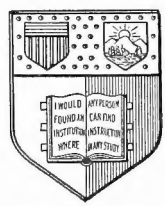
ANIMAL HUSBANDRY

TORMEY AND LAWRY



TORMEY AND LAWRY'S ANIMAL HUSBANDRY

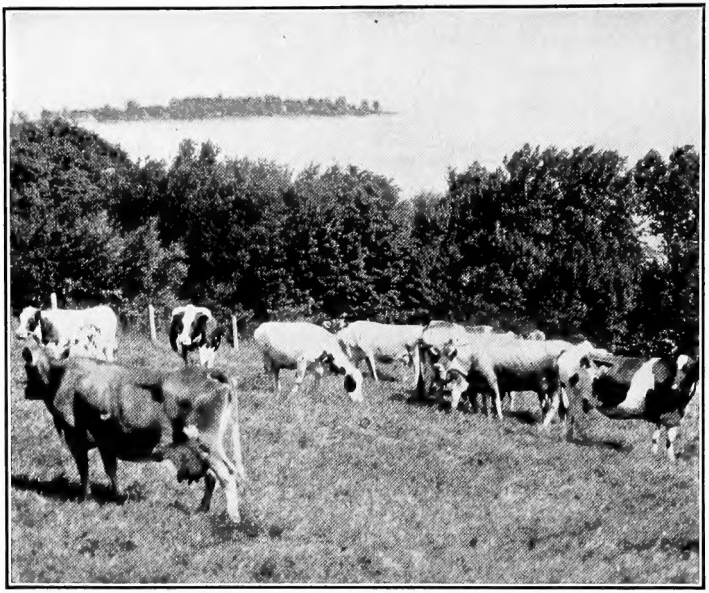
VIVIAN'S EVERYDAY CHEMISTRY

MOORE AND HALLIGAN'S PLANT PRODUCTION

EDITED BY

KIRK LESTER HATCH, B.S.

PROFESSOR OF AGRICULTURAL EDUCATION
THE UNIVERSITY OF WISCONSIN, MADISON



A contented herd of dairy cows in a well-shaded pasture.

Ample range of good pasture should be given brood sows and their litters of young pigs.

ANIMAL HUSBANDRY

BY

JOHN L. TORMEY, B.S.A.

ASSISTANT PROFESSOR OF ANIMAL HUSBANDRY
THE UNIVERSITY OF WISCONSIN, MADISON

AND

ROLLA C. LAWRY, B.S.A.

AMERICAN BOOK COMPANY

NEW YORK CINCINNATI CHICAGO
BOSTON ATLANTA

TORMEY AND LAWRY ANIMAL HUSBANDRY
E P 1

GENERAL INTRODUCTION

THIS series of agricultural texts is based on the theory that the successful farmer should know the physical and biological forces with which he has to contend; that he should understand the laws under which these forces operate; and that he should acquire some skill in directing them. He should ultimately become able to adjust and correlate these forces so as to bring them all under the orderly operation of economic law. In conformity with the above theory this series has been made to cover the following fundamental divisions:

The science and art of producing agricultural plants.

The production, care, and management of farm animals.

The establishment and conservation of soil fertility, with the chemistry of the same in relation to plant and animal production.

The proper balance and combination of these three aspects of agricultural production, in the business management of the farm.

What Vocational Agriculture Demands. — Vocational training in agriculture should differ from trade instruction in one most important regard: trade training develops skilled workers for the various branches of an industry; it neither develops, nor aims to develop, factory managers. It usually deals with parts of the construction, less frequently with the finished product, and more rarely still with the management of the manufacturing plant. Vocational agriculture, on the other hand, must train for the operation of the whole plant, as the farm is a unit in itself. The trained farmer must be skilled, not only in the arts of his varied industry, but also in the scien-

tific management of the entire farm. Added to skill there must be knowledge and understanding.

What the Federal Law Requires. — Under the Smith-Hughes law passed by Congress early in 1917, vocational instruction in agriculture — to quote its language — " must provide for directed or supervised practice in agriculture either in a farm provided by the school or other farms for at least six months per year." There can be no question as to the meaning or the intent of this law. It demands that agricultural instruction shall be *useful*, *practical*, and of *immediate application.*

What This Text is Designed to Accomplish. — The authors of this book have long held the opinion that is expressed in the Smith-Hughes law and made a condition of its fulfilment. They have therefore made radical departures from the usual style of textbook construction. In addition to the informational material, emphasis is placed on frequent sets of *Exercises* intended to provoke class discussion and to direct attention to the established practices on the home farm. Following these exercises are lists of *Home Projects* designed to suggest how the lessons gained from study of the text may be turned at once to practical account.

It is believed that by following the plan set forth in this volume teachers of vocational agriculture may fulfil the most vigorous demands of the Smith-Hughes law. It is hoped that students may also find herein something of inspiration, as well as of immediate practical use.

KIRK LESTER HATCH.

PREFACE

ANIMAL HUSBANDRY includes both the art of breeding, feeding, and caring for live stock, and the fundamental laws of science upon which these practices are based. The ability of a stockman to raise and care for animals in a proper manner rests ultimately upon his knowledge of breeds, feeds, and housing conditions.

The feeder well knows that the ever changing price of feeds has made his occupation one that requires both skill and scientific knowledge. He must raise suitable feeds that form a good crop rotation and which at the same time combine to make the most efficient ration for his purposes. Besides, he must purchase the by-products of milling establishments, slaughterhouses, and oil factories, whose nutritive value must be known if an intelligent selection is to be made.

The dairyman is continually being confronted with new problems. He must select his breeding animals with the greatest care. He must guard jealously the health of his herd, and he must conform to restrictions and requirements placed upon him by the state and by the manufacturers of his raw product.

The successful stockman must understand live stock history and the rules governing the conduct of the various breed associations in order to select his breeding stock intelligently. He must know the reasons for the sanitary precautions necessary to protect his animals from the

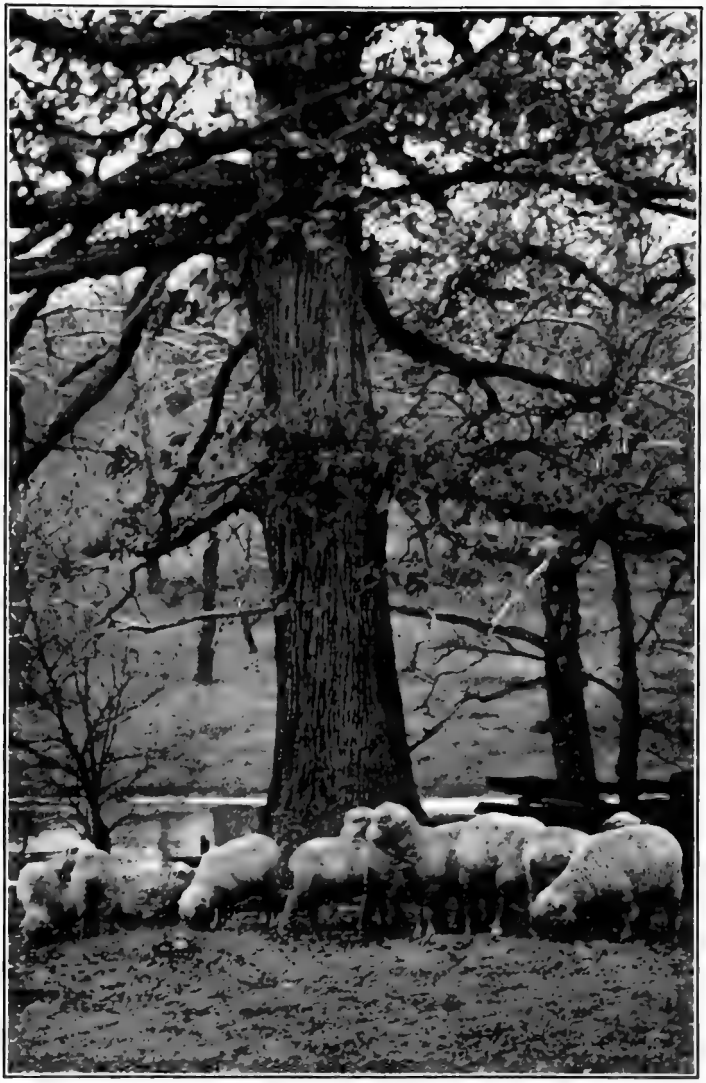
ravages of infectious diseases, and the scientific basis for the restriction placed upon the importation of live stock.

The prominence which poultry breeding has attained as a specialty, added to the widespread importance of raising fowls in both country and town, demands the space given to this section of the book. No aspect of animal husbandry requires more study of the fundamental principles of breeding, feeding, and marketing than does that of poultry.

All these essential elements of successful live stock farming make the study of animal husbandry one of especial interest not only to those who actually engage in farming but also to those who must depend upon agriculture for sustenance.

This volume has been prepared with the hope that its pages will, in some measure, meet the needs of students of animal husbandry and create a deeper interest in the live stock industry.

CONTENTS



(10)

A woods-pasture furnishing shade and protection from the weather is enjoyed by sheep, especially if water is plentiful.

ANIMAL HUSBANDRY

CHAPTER I

THE COMPOSITION OF THE ANIMAL BODY

In feeding animals, the feeder may consider himself a builder who uses feeds as materials with which to build the animal body. But the animal itself should be regarded as something more than a building. It may also be considered as a machine which, while being operated and kept in running order, creates heat, performs work, repairs broken-down material, builds new material, and grows and reproduces itself.

The plant and the animal bodies are built up from various substances which perform distinct functions and make up different parts of the organisms. The chemist has found about 13 chemical elements essential to plants. They are carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, potassium, calcium, magnesium, iron, sodium, silicon, and chlorine. These elements combine to form the following substances in both plant and animal life:

1. Proteins,
2. Carbohydrates,
3. Fats,
4. Mineral substances,
5. Water.

Proteins. — These substances contain carbon, hydrogen, oxygen, nitrogen, and usually sulphur and phosphorus.

Fig. 1. — Soy beans are high in protein.

Proteins form the most important part of feeding stuffs. As a rule the highest priced feeds are the richest in protein.

Protein substances are found near the growing tips of plants and usually constitute a higher percentage of young than of old plants. They are also found stored in seeds around the embryo. In animals, they are even more abundant than in plants, forming the cell walls, lean-meat tissues, brain and nerve cells, hair, hoof, horn, nails, and structural material for all the working organs of the body.

Protein materials usually contain 16 per cent nitrogen. In analyzing feeding stuffs for protein content, therefore, the chemist determines the percentage of nitrogen and multi-

plies this by 6.25; that is, 100 per cent divided by 6.25. Feeds high in protein make up a number of the best commercial by-product feeds, such as wheat bran, middlings, linseed meal, and cottonseed meal. Farm-grown crops which are high in protein are alfalfa, clover, peas, beans, and peanuts. Since protein is essential for the building of living tissues, it is necessary in the feed of young growing animals and milk-producing females. It is also necessary in smaller amounts in the feeds of all other classes of animals, for from it broken-down tissue is rebuilt.

Carbohydrates. — These are defined as substances made up of carbon, hydrogen, and oxygen with the hydrogen and oxygen in the same proportions as they are found in the composition of water, *i.e.*, two parts by volume of hydrogen to one of oxygen.

Included under the head of carbohydrates are starches, sugars, and cellulose. Cellulose forms the cell walls of plants and gives shape and stiffness to the stems, leaves, and seeds. Starch is stored in the seeds of plants like corn and wheat, and in roots and tubers like the potato. It serves as reserve material upon which the plant draws in time of need. Sugar is stored in roots as in the sugar beet, and in stems as in sugar cane.

The cellulose material is coarse and woody and makes up what the chemist calls "crude fiber." It is practically indigestible.

Starch and sugar form the valuable sources of carbohydrate feeding material. In the animal body, the carbohydrates consist largely of glycogen or animal starch and glucose, which are the forms in which this material is stored to be doled out to the animal, furnishing the heat and the energy necessary for doing work. When there is an excess

of this carbohydrate material, it is changed into fats and as such is deposited on the body of the animal.

Feeds high in carbohydrate material are the cereal grains: corn, oats, rye, barley, rice, and buckwheat, which contain large amounts of starch. Potatoes contain a high percentage of starch, sugar beets a high proportion of sugar, and the stems of grasses a large amount of crude fiber.

Fats. — Fats comprise a group of substances of varying composition. They are made up of carbon, hydrogen, and oxygen, with a relatively high percentage of carbon in their composition. In animals, fats may be considered as food stored against the time of need.

Because of their high carbon content fats liberate in burning about $2\frac{1}{4}$ times as much heat or energy as do carbohydrate substances; hence fats are said to have $2\frac{1}{4}$ times the energy value of carbohydrates. The percentage of fat in feed varies from .1 per cent in sugar beets to 39.6 per cent in peanuts. In animals it may vary from 15 per cent in the fat calf to 45 per cent or more in the body of the fat sheep.

Fig. 2. — Peanuts contain a high percentage of fat.

Mineral Substances. — These occur in the plant in various compounds of calcium, phosphorus, potassium, sodium, and magnesium. In animals most of the mineral matter is to be found in the bones, though phosphorus, as has already been indicated, is essential to protein compounds.

Such feeds as bran, alfalfa, clover, and peas are high in mineral matter, and for that reason are valuable for growing animals which need the minerals for bone building. The amount of mineral matter in feeds varies from .4 per cent in wheat flour to 64.4 per cent in some samples of raw ground bone. In animals, the mineral matter varies from 1.65 per cent in the fat pig to 4.66 per cent in the half fat ox.

Water. — Water is found in varying amounts in all living things. It is absolutely essential as a solvent of other

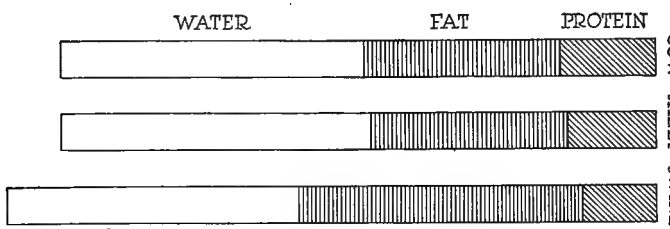


Fig. 3. — Composition of the animal body.

food materials; it forms the basis of the circulating media in the body; and it regulates the temperature of the organism. In feeding stuffs, the amount of water varies from about 6 per cent in well-dried oat straw to over 90 per cent in green clover crops. Growing plants contain relatively more water than do mature ones.

The bodies of young animals contain relatively more water than do those of older ones. The fatter the animal

the lower is the percentage of water, because fatty tissue contains less water than lean tissue. In the body of the extra fat sheep the per cent of water may run as low as 35, while in the body of the store sheep there is about 57 per cent of water. This is one reason why the butcher pays the best price for the fat animal.

Vitamines.— Until the last few years it was supposed that any feed containing proteins, fats, carbohydrates, and mineral matter combined in the proper proportions was a perfect feed. It has been recently discovered, however, that there are two other substances, called vitamines, whose chemical nature is at present unknown, which are necessary to life, growth, and reproduction. One of these substances is found in milk, unpolished rice, peanuts, kidney beans, and some other products. Since it is easily dissolved in water it is called water soluble vitamine. The other substance, found in butter fat, beef fat, cod-liver oil, margarines, leaves of cabbage and alfalfa, and in some seeds, is called fat soluble vitamine. Both vitamines are present in whole milk, cotton seeds, soy beans, kernels of corn, oats and wheat, and certain other plant and animal products. Young animals fed on feeds from which the vitamines have been removed fail to grow or even to live, and older animals fail to reproduce. The practical application of this discovery is to be found in feeding milk containing some butter fat to all young growing animals and in curing and storing hay and other roughage in such manner that their life-giving vitamines will not be washed away by dew and rains.

