This book belongs to:

Name .................................................................................................................. Date

Name of Parent or Guardian ..................................................................................

Address ..................................................................................................................

Age .......................................................... Grade in School ..................................

Name of School ..................................................................................................... County

Year in Club Work, Including This Year ..............................................................

Name of Club ........................................................................................................

Name of Leader .....................................................................................................

Name of Agent .......................................................................................................
THE DAIRY SCIENCE PROJECT

Barney Harris
Professor - Extension Dairyman

The 4-H Dairy Science Project is designed to introduce to the 4-H member the many areas in which science is involved in dairying. It may be carried in addition to the dairy animal project or it may be carried alone. The basic principles of dairying and related sciences will be discussed throughout this project rather than the "how to do it" approach.

It is hoped that studies of this nature will develop in the 4-H member a richer and broader understanding and appreciation of life. Its aim is to build a stronger foundation for the 4-H member today in order to cope with the problems of tomorrow.

Unit I of the 4-H Dairy Science Project serves as an introduction and prerequisite to Unit II. In Unit I you will find a brief discussion of the historical development of the dairy cow and the history of the five major dairy breeds of this country. Also, the characteristics of different breeds and how to select a dairy animal are discussed. After carefully studying the material, the 4-H member will be expected to answer the questions in the exercises.

INTRODUCTION

Have you ever given any consideration as to why a cow can eat green grass, yellow corn and other natural colored feeds and continue to produce white milk? Have you ever wondered why some breeds of cows such as Guernseys and Jerseys produce a golden colored milk, while Ayrshires and Holsteins produce white milk? If so, you have curiosity and an inquisitive mind and would probably enjoy reading and studying material as to "why" things occur. Also, you may find that broadening one's knowledge and understanding is as rewarding as the experience you gain in developing new skills.

Answers and explanations to the above questions are quite simple and only require some thought and study. Sometimes it is easier, however, for many of us to dismiss thought provoking questions from our minds and dwell upon carefree things. In which category do you fall?

In order that all segments of the sciences continue to advance, there is a need for young men and women to examine their scientific potential. Young men and women who have become involved in scientific research find it fascinating, interesting and rewarding. You do not necessarily have to become a dedicated researcher in order to enjoy the scientific approach to problems. You will also find the qualities of a researcher such as originality, observation, curiosity, reasoning power and imagination, an attribute to any business venture.

Studies concerned with the nature of living matter such as plants and animals or their products are called biological or agricultural sciences. Within the field of biological sciences we have many segments such as dairy science.

Each segment is an area of systemized knowledge. Research in a science helps to broaden and extend the boundaries of our present knowledge. New knowledge learned, however, must be applied before real progress can be made. Thus, science may be defined as an area of systematized knowledge derived from observation, study, and experimentation.

Scientific research helps us to distinguish between opinions, beliefs and facts. As an example, the earth was believed to be flat less than 500 years ago. Today, without question, we accept the fact that the earth is round. The reason for this is because we have sufficient evidence or proof showing that the earth is round. Thus, we can see that an opinion, a belief and a fact may be one and the same or there may be a great deal of variation.

4-H members having curiosity and imagination should feel responsible and compelled to examine all the facts available before reaching a final conclusion or opinion. In this manner we are able to develop sound and logical reasoning power.

If you are a 4-H member who has curiosity and enjoys finding answers to perplexing questions, then you may wish to join many other young men and women in an endeavor to unravel the mysteries of life. But wait, first you must be willing to study and familiarize yourselves with some of the knowledge and facts
that have already been found, established, and recorded.

The material in this publication is intended to aid you in developing a better understanding of the science involved in dairying. As you study the exercises, use a dictionary to master the vocabulary used and write down the words that are new to you so you will not forget their meanings.

**THE DAIRY ANIMAL**

*(Historical)*

The importance of milk in the human diet is generally recognized. However, less is known about the animals that have the unique ability of converting enormous amounts of feed into a nutritious food enjoyed by millions of people. The dairy cow has been rightly called “the foster mother of the human race,” and she can be found in most of the civilized countries of the world.

Just when and where man began domesticating dairy animals is not definitely known. Historians have suggested a date between 8000 and 5000 B.C., somewhere in Asia or northeast Africa. A mosaic frieze on one of the oldest buildings (estimated to be 5000 years old) unearthed in 1922 near Babylon in the Euphrates Valley depicts what is considered to be one of the oldest records of the use of milk. In the frieze or sculpture, the man sits under the cow’s tail milking her from behind. The sculpture also shows milk being poured through a strainer into a vessel.

