced, but they do not vary so much in percentage of butterfat contained in their milk.

The milk tests of individual cows (both high-quality grades and purebreds) conform rather closely to the average test for the breed. If the average is 4 percent butterfat, for example, the tests of most of the cows of that breed fall within the range of 3.2 to 4.8 percent. On the other hand, milk yields vary greatly. One cow may produce less than 3,000 pounds of milk annually, while another of the same breed produces 30,000 pounds or more. Consequently, if the test of milk but not the yield is known, it is impossible to form even a reasonably close estimate of the productive capacity of the cow. For example, the difference in butterfat production between one cow giving 16,000 pounds of milk a year and another giving 5,000 pounds, both testing 4 percent, is 440 pounds (640 pounds minus 200 pounds). But if the yield of milk and not the test is known, a much closer estimate may be made. If, for example, two cows give the same amount of milk, 12,000 pounds a year, but differ in test, one giving milk testing 4.8 percent and the other 3.2, the difference in butterfat production would be 192 pounds a year—a very considerable difference, to be sure, but not nearly so much as in the former example, 440 pounds.

In special cases, where an attempt is being made thru selection to increase the test of the milk of a herd, a knowledge of the test of each cow becomes a matter of more importance perhaps than an exact knowledge of yields of milk, provided the yields are on a generally satisfactory basis.

But in general the fact remains that many who attempt to evaluate production records tend to overrate the importance of high-testing or "rich" milk. Even the highest-testing cows of the breeds described in this circular cannot produce large amounts of butterfat unless they produce large quantities of milk. On the other hand, cows producing large quantities of milk, even tho the test may be low, produce large
quantities of butterfat. Thus a cow whose milk tests 7 percent but whose milk yield is only 3,000 pounds a year produces 210 pounds of butterfat a year; while a cow having a test of only 4 percent and a yield of 8,000 pounds of milk a year produces 320 pounds of butterfat, or 50 percent more than the other cow.

Selecting Females According to Production Records

In the selection of dairy cows and heifers production records may give information on three important matters,—namely, the present or probable future production, ability to transmit productive capacity to offspring, and length of life.

Productive capacity. The interpretation of production records as measures of productive capacity has been discussed in detail in the foregoing paragraphs, and need not be repeated here. In general, a production record made under known conditions is the best evidence obtainable of the productivity of an animal. That farmers appreciate this value of records is shown by the fact that in public sales cows having satisfactory records of production sell for 10 to 25 percent more than cows of comparable individuality and age but which have no records available.

Transmitting ability. The power to impart to offspring the capacity for high production may also be measured by production records, but not, of course, so directly as productive capacity itself. Transmitting ability must be measured by the records of the offspring. If the daughters or the sons’ daughters are as high producers as the mating of the dam and sire would lead one to expect, then the transmitting power of the parents is considered to be proved. Cows having high production records and proven transmitting ability are the best foundation stock from which to select herd sires and heifers for herd replacement (Fig. 6).

The reason why some cows that are high producers themselves do not transmit this quality to their calves, and consequently why sires and dams must be “proven” before they may be accepted as good transmitters, is that milk secretion is very complex. It is the result of a great number of genetic characters which are contributed to an individual equally by the sire and the dam. Some of these genetic characters tend to cause high production of milk and others low production. Because there are so many of them there is possibility of many different combinations, and the particular combination which results from the mating of two individuals may not be exactly what is expected. Nevertheless, when high-producing cows are
Fig. 6.—Good heifers should replace cows removed from the herd

The two heifers shown above are offspring of parents that were selected for high production and for true type for the breed. The heifers show excellent dairy qualities, with promise of high production, and are very good in breed type. Upper, Holstein; lower, Ayrshire.
Fig. 7.—Superior milk-producing ability combined with excellent dairy type

Illini Nellie 26578, at 10 years of age, shortly after completing a 365-day production record of 29,570 pounds of milk containing 1200 pounds of butterfat, a world's record for the Brown Swiss breed. Note the outstanding dairy form of this cow, including exceptional feeding capacity and mammary development, together with rugged constitution and general symmetry. In milking condition, she weighs about 1650 pounds. At eight years of age she was reserve grand champion at the National Dairy Show.

Up to September 1, 1939, Illini Nellie had produced 176,992 pounds of milk containing 6,866 pounds of butterfat. She was at that time one of 15 living cows in the herd each of which had produced more than 3,000 pounds of butterfat.

mated with sires whose dams were high producers the odds are heavily in favor of the offspring also having capacity for high production. Selecting herd sires from bloodlines closely related to those of the cows in the herd is one method of increasing the chances of favorable combinations (see also page 20).

Longevity. Determination of the transmitting ability of dairy animals thus requires a considerable amount of time. Cows that calve first at two years of age will be five years old, at least, before their transmitting ability can be known. If they have bull calves it will be even longer, for the records to be examined will then be those of their granddaughters. Obviously if the fullest value is to be obtained
from the use of these proven animals as foundation stock, they must be used for as long a period as possible. Length of life, or longevity, is thus a third important consideration in the selection of foundation cows and heifers, and it is a quality which also can be gotten at partly at least thru production records.

No standard in terms of years has so far been set up for rating the longevity of dairy cows, but some standards in terms of total production have been suggested. Cows that have reached a total production of 3,000 pounds of butterfat each have necessarily been high producers over a period of several years—and a considerable number of cows have accomplished this record. Cows which have given evidence of such sustained production may well be considered satisfactory from the standpoint of longevity (Fig. 7). In selecting dairy stock, however, the longevity not only of the particular animal itself but of its nearest relatives should be taken into consideration. In selecting young stock considerations of longevity must of course be based almost entirely upon that of the near relatives.

To stand up well under the strain of long-continued high production a cow must have ruggedness or sturdiness of body. Certain features of type, therefore, described in later sections of this Circular, are important indications of longevity.

**Records should not be used as sole basis.** Even tho records of production are the most direct and accurate measures of productive capacity, transmitting ability, and longevity, as a basis for selection they should be supplemented by a careful study of the type of the animals. The reasons why type should be taken into consideration even tho production records are available are given on pages 9 to 12.

**Selecting Sires by Use of Production Records**

The selection of a good sire is, as a rule, the most difficult problem that is met in managing a dairy herd. Good individuality, or type (pages 39 to 42), is very important in a sire, and is not particularly difficult to find, but the possession of good type does not in itself give sufficient assurance that the daughters will produce large amounts of milk and butterfat.

Sires, the same as dams, must be “proved” before their transmitting qualities are known. And during the time which must elapse between the first use of a bull and the completion of production records by at least five of his daughters (the minimum number required for proving a sire), a poor sire may cause definite deterioration in a herd, or a good one may go to the butcher’s block before he is known to be good. Furthermore, only a small proportion of the sires
Fig. 8.—Selection of a young bull is more important than the selection of a heifer

Because the herd sire contributes his characteristics to all the calves born in the herd, care should be taken to choose young bulls whose dams and other near relatives have good production records, who are from good bloodlines, and who have in addition rugged constitutions, good top lines, general refinement, and good breed type. The young Holstein calves pictured above meet all these requirements.
that are proved are worth keeping in a high-producing herd. Of 96
sires proved during 1937 in Illinois dairy herd improvement associa-
tions, 58, or nearly three-fifths, lowered production in the herds in
which they were used. Only 20 of the 96 sires were alive when these
records were completed, and only half of the living sires effected
increases in production of their daughters over that of their daugh-
ters' dams. More than half of the sires that were mated with cows
producing less than 350 pounds of butterfat brought about increased
production of their daughters over that of their daughters' dams, but
the higher the production of the dams, the smaller the proportion of
sires that brought about increased production. Of 5 sires used in
herds where the dams produced more than 450 pounds of butterfat,
only one increased production while 4 decreased production.

The most reliable method of choosing a herd sire that will be likely
to get daughters having capacity for high production of milk and
butterfat is to select one that is already the sire of such daughters. In
the event that a good proved sire, that is, one known to have effected
an increase in production, or to have not lowered the production of his
daughters under that of very high-producing dams, cannot be ob-
tained, the next best procedure is to obtain one that has a dam and
sisters with records of high production (Fig. 8). The records of full
sisters are of greater value than the records of half sisters. If there
are no daughters or sisters with milk and butterfat records, the records
of the dam and granddams are the third best basis for estimating the
transmitting ability of the bull. Production records of relatives and
ancestors farther removed than those mentioned are of small or
doUBtful value unless accompanied by the records of close relatives.