What Becomes of a Feeding Stuff in the Body of the Animal. — It has already been shown that there is a close relationship between the materials in the plant and in the animal body. The food materials in the plant, when eaten,

undergo various changes before they can be utilized by the animal. Some of this material is not made use of at all but passes off as waste.

What Happens to the Food. — Food, taken into the mouth, is chewed and mixed with a secreted liquid known as saliva. These processes are known as mastication and insalivation. The food is then passed into a long tortuous tube known as the digestive tract. In this tract it is broken down into simpler substances so that it may be absorbed. This breaking-down process is known as **digestion**. The process of taking the broken-down and dissolved food materials through the walls of the digestive tract is known as **absorption**. Transporting the materials to the different parts of the body and using them for the different purposes required is known as **assimilation**.

The digestive tract of all farm animals consists of a long and a very crooked tube distended in certain parts for the storage of food. The canal is divided into the following parts:

1. The gullet, extending from the mouth to the stomach,
2. The stomach,
3. The small intestine, which is divided into the duodenum, the jejunum, and the ileum, and extending from the stomach to the large intestine, and
4. The large intestine.

In the case of the cow and sheep, which are called ruminating animals, the gullet is expanded into three large receptacles in which the coarser rough foods are placed partially chewed by the animal. They remain here for a while, and later are returned to the mouth and rechewed. This process is known as **rumination**. The horse has a small stomach, but eats large quantities of hay. In the case of the horse,

the feed passes on through the stomach and is stored in a large receptacle located between the small intestine and the large intestine known as the cæcum. In this organ a great deal of absorption takes place. The hog consumes less roughage than the horse or the cow and has no such provision for the storing and softening of coarse roughage.

Now what changes take place in the feeds as they pass through the digestive tract?

Protein. — The protein material is first acted upon in the stomach by *pepsin*, a ferment of the gastric juice, secreted from the walls of the stomach. The gastric juice contains another ferment known as *rennin* which curdles milk so that it cannot pass through the stomach before being acted upon by the secretions of the stomach. The pepsin breaks the protein material down into simpler substances which are then passed on to the small intestine where they are acted upon by *trypsin*, an *enzyme* contained in the *pancreatic juice* (secreted by the pancreas, a gland located near the stomach), and by the *erepsin*, a juice secreted by the walls of the small intestine.

After having undergone all this action the protein material is changed finally into simple substances called *amino acids*. In this form it is absorbed from the digestive tract.

In the circulation of the blood these protein substances are carried to different parts of the animal's body and used to build up new tissues such as muscular fibers, ligaments, nerves, hair, hoof, horn, and skin, and to repair tissues broken down in work. What is left, over and above these requirements, goes to furnish heat for the body and energy for work. Some of the excess is used to furnish protein for the milk of female animals.

The greater part of the waste from the broken-down protein material is passed off through the kidneys in the urine. Small amounts are breathed out through the lungs and some passes off through the skin.

From the above it is evident that the animal uses protein for repairing waste and building up new material, and, when the protein is furnished in sufficient amount, to supply heat and energy. The importance of protein in the ration is obvious. No tissue building and consequently no growth can take place unless protein food is furnished in sufficient quantity.

Carbohydrates. — The carbohydrates make up the greatest bulk of the feeding stuffs. The digestive tracts of farm animals are arranged to accommodate large amounts of these substances.

The changes in these food materials begin in the mouth. While the food is being chewed, it is mixed with a liquid known as *saliva*, secreted by glands in the mouth. The function of the saliva is to moisten and soften the food so that it may be easily swallowed; and to change the insoluble starch into a soluble sugar called *maltose*. The action of the saliva continues on down the gullet and into the stomach. The maltose is not yet in condition to be absorbed by the system, but must be changed into a simpler carbohydrate form known as *glucose*.

The carbohydrate materials pass into the small intestine where they are broken down into simpler forms which may be absorbed from the digestive tract and assimilated by the animal body.

In the case of animals that live upon foods containing large amounts of crude fiber, or *cellulose*, special digestive structures are found. As has already been noted, the ox

and sheep have four so-called stomachs, although the first three are only enormous distentions of the gullet. These parts are called the *rumen* or *paunch*, the *honeycomb* or *reticulum*, the *manyplies* or *omasum*, and the *abomasum* or *true stomach*. In the last named, regular digestion takes place. In the first three named, especially in the paunch, there is room for vast quantities of rough feed. Here the rough feed lies for a time until it is regurgitated, chewed, swallowed the second time, and passed to the third stomach or manyplies. In the paunch, there is generally a great evolution of gas, due to bacterial fermentation. Under ordinary conditions, these gases are taken up by the blood circulation and expelled from the body through the lungs.

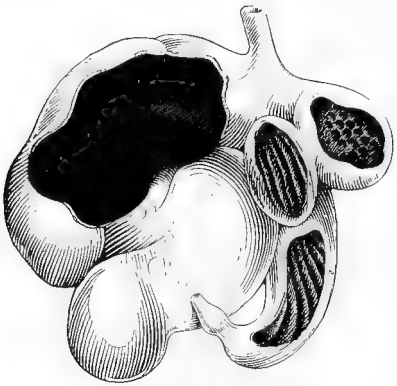


Fig. 4. — Stomachs of the sheep.

Often when large amounts of green, dew-laden clover or alfalfa are taken into the paunch, the evolution of gas is greater than the blood can dispose of and bloat or hoven occurs. If not relieved, the animal becomes greatly distressed, and the toxic or poisonous properties of these gases may cause sickness or death.

Fats. — The fats are not so readily changed by the digestive fluids as are the proteins and the carbohydrates. As they pass along they are first acted upon by *steapsin* (an enzyme secreted by the pancreas) and converted into soaps. Fats themselves are not soluble and are

changed to soaps so that they may be absorbed from the digestive tract. These soaps are converted back to fats after they have passed through the walls of the intestines and are then taken into the circulation. The fat that is not used to create heat or energy for external work is made into fatty tissue which serves as a food reserve.

Mineral Matter and Water. — Water is used all along the digestive tract as a solvent. It is found in all parts of the body, forming a necessary part of all tissues. Without water there can be no circulation whatever.

Mineral matter is taken up in solution all along the digestive tract, and is carried by the circulation to all parts of the body. Calcium or lime is used in building the skeleton. Phosphorus is used in the skeleton and also plays an important part in the protoplasm and cells of the animal. It is also found in protein compounds. Iron is found in the blood and to its presence is due the power of the red corpuscles to carry oxygen. Magnesium is found in the bones and in the blood, chlorine is necessary in protein digestion in the stomach, and sodium and potassium are found in the serum and the red corpuscles of the blood.

EXERCISES

1. Name a list of feeds high in starch. In oil. In protein. In sugar.

2. Classify the above feeds in order of the relative amounts of these substances which they contain.

3. Make a list of feeds of high water content and classify them in order.

HOME PROJECT

Make a collection of all the feeds used on the home farm and classify them in order of their most important content.

CHAPTER II

FEEDING STUFFS AND THEIR PREPARATION

How Feeding Stuffs are Analyzed. — In analyzing feeding stuffs the chemist determines the percentage of the following substances: water, ash, protein, fat, crude fiber, and nitrogen free extract. All of these are capable of furnishing nourishment to the animal body, hence they are called *nutrients*.

To determine the amounts of water and ash the chemist first takes a known weight of the feeding stuff, dries it at a

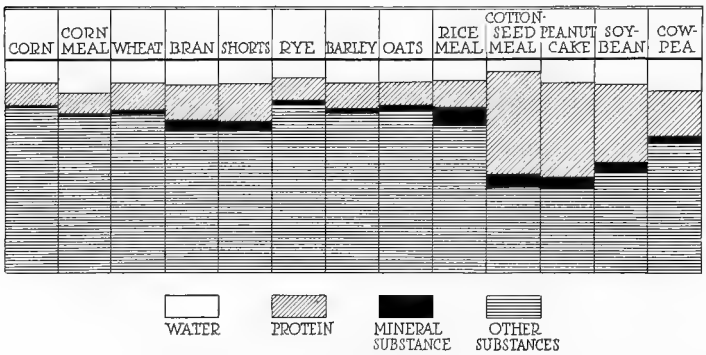


Fig. 5. — Composition of feeding stuffs.

temperature of 212° F. for a few hours, reweighs and repeats the drying process. When it finally comes to a constant weight the difference between the original and the dry weight is the amount of water driven off. Dividing the weight of water by the weight of the original sample

gives the percentage of water. The dry part of the sample is then burned. Mineral matter will not burn. The ash remaining therefore represents the amount of mineral matter.

As already indicated, the protein is found by first determining the nitrogen and multiplying it by 6.25. Since about 16 per cent of protein is nitrogen, the weight of protein is 6.25 times the weight of nitrogen.

Another sample of the feeding stuff is next treated with dilute acids and alkalies to remove all soluble portions. The insoluble part remaining is called crude fiber. It is composed chiefly of cellulose, abundant in seed coats, hulls, husks, and stems of plants. Crude fiber is largely indigestible. Feeds that are high in crude fiber and low in the more soluble nutrients are called *roughages*. Those comparatively low in crude fiber and high in the other nutrients are called *concentrates*.

Another sample is treated with ether. The portion soluble in ether is considered as fat although the term *ether extract* is to be preferred, because ether dissolves waxes, resins, and gums as well as fat. Waxes, gums, and resins are more abundant in roughage than in concentrates, hence the ether extract of roughage is less valuable than that of concentrates. Fat is very valuable as a nutrient.

Sugars and starches are included under the term nitrogen free extract. The sum of the ash, fat, protein, and crude fiber is subtracted from the total dry matter. The difference is the nitrogen free extract. The sum of the nitrogen free extract and the crude fiber makes up the carbohydrates of the feeding stuff.

An analysis of corn and timothy hay will serve to illustrate the varying amounts of the different nutrients.

	Corn %	Timothy Hay %
Water	10.6	14.1
Ash	1.5	3.9
Crude protein	10.3	5.0
Crude fiber	2.2	31.1
Nitrogen free extract	70.4	43.7
Fat	5.0	2.2
Total	100.0	100.0

It will be seen from the above that timothy hay, a roughage, is much higher in crude fiber and lower in nitrogen free extract than is corn, a concentrate.

In general, the value of a feeding stuff depends upon the digestible nutrients the feed contains. The animal cannot use all of each nutrient in a feed. There will be some waste. It is only the part of the feed that the animal utilizes that is of value. This is called the digestible nutrient and can be determined only by experiment. By digestibility is meant the relation which that portion of the nutrient retained and used by the animal bears to the total amount. This may be expressed in percentages called coefficients of digestibility. There are three general methods employed for determining the digestibility of feed. Only one of these, the most common and the least complicated, is explained in the following paragraph.

How Digestibility is Determined. — Digestion experiments are conducted with ruminating animals, either cattle or sheep. The animal is confined in a stall and an accurate account kept both of the feed fed and the amount of solid excrement. Both feed and solid excrement are weighed and analyzed. The difference in analysis between these

amounts represents the amount digested. From these data it is easy to determine the percentage of digestible nutrients in a feeding stuff. The relative values of feeds may be found by comparing the amounts of digestible nutrients which they contain as shown by the tables in the Appendix.

Factors Influencing Digestibility. — There are many factors which influence the digestibility of feeds. The most common of these are:

1. *The relative amounts of the different nutrients.* Feeds high in crude fiber and low in nitrogen free extract, such as coarse fodders, are low in digestibility, while those low in crude fiber and high in nitrogen free extract, such as concentrates, are high in digestibility.

2. *The maturity of the plant.* The stage of maturity has an effect upon the digestibility of roughages. The younger the plant, the higher the digestibility. This is due in a measure to the fact that as the plant advances in age, the crude fiber becomes more woody and harder for the digestive juices to dissolve. But the amounts of starch and sugar also increase, so that the total amounts of digestible material increase as the plant approaches maturity.

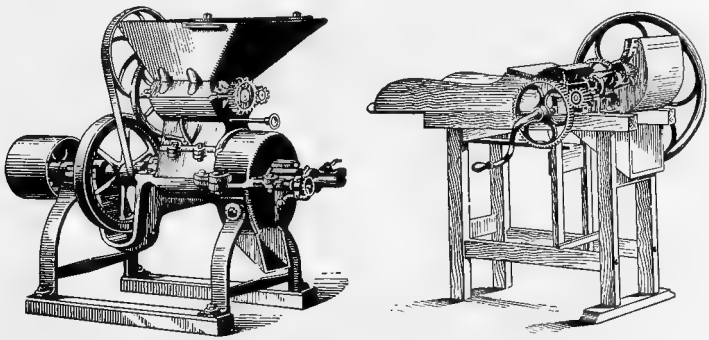


Fig. 6. — Grinding and cutting machines used to increase digestibility of feeds.

3. *Grinding or crushing feed.* In some cases grinding and crushing increase the digestibility of feeds. The value of crushing is especially marked in grains having a heavy outer husk, like oats and barley, which prevents the digestive juices from acting freely upon the more digestible interiors. Grinding seems to be more valuable for horses and pigs than for ruminants, whose paunches enable them to more completely break down the coarse husks.

4. *Cooking.* Cooking has been found to lower the digestibility of protein. In most cases investigators have found that the digestibility of feeding stuffs is lowered by cooking, though some starchy foods like potatoes are improved in feeding quality. Skillful feeders often cook feeds for prize animals for the purpose of adding variety to the ration.

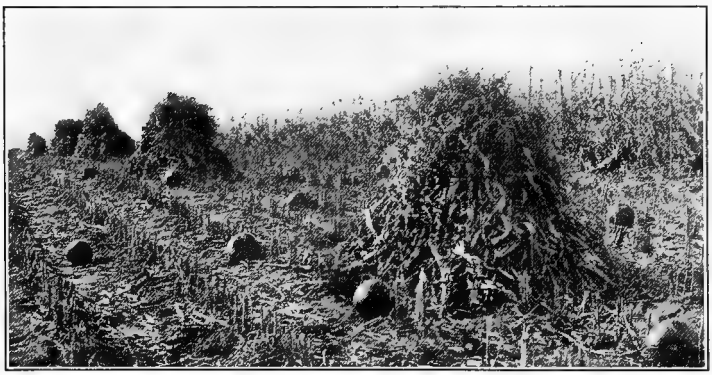


Fig. 7. — The digestibility of fodder depends on its proper curing.

5. *Drying and curing.* Drying forage does not lower its digestibility, although more work on the part of the digestive organs is required to masticate it completely and to carry it through the alimentary tract. Faulty curing may cause a loss of some of the more digestible parts of the plant.

6. *The kind of animal.* Animals of the same species digest food about equally well, although individuals may vary greatly in this power. Cattle and sheep digest roughage better than do horses and pigs, because the fermentation which takes place in their paunches breaks down the cellulose structure. The difference is less noticeable when concentrated foods are fed.

7. *Frequency of feeding.* The time of watering or the frequency and the order of feeding do not seem to affect the digestibility, although changes in order and time of feeding and watering may seriously affect the physical condition of the animal and thus lower the final nutritive effect of a ration.

8. *The amount of food given.* The amount of food given may affect digestibility. The digestibility has been found to increase on half rations and is probably due to more intense action on the part of the digestive juices. On the other hand, too much food may tax the digestive system, and some of it may pass through unchanged.

9. *The amount of work.* Medium work has been found to have a favorable influence upon digestibility, while hard or fast work lowers digestibility.

10. *The age of the animal.* After the digestive organs have reached full development and before they become impaired by old age, the power to digest food is greatest. Aside from this, age does not seem to influence digestibility.

11. *The breed.* One breed of animal digests food as well as another, although individuals may vary in this respect.

12. *The value of kindness.* Harsh treatment may influence digestibility by interfering with a normal secretion of digestive fluids.

The Preservation and Preparation of Feeding Stuffs. — In localities where feeding stuffs must be kept from one

season of the year to another, the question of preservation and its effect upon their feeding value is of large importance. There are two general methods now in use, viz., drying or curing, and ensiling.