In addition to historians, students of paleontology and zoology have also contributed by shedding light on the origin and development of cattle. Paleontologists search for the remains of prehistoric and later forms of cattle and make comparative studies to find the changes occurring during the years. The zoologist by studying the structure of the different parts of the anatomy of the breeds and by observing the differences and similarities can determine relationships which suggest the manner of development.

All students are familiar with those well-known proverbial phrases of the Bible where Palestine is praised approximately 20 times as a “land flowing with milk and honey” denoting an abundance of food. Throughout the Bible and in other early historic writings we note that the dairy animal and her products were regarded as highly desirable foods. Sanskrit writings, thousands of years old, tell how milk was one of the most essential of all foods.

There were no dairy cows in the New World at the time Christopher Columbus made his first voyage to America, for the Indians had no domesticated dairy animals. On his second voyage in 1498, Columbus brought a limited number of cattle that were taken to the islands of the West Indies or to South America.

The first dairy cattle were brought to the United States during the early 1600’s during the colonization of America. The Jamestown colonists are considered to be the first to import cattle into this country in 1611. Cows were of great importance to the welfare of the colonists because they were a dependable source of food. These early imported cattle, which served as the foundation of our great dairy industry, represented various breeds and were brought from England, France, the Netherlands, Sweden and Denmark.

The Pilgrims had made the mistake of not bringing cattle with them on the first voyage of the Mayflower in 1620 and the lack of milk was said to have had a bearing on the high death rate, particularly of children, since more than half died of malnutrition that first winter. Cows were required to be brought on later ships.

Since the pioneer days, the dairy cow has become established in all sections of the United States. In 1979, after more than three centuries, approximately 15.5 million dairy cattle, comprising the major dairy breeds, (Ayrshire, Brown Swiss, Guernsey, Holstein and Jersey) produced about 124 billion pounds of milk for the 20 million consumers in the U.S. During the same period in Florida, about 178,000 dairy cows on about 550 dairy farms produced 1.4 billion pounds of milk.

**Composition of Milk**

The average composition of cow’s milk is shown in Table 1. A chemical analysis shows that milk contains water, protein, fat, carbohydrates, and ash. The composition of milk will vary slightly among cows of the same breed. The average composition of milk of various mammals, including the cow is given in Table 2. Table 3 shows the change in cow numbers and total production during recent years.
TABLE 1. AVERAGE COMPOSITION OF COWS MILK

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>86.90</td>
</tr>
<tr>
<td>Milk fat or butterfat</td>
<td>4.00</td>
</tr>
<tr>
<td>Protein</td>
<td>3.50</td>
</tr>
<tr>
<td>Lactose or milk sugars</td>
<td>3.90</td>
</tr>
<tr>
<td>Ash or minerals</td>
<td>0.70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

**Nonfat milk solids**

TABLE 2. AVERAGE COMPOSITION OF MILK OF VARIOUS MAMMALS

<table>
<thead>
<tr>
<th>Spices</th>
<th>Fat %</th>
<th>Protein %</th>
<th>Lactose %</th>
<th>Ash %</th>
<th>Total Solids %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>3.70</td>
<td>1.65</td>
<td>6.98</td>
<td>0.21</td>
<td>12.57</td>
</tr>
<tr>
<td>Cow</td>
<td>4.00</td>
<td>3.50</td>
<td>4.90</td>
<td>0.70</td>
<td>13.10</td>
</tr>
<tr>
<td>Goat</td>
<td>4.09</td>
<td>3.71</td>
<td>4.20</td>
<td>0.78</td>
<td>12.86</td>
</tr>
<tr>
<td>Camel</td>
<td>5.40</td>
<td>3.00</td>
<td>3.30</td>
<td>0.70</td>
<td>12.39</td>
</tr>
<tr>
<td>Water buffalo</td>
<td>12.46</td>
<td>6.03</td>
<td>3.74</td>
<td>0.89</td>
<td>23.91</td>
</tr>
<tr>
<td>Whale</td>
<td>22.24</td>
<td>11.95</td>
<td>1.79</td>
<td>1.66</td>
<td>33.14</td>
</tr>
</tbody>
</table>

TABLE 3. MILK PRODUCTION OF FARMS IN THE UNITED STATES, 1940-79, (IN LBS.)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Milk Cows ¹</th>
<th>Total Milk Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Thous. lbs.)</td>
<td>(Million lbs.)</td>
</tr>
<tr>
<td>1940</td>
<td>24,940</td>
<td>109,412</td>
</tr>
<tr>
<td>1946</td>
<td>27,770</td>
<td>119,628</td>
</tr>
<tr>
<td>1950</td>
<td>23,853</td>
<td>116,602</td>
</tr>
<tr>
<td>1955</td>
<td>23,462</td>
<td>123,128</td>
</tr>
<tr>
<td>1960</td>
<td>19,527</td>
<td>122,920</td>
</tr>
<tr>
<td>1965</td>
<td>17,593</td>
<td>125,061</td>
</tr>
<tr>
<td>1970</td>
<td>12,000</td>
<td>116,982</td>
</tr>
<tr>
<td>1975</td>
<td>11,140</td>
<td>115,326</td>
</tr>
<tr>
<td>1979</td>
<td>10,777</td>
<td>123,623</td>
</tr>
</tbody>
</table>

¹Cows and heifers 2 years old and over, kept for milk.