Longevity is fully as important an attribute of a sire as it is of a
cow. As mentioned above, the first daughters of a sire usually do not
complete their first lactation periods until the sire is about five years
of age. The main reasons why so many sires are sold for slaughter
before their transmitting ability is known are that few farms are
equipped to handle mature bulls, and in small herds, where only one
bull is kept, bulls cannot be used for more than two years without
inbreeding. Breeding associations in which bulls are exchanged
among members greatly facilitate keeping bulls until their real worth
is known. (See Illinois Circular 460, Managing the Dairy Bull.)

Evaluating a Pedigree

Pedigrees of dairy cattle include the names and herd-book registra-
tion numbers of all direct ancestors for as many generations back as
the pedigree is written,—which is usually three or four. A good
SELECTING DAIRY CATTLE

pedigree also includes production records. Occasionally show-ring winnings are given.

In order to determine whether an animal is backed by records which indicate that it is likely to be capable of high production (if a milking cow) or of transmitting high production (both dams and sires), a pedigree must be carefully studied. A mere scanning will not serve the purpose. The kind of information which a good pedigree contains, and the type of misleading statements found in poor pedigrees, are illustrated in the sample pedigrees given below. The one of Illini Dictator, a Holstein bull bred by the University of Illinois, is used to illustrate the desirable features. Another, a purely fictitious pedigree of a scrub bull, "Springhouse Royal Gyp," contains features often found in undesirable pedigrees.

Notice particularly the following features of the pedigree of Illini Dictator:

1. Excellent yearly production records of the dam.
2. High total production of the dam—more than 4,000 pounds of butterfat and 100,000 pounds of milk—showing long-continued high production.
3. Two full sisters and one half-sister of Illini Dictator have high A.R. records, thus showing the transmission of high productive ability by the dam.
4. Both granddams and all great-granddams have records of high production and all grandsires and great-grandsires have many high-producing daughters. There are no gaps in the pedigree (none of the immediate ancestors are without production records), and all records are high.
5. The sire is a proved sire with a large number of high-producing daughters. The production records of these daughters are uniformly high, with none extremely high and none low. These records indicate transmission of high-production qualities thru the sire.
6. The records are stated in terms of pounds of milk and pounds of butterfat. The use of the term "butter" may be very misleading, as pointed out in Paragraph 7 in the discussion of the pedigree of "Springhouse Royal Gyp."
7. Details regarding the records are given, such as age of cow at beginning of record, number of milkings daily and length of record.
8. No "filler" is included,—no unofficial information or misleading relationships.

The pedigree of Springhouse Royal Gyp is hypothetical and is given to illustrate types of statements sometimes made in sales catalogs and in pedigrees sent to prospective buyers. Some faults of this pedigree are:

1. None of the female ancestors listed in the pedigree, including the dam, the granddams, and the great-granddams, have production records. Statements are given, however, which may lead a prospective customer to think that these cows are great producers.
PEDIGREE OF HOLSTEIN BULL: ILLINI DICTATOR, 70093

Bred by University of Illinois, Urbana, Illinois

**Illini Homestead Piebe Prince, 569148**

Sire of 26 A.R. daughters that have made 43 records (11 in ten months division) averaging more than 550 lbs. of fat. All records in Class B at less than 7½ years of age.

Including:
- Illini Iladoga Triniton, M.20,039 F.677.2 at 7y. 4mo.
- Illini Princess Triniton Lady, M.18,442 F.674.4 at 3y. 1mo.
- Illini Iladoga Beechnwood, M.19,039 F.712.8 at 4y. 1mo.
- Illini Homestead Princess, M.16,769 F.623.7 at 7y. 10mo.
- Illini Iladoga Lady Agnes, M.18,649 F.701.4 at 3y. 1mo.
- Illini Piebe Prince Star Joe, M.17,961 F.652.1 at 5y. 1mo.
- Illini Iladoga Peep Agnes, M.17,038 F.594.4 at 2y. 3mo.

Summary of all records:
- 6 records over 700 lbs. fat
- 8 records over 600 lbs. fat
- 34 records over 500 lbs. fat
- 16 records over 400 lbs. fat
- 55 records over 374 lbs. fat

**Illini Omsby Triniton Pietertje, 931061**

Produced in seven lactations, M.119,150 F.609.8

Individual records include:
- M.15,544 F.488.5 (305d.) at 3y.
- M.20,800 F.711.6 at 2y. 4mo.
- M.23,550 F.774.8 at 8y. (Class A)

Dam of three A.R. daughters:
- Illini Homestead Pietertje, M.17,869 F.631.6 at 2y. 2mo. (A)
- Illini Princess Triniton Lady, M.15,288 F.507.4 at 2y. 2mo.
- Illini Homestead Omsby Beechnwood, M.18,442 F.674.4 at 3y. 1mo.
- Illini Homestead Ormsby Beechnwood, M.19,066 F.752.1 at 4y. 1mo.
- Illini Princess Canary Lady, M.15,806 F.550.9 at 3y. 3mo.

(Two latter cows are full sisters to Illini Dictator)

**Prince Sylvia Ladoga, 356430**

33 A.R. daughters, 31 of them with records over 600 lbs. fat.

Including:
- Illini Ladoga Pietertje Agnes, M.21,844 F.888.3 at 9y. 5mo.
- M.19,162 F.710.6 at 7y. 4mo.
- M.20,788 F.730.0 at 6y. 1mo.
- M.17,792 F.690.5 at 4y. 7mo.

**Prince Colanthus Abbecker, 212547**

Has more than fifty A.R. daughters in U.S. and Canada, including:
- Lady Roberts Colantha, M.26,433 F.1175.6 at 8y. 3mo. (Class A)
- Polly Abbecker Mercedes, M.28,805 F.942.2 at 6y. 0mo. (Class A)
- Lady Norfolk Abbecker, M.21,570 F.828.5 at 4y. 0mo. (Class A)

**Lady Idaline Mercena, 455693**

M.630.5 F.22.8 at 4y. 7 day record

**Lady Norfolk Abbekerk, 311646**

Dam of one A.R. daughter

**Sir Bess Pietertje Piebe, 204840**

18 A.R. daughters. Four were bred by the University of Illinois and have 33 A.R. daughters; 31 of them with records over 600 lbs. fat.

34 records over 500 lbs. fat

52 records over 400 lbs. fat

55 records over 374 lbs. fat

**IlIini Homestead Piebe Prince, 714496**

M.28,856 F.1050.2 at 6y. 4mo.

**IlIini Homestead Piebe Bonheur, 714500**

M.22,550 F.753.4 at 3y. 3mo.

(above three records Class A)

**IlIini Ormsby Tritomia Pietertje, 931061**

Produced in seven lactations, M.119,150 F.609.8

Individual records include:
- M.15,544 F.488.5 (305d.) at 3y.
- M.20,800 F.711.6 at 2y. 4mo.
- M.23,550 F.774.8 at 8y. (Class A)

Dam of three A.R. daughters:
- Illini Homestead Pietertje, M.17,869 F.631.6 at 2y. 2mo. (A)
- Illini Princess Triniton Lady, M.15,288 F.507.4 at 2y. 2mo.
- Illini Homestead Omsby Beechnwood, M.18,442 F.674.4 at 3y. 1mo.
- Illini Homestead Ormsby Beechnwood, M.19,066 F.752.1 at 4y. 1mo.
- Illini Princess Canary Lady, M.15,806 F.550.9 at 3y. 3mo.

(Two latter cows are full sisters to Illini Dictator)

**King Ormsby Canary Pietertje, 208052**

Sire of eight A.R. daughters that average M.17,621 F.574.0 lbs. at 6y. 3mo.

Including:
- Johanna Ormsby Pietertje Canary, M.29,003 F.639.0 at 9y. 7mo.
- Illini Homestead Ormsby Beechnwood, M.17,170 F.506.5 at 5y. 3mo.
- Illini Ormsby Homestead Queen, M.16,550 F.531.0 at 2y. 3mo.