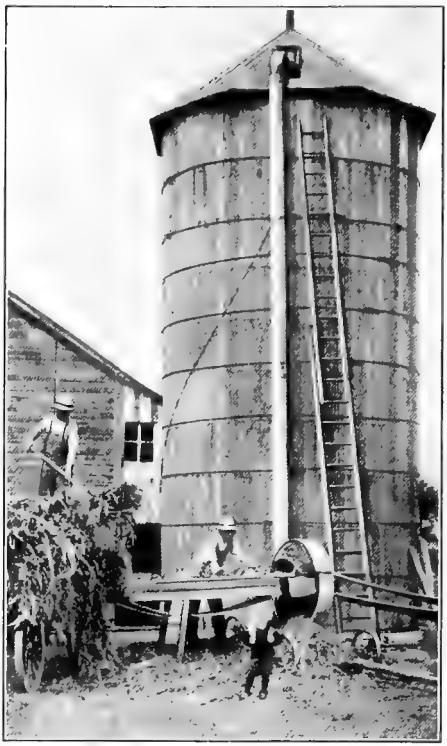


Fig 8. — Chopping corn forage and storing it in a silo.

Drying or Curing. — The majority of forage crops are so high in water content when harvested that a process of curing must be resorted to. While the mere drying of a foodstuff does not impair its nutritive value, there is generally a loss of feeding value through curing, because leaves are shattered in handling, and aroma is lost by the evaporation of dew. Bleaching by the sun also causes a chemical loss, and the rain and the dew carry off valuable nutrients in solution. Corn forage, allowed to stand in the field over winter, loses not less than 25 per cent of its feeding value by leaching and bleaching.

The making of good hay is an art. Since the leaves of alfalfa and clover contain the most valuable part of the

nutrients, the secret of successful haymaking is to withdraw the water so uniformly from the leaves and stems that the leaves may not be lost.

Since heating will cause a loss of its feeding value, early picked corn and grain threshed out of the shock, or from stacks, before sweating has taken place, should be carefully watched to prevent heating.

Ensiling. — Ensiling is the storing of crops as soon as they are cut in air-tight receptacles called silos. This method reduces the losses to a minimum. Ensiling preserves the entire plant without loss of water, thus producing a succulent feeding stuff. The chemical changes which take place in the silo make the feed more pleasing to the taste. These qualities give the ensiled crop a decided advantage over dried crops. The silo extends the conditions of summer feeding throughout the year. This is one of the strong points in favor of silage as a feed for producing both milk and beef.

Preparation of Feeding Stuffs. — In general, the less preparation made of feeding stuffs, the more economical the feeding process. However, the value of the feeding stuff may sometimes be increased by cutting, grinding, or soaking.

Cutting. — Hay or straw for horses and cattle is often improved by cutting it in lengths of 2 or 3 inches. This may be mixed and fed with a grain ration. In this way the value of the hay is apparently increased because the animals eat it with greater relish, and the grain goes further because it is better masticated by the animal. Shredding corn stover does not increase its feeding value but it reduces the stover to a form that is more easily stored, handled, and fed. The waste makes good bedding, is an excellent absorbent of liquid manure, and is easily applied to the soil.

Grinding and Crushing. — For fattening hogs there is no economy in grinding corn. In feeding young pigs or older animals for show purposes there may be some advantage in grinding. More rapid gains and a better finish may be put on, but these will be accomplished at an increased cost.

It does not pay to grind corn for fattening cattle if hogs are following. The gains made by the hogs are more valuable than the increased gains made by the cattle on ground corn, to say nothing of the cost of grinding. In case of feeding without hogs following, the grain should be ground to prevent loss of feed. For fitting cattle for show purposes, improved finish and more rapid gains may be made by feeding ground grains.

The dairy cow under the severe strain of heavy milking needs ground feed. This saves her energy for milk production and better results are thus obtained.

Calves do better on cracked or crushed grains because their organs of mastication are not so well developed and their digestive tracts are not so capable of handling the unground feed as those of the mature animal. Fine grinding should not be resorted to because of the additional cost, and because finely ground grain does not properly exercise the digestive organs.

Feeders of large numbers of work horses feed crushed grain and cut hay to good advantage. They find there is an actual saving in the amount of grain necessary; besides the horses are kept in better condition.

Sheep can usually grind their own grain, but young lambs do better on crushed or cracked grains.

Barley and old corn, on account of their hardness, are digested better by all animals when crushed.

Cooking and Soaking. — All modern investigators are agreed that uncooked foods are better for farm animals. For adding variety and palatability to the ration and improving the finish of animals being fitted for show, without regard to economy, cooked feeds are fed with good results.

Soaking feeds often improves them by rendering them more easily masticated and carried along the digestive tract. The mouths of grass-fed beef cattle often become sore from eating hard, dry corn. For them the corn may be improved by soaking for twelve hours before feeding. Barley is also improved for pigs by soaking it for the same length of time.

Care of Wet Feeds. — Slop or moistened feeds should not be allowed to stand long in dirty barrels, vats, or other receptacles. Under such conditions souring takes place and feeds become unpalatable. Disastrous results to animals may follow a neglect to keep receptacles clean.

EXERCISES

1. Would you feed ground corn to pigs? Why?
2. Does it pay to give feeds special preparation?
3. For what purposes should feed receive special preparation? How should it be prepared?
4. Which is to be preferred as a feed, pound for pound, grass or dry hay?

HOME PROJECT

By feeding two lots of pigs, one on whole corn and the other on ground corn, and slop, and keeping accurate records, compare these two methods of feeding corn. All other conditions must be the same.

CHAPTER III

CLASSES OF FEEDING STUFFS

FEEDING STUFFS are usually classified as roughages, concentrates, and root crops.

Roughages. — Roughages are bulky feeds that come from the grasses and forage crops. They have a low amount of digestible material in proportion to their weight. Included under the head of roughages are the grasses, the legumes, the straws of different cereals, silage, and stover.

Concentrates. — Included under this head are the cereal grains, the oil-bearing seeds, and a large number of so-called by-product feeding stuffs from the following sources: the milling of grains, the manufacture of cereal foods, starch, sugar and glucose, and the extraction of oils, and the slaughtering of animals. Concentrates are just what the name implies, concentrated feeds, since they are high in the easily digested nutrients.

Roots and Tubers. — This group of feeding stuffs includes a large number of crops that form a valuable source of food for animals in countries where corn cannot be successfully grown. Root crops may be considered as very succulent concentrates.

The Grasses. — Grass is the natural diet of all our domesticated live stock and the experienced feeder knows that the more he keeps his stock on a diet which closely resembles grass pasture the more successful his feeding.

Included among the grasses are corn, Kentucky blue grass, timothy, orchard grass, redtop, prairie grass, marsh grass, quack grass, brome grass, Bermuda grass, Johnson grass, Italian rye grass, the cereal grains, and other more or less important grasses.

Corn as Roughage. — Though usually grown for the grain to be used for human and animal consumption,

Fig. 9. — Roots used for food.

corn is in reality a giant grass. It is more valuable to the American farmer than all the other grains produced. When it is planted in rows about $3\frac{1}{2}$ feet apart it reproduces the grain more than a thousandfold. Indeed the richness of our soils in many sections of the country is rated by the amount of corn that can be raised upon them. When

this great crop is grown thickly in the row, or is sown broadcast upon the field, a veritable giant grass crop is formed that will yield 10 to 20 tons of green material per acre.

As a feed for all classes of live stock corn is unsurpassed. It should be remembered, however, that it is a highly carbonaceous feed and should not be depended upon entirely for feed for the young, or for the mother animal producing milk.

The Sorghums. — These embrace a number of large grasses which are becoming more and more important to the farmers of the semiarid regions of the West and Southwest. Although some of these plants are as large as corn they differ from it in that the seeds grow at the top of the plant instead of in the axil of the leaf, as is the case with corn. These plants are better than corn for dry climates because they do not suffer so easily from drought. The commonest of the sorghums used for feeds are Kafir, amber cane, and broom corn.

The Smaller Grasses. — While the farmer recognizes the value of corn and the sorghums for furnishing large yields of roughage, he looks to the smaller grasses, which need no cultivation and live on from year to year, for hay and pasture.

Kentucky Blue Grass. — Ordinary blue grass is the common grass of large sections of the country and is found in abundance in Kentucky, Missouri, and the Virginias. It flourishes where there is much lime in the soil, and if left to itself for a few years will drive out other plants. Grazing sections are valued in proportion to their ability to produce blue grass. A great many of the best beef cattle of the country are annually fattened on blue grass as a part or all of the ration.

Timothy. — Timothy is the commonest grass grown for hay. On the market it sells well because it is clean and bright and of uniform quality. The farmer likes it because it is easy to seed and easy to cure into hay.

Timothy hay is low in protein and ash and high in crude fiber. These qualities make it a poor feed for young animals, for sheep, and dairy cows. It should not be fed to these animals when clover or alfalfa is available. It is the popular hay for horses because it is free from dust and easy to handle and store. It can be fed to beef cattle during the later stages of fattening when they consume only small amounts of hay, but clover or alfalfa are more economical for this purpose.

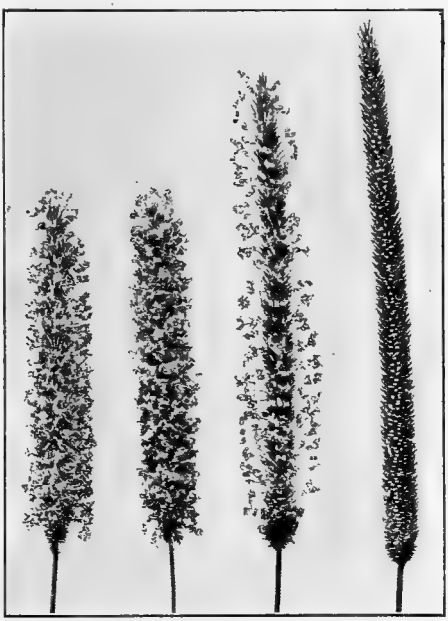


Fig. 10. — Timothy from blossom (left) to maturity (right).

Orchard Grass. — Orchard grass is grown in shady places where other grasses do not thrive on account of the scarcity of sunlight. This grass is very coarse and when allowed to mature fully is too high in crude fiber, and too low in protein, to make good feed for young stock. If cut before fully ripe, and properly cured, it makes good hay.

Redtop. — This is sometimes mistaken for blue grass which it closely resembles. It grows on low damp places and matures early in the summer. When young and soft it makes fairly good pasture, but it becomes wiry and tough as it approaches maturity. To make good hay it should be cut early.

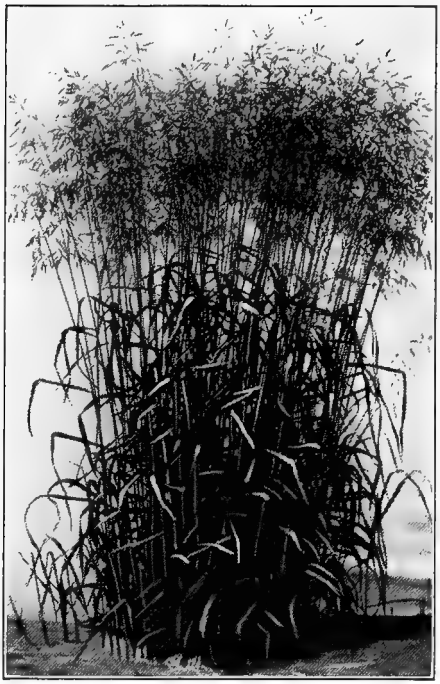


Fig. 11. — Brome grass.

Prairie Grass. — The original grass of all prairie regions is tall with but few leaves. When the land is once broken up this grass disappears. It is thus becoming extinct in cultivated sections of the country, and is of little economic importance. When cut and cured it makes good hay for horses, being especially free from dust.

Marsh Grass. — This coarse, woody grass is valuable in dry years to take the place of pasture grass for those who have unreclaimed marsh land. It cures into a clean hay but it is too low in protein to be valuable as a food for young stock and milk-producing animals.

Brome Grass. — This grass is quite commonly culti-

vated in the northwestern part of the Mississippi Valley and grown with success in the Dakotas and Canada. In these regions it is a heavier yielder than blue grass and has higher feeding value than timothy, especially for growing stock and for dairy cattle. It is also good for pasture.

Bermuda Grass. — This grass grows in the cotton belt states where it is more valuable for pasture than is blue grass. It is so persistent in its habits of growth that it is considered a pest in cultivated fields. If made into hay it should be cut early, because it becomes woody as it approaches maturity.

The Cereals as Grasses. — The cereals are usually grown for their seeds or grain. When pastures are poor or in case of insufficient land, the cereals may be used for feeding green as soiling crops, or they may be grazed off for pasture. If cut while the grain is still in the milk, a bright, nutritious hay may be made. Oats are the best substitute for grass, making the best pasture and the best hay. Barley is next in value and rye stands last.

The Legumes. — The legumes are plants which produce their seeds in pods. When the proper bacteria are present in the soil they have the power of fixing the free nitrogen of the air and storing it in nodules which develop upon their roots. In this way these plants add nitrogen to the soil upon which they grow. They utilize nitrogen in the growth of their stems and leaves. Hence they contain a high percentage of protein. They form the principal source of high protein roughages.

The principal legumes are alfalfa, the clovers (medium red, mammoth, alsike, Japan, white, sweet, and crimson), peas, cowpeas, beans, peanuts, vetches, sanfoin, and seradella.

Alfalfa. — Alfalfa flourishes in the semiarid regions of the West. It is the best of hay crops. The leaves which carry most of the protein are the most valuable portions of the plant.

In regions where alfalfa flourishes it makes the best of pastures. In some of the Western States large yields of milk are secured from cows running upon alfalfa pasture. Steers, hogs, sheep, and horses are also fattened on alfalfa pasture only. In the Middle West and the Mississippi Valley, however, it is not advisable to pasture this crop when the ground is soft, as the feet of the animals cut the crowns and thus seriously damage the plants. There is special danger, if sheep or cattle are turned on to alfalfa fields wet with rain or dew, from bloat, or hoven, that is likely to follow.

In making the hay, great care should be taken to save the leaves, which break off very easily.

Alfalfa can be ensiled with fairly good results. It should be considered as a hay crop, however, and ensiled only when wet weather prevents making it into hay. Alfalfa silage has a much stronger smell than corn silage and unless it is cut into short lengths it is hard to remove from the silo.

For the dairy cow there is no hay so good as alfalfa. It is the best source of home-grown protein, and furnishes, in the cheapest form, the constituents so necessary to milk production. For steer feeding, it is the best roughage to feed with corn, since it balances the ration by supplying the protein and mineral matter in which corn is deficient. Fed alone to steers it fattens them well. For calves, it is the best roughage, because it supplies the crude fiber necessary to proper development of the paunch of the calf, and

also contains the protein and mineral matter essential for the calf's growth. If fed judiciously in limited amounts, it is especially valuable for the growing colt. It is one of the best roughages for all classes of sheep. Hogs relish alfalfa hay better than any other roughage. For young growing pigs, it is valuable either as pasture in connection with the ordinary ration or cut and fed in the form of slop. For feeding the mothers of all young animals the hay is the best roughage that can be obtained.

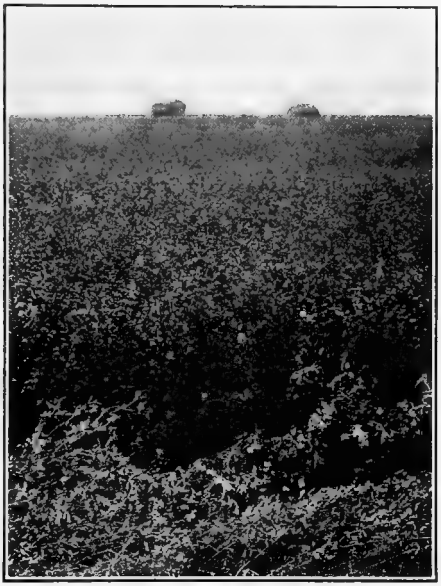


Fig. 12. — Alfalfa is the best of hay crops.