THE DAIRY BREEDS

The 5 major breeds of dairy cattle found in the United States are Ayrshire, Brown Swiss, Guernsey, Holstein, and Jersey. There also are several minor breeds such as the Dutch Belted, Milking Shorthorn, Red Dane, Red Polled and French-Canadian found in certain sections of the U. S. Our discussions, however, will be limited to the 5 major dairy breeds.

The term "dairy breed" is used to distinguish between cattle which are bred primarily for milk production and those which are used primarily for beef production. Cattle that may be used for both milk and beef production, such as the Milking Shorthorn, are referred to as dual purpose.

All of the 5 major dairy cattle breed associations have national offices in the United States to help promote the breed and maintain a file of all registered cows. Thus, a registered cow is a
purebred which has been registered by the particular breed association. In order to register a new animal with the breed association, the parents must be registered. The name and address of the Dairy Cattle Breed Association are as follows:

**Holstein**
- The Holstein-Friesian
- 1 South Main St.
- Brattleboro, Vermont 05301

**Jersey**
- The American Jersey Cattle
- P.O. Box 27310, 2105-JS
- Hamilton Road
- Columbus, Ohio

**Guernsey**
- The American Guernsey Cattle Club
- 70 Main Street
- Peterborough, New Hampshire 03458

**Ayrshire**
- Ayrshire Breeders’ Assoc.
- 2 Union St.
- Brandon, Vermont 05733

**Brown Swiss**
- The Brown Swiss Cattle Breeders’ Association
- P. O. Box 1038
- Beloit, Wisconsin 53511

Two common terms used in describing dairy cattle are grade and registered. Grade means that the animal has most of the physical characteristics of a particular breed.

Many dairymen do not care to register their animals regardless of eligibility. As a result, the registration and identification papers are soon lost. Afterwards, the animals are referred to as grades.

The following is a comparison of milk and fat produced by different breeds during a 305 day lactation.

**THE AYRSHIRE BREED**

The Ayrshire is the youngest of the major dairy breeds. Most of the development of the breed took place since 1750, after the other dairy breeds were well established. Ayrshires were developed in the county of Ayr in southwestern Scotland. The Scotsmen did an unusual job of developing a dairy breed which could withstand the rugged conditions of their hill country. The extreme hardiness and rustling ability of the animals is believed to be due to the character of the country in which they were developed, since only those animals with unusual ruggedness and strength could have survived to reproduce their kind.

This breed of cattle is characterized by its spotted red or brown and white color, shapely udders, general symmetry, balance, and smoothness of body. The horns of Ayrshires are long, spreading, and curved up at the ends. Ayrshire animals are sometimes quite nervous, however, most dairymen with well managed herds have no more problems than with the other breeds.

Calves of the Ayrshire breed weigh 60 to 75 pounds at birth and are usually strong and vigorous. The mature cow will weigh about 1200 pounds.

Ayrshire milk contains about 4.0 per cent butterfat and is whiter in color than Jersey or Guernsey milk. Also, the small fat globules found in Ayrshire milk makes it well adapted for cheese making.

**TABLE 4. DHIA 305-2-X-ME. BREED AVERAGES (1977)**

<table>
<thead>
<tr>
<th>Breed</th>
<th>Milk (Lbs.)</th>
<th>Fat (Lbs.)</th>
<th>Average BF Test (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayrshire</td>
<td>11,755</td>
<td>470</td>
<td>4.0</td>
</tr>
<tr>
<td>Guernsey</td>
<td>10,506</td>
<td>493</td>
<td>4.7</td>
</tr>
<tr>
<td>Holstein</td>
<td>14,293</td>
<td>525</td>
<td>3.7</td>
</tr>
<tr>
<td>Jersey</td>
<td>9,762</td>
<td>481</td>
<td>4.9</td>
</tr>
<tr>
<td>Brown Swiss</td>
<td>12,151</td>
<td>491</td>
<td>4.0</td>
</tr>
<tr>
<td>Milking Shorthorn</td>
<td>9,933</td>
<td>364</td>
<td>3.7</td>
</tr>
</tbody>
</table>

1 DHIA (Dairy Herd Improvement Association), 2X (Milked twice daily), ME (Mature equivalent, adjusted according to age). 305 (No. of days milked).
The first importations of Ayrshires into the United States were made in 1822. Since then, numerous animals have been imported from Scotland and from Canada. Though animals of this breed are dispersed throughout the United States, the largest numbers are found in the northeastern part of the country.