**Canary Pulkadot Wisconsin Lottie, 159458**

M.22,889 F.815.2 at 8y. (Class A)

**Illini Tritomia Pietertje, 714500**

M.15,089 F.531.1 at 2y. 6mo.

NOTES:

All animals named with the prefix 'Illini' were bred by the University of Illinois, Urbana, Ill.

All animals indicated * were owned by the University of Illinois. A.R. indicates Advanced Registry record.

All records made in Class B (three time milking) unless otherwise indicated.

Class A indicates four time milking.

All records for 365 days unless otherwise indicated.

Records are given in terms of pounds of milk (M.) and pounds of butterfat (F.).
PEDIGREE OF SCRUB BULL: SPRINGHOUSE ROYAL GYP

Born: December 4, 1934
Bred by Felix Doe, Springhouse, Illinois

Sprague Lady of Kenwood
This bull was never shown in competition, but was considered by many breeders to be better than the Grand Champion at most of the better shows. His sire is by a brother of the great production sire Par Value that has 23 A.R. daughters, including:
- May's Fancy Lady
  - Milk, 27,886; butter, 1,095.7
- Miss Twinkle Lady
  - Milk, 29,845; butter, 1,183.9

Sprague's Reservation
Full brother to:
- Anticipation Butter Girl
  - Dam of two daughters on test

Sire of:
- Springhouse Emma
  - Milk, 10,009; butter, 425.3

Jellico Queen Wilma
Dam of:
- Sunbeam Snowdown
  - Milk, 9,558; butter, 426.7
  - Milk, 9,534; butter, 487.6

Big Gyp's Never Do
Sire of 26 daughters including:
- Patricia's Flash
  - Milk, 10,493; butter, 521.0
- Suzanne Miracle
  - Milk, 11,461; butter, 582.3

Kenwood Dairy Maid
Paternal sister to:
- Kenwood Air Castle that has 15 daughters on test. Many of these daughters will make very outstanding records.

Sea Master's Day Dream
A wonderful sire. His first tested daughter Sea Master's Mermaid formerly held the State record in her class. Many of his daughters were used as foundation cows in other herds.

Inconsistent Diana
Grand Champion female at the Franklin County Club Show.

Gyp's Free Lancer
Sire of:
- Pleasant Juanita
  - Milk, 10,679; butter, 533.9
- Pleasant Jenny
  - Milk, 11,232; butter, 512.8

Reserved Lulu
A great producer

Prince Jellico of Springvale
By the same sire as:
- Cherry of Eggleston
  - Milk, 13,454; butter, 632.4

Pull Ball's Willowisp
Her dam and granddam average:
- Milk, 12,436; butter, 689.0

Pull Ball's Willowisp
Her dam and granddam average:
- Milk, 12,436; butter, 689.0
2. Neither the sire nor the dam has daughters with production records.

3. The nearest relatives with production records are cousins, (daughters of Pine Ridge Flareup) and two half sisters of the dam.

4. Only two male ancestors listed have daughters with production records. These are the great-grandsires Big Gyp's Never Do and Gyp's Free Lancer. The records given for the two daughters of Big Gyp's Never Do are very good, but there is nothing to indicate the producing ability of the remaining 24 daughters. These may have records or they may not. If they have records, they may be so low that the maker of the pedigree thought it best not to include them. A common fault in pedigrees is that a very few of the highest producing daughters of a sire are given great prominence and nothing is said of the others.

5. Gives the erroneous impression, to one glancing over the pedigree, that Sailor Lad of Kenwood has three very high-producing daughters. On closer examination it is evident that these cows are distant relatives, for their sire, Par Value, is a brother of the grandsire of Sailor Lad of Kenwood. Statements such as “His sire is by a brother of” are very confusing to persons unfamiliar with pedigrees.

6. The show-ring winnings mentioned, with one exception, give so little information with regard to the character of the shows where the winnings were gained that the statements are practically worthless. The one exception is that given in connection with Inconsistent Diana, where the character of the show is fairly accurately indicated.

7. The production records are given in terms of milk and butter instead of milk and butterfat. The tests as made by the dairy-cattle breed associations are determined and reported in terms of pounds of milk and pounds of butterfat. In pedigrees the figures are sometimes given in terms of butter instead of butterfat in order to make the records appear larger. This may mislead the uninformed buyer. Not only is this practice misleading to the uninformed, however; it may be actually inaccurate, for the factor commonly used in calculating pounds of butter from pounds of butterfat gives too large a result. The amount is greater than that usually obtained by churning butterfat into butter.

8. No information is given as to the length of the records, the number of milkings per day, or the age of the cows at the time the records were made.

**SELECTION ON BASIS OF DAIRY TYPE**

**Selection of Mature Cows**

In the absence of records of milk and butterfat production, which are the direct measure of dairy tendency in an animal, probably the best indication of dairy tendency can be gained from a careful estimate of the way in which the cow conforms to good dairy type and an examination of her condition of flesh, taking into account the state of lactation.
Except when dry, cows that have a strong dairy tendency,—that is, a strong stimulus to convert the nutrients of their feed into milk rather than into body fat,—are as a rule not excessively thin but angular in form, with prominent hook bones, withers, and backbone, and slender neck and thighs. Even tho a cow that has a strong dairy tendency has also a strong body and large feeding capacity, and even tho she is properly fed and cared for, she will during the period of highest production in a lactation produce more milk than is warranted by her feed consumption. Following calving such a cow usually draws on her body tissues for nutrients for milk production and loses weight, for she is incapable of consuming enough feed to support her high level of production. If at any time the feed supply is limited or lacking in some nutrient, cows having good dairy tendency use their body tissues for milk and become very thin. Under the same conditions cows lacking this characteristic tend to reduce their milk flow rapidly and become dry. When fed liberally they convert a large portion of their feed not into milk but into body fat.

The best time, therefore, to judge a cow’s productive capacity on the basis of type is a few weeks after she freshens, when she is at the highest level of production. Some cows that show good dairy type during most of the lactation period become so fleshy and blocky when dry that they appear to lack dairy type and are mistakenly classed as low producers.

Learn names of parts of a dairy cow. In learning to select dairy cattle the first step is to become familiar with the names of the different parts of a cow’s body, the names that are in common use by breeders and others working with dairy cattle. A list of these names, together with numbers indicating the location of the parts of the cow’s body to which they apply is given in Fig. 9. One should be able to locate all these parts on a living cow and also to make a diagram and indicate the parts from memory. After this is done, the next step is to make a study of dairy type and of the score card.

Become familiar with dairy type. A knowledge of the features that constitute dairy type is necessary before proceeding with any study of values and comparisons.

Cattle have been developed for two chief purposes, the production of milk and the production of meat. Refinement has been carried to such a point that even tho all our cattle are descended from the same sources, breeds kept primarily for milk purposes have a certain well-defined form, or dairy type. This form is modified somewhat in
Fig. 9.—The parts of a dairy cow


(Diagrammatic sketch courtesy Holstein-Friesian Association)
the various breeds by certain breed characters, but is, nevertheless, the outstanding feature of the conformation of all the dairy cattle breeds. Just as truly all the beef breeds have a distinguishing form, or type, called beef type, altho the beef breeds differ somewhat from each other in certain features of their form.

The distinguishing features of the dairy type of cow, as seen in a good dairy cow during the high-yielding part of a lactation period, are: (1) angularity of form, (2) development of milking organs, (3) development of feeding capacity.

Angularity of form. After calving, a good dairy cow loses weight and becomes angular in appearance. This means that parts of the skeleton, such as the withers, shoulders, backbone, hips, and pin bones, project more from the body and appear to be much sharper. Fleshy parts of the body, such as the thighs and loin, also become thinner after calving. Instead of having a full, rounded appearance, the thighs become thin and the outer surface is somewhat incurving. The loin becomes better defined; the bony framework supporting it and adjacent to it becomes more distinct.

The skeletons of all cows are nearly alike so far as the shapes of the bones are concerned. Slight differences, of course, are found in the lengths of certain bones and the angles at which they are joined, and these slight differences often indicate desirable or undesirable features. For example, in some cows the tail setting is very sloping, tho it should be carried out level with the rest of the top line.