Medium Red Clover. — Medium red clover is one of the commonest legumes in the Northern States, and is the usual crop sown in rotations with corn, grain, and hay. While not so valuable as alfalfa because of its smaller yields and lower protein content, its more extensive cultivation renders it equal to alfalfa as a feeding stuff.

Mammoth Red Clover. — As the name implies, this clover is larger and coarser than the medium red variety, and is not grown so widely for feed. It ripens somewhat earlier than the medium red. It may be pastured in the

spring for two or three weeks and then cut before it gets too coarse, in which case, if well cured, it makes good hay. The second crop is usually plowed under.

Alsike Clover. — This clover which resembles white clover is much larger and has pink blossoms instead. It is usually grown with timothy. It is not so heavy a yielder as medium red clover but is of finer texture and makes an excellent quality of hay for all classes of live stock.

Crimson Clover. — This variety is grown most extensively in the East and South. If cut early, it makes a good quality of hay. After it has begun to ripen, the heads are covered with barbed hairs which may form balls in the intestines of horses and cause serious digestive troubles sometimes resulting in death.

Fig. 13. — Medium red clover. One of our commonest legumes.

White Clover. — White clover is perennial in nature and the best crops are grown on well-drained clay lands. It makes good pasture but it is said to cause an abundant secretion of saliva in horses.

Sweet Clover. — This legume is sometimes regarded as a weed and is not extensively sown as a hay or pasture

crop. If it is cut early before it has become too coarse and woody, it makes a valuable hay. For this reason it is growing rapidly in favor in certain sections of the country.

Peas. — Peas are often very profitably grown with oats, when the crop is to be grazed off by hogs, or to be fed to dairy cows. In districts where peas are grown for canning purposes, the vines are cured into hay or made into silage. As silage they form one of the best feeds for fattening sheep. They may also be used for feeding dairy cows and beef cattle. Ensiled pea vines contain a large amount of water, and if fed in too large quantities may cause serious digestive disturbances. They should always be fed in connection with hay or a dry grain ration to counteract this tendency. Peas contain high percentages of both phosphorus and protein which make them excellent feed for all classes of young stock. The dried seeds when ground are valuable as feed for hogs and dairy cattle.

Beans. — While beans are usually grown for human food, they may be used to good advantage for feeding stock. They are high in protein and mineral matter. Where beans are raised for the market, the straw is valuable as a roughage for fattening sheep.

Cowpeas. — Cowpeas are grown extensively south of the Ohio River. In some of the North Central States fairly good results have been obtained from their use. They are hard to cure, but where they can be grown successfully, they may form a good roughage for sheep and dairy cows.

Peanuts. — Though usually grown for human consumption, peanuts are used as a feed for live stock to a considerable extent in some states. Hogs do well when turned upon the crop in the field and allowed to dig the peanuts for themselves. When peanuts are harvested in the usual

way the vines may be cured into a nutritious hay and fed to horses, cattle, and sheep.

Vetch. — Hairy vetch is the principal vetch grown as a feed for live stock. It makes good pasture for hogs, cattle, and sheep, and can be made into a hay of excellent quality.

Straw. — This term applies to the stalks of the cereals after the grain has been removed. Straw is high in crude fiber and low in protein, nitrogen free extract, fat, and mineral matter. It is therefore low in digestibility.

As a feeding stuff, straw is very useful to supply roughage to horses and cattle that are being maintained over winter. It is often fed with advantage to fattening steers along with a liberal supply of concentrates and other roughages. It may also be cut into short lengths and introduced into the grain ration of the horse. "Heavy" and other greedy horses should receive some straw as part of their rations to prevent overeating of dusty hay. Oat straw is the best. Barley straw comes next in feeding value. Wheat and rye straw have small value as feed.

Concentrates. — Concentrates or concentrated feeding stuffs, as they are sometimes called, are necessary in the rations of all animals that are performing hard work, or that are being fattened, or those which are rearing young.

Concentrates may be classified under the following groups:

1. Seeds of various plants,
2. Commercial by-product feeds.

Under the head of seeds come the cereal grains, oil-bearing seeds, and leguminous seeds low in oil. Under the head of "by-products" come a great many feeds that are the result of commercial operations in the manufacture of certain commodities.

Corn. — Corn is the king of American crops. The grain is high in starch and fat. It is comparatively low in protein and mineral matter and contains but a small amount of crude fiber. It is one of the best feeds to put on fat and to furnish heat and energy to the animal. Since the corn kernel is low in protein and mineral matter, so important for growth, corn should not be the sole feed for the growing animal, or the dairy cow, but should always be fed with some other feed that is high in these important substances. Normal growth is impossible on an exclusive corn ration.

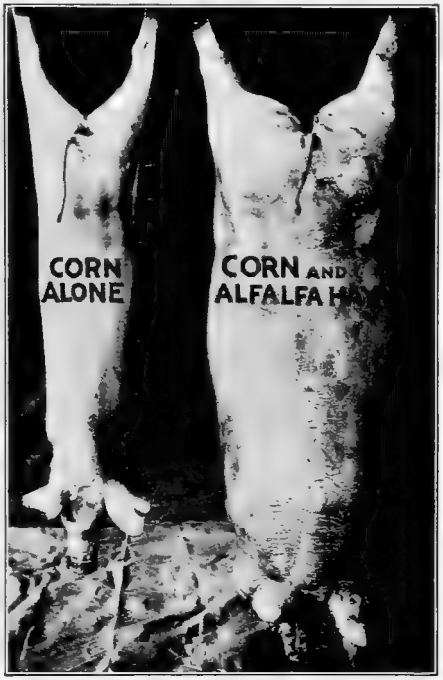


Fig. 14. — Carcass of hog, fed on corn alone, and one of hog fed on corn and alfalfa.

Corn may well make up a part of the rations of all of our farm animals, provided good judgment is exercised in the amounts and the proportions fed. For the dairy cow from 20 per cent to 50 per cent of the ration may be made up of corn. For fattening steers it is practically indispensable. Although there is a prevalent notion that corn is not a good feed for horses, it has been found as effective as

oats, which is usually considered to be the standard feed. For fattening horses for the market, corn has been found cheaper and better than any other farm-grown feed. For the fattening of sheep and lambs, corn is very valuable. In America, corn is the chief ration for hogs.

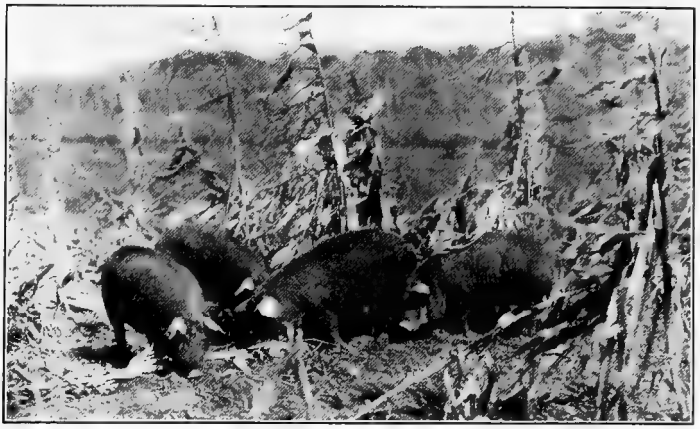


Fig. 15. — Fattening hogs on unhusked corn.

Wheat. — Wheat is raised in large amounts for human consumption, and is generally taken as a standard when considering the price of foodstuffs.

As a feed for live stock, wheat is of little importance, because it is generally too high in price. However, it often happens that some of the grain is damaged by rains, frost, or blight. These damaged kernels are useful for feeding purposes. Wheat is higher in protein and mineral matter than corn and is therefore to be preferred in the ration of the growing animal.

Oats. — This grain stands next to corn as a feeding stuff. Oats is very variable in quality and in weight per

bushel. The standard weight calls for 32 pounds, but this may vary from 20 pounds in the South, where a great deal of hull appears, to 40 pounds in the states of the Northwest, where a more plump kernel with less hull is produced. Per hundred pounds of weight, this grain is higher in protein and mineral matter than corn, but is lower in digestible carbohydrates due to a higher percentage of crude fiber and a somewhat lower percentage of starch. It is higher in fat than wheat.

Oats is one of the safest of feeds. Due to the high amount of crude fiber it carries, it is not a heavy feed; and its well-proportioned amounts of the various nutrients make it approach more nearly to the requirements of a properly balanced ration, for all classes of animals, than any other single feeding stuff. It is the best feed for the road horse. For growing young horses, calves, and sheep it is almost indispensable, forming either all or part of the grain rations for these animals. It may also form about 20 per cent or more of the grain ration for the dairy cow, and some of the slop ration for the brood sow. The high amount of crude fiber makes this grain poorly adapted for fattening swine. It is well to have oats in the ration of the young lamb, and the breeding ewe. Oats makes a good feed for all classes of male animals.

Barley. — This cereal grain is one of the most widely grown crops that the world produces, and forms one of the principal sources of human food. For this purpose, large quantities are used in the manufacture of pearl barley. As a feeding stuff, it is good for all classes of farm animals.

In the western part of the United States, barley is the principal horse feed, and in parts of the country near the corn belt, it is growing in popularity as a substitute for oats.

Because of the hard outside hull, this grain is better for the horse if crushed. As a feed for cattle, mixed with corn, it makes a better feed than either barley or corn fed alone. For the dairy cow it should be either crushed or ground. Barley is also used for feeding hogs. Since it ripens early, it makes a good feed for summer and early fall. In the form of slop, with ground oats or ground corn, it greatly improves the ration for the young pig. If fed whole, it should be soaked for about twelve hours before feeding.

Rye. — Rye is usually grown on poor soils where it ordinarily yields better than other cereals. It is not a popular feed because of its low yields and because it is an unsafe feed for some classes of live stock. The grain frequently carries ergot, a parasitic disease that may cause serious trouble, and even death. When mixed with other cereals it may be fed to fattening animals with good results. Horses doing heavy, slow work keep in excellent condition on it.

Emmer. — This cereal is a member of the wheat family. It has a heavier bran than wheat and because of this is more variable in its composition and feeding value. It will do better than some other cereals in regions of light rainfall. Large quantities are grown in the West, where it is used in place of oats for feeding all classes of live stock.

ROOT CROPS

Root crops are those crops that store most of their material in the roots. In European countries and also in Canada large quantities of roots are used as feeds for cattle, sheep, and horses. In the United States corn can be grown more cheaply. Corn silage makes a feed stuff equal in value to root crops at one half the cost.

Root Crops High in Water. — Root crops are high in water content, which may vary from 80 per cent to 90 per cent. The dry matter in them is in feeding value equal to an equivalent weight of the best grains. Root crops may thus be considered as watered concentrates which are of great value in furnishing succulence to the ration of the animal. They also have a tonic effect not produced by other crops. Roots are usually sliced or pulped and fed alone or with the grain ration. In Scotland and England, they are sometimes pulped and mixed with cut straw or hay, and allowed to stand for some time before feeding.

Roots Similar to Grass. — Roots are valuable for the breeding animal, the animal producing milk, and for growing and fattening animals. The Utah Experiment Station reports as follows: "(1) The live weight gain for cattle and sheep was greater, and for hogs less, when fed on roots. (2) The dressed weight of cattle, sheep, and hogs showed in every case greater shrinkage for those fed on roots. (3) The root-fed animals contained more blood and necessarily more water in the blood. (4) The root-fed steers had heavier vital organs. (5) The fat was always less for the root-fed animals." The foregoing shows that the bodies of the root-fed animals are about the same as the bodies of animals that feed on grass, which is nature's ration and the one upon which the animals do best and keep in the best health. For animals that are to be fattened or fitted for show, roots are very valuable.

Roots Commonly Used. — Some of the common roots for the dairy cow are the sugar beet, the rutabaga or swede, and the carrot. For beef cattle the mangel is usually produced and for sheep the flat turnip is most commonly grown. Though sugar beets are hard to harvest they are

excellent to add to the ration of the cow. Sugar beets are about equal to silage in feeding value but cost more to produce. Mangels are heavy yielders, and should be fed pulped or sliced. Rutabagas may taint the milk of cows, and should be fed after milking. Carrots are good for horses, especially for young horses. While potatoes are low in yield compared with some of the other crops, small and otherwise unsalable potatoes may be fed sliced to cows, and cooked to pigs, with good results.

Roots should be stored in a good root cellar and not allowed to freeze. Frozen roots should never be fed.

CORN SILAGE AND ITS PREPARATION

Although any green forage crop may be ensiled, experience has taught that corn is the best crop for the silo.

Filling the Silo. — The best time to cut corn for silage is when the kernels are well glazed, or about the same stage of growth that corn is usually cut for grain. When filling the silo, the material should be chopped with a silage cutter into bits about $\frac{1}{2}$ inch in length, and well tramped down, especially at the edges, in order to exclude the air. The maximum amount of silage can be stored in the silo if the material is allowed to settle a day or two after each day's filling. One of the approved modern methods of handling silage is to fill the silo as full as possible and then to seal it by planting on top of the silage, oats or other crop that, in growing, will form a mat which will exclude the air. After the silo is opened, there should be continuous feeding to prevent long exposure to the air, which will cause molds to grow, and result in poor feeding material. About two inches in depth of the silage should be fed each day. This

means there should be a relationship between the exposed surface of the silage and the amount of feed used daily. Practically all silos are now made round, because the round silo has more volume for the same amount of building material, more uniform pressure throughout, and there are no corners in which it is difficult to pack the silage.

How to Calculate the Capacity of a Silo. — A silo that is twice the diameter of another requires only twice the building material, but holds four times the amount of silage for each foot in height, and one that has three times the diameter, has nine times the capacity. In arranging the silo, it is a good rule to allow 35 or 40 pounds of silage daily per cow. In a silo 30 feet deep, each cubic foot of silage weighs about 40 pounds, and the average square foot of surface 2 inches thick about 7 pounds. It will then take about 6 square feet of surface 2 inches thick to supply one cow for one day. To supply a herd of 30 cows, it will take 30 × 6 square feet or 180 square feet, which will be furnished by a silo with a diameter of 15 feet. The silo 30 feet deep and 15 feet in diameter will supply silage for a period of 180 days for a herd of 30 cows, if each animal is fed 40 pounds of silage daily.

Feeding Silage. — As a feed for the dairy cow in the corn belt silage is practically indispensable. It may be fed to young calves, but it must be remembered that corn silage is a feed low in protein and mineral matter and high in crude fiber. For calves it must be supplemented with feeds higher in protein. Silage may be fed to horses in limited amounts, but it is too watery to furnish a large proportion of the ration of working horses. Only the best quality of silage, free from molds, should ever be given to the horse. Sheep do well when silage forms part of the ration.

There is danger in feeding frozen silage. After it has thawed out it may be fed, but it spoils quickly after having been once frozen. Frosted corn makes good silage, but is drier than silage made from corn that has never been frozen. Since silage corn loses a great many of its leaves after being frosted, it should be cut, if possible, before frost comes.

Manufacturers of condensed milk and Swiss cheese often contend that silage-fed milk makes a poor quality of these products. Scientific investigation has failed to show that there is anything in silage milk that makes it different from other milk. In some localities milk produced by silage-fed cows is accepted at condensaries. Owing to its high water content there is some danger of unsanitary conditions existing about barns where silage is used, but if properly handled and fed, silage produces a good quality of milk.

EXERCISES

1. Write a list of roughages in the order of feeding value.
2. Arrange a list of concentrates in order of protein content.
3. Make out a list of feeds that are high in oils.
4. Write a classified list of seeds used as feeding stuffs.
5. Is cottonseed worthy of special consideration as a feeding stuff? Why?