THE BROWN SWISS BREED

The Brown Swiss breed was developed in the rugged mountains and valleys of northeastern Switzerland and is probably the oldest of the dairy breeds. In addition to producing milk, the Swiss people use both the oxen and cows as draft animals for work and as a source of meat.

In Switzerland, during the winter season, the cattle are housed in dark and poorly ventilated barns. However, as spring approaches, the cattle are taken to the edge of the valleys and lower Alps where good pasture is available. As spring and summer advances, the cattle are taken to higher elevations, sometimes reaching an elevation of 6,000 to 8,500 feet. In the late fall and early winter, the cows are returned to the valleys before the snow covers the mountains.

Most of the milk produced while the cows are grazing in the mountains is processed as cheese. Cheese has continued to be an important part of the diet of the Swiss people for many generations.

Brown Swiss may be described as being rugged, heavily muscled, and lacking some of the refinement of the other dairy breeds. Calves are light in color, but become darker with age. Generally, color varies from a silver to dark brown. The nose and tongue are black and a light colored band extends around the nose. Horns incline forward and slightly upward. Brown Swiss are usually gentle and not easily excited. The cows are said to be persistent producers (produce milk over a long period) and also have long productive lives in the herd. The average mature cow will weigh about 1400 lbs.

Brown Swiss cattle were first imported into the United States in 1869. The largest number are in the North Central States, New York, and Pennsylvania. There are many Brown Swiss cows in Florida, but generally in herds where other breeds predominate.

THE GUERNSEY BREED

The Guernsey Breed originated on the Island of Guernsey, one of the English Channel Islands, located about 15 miles from the northern coast of France. The island has a temperate climate and a productive soil. Its greatest length is 9 miles and its greatest width is 5 miles. Because of the small size of the island and the strong demand for land on which to grow vegetables for export, the breed developed had to be very efficient to maintain a place in the economy.

Guernseys vary in color from an almost red to a very light fawn with clearly defined white markings. The white markings are usually found on the face, flank, legs, and switch, but may be on any part of the body. A cream-colored nose is desired, but a few cows have been observed to have black muzzles.

Guernsey cattle produce a golden colored milk that contains about 4.8 per cent butterfat. The golden color is primarily due to the presence of the pigment carotene which is found in milk. In addition to causing a richer appearing milk, carotene can also be converted into vitamin A in the human body. Since carotene is derived from the feed the cow eats, the milk may have a richer appearing color when the cows are eating feeds containing high levels of carotene such as carrots and pasture.

The first cattle of this breed imported into the United States came into Massachusetts in 1830. Importations were not numerous, however, until after 1870. Guernsey cattle are found throughout the country, particularly in the northeast and the North Central States. In Florida there are several registered Guernsey herds and many mixed herds that have some pure-bred Guernseys.

In recent years, the American Guernsey Cattle Club and Guernsey breeders have made tremendous strides in increasing the size of the Guernsey cow. Today’s mature Guernsey cow will weigh about 1200 lbs.

THE HOLSTEIN-FRIESIAN BREED

The Holstein breed, as it is commonly called in the United States, has the official name of
Holstein-Friesian. In Europe and many other countries, the breed is known as Friesian.

The Holstein breed was originally developed in the northern part of Holland (Netherlands), and in the neighboring provinces of northern Germany. The early development is obscure, but it is agreed that they have been bred in Holland for many centuries.

The environmental conditions in Holland have had a marked effect upon the growth and development of the Holstein breed. The fertile soil and abundant rainfall of the region was favorable for the production of an abundance of pasture grasses. Even today, the cattle are said to live almost entirely upon grass during the summer months. The extra grass is stored as hay and silage for feeding during the winter months. Starting about the first of October, the cattle are placed in the stable and will remain there until about the first of May. Frequently, the stable is separated only by a door from the living room of the family. While in the stable, the cattle are maintained in a very sanitary condition.

The Holstein cow varies in color from an almost black to an almost white. Most breeders, however, prefer animals on which the two colors are about evenly divided. The colors are always sharply defined and not mixed or blurred.

Cheese has always been an important part of the diet of the people in Holland. The small fat globule and the low fat content (3.64%) of Holstein milk adapt it well for cheese making. The color of the milk is white due to the ability of the Holstein cow to convert the yellow carotene pigment into colorless vitamin A.