The dairy-cattle breeds differ in their angularity and there are also great differences between cows of the same breed in this characteristic, tho the best dairy cows are, as a rule, the most angular. Angularity of form and good dairy type as a whole are best exemplified

1 A term often used in discussing angularity is “wedge shape.” A good dairy cow is said to have three wedges. The front wedge is outlined by starting with the withers as the apex of the wedge and imagining lines drawn from the apex downward to the widest parts of the shoulders to form the sides of the wedge. The top wedge is formed by lines drawn from the withers as the apex to each of the hip bones, lines connecting the hip bones forming the base.

The side wedge, as its name implies, can be projected when viewing the animal from the side. The sides of the wedge are formed by a line extending lengthwise of the top line of the animal, and by another line extending forward from the bottom of the udder past the bottom of the chest. It is usually necessary to project the lines forward some distance in front of the cow before they meet. In many cows, particularly those of the larger breeds, the wedges are not readily discernible, and in all breeds they are much less sharply outlined when the cows are dry and in good flesh. In this circular, therefore, but little emphasis is placed on wedge form and more attention is given to other phases of angularity.
in the Jersey breed. The Guernsey ranks next in angularity, followed by the Holstein, Ayrshire, and Brown Swiss.

Angularity is to some extent a relative matter, for the degree of fleshiness must be considered. Cows differ greatly in the amounts of flesh that they carry and even good dairy cows usually put on fat and gain in weight during the dry period. When fat, cows have a rounded, blocky form. Animals that have become very thin as a result of underfeeding for an extended period appear very angular because the outline of so much of the skeleton is visible. The angularity of cows composing a group, or ring, is evaluated best when all carry approximately the same degree of flesh.

Development of milking organs. Cows of high production almost invariably have large udders and, as a rule, the udders of such cows remain large throughout most of the lactation period. The size decreases somewhat, of course, following each milking. Extending forward from the udder on the under side of the body are the milk veins, which carry blood from the udder toward the heart. In high-producing cows the milk veins usually are large and crooked. They ordinarily increase in size from first calving up to maturity. A well-developed, large udder and large milk veins are good indications of dairy capacity, altho they are not infallible guides.

A high-producing cow requires a capacious udder. Ordinarily an udder which has a wide and level attachment at the front and a high and wide attachment at the rear possesses large capacity. When these attachments are deficient, a large udder becomes more and more pendulous, the capacity being taken care of by increased depth. A pendulous udder may extend downward so far that it strikes against the legs when the cow walks and is stepped upon by other cows when she lies down. An udder originally having good quality may, with continued striking by the legs, develop firm tissue in place of some of the secreting tissue.

Figs. 20 to 25, pages 51 to 57, show an udder of ideal form and others which depart from the ideal. In the ideal udder the fore attachment is nearly parallel with the under line of the body and the udder extends backward terminating in a high and wide attachment in the rear. When the attachments are faulty the udder cannot be ideal in form, and furthermore the udder under such conditions tends to become progressively worse with advancing age. The fore attachment breaks away from the body and becomes more nearly vertical, so that a gap is formed between the udder and the abdominal wall. The rear attachment recedes from its high position and causes the udder
to swing forward and the rear quarters to extend lower than the fore quarters. This often results in the teats pointing forward instead of hanging squarely as in the ideal udder.

The quality of the udder is one of its important attributes. Size alone is not a true indication of capacity. Some udders contain, in addition to secreting tissue, considerable amounts of connective, or non-secreting, tissue. This tissue gives the udder firmness in contrast to the soft, spongy texture of secreting tissue. The udders of greatest capacity have a high proportion of secreting tissue and they collapse, or reduce greatly in size, following milking. Udders with relatively small proportions of secreting tissue do not show so much reduction in size with milking and have a firmer consistency. Here again the stage of lactation must be considered, for immediately after calving udders are usually very firm or even hard, and for the first 4 to 6 weeks the udder of a high-producing cow is firmer than it is later.

Development of feeding capacity. A striking and almost constant feature of dairy form in cows yielding large amounts of milk is their large middle, or barrel. The function of a cow is to convert pasture crops, hay, silage, and other bulky feeds which are not readily marketed, into products which are easily marketed and which are valuable as human food. Since such roughages are relatively low in nutrient value, a high-producing cow needs a capacious digestive system (Fig. 10).

The barrel includes all the middle portion of the animal extending from the backbone to the under line and from the shoulders and chest to hip bone and flank, or it may be said to include all the region between the fore legs and rear legs except the udder. Capacity of barrel depends upon the depth of the barrel from top to bottom and also on its width, or the distance thru the barrel in a horizontal direction at right angles to the backbone. The size usually increases with age up to maturity and at any given time depends upon the amount and character of the feed consumed. In a cow having good feed capacity, however, the barrel is usually of extraordinary size in comparison with the rest of the body.

Become thoroly familiar with the score card. The score card (page 32) is a convenient means of analyzing and studying the different parts of a cow. Students studying the selection of dairy cattle should memorize the score card and know how to make a detailed analysis of a cow, whether actually scoring the animal or comparing it with another. Beginning farmers in dairying may find it advantageous to follow the same methods. The score card names the
# DAIRY CATTLE SCORE CARD

## SCALE OF POINTS—COW

<table>
<thead>
<tr>
<th>Possible score</th>
<th>Points deducted</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
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</tbody>
</table>

### I. Characteristics Indicating Ideal Body Form—25 points

**Dairy type.** Outstanding evidence of a high-class dairy cow, as shown by angularity of body and freedom from excessive fleshiness (stage of lactation considered) especially in shoulders, withers, vertebrae, hips, and pin bones; pronounced development of milking organs and feeding capacity; thighs thin and wide apart; neck long and slender; face broad between the eyes and well dished (breed differences to be taken into account) backbone prominent; parts well balanced with general symmetry throughout.

Rump. Broad at both hips and pin bones; long; thighs wide apart and high; pin bones at nearly the same level as hip bones; tail setting smooth, and level with top line.

Refinement. Freedom from coarseness of bones as noted in withers, hip bones, pin bones, tail setting, legs, head, and horns; pin bones and tail setting free from patches of fatty tissue; small amount of dewlap; bone medium in size as indicated by clean-cut head and long, slender tail.

Style and activity. Head held up; good top line; legs straight; gait regular and even; wide-awake appearance, alert, active; well proportioned throughout, with pleasing appearance and absence of marked defects.

### II. Characteristics Indicating Constitution, Strength and Stability—19 points

**Chest.** Deep and full, showing lung capacity; wide on floor, as indicated by front legs being wide apart, and full at elbows.

**Back.** Straight; broad; loin broad.

**Legs.** Straight and strong; wide apart.

**Condition and health.** Thrifty and vigorous appearance, as indicated by not less than a moderate amount of flesh; skin mellow, loose, of medium thickness, not papery or hard; hair fine and soft.
Desirable weights for mature cows when milked are as follows: Guernsey, 1,100 lbs.; Holstein, 1,350 lbs.; Jersey, 1,000 lbs.; Swiss, 1,300 lbs.

Estimated weight of animal: No. 1 ...................................; No. 2 ...................................
Correct weight of animal: No. 1 ...................................; No. 2 ...................................

III. Characteristics Indicating Feeding Capacity—22 points

**Barrel.** Capacious; relatively long; deep in rear portion, especially just in front of the udder; ribs well arched, particularly in upper part; loin extending in width on both sides almost as wide as hips.

**Muzzle and mouth.** Wide, full lips; strongly muscled jaws; good teeth.

IV. Characteristics Indicating Development of Milking Organs—34 points

**Udder.** Size: when fully distended with milk, long and wide but without great depth; great reduction in size after milking, but retention of good shape.

Shape: wide, extending well forward and closely attached to body in front; rear attachment high and wide; rear udder extending full width between rather than in front of the hind legs; floor level without strictures or clefts; quarters uniformly developed.

Quality: collapsible and spongy in texture when milked out.

**Teats.** Uniform; of convenient size and length; free from lumps and warts, extra openings and leakage (extra teats objectionable if they interfere with milking).