HOME PROJECT

Assist in the preservation or preparation of feeding stuffs on the home farm. Keep a careful account of the processes involved, the expenses incurred, and the results obtained, in connection with at least one such feed.

CHAPTER IV

BY-PRODUCT FEEDING STUFFS

By-product feeding stuffs are derived from various sources, such as the milling of grains, the manufacture of cereal foods, starch, sugar, glucose, the extraction of oils, the slaughter of animals, and the manufacture of butter and cheese.

Wheat Bran. — This is the most widely used of all by-products and the one best known to the American farmer. The outside coats of the wheat grain are high in protein and mineral matter, principally phosphorus. In milling, these coats are removed. Bran is made up of these coats, and if of good quality, consists of large flakes, bright in color, and light in weight. It contains a high percentage of crude fiber which gives it bulk and makes it a light and safe feeding stuff.

As a feed for farm animals it has a wide range of usefulness. For the dairy cow it is considered almost indispensable by some feeders because it furnishes the protein and mineral matter so essential to the production of milk. Its bulk, lightness, and laxative properties make it easily digested and help to keep the animal in a thrifty condition. For fattening steers it is sometimes too high in price to be used regularly unless fed in connection with corn, a combination that brings good results. For calves, bran is an excellent feed when fed with either oats or corn.

It is a good feed for horses also if fed with corn to add bulk to the heavy corn ration. Bran is often made into a mash and given to horses as a laxative. The practice of feeding this mash regularly, whether the animal needs it or not, is now looked upon with disfavor.

For all classes of young and growing animals, bran is one of the safest and best of feeds.

Wheat Middlings. — In the process of milling, after the bran is taken off, the next part that is removed is known as "middlings." This is the part of the kernel between the coarse bran and the finer flour beneath. Shorts and middlings are terms used interchangeably. Middlings are high both in protein and mineral matter, being somewhat lower in the latter than bran. When middlings are clean and free from mill sweepings, they make an excellent feeding stuff, especially valuable for hogs when mixed with ground corn. They are not so good as bran for dairy cows.

Red Dog, or Coarse Feeding Flour.— This material is finer and whiter than middlings, but does not command so high a price as flour because it contains many wheat germs which give to it a dark color. When this material can be bought for a reasonable figure, it is good feed for hogs if mixed with coarser feeding stuffs and fed in the form of a slop.

Buckwheat Middlings and Bran. — In the manufacture of buckwheat flour, the coarse hulls and the coarser parts on the outside of the grain are separated from the finer flour beneath. Buckwheat middlings form a valuable feeding stuff. When they can be obtained free from woody hulls, they rank in value with wheat bran and middlings as a feeding stuff for dairy cattle. When the hulls are mixed with middlings, buckwheat bran is formed, the value of which is lessened as the proportion of hulls is increased.

Screenings. — From the cleaning of the wheat before it is ground and from material swept from the mill floor, a by-product known as screenings is obtained. This material varies in feeding value according to the relative amount of grain and waste material which it contains. Large numbers of sheep are annually fattened upon screenings as part of their diet.

Rice Bran. — In the milling of rice, the harsh outside hulls are removed, which, with some of the material adhering to them, form rice bran. The hulls themselves are valueless as a feed. The value of the bran depends upon the amount of rice meal it contains. The hulls are often ground fine and mixed with the meal so that their presence cannot be easily detected. In purchasing rice by-products one should always be guided by the chemical analysis.

BY-PRODUCTS FROM THE MANUFACTURE OF CEREAL FOODS

Oat Hulls. — In the manufacture of oatmeal the outside husk is removed. These hulls are high in crude fiber and have about the same feeding value as oat straw. They are often used to adulterate ground corn, in which combination they are put upon the market as ground corn and oats. While a great many of these so-called ground corn and oats mixtures are good feeds, many of them are too high in crude fiber to be of value.

Barley Feeds. — Pearl barley is a cereal food made from the barley grain. For this purpose only the best of the grains are used from which the outside hulls are removed. These hulls are used to adulterate the poorer grains, unfit for pearling purposes, and the ground combination forms a barley feed. The hulls may also be mixed with other grains

and the combination sold as mixed feeds. These barley feeds therefore vary greatly in feeding value.

Hominy Feeds. — Hominy is made from corn. Only the best grains are used and these must grade up to a certain size. From the select grains the outside hulls and tips are removed. The coarse tips and seed coats and a great many small kernels are left as by-products. These materials are mixed together in various ways and sold under a great variety of trade names such as hominy chop, and hominy feed. Their feeding value is shown by chemical analysis.

BY-PRODUCT FEEDS FROM THE MANUFACTURE OF STARCH AND GLUCOSE

Corn is used in the manufacture of starch and glucose. Since only the starch grains are desired by the manufacturer, the by-product materials are made up of the hull, the tips, the germs, and the gluten portions of the corn kernel. The feeding stuffs thus obtained appear below.

Corn Bran. — This material is made up of the outside layer of the corn grain and is removed in the earliest part of the starch-making process. It contains a high percentage of crude fiber and mineral matter. It does not equal wheat bran in feeding value, and is generally used to adulterate other by-products to form some of the so-called mixed feeds, sold under the names of sugar feeds and starch feeds. It is also used to mix with the gluten meal to form gluten feed.

Germ Meal. — In another part of the starch-making process the germs of the corn are removed. These germs are ground and the oil is pressed out, leaving germ oil cake. This ground cake forms germ oil meal, a feeding stuff high in protein, mineral matter, and fat. It is valuable to mix with some of the coarser concentrates, but when left in stor-

age for too long a period, it may become rancid and unpalatable.

Gluten Meal and Gluten Feed. — The gluten residue of the corn kernel is rich in protein. When this is ground it forms gluten meal which is almost too concentrated to feed alone. The manufacturer mixes corn bran with the meal and forms gluten feed, one of the best feeds for dairy cows. The feeding value of the gluten feed depends upon the amount of bran it contains.

Sugar and Starch Feeds. — These are mixtures prepared in various ways from the by-products obtainable from starch and glucose factories. Their feeding values are variable, and in purchasing, the feeder should insist upon relatively high protein and low crude fiber content.

BY-PRODUCT FEEDS FROM THE MANUFACTURE OF SUGAR

Ordinary sugar is made from sugar cane and sugar beets. Some of the by-products of the sugar industry are useful for feeding purposes.

Beet Pulp. — In the manufacture of beet sugar there is a by-product known as beet pulp, consisting largely of crude fiber. It also contains a considerable amount of protein and mineral matter. In the wet form it is a wholesome and valuable feed for dairy and beef cattle. When fed in the open, in cold weather, care should be taken to prevent freezing. It should be fed in warm stables, and all feeding receptacles should be kept fresh and clean. In the immediate vicinity of beet sugar factories it is often stored in silos. Most of the beet pulp is dried, however, in which form it can be readily transported, and the danger of freezing and spoiling is reduced to a minimum. In the dried

form the pulp can be stored the same as bran or any other dry feed. Dried pulp is a good feed for horses and sheep as well as for beef and dairy cattle.

Molasses Feeds. — The liquid drawn off during the crystallization of sugar is known as molasses. The molasses from sugar cane is sweet and palatable and makes a good feeding stuff. In the South, where this material is obtained in large quantities, it is fed freely to mules and is considered to have feeding value equal to corn. A great deal of black molasses is used for feeding beef cattle that are being fitted for show, and very good results are obtained from its use.

Molasses obtained from the sugar beet is not so palatable as that obtained from the cane plant. It is often mixed with other feed stuffs and the mixtures are called molasses feeds. These feeds vary greatly in feeding value, depending upon the quality of the materials with which the molasses is mixed. Alfalfa is sometimes mixed with molasses. If the alfalfa is good the mixture is good, but it often happens that the alfalfa is poor and then the mixture is not so good as alfalfa hay, even though it does contain molasses and may cost more. Molasses is sometimes used to act as carrier and sweetener for practically worthless material. Purchasers of molasses mixtures should be careful to buy only those feeds whose feeding value is known.

BY-PRODUCT FEEDS FROM THE EXTRACTION OF OILS

Some plants produce seeds high in oil of great commercial value. From flaxseed, linseed oil, used largely in the manufacture of paint, is obtained. This oil commands a high price and thus makes the manufacture of linseed oil a lucra-

tive industry. From the seed of the cotton plant is derived cottonseed oil, used in the manufacture of soaps and for other purposes. Commercial oils are also obtained from corn and peanuts.

Flax, cotton, and peanut seeds are not only high in oil content but are also rich in protein and mineral matter. After the oil has been extracted from these seeds, the by-product materials form feeding substances that are the heaviest carriers of protein of all commercial feeds.

Cottonseed Meal. — After the extraction of cottonseed oil the cake remaining is called cottonseed cake. If this cake is ground, cottonseed meal is formed. The cake is sometimes merely broken into nut form.

Cottonseed cake or meal is one of the cheapest and best carriers of protein. It can be fed in limited amounts to all classes of animals. For the dairy cow it is a satisfactory feed and gives excellent results when fed in small amounts

Fig. 16. — Fancy cuts of beef from animals whose feed contained cottonseed meal as the principal concentrate.

in connection with a good grain ration. For feeding steers it is now conceded to be one of the best high protein feeds, when fed with corn as part of the ration. Cottonseed meal can be used to replace some of the grain in the ration of the horse with good results. In sheep feeding, cottonseed cake can be utilized and the fattening ration is often improved by introducing a limited amount of this feed.

Cottonseed Poisoning. — Hogs have often been poisoned by being fed upon cottonseed meal. The usual advice given is not to feed cottonseed meal to hogs. Cattle have been known to go blind after having been fed upon this material for a 100-day period, and in instances where fed too long death has ensued.

Fed in limited amounts, cottonseed meal is a safe feed and should be more generally used. If fresh it has

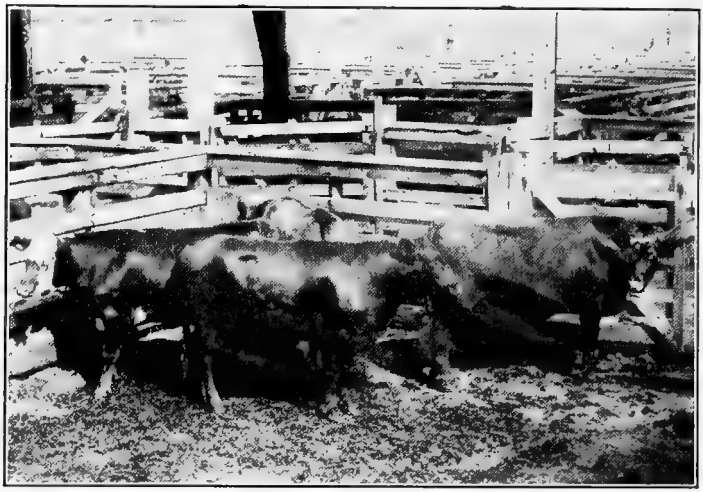


Fig. 17. — Cattle fed on shelled corn, linseed oil meal, shock corn, and clover hay.

a bright yellow color. Old feed that has been long stored or that has been wet and become moldy should not be fed. From 2 to 4 pounds daily in the rations of either the dairy cow or the steer are perfectly safe amounts.

Linseed Oil Meal. — There are two methods of extracting linseed oil from the seed of flax. In the old process, the oil is extracted by pressure, and in the new process, the oil is dissolved out by treating the ground flaxseed with naphtha.

Most of the linseed oil now on the market is obtained by the old process, so that old process oil meal is the kind most in use as a stock feed. The new process extracts the oil somewhat more completely than does the old, so that the old process oil meal is somewhat higher in fat and slightly lower in protein content. In extracting the oil by the new process, however, the seed is heated by steam to drive off the naphtha. This heating lowers the digestibility of the protein so that the amount of digestible protein in the two feeds is nearly the same. Linseed meal is a valuable feed on any stock farm, but it is too rich and high priced to feed in large amounts. Its high content of protein makes it an excellent feed to add to rations low in this nutrient. Its high content of oil gives to it a mild laxative effect.

For dairy cows, about ten per cent of linseed meal in the grain ration increases the flow of milk and improves the condition of the animal. For young calves a small amount of oil meal improves the quality of the ration. Breeding animals should receive a small amount of the feed in the ration. Animals that are being fitted for show or sale are given an added appearance of thrift and finish by the use of oil meal. A small amount of this feed will improve the rations of both sheep and hogs.

BY–PRODUCT FEEDS FROM SLAUGHTERING OF ANIMALS

The principal by-products of the great slaughtering houses furnished to the feeder of live stock are tankage, dried blood, and meat meal. These feeds are all rich in protein and some of them are high in mineral matter.

Tankage. — Tankage is prepared by boiling down refuse material from slaughtered animals in order to secure the

oil. After the oil has been removed the remaining material is dried so that it may be shipped, stored, and kept over long periods of time. The poorer grades of tankage are sold as fertilizer, and those portions that do not contain any of the refuse of the digestive tract are sold for feed stuffs. Tankage is especially valuable for feeding young pigs. It is so high in protein that it should not furnish more than 10 per cent of the ration. It is an economical feed in spite of its high price. Farmers who have no skim milk to feed to young pigs should make large use of tankage.

Blood Meal. — Dried blood meal is also very high in protein material and is valuable to add in small amounts to the ration of the pig and calf. Used sparingly it acts as a corrective of stomach disorders.

Meat Meal. — Meat meal obtained from refuse scraps may be fed to advantage to young animals. Because of its richness it should be fed sparingly. All of the slaughter-house by-products that are sold as feed stuffs are so thoroughly sterilized by the high temperature to which they are subjected during the process of manufacture that no contagious diseases can be contracted from their use.

BY-PRODUCT FEEDING STUFFS FROM THE DAIRY INDUSTRY

Milk is nature's food for the young animal, and normal milk contains all the nutrients in correct proportions for its proper development. The nutrients in milk are highly digestible. The first milk secreted by the dam after the young animal has been born is called colostrum. It is high in protein and has a laxative effect upon the young animal, its purpose being to cleanse the digestive tract. After about five days the milk of the cow is in normal condition.

Milk contains a sugar called milk sugar which has the same composition as cane sugar.

The commercial value of cows' milk is generally established by its fat content, which may vary from 3 per cent or less to over 5 per cent. The fat content varies with individual animals, the stage of lactation, and the progress of the milking. The fat content of milk increases as the lactation period advances, and last drawn milk is richer in fat than first.

At the present time butter fat commands such a high price that few people can afford to feed whole milk except in those rare cases where it is fed to choice young animals that are kept for breeding or show purposes.

Skim Milk. — Milk from which the fat has been removed is proportionately higher in protein and ash than whole milk. It is valuable for rearing calves, and is the cheapest and most reliable feed for this purpose. It is one of the best feeds for young pigs. Five or six pounds of skim milk has the same feeding value as one pound of corn. Skim milk may also be fed to young colts after weaning, with good results.

Buttermilk. — Buttermilk is the by-product from butter manufacture. It has practically the same composition as skim milk, and if the material has not been too badly diluted, as is often done at creameries, it is equal to skim milk as a feed for pigs.

Whey. — Whey is the by-product derived from cheese factories and it is only with difficulty that thrifty calves can be reared upon it. For pigs it has about half the feeding value of skim milk and should be fed in connection with a good grain ration. Whey should be fed fresh. If exposed to the sun in filthy tanks it is not suitable for feeding.

CONDIMENTAL STOCK FOODS

Condimental stock foods are said by their manufacturers to have peculiar medicinal properties not possessed by the common run of feeding stuffs. They contain small amounts of various drugs and herbs, which when properly given under the direction of a qualified veterinarian, produce good results with sick animals or those otherwise out of condition.

The Value of Stock Foods. — Various experiments have been made with different stock foods upon all classes of farm animals at the several experiment stations, and in no instance have these foods equaled the claims made for them. Gains made upon rations containing these materials were always more expensive than those made upon rations that did not contain them.