The first importations into the United States were made in 1795, but no descendants of these have been traced. The first importation to be kept pure was made in 1852. Beginning in 1870, heavy importations were made each year, reaching a peak in 1885, when 2,538 head were imported in one year. Since 1905, very few Holstein have been imported because of the prevalence of foot and mouth disease in Europe.

THE JERSEY BREED

The Jersey breed was developed on the Island of Jersey, the largest of the English Chan-nel Island group. It is eleven miles long and about nine miles wide. The Island is located about nine miles from the coast of France and about seventy miles from England. The soil of this island is very fertile, and intensive methods of farming are employed.

In 1789, a law was passed which prohibited the importation of cattle onto the island except for slaughter. During World War II, the Germans occupied these Islands and brought some cattle from France. These were all slaughtered at the end of the occupation.

The breeders on the Island have made intensive efforts to improve their cattle in both type and butterfat producing ability. As a result, a small, refined, uniform, and efficient cow was developed. The American Jersey is somewhat larger than the Island Jersey. This is probably due to a better feeding program in America and a desire for larger cows.

The Jersey is the smallest of the dairy breeds. The mature cow normally weighs from 900 to 1000 lbs. Cows of this breed are very sensitive and react quickly to both good and bad treatment. When carefully handled, they become exceedingly gentle.

Of all breeds discussed, the Jersey is the most variable in color. Individuals may be of solid color or white spotted. Solid colored animals may be black or any shade of color from black to a very light fawn.

Jersey milk averages about 5.3 per cent butterfat and is higher than all other milk in both its fat and total solids content. The butterfat is high in carotene, which gives the fat a yellow color. The fat globules from Jersey cows are larger than those from other breeds. Over a period of many years, it has been considered the ultimate in milk for home consumption. During recent years, however, it has lost some of its popularity with some people because of the increasing aversion to high fat diets.

It is believed that the first importations of Jerseys into the U. S. occurred in about 1815. The first definite record of importations into the U. S., however, were made in 1850. Between 1870 and 1890, a relatively large number of animals were brought over. Since that time, many animals have been imported into the United States. Jersey cattle are found all over the United States.
SELECTING A DAIRY ANIMAL

Selection of the dairy calf is the most important step taken by a 4-H member beginning the 4-H dairy animal project. For this reason, we believe it is important that the science student understand the selection process, even though an animal may not be desired.

Prior to the selection of a dairy calf, the new 4-H member should attend a dairy show and observe the different breeds being exhibited. Generally, it is best to select an animal from one of the breeds that predominate in the community. In this manner, a more competitive spirit is developed among the 4-H members since large classes can be exhibited on show day.

Also, information concerning type and performance should be considered before purchasing the project animal. Your plans for the future should govern the emphasis you place on general appearance (type) or estimated performance (milk production).

In order to unify information about dairy cattle, the Purebred Dairy Cattle Association developed the Unified Dairy Cow Score Card. A copy of the Unified Dairy Cow Score Card has been included for your information. Note the pictures of the ideal cows for the five major dairy breeds.

SELECTION ON THE BASIS OF TYPE

In selecting an animal for the 4-H project, it is important that it possess desirable conformation and eye appeal. It is quite discouraging for a youngster to exhibit an animal that does not have desirable type qualities. Also, it is even more discouraging where overzealous relatives and friends, meaning to be kind, build up false hopes in a youngster that his animal will win first prize. Club members need to realize that outstanding calves are difficult to obtain and that the main objective of 4-H Club work is to learn while developing a strong project.

In selecting dairy calves for show purposes, choose only those that are healthy and equal in size to the average expected for the age and breed. Avoid selecting small animals or large animals that are unsymmetrical and coarse with hope that they will develop into blue ribbons animals. When selecting a dairy calf check the following features:

1. Straight and strong top line.
2. Reasonably straight, strong and desirable rear legs.
3. The withers and shoulders snugly held to the body.
4. Smooth and level tail setting.
5. Shoulders and neck blending with the body.
6. A neck that is long and lean with a clean-cut throat and dewlap.
7. Strong head representing the respective breed.
8. Good body capacity, length of body and depth in chest floor.
9. If developed udder—uniform teat placement, symmetrical and balanced udder, strong rear and fore udder attachment.
10. A capacious udder with good quality and texture. Udder should be partially collapsed after milking.

SELECTING ON THE BASIS OF PRODUCTION

Many 4-H members selecting a dairy calf for their animal project will not have access to production records, especially where the herd is not on a testing program (Dairy Herd Improvement Association-DHIA), and in cases where the calves are not identified. Situations of this sort often result in the younger showing a grade animal. In some cases, it might be advantageous for the youngster to start with a grade calf until experience is gained.