**Milk veins.** Large, long, crooked and much branched; milk wells large and numerous (age of cow to be considered).

<table>
<thead>
<tr>
<th>Total possible score</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points deducted</td>
<td></td>
</tr>
<tr>
<td>Net score for animal</td>
<td></td>
</tr>
</tbody>
</table>

1Prepared and used by the Department of Dairy Husbandry, University of Illinois.
2For marked deficiency in style or any serious abnormality, as many as 50 points may be deducted from the total score of an animal.
Since there is a direct relation between feeding capacity and milk yield, it is essential that dairy cows have large feeding capacity. The upper cow has excellent capacity, as shown by great depth and width of barrel. The lower cow lacks depth and width.
important features or characteristics, and it assigns to each of these features the highest score possible for an animal of ideal dairy type.

Perhaps the greatest value of the score card lies in the fact that it calls attention to the individual parts or features of the animal, so that each of these must be studied as a separate unit. A general survey made without such a detailed analysis may fail to take account of defects or excellencies of parts having a very important bearing upon the closeness with which the animal approaches the ideal.

(The use of the score card is explained in detail on pages 42 to 52.)

Selecting Heifers According to Type

The object in selecting heifers is to choose those which will develop into good dairy cows. Though there is no certainty that the parts which show desirable conformation will be equally good when the animal matures, there is a high probability that this will be true.

The first essential is that the heifer be a healthy, growthy individual with promise of developing into a cow of at least average size for the breed. A heifer with a rough, uneven coat of hair that is harsh and lacks luster and with a "pot belly" shows evidence of improper feeding and a stunted condition or of ill health. A bright, alert appearance, and a healthy coat of hair and pliable hide, together with a trim body having good length and depth and a full, rounded development at the heart girth, indicate health and vigorous growth.

Good dairy form, of course, is another essential. A heifer does not show as much angularity as a cow in milk, because withers, hips, and other prominent parts of the skeleton carry more flesh. She should, however, be without blockiness, such as thick, heavy brisket, thick withers and thighs, and meaty loin. Dairy type—angularity and freedom from fleshiness—of a heifer is shown to better advantage after calving than before. The udder increases in size with age, but even in small heifers having good dairy type the udder shows loose folds of skin indicating possibility of expansion. The teats should be uniform in size and symmetrically placed.

The feeding capacity of the young heifer is not so great in proportion to body size as in the mature cow, but as the heifer approaches milking age, her feeding capacity should increase. Feeding capacity in the young heifer is shown largely by length of body, with ribs which are well arched in the upper part with a well-rounded barrel and deep flank.

General appearance and style should be considered. The bones should not be unusually large or coarse. Straight, strong backs and top lines, with heads well held up contribute to the pleasing appear-
Fig. 11.—A high-producing herd is built up by careful selection of young stock

Selection of young calves should not be limited to production records, but such records should be supplemented by a careful study of the type and individuality of the animals. Most of the desirable characteristics sought in the mature cow can be visualized in the young heifer. Interest and enthusiasm of father and son in the development of the herd can be maintained by mutual discussion and selection of the calf herd.

ance of an animal. Broad, level rumps are desirable for the same reason and also because breadth of rear quarters is thought to be related to milk capacity. Heads should show lack of coarseness, be broad in the forehead, and be proportionate to size of body.

Some deficiencies, or faults, in a heifer become less apparent or disappear as she advances in age, while others are of such nature that they become more pronounced. At maturity certain earlier deficiencies may have been entirely overcome, but others may have become so much worse that the continued usefulness of the animal is open to question.

Among these deficiencies which tend to be corrected with age are insufficient feeding capacity, arched back combined with low pin bones, small size of udder, and length and diameter of teats. Usually a heifer that has grown rapidly in skeleton is underdeveloped in feeding capacity, particularly in depth of barrel, and is spoken of as being "leggy." If the depth of chest of such an animal is good, it is very likely that the depth of barrel will increase and the deficiency will be
Fig. 12.—Heifers just before first calving

These heifers show depressions, or settling at the pin bones, swelling in front of the udder, and marked congestion, or caking, of the udder. These abnormal conditions disappear within a short time after calving.
Fig. 13.—Winged shoulders may develop into a serious defect

The condition known as winged shoulders, shown on the above Guernsey cow, permits the shoulder bone and leg to project outward. Note the weakness resulting from the lack of firm union of the shoulder with the body.
overcome. With the development of greater feeding capacity, the increased weight of the middle portion tends to pull down an arched back, and at the same time brings the pin bones into a higher position. The udder of a good dairy cow usually increases in size for several lactation periods following her first calving. The length and diameter of teats may also be expected to improve somewhat as a young cow advances in age, but very small or very short teats may never attain a convenient size.

A number of the faults or deficiencies, on the other hand, tend to become more pronounced with age. A low back is a serious fault in a heifer because it indicates weakness of constitution and is very likely to become worse as the middle of the animal becomes larger and heavier. Crooked legs, either sickle-hocked or cow-hocked, of heifers tend to become gradually worse. So also do winged shoulders (Fig. 13). Moreover, because the tendency toward winged shoulders is a hereditary condition, careful attention should be given to this feature in the selection of heifers for the breeding herd. Poorly-shaped udders of heifers or young cows seldom improve and usually continue to become more faulty in shape. Udders that are firm and "meaty," that contain excessive amounts of connective tissue, tend to break away from the body and become pendulous. The pendulous condition may also result from deficiencies in the fore and the rear attachments (Figs. 20-25, pages 51 to 57).

**Selection of Dairy Bulls by Type**

Young bulls are selected in much the same way as heifers. Special attention, however, is given the masculine features. After a bull is 6 to 8 months old, he develops a larger head than a heifer and his neck becomes thicker and more rounded. As he becomes older his neck assumes the characteristic arch, or crest, which is lacking in the cow. Feminine-like heads in bulls are undesirable. The shoulders also become heavier, but the body as a whole should exhibit considerable angularity and freedom from blockiness. Heavy fleshing of brisket, loin, and thighs is undesirable. Viewed from the rear, the thighs should be only medium heavy with a tendency toward an incurring outer surface.

Good feeding capacity in the young bull is characterized by the same points as in the young heifer. With increased age, the barrel should become deeper and the flank be carried down well but, as a rule, the mature bull should not be so "paunchy" in appearance as the mature cow. This is partly a matter of so adjusting the roughage and
Fig. 14.—Qualities desired in young bulls

The bull calves shown above have well proportioned body parts without paunchiness. These characteristics indicate rapid growth and rugged development without coarseness. The alertness and vigor of these animals indicate good health. Upper, Brown Swiss; lower Holstein.
Fig. 15.—Qualities desired in mature bulls

Both bulls pictured here show the desirable qualities of smooth, straight top lines, and long level rumps. They also have excellent feeding capacity, as determined by long and deep barrels. Note the masculinity of the head and neck without the sacrifice of a clean-cut appearance. Both are good representatives of their respective breeds. Upper, Jersey; lower, Holstein.
concentrates in the ration that the bull will not be forced or allowed to consume a large proportion of roughage.

*Good size* is desired. Mature bulls, as a rule, should weigh not less than 50 percent more than mature cows of the same breed. This means that the young bull should show evidence of rapid growth and large size for his age. Such size requires strong bones, altho very large, coarse bones are not wanted.

*Good style* is shown by a clean-cut appearance, that is, freedom from folds of loose skin about neck and brisket, medium-sized bones, neat head and shoulders, and a straight top line. Shoulders which join smoothly to the body without deep depressions back of them, and a full development back of the elbows, showing a broad, capacious chest, are desired.

*Strong, straight legs and good feet* are especially desirable in the mature bull. Legs and pasterns should be so strong that the animal stands squarely on his feet.

*Common faults* in the bull are rough shoulders, narrow heart girth, sloping rump and small rear quarters. As in the cow, a sloping rump detracts greatly from appearance. In some bulls the rear quarters are very small and narrow in proportion to the rest of the body. A long, broad, and level rump is fully as important as in the cow, and when a bull has this kind of rump, his rear quarters are usually sufficiently developed to give a well-balanced appearance.

Many of the other parts of a bull’s body not mentioned in this brief discussion are evaluated in the same manner as the parts of a cow’s body are evaluated in the selection of a cow.