If animals need condiments, stimulants, or condition powders, which is seldom the case if they are properly fed, it is better to consult a competent veterinarian than to resort to the use of expensive cure-alls.

EXERCISES

1. Make out a list of high protein by-product feeds.
2. What by-product feeds need to be purchased with caution on account of great variation in their feeding value?
3. Why may not roots form the bulk of a ration?
4. What combination of feeds would make an ideal ration for horses? For milk cows? For pigs?

HOME PROJECT

Test one of the combinations of feeds on some of the animals at home, keeping accurate record of cost and results.

CHAPTER V

HOW THE ANIMAL USES ITS FEED

Rations. — A ration is the amount of feed given to an animal in twenty-four hours, irrespective of the time of feeding or into how many portions this feed is divided. A balanced ration is one that supplies protein, carbohydrates, and fats in the proper amounts and proportions so that there is neither excess nor deficiency. A maintenance ration is one that will keep an animal at constant weight.

Feeding for Maintenance. — Feeding for maintenance means feeding so that the animal will neither gain nor lose in weight. The maintenance ration should furnish material sufficient to repair broken down tissue; should supply energy for carrying on the vital functions, such as breathing, digestion, absorption, and assimilation; and should produce sufficient heat for the animal body.

Roughages Preferred for Maintenance. — As a rule, roughages are more economical for maintenance rations than are concentrates. If the animal is doing no work there is not much breaking down of tissue, but the normal heat of the body must be maintained. Idle horses and cattle are more economically maintained on a ration consisting mostly of coarse roughages than on less bulky but more expensive concentrates. The ration does not need to contain a great deal of protein to supply the

demands of the mature animal at rest, and the bulkier carbohydrates furnish sufficient heat.

Relation of Size to Maintenance. — For animals of the same age, class, type, and kind, the larger the animal, the larger must be the maintenance ration. The protein requirements vary directly with the weight of the animal, because the muscular tissue varies directly with the weight. The most of the heat produced in the animal body comes from the carbohydrates and fats in the feed stuff and escapes from the surface of the body. A large animal has proportionally less body surface than a smaller animal of the same class and type. The large animal thus requires somewhat less carbohydrate and fat material in proportion to its weight than does the small animal of the same type.

Other Factors in Maintenance. — The fat animal requires a higher maintenance ration than the thin animal because it carries greater weight, and added weight requires added energy to move it about. Under ordinary conditions, the higher the external temperature, the smaller the maintenance ration, because there is less radiation of heat from the body surface. Nervous animals are harder to maintain than quiet ones. Animals also vary in their capacities to digest and assimilate food. Other things being equal, animals of the same general type make about the same comparative uses of the feed given to them, regardless of the breed to which they belong. It is practically impossible to keep a young animal at constant weight during its period of growth.

Feeding for Meat Production. — Feeding for meat production accomplishes two ends, growth and fattening. Growth prepares the framework and fattening increases

the weight and improves the quality of flesh, making the meat more juicy, tender, and nutritious.

Growth and Fattening. — During growth, the muscular fibers increase in number, length, and thickness. The

Fig. 18. — Cuts of pork from pigs fed rations rich in proteins. These cuts have less fat than those shown in Fig. 19.

skeleton and all the organs of the body increase in size and capacity to do work. In fattening there may be a slight growth in the muscular tissues, but during the fattening process the greater part of the gain in weight is due to an increase in the amount of fatty tissue. Fat is

Fig. 19. — Cuts of pork from pigs fed fat-producing foods.

deposited between the muscular fibers and the layers of muscle, beneath the skin of the animal and around the internal organs.

The quantity, quality, and palatability of the feed has much to do with the amount of fat deposited upon the animal's body. Only that over and above maintenance

requirements is used for making fat. An older animal will fatten more readily than will a young one, because the young animal grows, while the old one only lays on fat. The quiet animal fattens more readily than the nervous, restless animal, because less of the food is wasted in needless exercise. The breed of an animal has little effect upon fattening quality, but the type has an important bearing upon the quality of meat produced. If the climate is very cold, shelter from strong cold winds is an aid in fattening, as less food will be required to keep the body warm. Thrifty steers can stand steady cold weather and fatten better than in weather so warm as to cause loss of appetite. The hog, having a lighter coat and taking less exercise, needs greater protection from the cold than does the steer.

Effect of Water, Light, and Air. — The fattening animal should have free access to an abundance of good, pure, and fresh water. Water helps to regulate the temperature of the animal body and is necessary to carry on the increased activity in the life processes due to fattening. Sunlight is necessary to the growing animal, in order that its body and organs may develop normally. For a brief period an animal will fatten more rapidly and cheaply in dark quarters than in light, although light is essential to health. Darkened quarters prevent annoyance from flies and keep the animal in a quieter condition. They fatten better when quietness prevails. Regularity in time of feeding and the amount and kind of feed given are also important factors. If changes, either in the feed or in the conditions surrounding the animals are to be made, they should be made gradually. A changing period under any circumstances is always a losing period.

Feeding for Milk Production. — Feeding for the production of milk differs from feeding for the production of body fat. The ration for fat production needs to supply only sufficient protein and mineral matter to repair waste and build up a small amount of new tissue. The bulk of the body fat is built up from the carbohydrate and fat material in the ration in excess of the amount necessary for maintenance. On the other hand, in the production of milk there is the constant need for protein and mineral matter in the milk which the cow secretes. Considerable protein and mineral matter are therefore necessary in the ration to supply the demands of the milk-producing animal.

The Dairy Cow an Economical Food Producer. — The dairy cow makes the most economical use of the food given her. The constant outlet of milk prevents her system from becoming clogged, as in the case of the steer depositing fat. There is perhaps more variation in the ability of different cows to produce milk than in the ability of steers to lay on fat. Several factors cause a variation in the cost of producing milk. In the same herd one cow may make a good profit, while another, under the same conditions, may show actual loss. While a competent judge may be able to determine quite accurately from external appearances the fattening qualities of a steer, only an approximation of the ability of the cow to produce milk can be so made.

Care as Essential as Feed. — The amount and character of feed given is a large factor in milk production. Cows that are expected to produce heavily must be liberally fed. The ration of the cow should be palatable and contain a liberal supply of protein and mineral matter.

While exercise requires more feed, a certain amount of exercise is necessary to keep the animal in good physical condition. The dairy cow requires a higher and more uniform temperature than the beef animal because she has no protecting layer of fat. The skin and hair of the dairy cow are also thinner than on beef animals. Milk secretion is controlled by the nervous system of the animal, and any shock to the nervous system such as that resulting from exposure to cold cuts down milk production.

Importance of Water. — Dairy cows require large quantities of water, because milk contains about 87 per cent of water. More water is also necessary to regulate the heat of the body. The dry cow requires only about 65 per cent as much water as the cow giving milk. The water supply should be fresh, pure, and easily accessible. Some cow stables are now equipped with drinking cups so that without effort the cows can obtain drinking water at will.

Feeding for Work Production. — Within certain limits, the working capacity of the animal depends upon the amount of food consumed over and above the amount necessary for maintenance. Rations for work animals should be such as will furnish the greatest amount of energy. Concentrated feeds rich in digestible nutrients supply this in most convenient form. Bulky feeds that require a great deal of energy to digest leave but little excess to be utilized in doing work.

Nutritive Ratio. — The nutritive ratio is the ratio that exists between the sum of the digestible fats and carbohydrates and the digestible protein in the ration or feeding stuff. The nutritive ratio is found by multiplying the digestible fat by $2\frac{1}{4}$, adding the product to the digestible carbohydrate material, and dividing the sum by the

amount of digestible protein. The quotient derived will be the second term of the ratio of which the first term is 1.

For example, dent corn contains 7.8 pounds of digestible protein, 66.8 pounds of digestible carbohydrates, and 4.3 pounds of digestible fat in each 100 pounds. The nutritive ratio of dent corn is found in the following way: $\frac{4.3 \times 2\frac{1}{4} + 66.8}{7.8} = 9.8$. The nutritive ratio of corn is then said to be 1 : 9.8.

Rations that are relatively rich in protein are called narrow rations and those that are poor in protein are called wide rations. Cottonseed meal has the narrow nutritive ratio of 1 : 1.14; rye straw has the wide ratio of 1 : 57.8; and oats has the medium nutritive ratio of 1 : 5.49.

How Rations should Vary. — Youth is the period of the animal's life when normal development and growth take place. To secure the maximum growth the ration of the young animal should supply sufficient quantities of protein and mineral matter.

The mature animal does not need such a high proportion of protein and mineral matter in its ration, because growth is complete. Sufficient protein to repair waste is all that is essential. Because carbohydrate and fat materials are cheaper than are protein and mineral matter, it is more economical to feed the mature animal a wider ration than that fed to the young animal.

The Needs of the Young Animal. — In the corn belt young animals are often raised to maturity on rations deficient in protein and mineral matter. Young pigs suffer most from this lack. The rations of calves usually contain roughage materials higher in mineral content. Lime and phosphorus are the mineral constituents needed in

large amounts by young animals. These substances may be supplied by feeding such feeds as alfalfa and clover which are high in lime, and bran and middlings which are high in phosphorus, or feeding ground rock phosphate, bone ash, and calcium phosphate in mineral forms. Charcoal is valuable for hogs and should be supplied to them in a trough mixed with salt. Common salt is a mineral substance which all animals crave and free access to it should be allowed.

Young ruminants need roughage. Frequent attempts have been made to raise calves to maturity on purely concentrated rations, but without success. Non-ruminants may grow to maturity on concentrated feeds alone.

Experiments have proven that milk with a medium amount of fat is better for young animals than milk that is abnormally high in fat. The milk of the average cow has only a medium fat content, and the calf grows and does well on it. Some of our special dairy breeds have been developed to produce milk rich in fat, but the mineral and protein materials are not correspondingly high, and calves do not thrive so well when fed on such milk.

Feeding Standards. — It is not long since the feeding of animals was considered little more than the work of a common artisan. Cows, sheep, and horses were either allowed to graze the range or were given feeds at hand without thought as to their value. At the beginning of the last century, science invaded this field and live stock feeding became a science as well as an art. In time, standards were formulated setting forth the feed requirements of different classes of animals kept under different conditions. The first standard appeared in 1810, and consisted of a table in which were shown the amounts of different feeding

stuffs necessary to furnish the equivalent feeding value of 100 pounds of meadow hay. The next standard of importance was based upon the total amounts of protein, carbohydrates, and fats in the feed stuffs.

The Wolff Standards. — The feeding standards of Dr. Emil von Wolff, a German scientist, are based upon the amounts of digestible protein, carbohydrate, and fat material required by various farm animals under different conditions. The first presentation of these standards was made in 1864, and they appeared for the first time in America in 1874. These standards are now called the Wolff-Lehmann standards because of the assistance of Dr. C. Lehmann, a pupil of Wolff, in presenting them to the public. The Wolff-Lehmann standards are widely used because they are positive and easily understood.

Calculating Rations by the Use of Feeding Standards. — It is practically impossible to get any one feed stuff that will supply all nutrients in the amounts and proportions that will properly nourish the animal without deficiency or waste. Some of our feed stuffs are high in protein. The use of such a feed alone would cause a waste of protein. Other feeds are high in carbohydrates and fat. To get the required amount of protein from such a feed would necessitate the loss of non-protein material. If the feeds are introduced into the rations in the proper proportions, the deficiency of protein in one feed will be counterbalanced by the excess in another, and a properly balanced ration will result.

A proper mixture of feeds always gives better results than any single feed. Palatability and adaptability to the animal are also good qualities. A certain amount of succulent feed should be introduced into a ration as an aid to digestion.

The following table sets forth the number of pounds of total dry matter, digestible protein, carbohydrates, and fat necessary for various farm animals.

WOLFF–LEHMANN FEEDING STANDARDS MODIFIED

Animal	Pounds per Day per 1000 Lb. Live Weight				
	Dry Matter	Digestible Nutrients			
		Protein	Carbo-hydrates	Fat	Nutritive Ratio: 1
Oxen					
At rest	18	0.7	8.0	0.1	11.8
At heavy work	28	2.8	13.0	0.8	5.3
Dairy Cows					
11 lb. of milk daily	25	1.6	10.0	0.3	6.7
22 lb. of milk daily	29	2.5	13.0	0.5	6.0
Horses					
Light work	20	1.5	9.5	0.4	7.0
Heavy work	26	2.5	13.3	0.8	6.0
Breeding Ewes					
With lambs	25	2.9	15.0	0.5	5.6
Brood Sows	22	2.5	15.5	0.4	6.6
Fattening Cattle					
First period	30	2.5	15.0	0.5	6.5
Last period	26	2.7	15.0	0.7	6.2
Fattening Swine					
First period	36	4.5	25.0	0.7	5.9
Last period	25	2.7	18.0	0.4	7.0
Growing Cattle					
Young calves	23	4.0	13.0	2.0	4.5
Yearlings	27	2.0	12.5	0.5	6.8
Growing Sheep					
Young lambs	26	4.4	15.5	0.9	4.0
Yearlings	23	2.2	12.6	0.5	6.3
Growing Pigs					
At weaning time	44	7.6	28.0	1.9	4.0
At 8 mos. age	30	3.6	20.5	0.4	6.0

It will be noted that the standards are made for 1000 pounds live weight of the animal, and call for material

sufficient for twenty-four hours. If animals are heavier in weight, the standard can be changed to vary in direct proportion to the live weight of the animal; the 1100 pound animal requiring 10 per cent more and the 900 pound animal requiring 10 per cent less than the amount given in the table. The 250 pound hog will require $\frac{1}{4}$ of the amounts set forth in the standard. In the Appendix will be found the number of pounds of total dry matter, digestible protein, carbohydrates, and fats in feed stuffs. If the feeds are combined so that the sum of the nutrients they furnish in combination corresponds to the number of pounds called for in the standard, the ration will be balanced according to the standard.

Figuring a Ration. — To plan a ration for a 1000 pound steer at rest, first find the requirements according to the standard used. The Wolff-Lehmann standard calls for 18 pounds of total dry matter, 0.7 pound of digestible protein, 8.0 pounds of digestible carbohydrates, and 0.1 pound of digestible fats in the ration. The nutritive ratio of the mixture should be 1 : 11.8, which is wide, because the steer at rest needs little protein but requires considerable heat-making food to maintain the temperature of the body. Roughage is better for this purpose than are concentrates.

Assuming that timothy hay and oat straw are both available, 10 pounds of each can be taken as a trial ration. The Appendix tables show that in 100 pounds of timothy hay there are 86.8 pounds of dry matter, 2.8 pounds of digestible protein, 42.4 pounds of digestible carbohydrates, and 1.3 pounds of digestible fats. In 10 pounds of timothy hay there will be $\frac{1}{10}$ of those amounts, or 8.68 pounds of dry matter, 0.28 pound of digestible protein, 4.24 pounds of digestible carbohydrates, and 0.13 pound of digestible

fats. In like manner it will be found that 10 pounds of oat straw will furnish 9.08 pounds of dry matter, 0.13 pound of digestible protein, 3.95 pounds of digestible carbohydrates, and 0.08 pound of digestible fats.