Selecting a heifer on the basis of production will of necessity involve examining the production records of the dam and the transmitting ability of the sire (traits passed on to his offspring). In this manner, assume that fifty per cent of the inheritance of the animal comes from the dam and fifty per cent from the sire. Likewise, we may assume that twenty-five per cent of the genetic make-up of the individual animal came equally from the four grandparents. The animal’s production performance is closely related to the performance of the ancestors. A record of the ancestor’s production and history is called a pedigree of the individual animal.

Pedigrees in ordinary practice tend to overrate animals. The main reason is that in many
instances only production records of the sire's best daughters are included in the pedigree.

The use of the pedigree in selecting dairy cattle can be misleading. Breeders are sometimes guilty of relying on family names that trace back to an outstanding cow several generations past. Obviously, if an outstanding animal is very many generations back in the pedigree, the genetic superiority has been halved so many times that there is not much left. The most accepted method of selecting dairy cattle is to pay attention to individual excellence and the excellence of near relatives rather than to remote relatives and genetically insignificant family names.

It has been said: "Individuality tells us what an animal seems to be, his pedigree tells us what he ought to be, but his performance as a breeding animal tells us what he is."

Figure 1 — A pedigree showing the genetic contribution from parents and grandparents to animal X. A record of the ancestors.

EXERCISE I

THE DAIRY ANIMAL

1. Give a general definition of science.

2. What are some of the good qualities of a scientist or businessman?

3. Can you distinguish between facts and beliefs? Briefly discuss.

4. For how many years have dairy cattle been domesticated?

5. Does your family consider milk an important part of their diet? If so, why? If not, why not?

6. List all the dairy products that you have ever eaten.

7. When and where were cattle first imported into the United States?
8. How do historians, paleontologists and zoologists arrive at the date of the origin and development of cattle?

9. Some of the earliest writings concerning milk are found in the Old Testament. Examine the concordance of a Bible and see if you can find 2 or 3 verses referring to milk. Do you know what the term milk means?

10. Why did so many of the children of the Pilgrims die that first winter in the United States?

11. List the composition of cow's milk. How does goat milk compare?

12. What is the largest component of cow's milk? What is the smallest component? What component gives the cow's milk its sweet taste?

13. Can you tell the difference between the number of cows on the dairy farms in 1979 as compared to 1940? What about the total milk production for the same period?

14. Define the following terms:

A. Domesticate —

B. Excavations —

C. Pilgrims —

D. Malnutrition —

E. Mammal —
15. If the information is available, trace your ancestors by completing the following pedigree form.

(Father)

(Mother)

16. How do you explain the variation in color of Holstein and Guernsey milk? If possible, examine the color of the milk from the two breeds. You will note that the Holstein milk is white while Guernsey milk is a golden color.

17. What is the difference between a purebred, registered, and grade animal?

18. Where did each of the dairy breeds originate? By using a map name two other countries that are located in the same area.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Place of Origin</th>
<th>Neighbor Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayrshire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown Swiss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guernsey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holstein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jersey</td>
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</tbody>
</table>
19. (A world map is needed) A load of dairy cattle are about to be transported by ship from Miami to Cape Town, South Africa via England. The boat is loaded and you are the navigator. Proceed toward your destination giving 6 latitude and longitude readings scattered between the two points.

<table>
<thead>
<tr>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td></td>
</tr>
<tr>
<td>B.</td>
<td></td>
</tr>
<tr>
<td>C.</td>
<td></td>
</tr>
<tr>
<td>D.</td>
<td></td>
</tr>
<tr>
<td>E.</td>
<td></td>
</tr>
<tr>
<td>F.</td>
<td></td>
</tr>
</tbody>
</table>

20. Observe the information given on the Dairy Cow Unified Score Card. List the 4 major breakdown of the dairy cow as outlined on the score card.

A.

B.

C.

D.

21. If you do not presently have a copy of "Milk Facts" you may obtain one free by writing Milk Industry Foundation, 910 17th Street, N. W., Washington, D. C. 20006. After you have received your copy, turn to page 8, 9 and 10 and obtain the appropriate information to answer the following.

<table>
<thead>
<tr>
<th>State</th>
<th>Average Prod./cow</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1st</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2nd</td>
</tr>
<tr>
<td>Florida</td>
<td></td>
<td>Last</td>
</tr>
</tbody>
</table>

22. List 3 milestones as found on the last page of Milk Facts that you consider the most important in the development of the dairy industry.

A.

B.

C.
23. Select one of the five major breeds of dairy cattle and briefly discuss the country or area in which the breed was developed. You may use an encyclopedia or other material to supplement the material in Unit I.