**HOW TO USE THE UTILITY SCORE CARD**

The utility score card\(^1\) (pages 32 and 33) is divided into four main headings. Under these are listed the main features comprizing these characteristics, together with a brief explanation of them.

Keep all these features in mind as you examine carefully the animal to be scored. Scoring work is customarily begun on an animal that is one of the best available representatives of its breed. Such an animal should have a fairly high total score. No animal, however, is perfect and it is usually possible by careful study to find some departure from the ideal in almost every feature. Occasionally animals are given a perfect score on some one point, such as refinement.

\(^1\)This score card can be used with any of the dairy breeds, as all dairy cows of good production possess the characteristics of dairy type to a greater or less degree regardless of breed. This score card is called a utility score card because it attempts to place a value upon the cow both as a useful milk producer and as an animal which has desirable type for breeding purposes.
Dairy type is the first feature listed on the score card. Study the animal carefully and decide how closely it approaches the ideal in this characteristic. The first column at the right shows that the possible score here is 16. If you decide that the animal lacks about 20 percent of being the ideal type in body form, you will indicate a cut of 3.2 points. Enter this amount in the column for Points deducted. The next feature listed is Rump. If you grade the animal 10 percent deficient in this feature, enter the number of points deducted as .3, or 10 percent of a possible score of 3 points. When the scoring of individual features is completed, total the number of points deducted, and subtract from 100 to get the net result of your scoring.

The advantages of scoring by deducting a certain percentage of the possible score are very apparent after using this plan for a time. A suitable score may be arrived at more easily for features for which only 2 or 3 points are allowed if the percentage basis is used instead of a hit-or-miss plan.

As the amount to be deducted is very puzzling at first, it is necessary to adopt some sort of standard from which to work. Our best dairy cows do not generally score more than 90 to 93 percent of the ideal. In fact, it is seldom that an animal scores over 90 percent. In scoring, therefore, no cut should be made which is less than 10 percent of the possible score. If 10 percent is too great, enter the points deducted as 0. Animals which are markedly deficient in certain features may be given cuts of 25 to 33 1/3 percent of the possible score. A cut of this size is considered a serious one. A cut of 40 percent is very severe and it is seldom that dairy animals of good breeding are given cuts of more than this amount.

The scoring of an animal having serious defects, abnormalities, or injuries is another difficult problem. When the utility score card is used, the amount deducted for blemishes, defects, injuries, etc., that do not interfere with the usefulness of the animal should be in a suitable proportion to the amount allotted for such abnormalities on the score card under the heading of Style and activity, which is 3 points. Some of the common defects, blemishes, or abnormalities that would come under this classification are: a crooked tail resulting from fracture or other cause; small enlargements of the knees; blindness in one eye; caking or inflammation of the udder following calving. Some of the more serious defects to which the note at the bottom of the score card might apply are: blindness in both eyes; failure of one or more quarters of the udder to function; greatly enlarged knees; severe lameness; badly winged shoulders.
MEANING OF SCORE-CARD HEADINGS

I. Characteristics indicating ideal body form

**Dairy type.**—Desirable features: A well-balanced proportion of parts and unmistakable presence of three distinguishing features of dairy type; namely, angularity of form, development of milking organs, and development of feeding capacity. All prominent points of the body framework plainly visible, thighs relatively thin and wide apart to make room for udder. In scoring, consider both stage of lactation and breed.

Undesirable features: Poorly developed milking organs or feeding capacity; parts poorly proportioned; blocky form with thick covering of fatty tissue. Heavy thighs set close together.

**Rump.**—Desirable features: Good length and breadth; level; evident capacity for giving birth to calf; freedom from roughness and coarseness; smooth, level top line. Cows with broad, level rumps are said to have more capacious udders than those with sloping rumps (Fig. 16).

Undesirable features: Rump sloping toward the rear (Fig. 18-B) as a result of the pin bones being lower than the hip bones; sloping forward (Fig. 18-G); or sloping to the side from the top line toward the thurls, even tho the top line may be nearly straight and level. Coarse and heavy tail setting (Fig. 18-B, C, H, and I), indicating possible lack of refinement throughout the cow's entire framework. Rump short (Fig. 18-F) and narrow at the hip bones or pin bones or in both regions; irregularities or niches in the top line (Fig. 18-D and E) which detract greatly from a pleasing appearance.

**Refinement.**—Desirable features: Bone medium in size for the breed; head, legs, and tail free from coarseness and apparent injuries. Long, slender tail and small horns, clean-cut appearance throughout.

Undesirable features: Heavy, coarse bones; patches of fatty tissue in region of rump, large amount of dewlap.

**Style and activity.**—Desirable features: Head held up strongly and the top line of the back nearly straight (Fig. 18-A). Strong, straight legs placed squarely under the body and a good carriage with regular and even gait. Docile but active and alert disposition, as shown by bright, prominent eyes and tendency to observe activities about her. All parts well proportioned and no marked defects.

Undesirable features: Dull, deep-set eyes; easily frightened and untractable. Rough, uneven top line (Fig. 18-B to I). A sway-back top line detracts from the appearance of the animal but does not necessarily indicate physical weakness. The type of rump shown in Fig. 18-G is often associated with the sway-backed condition. Legs crooked as viewed from the side or rear; rear feet and legs turned outward; uneven gait; crooked neck, or ewe-neck; lameness; winged shoulders (Fig. 13).

A cow whose legs curve forward from the hock joint so that she stands with her rear feet rather far under her body is termed "sickle-hocked;" one whose rear legs are crooked with the hocks close together and the feet turned outward is spoken of as "cow-hocked."

Winged shoulders, a defect found occasionally, seems to be caused by
a weakness in the ligaments and muscles which attach the shoulders to
the other parts of the body framework. Usually the most noticeable effect
is that the lower front parts of the shoulders project outward from the
body, altho sometimes the most marked effect is that the elbows project
from the chest. This defect is likely to become more pronounced as the
cow grows older.

At this stage in the scoring, check for other marked defects which may

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**Fig. 16.—A contrast in rump and pelvic development**

The ideal form of rump and pelvic development is shown in the pictures at
the left. Note the long, smooth, level development of the rump, with pin bones
placed high and on a level with hips. The tail setting is also level and smooth
and carries out neatly between the pin bones. The defective rump shown at the
right is short, lacks smoothness, and is very sloping from hips to pin bones.
Since reproduction is essential for the initiation of lactation, it is desirable that
the pelvic region be so constructed that the cow is able to give birth to the calf
with safety and ease. The broad, level rump is best for this purpose.
One of the serious faults found in cows with sloping rumps is that the udder tilts forward at an angle similar to that of the slope of the rump. In cows of this type the rear quarters of the udder frequently become overdeveloped, causing the front attachment to break away from the body and the udder to become pendulous. A level rump and an udder with a level floor are shown in the upper illustration, while the lower illustration shows a badly sloping rump and an udder suspended at the same angle.
Fig. 18.—Some common faults in rump and top line

A. Ideal rump and top line. Note straight lines and attractive appearance; compare with Figs. 1, 2, and 3, pages 4 to 6. B. Pin bones too low, causing extreme slope from hip bones to pin bones. C. The sloping rump illustrated here is caused by the pin bones being set too low, as in B, but the tail setting extending upward tends to give the appearance, to a casual observer, of a nearly straight top line. (Fig. continued on following page)
Fig. 18.—Some common faults in rump and top line (continued)

D. Irregular top line, showing niche in tail setting and weakness of back; also tendency for animal to be ewe-necked. E. Short, sloping rump with coarse bony tail setting extending far forward between hip bones. F. Curving top line, giving a very unattractive appearance in contrast to straight lines and attractiveness of A. Note the similarity in general contour of F and the cow shown in the lower half of Fig. 17.
Fig. 18.—Some common faults in rump and top line (continued)

G. Sway-backed individual with general slope of rump forward. H and I. Tail setting exceedingly coarse and bony, extending much too far forward on the top line. Extreme coarseness of entire rump. Note high withers and sway-backed appearance, which gives impression of lack of stability. Compare with appearance of cow in lower part of Fig. 4, page 10.
interfere with the usefulness of the animal, such as greatly enlarged knees resulting from injury on floors; severe lameness; blindness in both eyes; loss of one or more quarters of the udder, etc.