For the purpose of comparison, these facts are tabulated as follows:

RATION FOR 1000 POUND STEER AT REST

First trial ration

FEEDING STUFFS	DRY MATTER	DIGESTIBLE NUTRIENTS			NUTRITIVE RATIO
		CRUDE PROTEIN	CARBO-HYDRATES	FATS	
	lb.	*lb.*	*lb.*	*lb.*	
10 pounds timothy hay .	8.68	0.28	4.24	0.13	
10 pounds oat straw . . .	9.08	0.13	3.95	0.08	
Sum of first trial ration .	17.76	0.41	8.19	0.21	1 : 20.6
Wolff-Lehmann standard .	18.00	0.7	8.00	0.10	1 : 11.8
Excess or deficit	−0.24	−0.29	+0.19	+0.11	

The first trial ration is low in dry matter, very low in protein, and high in carbohydrates and fats. Some feed that is high in digestible protein and low in non-protein material must be found to balance the ration. New-process linseed oil meal is such a feed. If one pound of this meal be added, the second trial ration will appear as follows:

Second trial ration

FEEDING STUFFS	DRY MATTER	DIGESTIBLE NUTRIENTS			NUTRITIVE RATIO
		CRUDE PROTEIN	CARBO-HYDRATES	FATS	
	lb.	*lb.*	*lb.*	*lb.*	
First trial ration	17.76	0.410	8.190	0.210	
New-process linseed meal, 1 lb.	0.91	0.315	0.357	0.024	
Second trial ration . . .	18.67	0.725	8.547	0.234	1 : 12.5
Wolff-Lehmann standard .	18.00	0.700	8.000	0.100	1 : 11.8
Excess or deficit	+0.67	+0.025	+0.547	+0.134	

The addition of 1 pound of new-process oil meal makes the second trial ration too high in all nutrients, — the excess being most noticeable in digestible carbohydrates and fats. If two pounds of oat straw are deducted, the third trial ration appears as follows:

Third trial ration

Feeding Stuffs	Dry Matter	Digestible Nutrients			Nutritive Ratio
		Crude Protein	Carbohydrates	Fats	
	lb.	lb.	lb.	lb.	
Second trial ration . . .	18.670	0.725	8.547	0.234	
Oat straw (deducted), 2 lb.	1.816	0.026	0.790	0.016	
Third trial ration. . . .	16.854	0.699	7.757	0.218	1 : 11.8
Wolff-Lehmann standard .	18.000	0.700	8.000	0.100	1 : 11.8
Excess or deficit	−1.146	−0.001	−0.243	+0.118	

The third trial ration falls below the standard by 1.146 pounds of dry matter, which is unimportant; 0.001 pound of digestible protein, which is insignificant; and 0.243 pound of digestible carbohydrates, which is offset by an excess of 0.118 pound of digestible fat.

Thus a satisfactory ration for a 1000 pound steer at rest might consist of 10 pounds of timothy hay, 8 pounds of oat straw, and 1 pound of new-process oil meal.

It is practically impossible to keep the fat of the ration as low as the standard requirements, but since carbohydrate and fat material are both sources of energy and fat for the animal, these two nutrients may interchange in the ration. So long as the protein supplied in the ration is near to the requirements of the standard and the nutritive ratio of the ration is close to that of the standard, it matters little if the fat content is high. Neither is it so

important to keep the dry matter requirements up to the standard, since it is the digestible parts of the ration, rather than the total of its constituents, that is of greatest importance.

Suppose a ration is required for a cow weighing 900 pounds, and producing 16.6 pounds of milk daily. The standard for the 1000 pound cow producing 16.6 pounds of milk daily, calls for 27 pounds of dry matter, 2.0 pounds of digestible protein, 11.0 pounds of digestible carbohydrates, and 0.4 pound of digestible fats. The 900 pound cow will require nine tenths as much or 24.3 pounds of dry matter, 1.8 pounds of digestible protein, 9.9 pounds of digestible carbohydrates, and 0.36 pound of digestible fats.

Assuming that there are available for feeding, corn silage, red clover hay, wheat bran, and ground oats, the following amounts may be selected for a trial ration: 20 pounds of silage, 10 pounds of clover hay, 5 pounds of bran, and 2 pounds of ground oats. Tabulating these materials, as was done in the case of figuring the ration for the steer, the results appear as follows:

TRIAL RATION FOR A 900 LB. COW PRODUCING 16.6 LB. OF MILK DAILY

FEEDING STUFFS	DRY MATTER	DIGESTIBLE NUTRIENTS			NUTRITIVE RATIO
		CRUDE PROTEIN	CARBO-HYDRATES	FATS	
Roughages	*lb.*	*lb.*	*lb.*	*lb.*	
Corn silage, 20 lb.	5.280	0.280	2.840	0.014	
Clover hay, 10 lb.	8.470	0.710	3.780	0.180	
Concentrates					
Wheat bran, 5 lb. .	4.405	0.595	2.100	0.125	
Ground oats, 2 lb.	1.760	0.202	1.050	0.740	
Trial ration . . .	19.915	1.787	9.770	0.3930	1 : 5.96
Standard	24.3	1.800	9.900	0.3600	1 : 6
Excess or deficit . .	−4.385	−0.013	−0.2300	+0.0330	

This ration is quite near the standard in all nutrients and the nutritive ratio is about the same as that of the standard. According to the standard, a ration consisting of the above feeds in the amounts given would be suitable for the 900 pound cow producing 16.6 pounds of milk daily.

Helpful Rules in Figuring Rations. — A few simple rules are of value in calculating rations. The average ration of the average dairy cow is about as follows: 24 to 40 pounds of silage, 6 to 10 pounds of hay, and 1 pound of grain mixture daily for each pound of butter fat produced weekly, or 1 pound of grain mixture for every 3 or 4 pounds of milk produced. The nutritive ratio of this ration is between 1 : 6 and 1 : 7.

A 1000 pound fattening steer will require about 15 pounds of grain mixture or about 18 to 20 pounds of corn on the cob, 15 to 20 pounds of corn silage, and 6 to 10 pounds of alfalfa or clover hay. A rule for feeding horses is to supply about 1 pound of hay daily for each 100 pounds of live weight. The horse on light work should receive about 1 pound of grain to each 100 pounds of live weight and the horse at heavy work should receive one third to one half more to keep it in good flesh. In the Haecker standard, in the Appendix, the 1000 pound cow requires for maintenance, independently of the milk produced, 0.7 pound of digestible protein, 7.0 pounds of digestible carbohydrate material, and 0.1 pound of digestible fat. For each 100 pounds that the cow weighs more than 1000 pounds, the maintenance standard is increased by one tenth, and for each 100 pounds that the cow weighs less than 1000 pounds, one tenth is deducted. To the maintenance requirements are added the amounts necessary to produce the required amount of milk of a certain richness in fat, and the same

method of finding the amounts of the various feed stuffs is followed, as in the case of calculating for the Wolff-Lehmann standards.

EXERCISES

1. Calculate a ration for a 250 lb. pig, using the Wolff-Lehmann standards.
2. Calculate the nutritive ratio of the various rations fed on the home farm.
3. Compound a better ration in each case if the home rations are deficient or expensive.
4. By the use of the Haecker table calculate a ration, using home-grown feeds, for a 1200 lb. Holstein cow giving 40 lbs. of 3.5 per cent milk daily.

HOME PROJECT

Try out for at least one month's time on the home farm some new ration that you have calculated, keeping accurate account of results.

CHAPTER VI

BREEDS OF HORSES

Breed is a term applied to a group of animals homogeneous in blood, possessing certain well-defined characters, which are uniformly transmitted by inheritance; and whose records are kept by a duly authorized association.

Type is a term that designates the use to which an animal is adapted. In each class of live stock there are different types evolved by the special use made of the animals during the development of the breeds. Thus, under the term " beef type " are included animals especially adapted to the production of beef. To the " dairy type " belong animals suited for the production of milk.

The breeds of horses are classified according to type or use. There are certain breeds of horses which are better suited for certain purposes than other breeds. The Percheron horse is better adapted for pulling heavy loads than the thoroughbred. The latter has been developed for speed, and for this purpose is much better than the Percheron.

CLASSIFICATION OF HORSES

According to type, horses are classified as draft horses, coach horses, saddle horses, roadsters, and ponies. Mules and asses are given a separate classification.

The breeds of draft horses are Percheron, Belgian, Clydesdale, Shire, and Suffolk Punch.

Fig. 20. — Champion six horse team. Percheron geldings.

The breeds of coach, or carriage, horses are Hackney, French Coach, German Coach, Cleveland Bay, and offshoots therefrom.

Breeds of horses belonging to the roadster type are American Trotter and Pacer, Arabian horse, and Thoroughbred.

Included among ponies are the American ponies, which comprise Indian ponies, mustangs, and bronchos; Shetland ponies, Welsh ponies, and Hackney ponies.

According to the use to which they are put, mules are classified as plantation or sugar mules, lumber mules, railroad mules, levee mules, and mine mules.

THE PERCHERON HORSE

Percheron horses are the most popular and widely distributed of all the draft breeds in America to-day. They originated in the district or province of La Perche, located in the north-central part of France. In the early history of France, along about the eighth century, horses were used a great deal in war, and the French drew freely for breeding purposes upon the Arabian horses which they captured from the Saracens whom they defeated in 732 A.D. War as fought in those days demanded active, strong, and rather heavy horses. Such horses had been developed by the nomadic Arabs and were selected for use in France. These Arabian fusions were practiced until about a century ago, when a demand for large, active, strong horses arose in France to be used not for war but on the heavy omnibuses in the cities, and for farm work in the country. These horses were strong, powerful, and active, somewhat rangy in conformation, but well muscled. When railroads became

common and the use of street cars and motor buses supplanted the horse-drawn vehicles there arose a new demand for heavy draft horses. The American trade which called for strong, heavy animals has had much to do with developing the Percheron draft horse.

The country in which these horses originated is fertile, the climate is mild and furnishes ideal conditions for the rearing of good horses. The French government has also helped to improve the horses of the nation by inspecting them, keeping the good animals in the country and subsidizing the best ones for breeding purposes.

The first importation of Percherons to this country was made in 1839 into the state of New Jersey. In 1851, the horse "Louis Napoleon" was imported and found his way to Illinois, where it is said he became the sire of over 400 colts whose good qualities helped to advertise these horses and make them popular with farmers.

Characteristics. — The prevailing colors of the Percheron are gray and black. Some bays and browns occur, but they are less popular and common than the two above named. Formerly the imported horses were not so heavy as the type now popular, and more grays than blacks were brought into the country. The Percheron type is that of a strong, well-muscled, thick-bodied, clean-boned, low-set draft horse. The good Percheron is noted for the size and quality of its feet; well-muscled arms, forearms, gaskins and thighs; clean, hard, flinty cannon bones, free from superfluous hair; strong, deep, and wide chest; short, wide back; strong, well-breasted neck; and a good head carrying neat ears and bold, clear eyes. The action is free, bold, and straightforward, showing vitality and vigor in the horse. Some of the too common weaknesses are tendencies to

droop at the croup, sickling at the hocks which may have a tendency to fill, and somewhat short and steep pasterns, giving the horse a " stilty " gait. There is also a tendency to be too rangy, which is not desired when one wishes to grade up a " blocky " lot of horses.

Fig. 21. — Percheron horse.

The Percheron is very prepotent and his ability to transmit his good qualities to his progeny has made this horse popular throughout the country. The absence of hair, which is liable to gather mud and snow, around the fetlocks and on the cannon bones has made this breed a favored one with farmers, and their weight and size, together with the good quality of their feet, have made these horses good sellers in the cities.

THE BELGIAN HORSE

History. — Belgian horses were first imported into America from Belgium about 1886. Because of their size, compactness, early maturing qualities, strength, and quiet disposition, they have met with much favor at the hands of American farmers. The history of their origin has been rather obscure, although it is known that draft horses have been produced in this section of Europe for centuries, and horses from Belgium have played an important part in the improvement of other European draft breeds.

They are said to be a product of the environment in which they developed, so that few men stand out prominently as improvers of the breed. Since about 1850, the government of Belgium has done much through subsidies to encourage the producers of these horses, and to keep the best ones in the country. More males than females are brought to America, most of the females being kept in Belgium or sold to Germany, where Belgian horses are also well liked.

Characteristics. — These horses are very compact, being the heaviest breed of horses for their apparent size. The body is short and round with well-sprung ribs, and set upon short legs. The principal colors are sorrel, chestnut, roan, bay, and black. Grays are quite uncommon. The breast is wide and the limbs are muscular. The objections to the breed are a tendency to meatiness in the region of the joints and roundness of hocks and cannon bones. The pasterns are often too short and steep, and a common criticism is that the feet, although of good material, are too small in circumference at the hoof head and too high at the heel. These combined defects often lead to poor action and a stumbly gait.

Mature males should weigh 2000 pounds and mature females at least 1600 pounds each.

THE CLYDESDALE HORSE

History. — Clydesdale horses, of pure Scotch origin, and the favorite horses in Scotland, are found in all parts of the world where Scotchmen live. They are produced in largest numbers at present in southwestern Scotland, although good Clydesdales are bred in England, in Australia, in Canada, and in the United States.

In developing these horses, there are certain prominent characteristics for which the Scotchmen have firmly stood, and these features are the principal ones for which the Clydesdale horse is noted. Males of the proper proportions

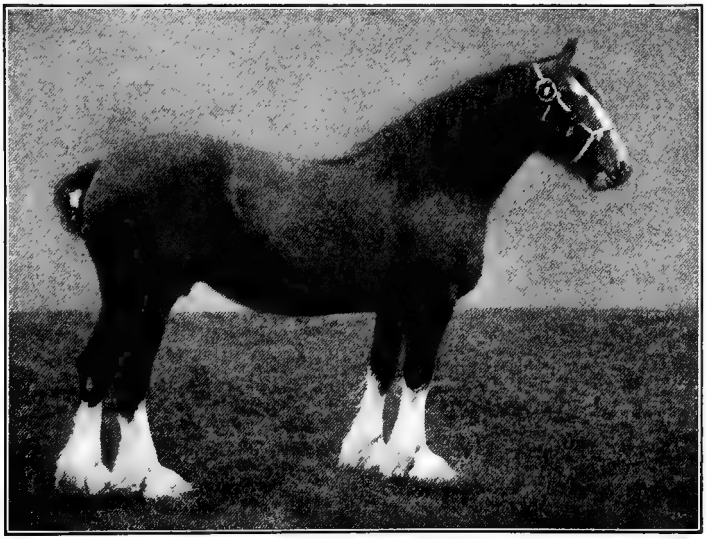


Fig. 22. — Clydesdale horse.

should weigh as much as 2000 pounds, and the females should weigh at least 1600 pounds when mature.

Characteristics. — These horses have been selected for their true and snappy action, excellent conformation and quality of feet, pasterns, and limbs. The best Clydesdales have large feet with open hoof heads and liberal width at the heels; the pasterns are long and sloping; the cannon bones are clean, hard, and supported by strong well-defined tendons. The feather or hair that grows back of the cannon bones is fine, denoting quality. The hock joint is usually well set and clean, and the knees are large, straight, and flat. The thighs and quarters are strong, and the arm and forearm are well muscled. They have gently sloping shoulders and are high at the withers.

The body is somewhat rangier than that of the Belgian or Percheron. The Clydesdales are excellent draft horses and good types sell well; but they have not met with the favor on the market that the Percherons enjoy, because they lack compactness of form. American farmers who have used the Clydesdale horse object to the hairy legs, which gather mud and snow, and are thus hard to keep clean; and the market does not favor pasterns that slope extremely.

In America, they were first imported to Canada in 1842, where they are found to-day in greater numbers than in the United States. Their continued use has greatly improved Canadian horses.

The favorite and commonest color of the Clydesdale is bay with perhaps one or more white feet and cannon bones, and a white star on the forehead or white strip in the face. Black, gray, and chestnut colors are also found, but they are not encouraged in fancy breeding.

THE SHIRE HORSE

The Shire horses are the most popular draft horses in England. They have become general in city use in that country because of their great weight and strength.

They have developed and are now bred mostly in the low flat lands of England, where the soil is rich, climate moist, and vegetation abundant.