24. List some desirable traits of a good dairy calf or cow.

25. Discuss the way you would prefer to select a dairy calf.
EXERCISE II

Questions are to be answered on a field trip to a dairy farm. Plans for the visit should be arranged by the Extension Agent or your local leader. Answers to these questions are to be obtained from the dairyman.

Name of Dairy:

Location:

Cows in Production:

1. Predominate breed on dairy _______. Others _______.
2. Number of acres in dairy farm. _______.
3. Principle basis for culling cows:
4. Are cows milked in a stanchion barn or a milking parlor?
5. Total production per day _______ gal. (8.6 lbs. = 1 gal. or 3.78 liters)
6. 4-H member calculate average production per cow _______ lbs.
7. Briefly discuss points that were of interest to you at the dairy.

Contact the dairyman in advance so that a class of cows may be selected for judging. (A fairly easy class should be selected). Write your reasons for the class of milking cows in the space below. Write complete sentences. Number the cows 1 - 2 - 3 - 4 when judging.

I place _______ over _______.

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________
DAIRY COW UNIFIED SCORE CARD

Breed characteristics should be considered in the application of this score card

Order of observation

1. GENERAL APPEARANCE

(Attractive individuality with femininity, vigor, stretch, scale, harmonious blending of all parts, and impressive style and carriage. All parts of a cow should be considered in evaluating a cow’s general appearance)

<table>
<thead>
<tr>
<th>Breed Characteristics</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEAD — clean cut, proportionate to body; broad musle with large, open nostrils; strong jaws; large, bright eyes; forehead, broad and moderately dished; bridge of nose straight; ears medium size and alertly carried</td>
<td>10</td>
</tr>
<tr>
<td>SHOULDER BLADES — set smoothly and tightly against the body</td>
<td>10</td>
</tr>
<tr>
<td>BACK — straight and strong; loin, broad and nearly level</td>
<td></td>
</tr>
<tr>
<td>RUMP — long, wide and nearly level from HOOK BONES to PIN BONES; clean cut and free from patchiness; THURLS, high and wide apart; TAIL HEAD, set level with backline and free from coarseness; TAIL, slender</td>
<td></td>
</tr>
<tr>
<td>LEGS AND FEET — bone flat and strong, patterns short and strong, hocks cleanly moulded. FEET, short, compact and well rounded with deep heel and level sole. FORE LEGS, medium in length, straight, wide apart, and squarely placed. HIND LEGS, nearly perpendicular from hock to pastern, from the side view, and straight from the rear view</td>
<td>10</td>
</tr>
</tbody>
</table>

2. DAIRY CHARACTER

(Evidence of milking ability, angularity, and general openness, without weakness; freedom from coarseness, giving due regard to period of lactation)

<table>
<thead>
<tr>
<th>Body Structure</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>NECK — long, lean, and blending smoothly into shoulders; clean cut throat, dewlap, and brisket</td>
<td>20</td>
</tr>
<tr>
<td>WITHERS, sharp. RIBS, wide apart, rib bones wide, flat, and long. FLANKS, deep and refined. THIGHS, incurving to flat, and wide apart from the rear view, providing ample room for the udder and its rear attachment. SKIN, loose, and pliable</td>
<td>20</td>
</tr>
</tbody>
</table>

3. BODY CAPACITY

(Relatively large in proportion to size of animal, providing ample capacity, strength, and vigor)

<table>
<thead>
<tr>
<th>Body Measurement</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>BARREL — strongly supported, long and deep; ribs highly and widely sprung; depth and width of barrel tending to increase toward rear</td>
<td>10</td>
</tr>
<tr>
<td>HEART Girth — large and deep, with well sprung fore ribs blending into the shoulders; full crops; full at elbows; wide chest floor</td>
<td>10</td>
</tr>
</tbody>
</table>

4. MAMMARY SYSTEM

(A strongly attached, well balanced, capacious udder of fine texture indicating heavy production and a long period of usefulness)

<table>
<thead>
<tr>
<th>Udder Structure</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>UDDER — symmetrical, moderately long, wide and deep, strongly attached, showing moderate cleavage between halves, no quartering on sides; soft, pliable, and well collapsed after milking; quarters evenly balanced</td>
<td>10</td>
</tr>
<tr>
<td>FORE UDDER — moderate length, uniform width from front to rear and strongly attached</td>
<td>6</td>
</tr>
<tr>
<td>REAR UDDER — high, wide, slightly rounded, fairly uniform width from top to floor, and strongly attached</td>
<td>7</td>
</tr>
<tr>
<td>TEATS — uniform size, of medium length and diameter, cylindrical, squarely placed under each quarter, plump, and well spaced from side and rear views</td>
<td>5</td>
</tr>
</tbody>
</table>

MAMMARY VEINS — large, long, tortuous, branching

"Because of the natural undeveloped mammary system in heifer calves and yearlings, less emphasis is placed on mammary system and more on general appearance, dairy character, and body capacity. A slight to serious discrimination applies to overdeveloped, fatty udders in heifer calves and yearlings."