II. Characteristics indicating constitution and health

Chest. — Desirable features: A deep, full, wide chest is indicative of good health and a strong body. The chest is considered to be wide when the hand with fingers fully spread can be placed horizontally on the floor of the chest directly between the front legs (Fig. 19).

Undesirable features: Chest narrow at bottom, or floor; depressions back of shoulders indicating narrowness thru body at this point; front legs close together (Fig. 19).

![Fig. 19.—A contrast in constitution as evidenced by width of chest. On the left is shown a chest of very good width, indicative of a strong constitution. The chest pictured at the right is very narrow and is indicative of weakness in constitution and general lack of stability. These details may be readily observed by noting the position of the front legs.](image)

Back. — Desirable features: A straight, strong back, with broad, level loin indicates a strong body framework.

Undesirable features: Greatly depressed back giving a sway-backed appearance (Fig. 18-G); narrow, sloping loin.

Legs. — Desirable features: Straight, strong legs placed squarely under the body and wide apart (Figs. 19 and 20).

Undesirable features: Legs that are crooked, either sickle-hocked or cow-hocked; legs close together; heavy, coarse bones that often are weak; enlargements of the joints caused by injuries.

Condition and health. — Desirable features: Not less than a moderate covering of flesh, together with well-developed muscles showing vigor and strength and indicating that the cow has ability to consume sufficient amounts of nutrients to supply her needs. High-producing dairy cows
must carry ample reserves of flesh throughout the lactation period in order to withstand year after year the effects of producing offspring and milk. Often these reserves of flesh are wrongly interpreted to indicate a lack of dairy tendency. Good health is shown by an alert appearance and by a skin, or hide, that is pliable, loose, of medium thickness, having fine, soft, lustrous hair (Fig. 5, page 11). At times the hair and hide may become rough and hard on account of exposure to hot sun or treatment with fly sprays. Such condition of the hair or hide should not of course be interpreted as an indication of poor health.

**Undesirable features:** A very thin condition of flesh; hide very hard; hair rough and dry, with lack of luster; a droopy, sluggish appearance; dull eyes.

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**Fig. 20.—A contrast in rear udder attachment**

Poor type dairy cows (right) frequently are so narrow between the thighs that there is little possibility of rear udder development. Note at the left the extreme width between thighs which permits high and wide attachment and well-balanced rear udder development.

**Size.**—**Desirable features:** Large and well grown for age, without roughness and coarseness, breed considered. Large cows have greater producing capacity than small cows. The weights given are higher than the averages for the respective breeds.

**Undesirable features:** Undersized for age or distinctly stunted.

**III. Characteristics indicating feeding capacity**

**Barrel.**—**Desirable features:** Great size in proportion to body as a whole, and good length and depth; great depth and width just in front of udder; a rounded appearance (barrel-like), with ribs extending outward from backbone and well arched, giving great width; loin broad and level. The barrel is given the second largest number of points on the score card. For this reason it should be given thorough study.
Undesirable features: Lack of length between fore and rear legs; upper part of ribs nearly straight and sloping sharply downward; lack of depth, often giving cow a "tucked up" appearance.

Muzzle and mouth.—Desirable features: Large mouth and strong jaws indicative of ability to consume large amounts of coarse feed.

Undesirable features: Very small head; narrow pointed muzzle; teeth badly worn or missing.

IV. Characteristics indicating development of milking organs

Udder.—Desirable features: Great width and length, but with depth no greater than the length; reduction in size upon milking; good shape (Figs. 20-25); soft and spongy when milked out, indicating high proportion of secreting tissue.

Undesirable features: Small size, not extending far back between legs or far forward; front quarters drawn (broken) away from body, causing them to sag downward; extending downward a great distance (pendulous) (Fig. 21); little reduction in size after milking; firmness or hardness indicating lack of secreting tissue; lumps in udder; teats pointed forward or hanging close together (Figs. 22 and 23).

Teats.—Desirable features: Four in number; uniform in size and symmetrically placed on the four quarters of the udder; size and length suitable for easy milking; when cow is standing, all teats at same height from floor.

Undesirable features: Teats very small or short, or very large; teats very close together, interfering in milking; extra teats or extra openings which interfere with milking; teats which leak when udder is full; lumps or warts on the teats.

Milk veins.—Desirable features: Large veins with many branches extending forward from the udder; milk wells (openings in body wall thru which veins enter body) large to prevent constriction of blood flow.

Undesirable features: Short, small veins with few branches.

THE BREED SCORE CARD

Each breed association has published a special score card which differs somewhat from the general, or utility, score card. Features which the breed association wishes to emphasize are given special prominence or a larger possible score than on the utility score card.

In the score card for Guernsey cows, for example, 20 points are allowed for skin secretions because the breeders feel that this is a point in which improvement should be made. The Guernsey breeders desire to maintain a high yellow color in the milk, as the color of Guernsey milk is one of its strong selling points. While a direct relationship of this sort has not been satisfactorily demonstrated experimentally, the breeders believe there is a high correlation between the amount of the skin secretions and the degree of color in the milk.
Fig. 21.—A poorly shaped udder is a distinct handicap to a dairy cow

An extremely pendulous udder which is readily subject to injury is shown in the upper illustration. Such a condition is the result of a deficiency in fore and rear attachments. The lower part of the illustration shows an udder which is badly cleft, that is, there is a deep fissure between the fore quarters. The fissure may sometimes extend backward between the rear quarters also.
Fig. 22.—Some common faults in udders and teats

A. Ideal udder. B. Udder ideal in shape and size but teats too short. C. Teats too long. D. Teats have enlargements at the base which interfere with milking. E. Udder "cut-up" or stricture between front and rear quarters, and front also weakly attached to body. F. Udder tilts forward, with capacity of front quarters much less than that of rear. Note extra teat, which is likely to interfere with milking. See discussion pages 30-31.
Fig. 23.—Some common faults in udders and teats (continued)

A. Udder too small, lacks capacity. B. Greatly lacking in capacity, and teats too short and slender for convenience in milking. C. Teats not properly distributed. Extra teat may interfere with milking or may have small ducts and leak milk. D. Poor front attachment and poorly developed rear udder. E. A funnel-shaped and pendulous udder. Such udders usually lack capacity and the teats often hang so close together that milking is inconvenient. F. Udder tilted forward to such an extent that milking is difficult.
Fig. 24.—Some common faults in udders (continued)

A. Ideal udder. B. Lacks development in fore and rear parts. C. Not closely and firmly attached to body in front, commonly referred to as “breaking away.” D. Front shows further “breaking away,” udder deficient in size. E. Udder deficient in front attachment and rear portion. F. Very defective front attachment and poorly developed rear quarters.
All the udders shown in this illustration are defective in the front attachment and also have poorly developed rear quarters. C shows a pendulous, funnel-shaped udder. D, E, and F illustrate udders which are funnel-shaped and teats which point forward. Lack of capacity is one of the characteristics of udders of this sort. The teats in D are too small.
The Jersey cow excels those of other breeds in symmetry and development of udder and in placement and shape of teats. This is the result of decades of emphasis upon these points, and the high score allotted on the Jersey score card to mammary development (38 points) is evidence of the value still placed upon these features by Jersey breeders.

The score cards published by the various dairy-cattle breed associations are used in the same way as the utility score card. These score cards resemble in general the utility card, altho there are several differences. The breed score cards do not classify the features, or characteristics, under a few main headings, as in the utility card. The "Scale of Points for the Mature Holstein-Friesian Cow" lists the parts as twenty-four separate items, including such items as ears, horns, crops, chine, and flanks not included in the utility score card. Much greater emphasis is given in the breed score cards to parts, such as rump and head, and to general style. Refinement and breed type is desired in all these parts so that animals will be good representatives of the breed.

The score cards published by the breed associations for bulls are used in the same way as the score cards for cows. The descriptions for many of the parts on the score card for mature Holstein-Friesian bulls are identical with those for the cows. This does not mean, however, that the parts are exactly alike and that the head and shoulders of the Holstein cow and bull, for example, are identical. The beginner must learn the differences between the feminine and masculine types and what constitutes the ideal type in both sexes. This cannot be done merely by study of the score card. Thoro and painstaking studies of the best representatives of the dairy breeds aided by the score card and the guidance of an experienced person are the best means of fixing the ideal types in mind.

**COMPARATIVE SELECTION**

Assigning placings, or rankings, to a number of animals in the order of their excellence is termed comparative selection. The object of comparative selection is to identify and rank dairy cattle according to their usefulness as milk producers and as members of the breeding herd. The score card is seldom used in comparative selection, but the skill and knowledge acquired from its use are of great value in making correct placings.

In selecting animals for purchase, a buyer may study carefully all the animals in a number of herds and the herds may include from ten
to a hundred head. In public shows, as many as fifty to a hundred animals may be entered in one ring, or class, and it is the duty of the judge to select from the entire group a few of the animals which in his judgment are the best of all those shown and to give them a rank, or placing, in the order of their merit.

It is only after one has become familiar with the score card values and is able to appraise an animal quickly that he can proceed competently with comparative selection. The beginner, when judging high-producing cows, where constitution and health are often very closely related to body form, will find it simpler to keep in mind only the outstanding points concerning body form, feeding capacity, and milking organs. By concentrating on these, he can, as a rule, evaluate a group of good dairy cows quickly and satisfactorily. As he gains in experience, he will unconsciously become more discriminating and take into consideration more of the details outlined in the score card. When one has had sufficient practice in comparative selection, the process becomes more or less automatic and one no longer gives so much conscious and studied attention to each minute detail.

How to Proceed With Comparative Selection

Begin the study of comparative selection by using cows in milk, since points of difference are more readily distinguished with this class of animals than with dry cows or heifers. As the cows are led about in a circle 30 to 40 feet in diameter, stand in the center of the circle or far to the outside, not closer than 15 feet to the cows. Observe their general appearance and style, particularly the angularity, straightness of the back, levelness of the rump, size, straightness of the legs, the gait, and the presence of outstanding defects, if any. This view also gives a splendid opportunity to compare the feeding capacities of the animals as shown by depth of barrel and the relative sizes and shapes of udders. Note particularly while the cows are moving the straightness of the back and rump. A low back or a low rump or defects such as lameness may not be evident when the cows are standing.

With the cows lined up side by side, all facing in one direction, observe from the rear the character of the rump, the size and attachment of the rear udder, the straightness of the hind legs, and the width of the barrel of each cow. Walk in front of the cows, observe the angularity of the withers and shoulders, the character of the head, and the general quality and style of the animal.

With the cows placed in a line one behind the other, all facing in
the same direction and quite near together, compare the top lines and the relative depths and sizes of the barrels and udders. Note also the levelness of the under lines of the udders and the placement of the teats. It is necessary to be at least 20 feet away in order to get the best comparison.

Handling the cows is the next procedure. This is done to verify observations made at a distance and to check up on points not possible to evaluate without handling, such as the thickness and mellowness of the hide, softness of the hair, and most important of all, the quality of the udder. Feel the front attachment of the udder to the body and make note of clefts or strictures between the quarters. Examine the milk veins and wells.

Deciding on Rankings

Having satisfied yourself that you have obtained accurate information regarding the excellent attributes or qualities, as well as the faults, of each animal in the ring, decide which is superior in the main features emphasized by the score card; namely, body form, constitution, feeding capacity, and development of milking organs. This is sometimes difficult, because nearly every animal has some good features and some poor ones. In deciding how much weight is to be given faults, keep in mind the extent to which the faults affect the four main characteristics of a dairy cow, as indicated by the values on the score card. Suppose Cow A has crooked legs and a high tail setting but in all other respects is excellent, while Cow B lacks greatly in feeding capacity but in all other respects is very good. A would be placed over B because the faults of A do not carry so much weight as that of B (see score card, pages 32 and 33). Likewise, suppose C is faulted seriously for lack of size and capacity of udder but in all other respects is better than either A or B. Then B would be placed over C because the characteristics indicating development of milking organs are more important than feeding capacity, having a weight of 34 points against a weight of 22 points. It is not expected, of course, that one will keep in mind all the numerical values given on the score card, but he should know the relative importance of the main features outlined by it.

Very often the decision in the placing of animals is complicated by more factors than in the simple illustrations just given, but the same principles apply; and the necessity for thorough familiarity with and experience in the use of the score card is again apparent.
Production Records of Cows Shown in Illustrations

That pleasing form and appearance may be combined with high production is evidenced by the advanced registry records given below of cows pictured in this circular. These records are for 365 days.

(Fig. 1, page 4)
(Upper) FAIRY Boy’s GIRLIE 355769. Record: Milk 11,429 pounds; fat 584.9 pounds. (Class A)
(Lower) McJOHN’S NELLIE M. 17455. Record: Milk 19,566 pounds; fat 745.1 pounds. (Class A) Dam of Illini Nellie 26578.

(Fig. 2, page 5)
(Upper) CHAllENGER OF PROSPECT’s PRIDE 164710. Record: Milk 10,673 pounds; fat 470.7 pounds. (Class B)
(Lower) MCJOHN’S NELLIE M. 17455. Record: Milk 19,566 pounds; fat 745.1 pounds. (Class A) Dam of Illini Nellie 26578.

(Fig. 3, page 6)
PENSHURST CHAMPION MAUD 133056. Record: Milk 10,535 pounds; fat 444.1 pounds. (305 days; Class B)

(Fig. 4, page 10)
(Upper) JANICE’S BEAUTY OF lOLA 106456. Record: Milk 14,448 pounds; fat 703.3 pounds. (Class A)
(Lower) IMP. POLLY OF La TURQUIE 66025. Record: Milk 15,110 pounds; fat 705.7 pounds. (Class A)

(Fig. 5, page 11)
(Upper) ILLINI PRINCESS TRITOMIA LADY 1408918. Record: Milk 19,666 pounds; fat 752 pounds. (Class B)
(Lower) ILLINI HOMESTEAD PIEBE GIRL 1033689. Record: Milk 19,267 pounds; fat 612 pounds. (Class A)

(Fig. 7, page 19)
ILLINI NELLIE 26578. Record: Milk 29,570 pounds; fat 1200 pounds. (Class B). Total production to September 1, 1939: milk 176,992 pounds; fat 6,866 pounds.

(Fig. 10, page 34)
(Upper) ILLINI LADOGA AGNES ORMSBY 1232105. Record: Milk 18,911 pounds; fat 824.4 pounds. (Class B). Total production to March 25, 1938: milk 100,088 pounds; fat 3,988 pounds.
(Lower) ILLINI PIEBE LADOGA AGNES 1408911. Record: Milk 16,993 pounds; fat 592.9 pounds. (Class B)

(Fig. 12, page 37)
(Upper) ILLINI ILLADOGO PRINCESS AGNES 1465083. Record: Milk 13,938 pounds; fat 522 pounds. (Class B; Age 2 years)
(Lower) ILLINI HOMESTEAD PARThENEA GIRL 464648. Record: Milk 20,393 pounds; fat 717.1 pounds. (Class A; Age 2 years, 11 months)

(Fig. 13, page 38)
ORNDALE VERN 272794. Record: Milk 10,588 pounds; fat 568 pounds. (Class B)

(Fig. 17, page 46)
(Upper) See Fig. 10 (Upper)
(Lower) ILLINI PIEBE PRINCE ONA GIRL 1465073. Record: Milk 17,451 pounds; fat 553 pounds. (Class B; Age 2 years)

All the illustrations, except the drawings, shown in this circular are of animals owned by the University of Illinois. The drawings were made by Mrs. F. W. Cooke, under the supervision of the authors.
PROFICIENCY IN SELECTING DAIRY CATTLE cannot be attained thru casual inspection of dairy animals. Long experience or painstaking, systematic study is necessary.

The value of a dairy cow in a herd depends on her capacity to produce milk and butterfat efficiently over a period of years and to transmit to her offspring a similar capacity. To do this well she must have a rugged body and vigorous health. A dairy bull also must be able to transmit to his offspring the capacity for high production and bodies strong and suitable to their purposes.

There are two bases for estimating these qualities in an animal. One is a record of the pounds of milk and butterfat produced by the animal or its near relatives; the other is the appearance of the animal—how it conforms to certain distinctive features of dairy type. In this circular these two bases are described and suggestions are offered for putting them into practical use.