Subscores are not used in breed type classification.

TOTAL 100
BREED CHARACTERISTICS

ARYSHIRE
Strong and robust, showing constitution and vigor, symmetry, style and balance throughout, and characterized by strongly attached, evenly balanced, well-shaped udder.
COLOR—Light to deep cherry red, mahogany, brown, or a combination of any of these colors with white, or white alone, distinctive red and white markings preferred, black or brindle objectionable.
SIZE—A mature cow in milk should weigh at least 1200 lbs.
HORNS—Inclining upward, refined, medium length and tapered toward tips. No discrimination for absence of horns.

GUERNSEY
Size and strength, with quality and character desired.
COLOR—A shade of fawn with white markings clearly defined. Skin should show golden yellow pigmentation. When other points are equal, a clear (buff) muzzle will be favored over a smoky or black muzzle. A bright golden yellow pigmentation on the nose, around the eyes, in the escutcheon, around the udder and at the point of tail is favored. Two of the 10 points under General Appearance are to be allotted to yellow skin secretion.
SIZE—A mature cow in milk should weigh at least 1100 lbs. "In milk" means normal condition after having been in milk from 3 to 6 months.
HORNS—No discrimination for absence of horns.

JERSEY
Sharpness with strength indicating productive efficiency.
COLOR—A shade of fawn, with or without white markings.
SIZE—A mature cow in milk should weigh about 1000 lbs.
HORNS—No discrimination for absence of horns.

BROWN SWISS
Strong and vigorous, but not coarse. Size and ruggedness with quality desired. Extreme refinement undesirable.
COLOR—Solid brown varying from very light to dark. White or off-color spots objectionable. Females with any white or off-color markings above the underside of the belly or with white core in switch do not meet color standards of the Brown Swiss breed, and shall be so designated when registered. Pink noses and light streaks up the side of the face objectionable.
SIZE—The minimum weight for mature cows should be about 1500 lbs.
HORNS—No discrimination for absence of horns.

HOLSTEIN
Rugged, feminine qualities in an alert cow possessing Holstein size and vigor.
COLOR—Black and white or red and white markings clearly defined.
SIZE—A mature cow in milk should weigh a minimum of 1500 lbs.
HORNS—No discrimination for absence of horns.

EVALUATION OF DEFECTS

In a show ring, disqualification means that the animal is not eligible to win a prize. Any disqualified animal is not eligible to be shown in the group classes. In slight to serious discrimination, the degree of seriousness shall be determined by the judge.

EYES
1. Total blindness: Disqualification.
2. Blindness in one eye: Slight discrimination.

WHY FACE
Slight to serious discrimination.

CROPPED EARS
Slight discrimination.

PARROT JAW
Slight to serious discrimination.

SHOULDERS
Winged: Slight to serious discrimination.
TAIL SETTING
Wry tail or other abnormal tail setting: Slight to serious discrimination.

LEGS AND FEET
1. Lameness — apparently permanent and interfering with normal function: Disqualification.
   — apparently temporary and not affecting normal function: Slight discrimination.
2. Bucked knees: Slight to serious discrimination.
3. Evidence of arthritis, crampy hind leg: Serious discrimination.
5. One or more light quarters, hard spots in udder, obstruction in test (spider): Slight to serious discrimination.

udder
3. Udder definitely broken away in attachment: Serious discrimination.
5. One or more light quarters, hard spots in udder, obstruction in test (spider): Slight to serious discrimination.

Dry Cows
Among cows of apparently equal merit: Give strong preference to cows in milk.

FREEMARTIN HEIFERS
Disqualification unless proved pregnant.

Overconditioned
Slight to serious discrimination.

Temporary or Minor Injuries
Blemishes or injuries of a temporary character not affecting animal’s usefulness: Slight discrimination.

Evidence of Sharp Practice
1. Animals showing signs of having been operated upon or tampered with for the purpose of concealing faults in conformation, or with intent to deceive relative to the animal’s soundness: Disqualification.
2. Uncut heifers showing evidence of having been milked: Serious discrimination.
Notes

References


YOU ARE INVITED TO...

Get acquainted with other interesting educational 4-H projects. Your experiences in 4-H can open the door to a challenging career.

WRITE OR CALL
YOUR COUNTY EXTENSION
AGENT