Although much valued in England, both in the cities and on the farms, and used to a large extent in continental

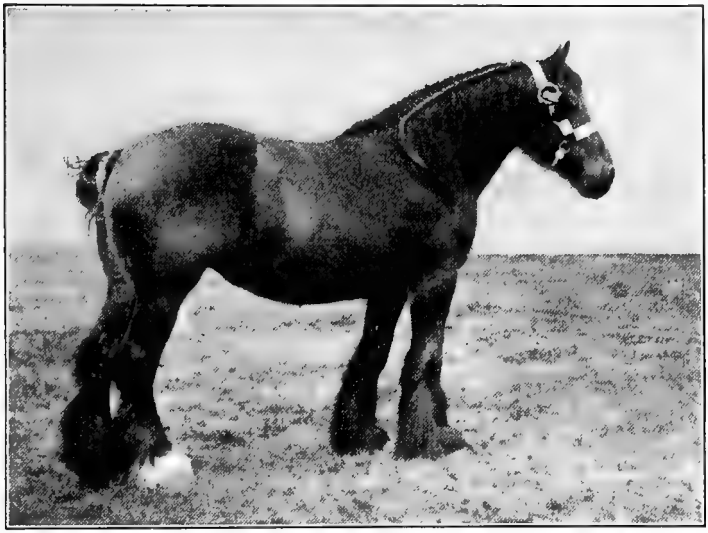


Fig. 23. — Shire horse.

Europe and in Australia, they have not met with general favor in America, because of the abundant growth of hair on their legs, to which our farmers object.

Some people have difficulty in distinguishing between the Shire and the Clydesdale breeds. While bay is the pre-

vailing color in both breeds, and both have hairy legs, the body of the Shire is much more compact, the legs much rounder and meatier, and the hair, skin, bones, and feet much coarser in quality. The pasterns and shoulders of the Shire are steeper and the action is less rapid, true, and snappy than in the Clydesdale.

The colors are bay, black, gray, and chestnut, the popularity of color running in about the order named.

THE SUFFOLK HORSE

Origin. — The Suffolk or Suffolk Punch is a breed of draft horses that developed in the county of Suffolk in eastern England, and it is in this section of the world that the greatest numbers are to be found to-day. They have never been much exploited in America, which accounts, in a great measure, for their apparent lack of popularity. The breed, however, has merit and will, no doubt, enjoy wider distribution when its worth is more widely known and appreciated.

Characteristics. — The purity of this breed can be traced further back than any other breed of British horses, being well established as early as the beginning of the eighteenth century. As to form, they are characterized by a low, deep, compact body; short, strong back; excellent spring of ribs; strong thighs, and depth of flank. They are excellent feeders, and can easily be kept in good flesh. Their action is good and their limbs are clean. The general objections are feet of limited size, although generally of good quality and texture, and pasterns somewhat too steep. They are also criticized for being too light in the limbs in proportion to their heavy bodies, although the bones are clean and strong and the muscles are well developed.

Fig. 24. — Suffolk horse.

These horses are uniformly chestnut in color and breed very true to type, which makes them valuable for purposes of grading. The males weigh from 1900 to 2000 pounds, and the females about 1600 to 1700 pounds, at mature weight.

THE HACKNEY HORSE

Coach Breeds. — The Hackneys belong to the coach or carriage horses, which include three other types; French Coach, German Coach, and Cleveland Bay.

History. — Hackneys are heavy harness horses, in which beauty and attractiveness of action are combined with strength and symmetry of body. They originated in Yorkshire, England, where as early as 1800 they were bred for trotting purposes. In early Hackney pedigrees there

often appear the same names as are found in trotting horse pedigrees, showing that these breeds have similar origin. Later, toward the middle of the nineteenth century, the establishment of horse shows did much to encourage improvement in the breed. The action of the Hackney is attractive, being strong and " flashy " rather than " speedy." Speed is sacrificed for great knee and hock action, which produce the " high stepping " horses so popular at horse shows. Since weight is essential to strength, and action is associated with lack of weight, the greatest difficulty met in getting good Hackneys is to attain proper weight and retain quality and action in the animal.

Characteristics. — In form the Hackney is muscular, with a round, compact body. To allow the desired high knee action, the shoulder is well sloped and muscular. Strength and depth of thigh favor the extreme action of the hock. The neck is quite muscular and nicely curved; the head is clean with a straight profile. The loin is heavily muscled, and the croup is comparatively straight. The feet of the Hackney are well shaped and of good quality. The pasterns are long, strong, gently sloping, and springy, and the joints of the knee and hock are large, clean, and well set.

These horses are generally chestnut, brown, or bay of solid color, making them easily matched.

Males weigh up to 1500 pounds and females up to 1300 pounds.

Hackneys are well distributed throughout the world wherever fancy carriage horses are demanded. Although the first importation of any great numbers to America did not appear until after 1881, they are now our most popular heavy harness horse.

THE FRENCH COACH HORSE

History. — This breed of horses has been developed in France, in a region west of the city of Paris. They were used for several different purposes, which evolved several

Fig. 25. — French Coach horse.

different types. For centuries the French people have had racing horses, especially horses that could trot rapidly under the saddle for distances of from one to three miles. This developed the Trotting type. The government of France has done much to encourage the breeding of horses for army or remount purposes, and it offers a premium or subsidy of from $100 to $1000 annually on good stallions,

so that the owners will keep them in France for breeding purposes. This government aid gave rise to the army type. In France, as in other countries, a desire on the part of the people for a horse suitable for carriage work gave rise to the carriage type. The animals of the carriage type, the most popular in America, weigh from 1200 to 1400 pounds; an average weight for males being 1350 pounds and for females about 1200 pounds.

Characteristics. — In perfecting this breed, the French introduced blood from all available sources, the aim being to produce the desired type, regardless of origin. From England came the blood of Thoroughbreds and Hackneys; from Arabia the blood of the Arabian horse; and from America some American Trotter blood. The result of these infusions is a horse of strength, style, and quality, and with an abundance of action.

The prevailing colors are bay, brown, and black, and the height is about 16 hands They are an upstanding breed with clean heads and necks, round, compact bodies, and deep, strong quarters. Although most popular in France, they are found in large numbers in America.

THE GERMAN COACH HORSE

History. — This breed of horses was developed in the northwestern part of Germany for heavy carriage purposes, and by the government for army purposes.

It is definitely known that these horses have been bred in Germany for centuries, but authorities are uncertain as to their true origin and development. The various German states have produced the different types of German Coach horses in America to-day, and these types have different names. Thus we find advertised the East Prus-

sian or Trakehner, the Hanoverian, the Holstein, the Oldenberg, East Friesland, and Mecklenburg, all claimed to be German Coach horses.

Characteristics. — The German Coach horses generally seen at American shows are somewhat heavier than the French Coach horses, and the stylish action of the Hackney is usually lacking. They have strong muscular necks and shoulders; round, strong bodies; level croups, and strong thighs and quarters. The colors are black, bay, and brown. They weigh about 1350 to 1450 pounds, and stand about 16 to 16½ hands high. In Germany, the lighter ones are used for fast driving, and the heavier ones as horses of all work. In this country they have not attained any great popularity.

THE CLEVELAND BAY HORSE

History. — This breed of coach horses originated in Yorkshire, in northern England. They were developed to meet the demand for a heavy horse for cross country coaching, and to draw heavy " turn-outs " in the cities.

Characteristics. — They are an upstanding breed, universally bay in color, weigh up to 1500 pounds, and have strong action. They are very prepotent in transmitting these characters when crossed with common breeds. For these reasons, they can be easily matched, are attractive, and good specimens sell well.

Cleveland Bay horses have never become very popular in America. Their size and endurance might make them useful for farm work, but farmers prefer to raise the more salable and profitable draft horse. In competition with the Hackney, they lack the action and quality necessary for great success as heavy harness or carriage horses.

THE AMERICAN TROTTER AND PACER

The Roadster Type. — This group of horses includes among others the following three prominent breeds; American Trotter and Pacer, Arabian, and Thoroughbred.

History. — The American Trotter, whose ancestry can be traced to the trotting and Thoroughbred horses of England, has been developed for the sole purpose of speed and pleasure. By selecting and mating the horses that made fast records, a type best suited for speed has been evolved. American Trotters are the fastest trotting horses in the world. Trotting bred horses that come up to certain standard requirements set forth by the American Trotting Register are known as "Standard Bred Horses."

Characteristics. — The trot is a gait in which one front foot and the opposite hind foot are moved forward at the same time. In the pace, one front foot and one hind foot on the same side are moved forward at the same time. In both the trot and pace, there is a time that all four feet are in the air, the horse being thrown forward with momentum sufficient to carry his weight through the air. The trot is straightforward. In the pace, the body has a swaying motion from side to side. The pace is a faster gait than the trot, the world's pacing record for a mile being about three seconds lower. The trot is a more powerful looking gait, and for driving purposes it is the more popular. In the pace the feet are not lifted so high from the ground, which is an advantage on hard roads and streets, giving the horse somewhat better wearing qualities.

The form of these horses is strongly in contrast with the form of the draft horse. Strength is sacrificed for speed,

Fig. 26. — American Trotter.

and huge muscles are replaced by strong tendons. Short, thick, coarse bones are replaced by more slender and refined bones of great strength, smoothness, and hardness. The hair is also finer than that of the draft horse. The eyes are bright and clear, the chest is deep and full, and the back short and strong; all these points indicating endurance and constitution. The joints are clean and strong, and the feet of proportionate size and of extra good quality.

Some Great Race Horses. — The history of the trotting horse is associated with the racetrack, and records made there have influenced the selection of breeding stock. The horse, Messenger, imported to America in 1788 and traced back to Thoroughbred stock, had a marked influence upon

American horses. A great many trotting horse families trace their parentage back to Messenger, and an elaborate pedigree of Dan Patch (1:55¼) traces back to Messenger 43 times. Some of the leading families are the Clay, Morgan, Hal, Mambrino Chief, Hambletonian, and Pilot. Since most of these families started about the middle of the nineteenth century, the trotting horse is of comparatively recent development.

The Morgan family, from which are obtained the Morgan horses, is not famous for speed, but for horses that are symmetrical, useful, beautiful, and stylish.

The Standard Bred trotting horses are most useful for producing roadsters, a class of horses which the automobile is rapidly supplanting. The United States government is now developing a type of heavy harness horse by mating the heavier and stronger Standard Bred horses.

THE ARABIAN HORSE

The Arabian horse deserves study because its blood has had much to do in developing practically all of our modern breeds.

History. — The breed of Arabian horses was well established before the time of Mohammed, who lived about seven hundred years after the birth of Christ, and the history of this breed is definitely known back to about 1500 A.D. The blood of the Arabian horse is distributed over practically the entire world in the breeds of light horses. Arabian horses were first imported into England early in the seventeenth century, and helped to develop the Hackney and Thoroughbred. They were introduced very early into America and had a marked influence upon our light horses.

Characteristics. — This breed of horses is noted for beauty, endurance, and fearlessness. They are strongly and symmetrically built, and stand about $14\frac{1}{4}$ hands high. The colors may be white, gray, bay, chestnut, brown, or black.

THE THOROUGHBRED HORSE

This term is properly applied only to a distinct breed of horses developed principally in England.

History. — It is thought that the ancestry of the Thoroughbred traces back to Oriental and African horses, that were brought into the British Isles as far back as the seventh or eighth centuries. From these horses some of the best of the progeny were selected to serve for cavalry and racing purposes. By selecting the fastest and largest ones the general improvement of the breed was accomplished.

In America, the Thoroughbred horse has attained as much perfection as in the British Isles. The first ones were introduced into Virginia as early as 1730, and in that state are now found some of the best horses of the breed, which are used for hunting and pleasure purposes.

Characteristics. — They have been bred pure longer than any other known breed and have been developed primarily for speed under the saddle; consequently the form evolved is best suited for that purpose. The typical Thoroughbred is extremely refined about the head with fine ears and a rather straight profile. The eye is clear and bright, indicating great nervous strength and endurance. The neck is long and slender and the head is carried low rather than high, as is the case of the more stylish carriage horses. The body is long and sinuous; and in strong contrast with

the short thick muscles so much sought for in the draft horse, this horse has long, strong tendons. The legs are quite long; the muscles refined; the pasterns long and strong, and the bones and feet of the best quality. The horse is strong in the quarters, with strong tendons and joints in the rear limbs. The blood vessels show very prominently, which is considered an index of good breeding. In action, the one ideal is that of speed, for which style is sacrificed. The Thoroughbred should travel close to the ground, and waste no energy in fancy steps. This horse has had so much to do with attracting the attention of man toward the improvement of live stock that its study is quite important, even though it does not receive much attention from the practical breeder.

At the present time this breed is very useful in crossing with common horses to impart quality. The American Trotter, Hackney, and Coach breeds all owe much of their quality and refinement to the infusions of Thoroughbred blood they have received in their development.

PONIES

Practically every country in the world where horses are found has developed its own type of ponies. The sparse feed and severe climatic conditions under which they are produced tend to give the pony its small size, which alone distinguishes it from the horse. In the British Isles the height of the pony is given as 14 hands, but the American standard is 14 hands, 1 inch. The height of the polo pony is 14 hands, 2 inches, or about the height of the Arabian horse.

Ponies are useful for riding, for drawing light vehicles, and

in some cases for doing light draft work. Their great endurance makes them especially desirable for long trips and for use in sections of the country where agriculture has not reached a high state of development. They can be cheaply kept because they are able to use their food to the best possible advantage.

In breeding ponies, one of the great difficulties is to keep the size within the limits set by the breed requirements. The care and attention which must of necessity be given to breeding operations tends to increase the size of the animals with each succeeding generation.

American Ponies. — In America, the common pony is the mustang, a term applied alike to both bronchos and Indian ponies. These ponies, which are small and very hardy, have been bred on the ranges where they have run wild for many years. Their weights range from 850 to 900 pounds. Though difficult to break, they are faithful, intelligent, fearless when trained, and have great endurance. These qualities have made them the favorite pony of the cowboy on the western ranges.

Ponies of Great Britain. — In Great Britain, there are a number of breeds of ponies produced, the most common being the Shetland, the Welsh, and the Hackney.

The Shetland Pony. — The Shetland ponies are the smallest breed. In their native country, the Shetland Islands, lying to the north of Scotland, they are used to carry loads, to work in mines, and to draw vehicles. Living under the influence of a very severe climate, they are the hardiest little horses that the world produces. In conformation they are blocky; their weight varies from 325 to 375 pounds, and their height is from 36 to 40 inches. When allowed to run out of doors, they produce long,

shaggy coats of hair. The common colors are brown, black, and bay. There are also chestnuts, grays, and a great many broken colors. In this country, the Shetland pony is a favorite with children, and as pets they have found their way into nearly every country in the civilized world.

The Welsh Pony. — The Welsh pony is produced in the mountain sections of Wales. Forced to exist under very severe conditions, it has developed great hardiness. It is not so blocky as the Shetland, but is speedier and more useful for both riding and driving.

The Hackney Pony. — The Hackney pony is really a Hackney horse less than $14\frac{1}{2}$ hands high. Its size has also been reduced by introducing some of the blood of the Welsh pony. It has marvelous action, and because of this it is, in this country, meeting with the favor of people who wish small horses for fancy driving purposes.

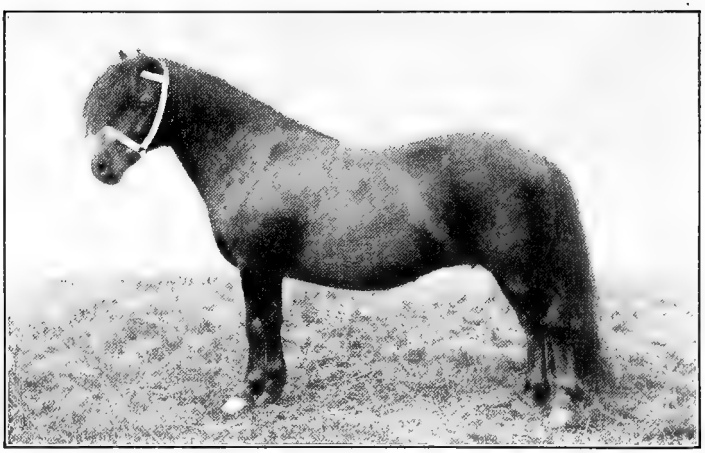


Fig. 27. — Shetland Pony.

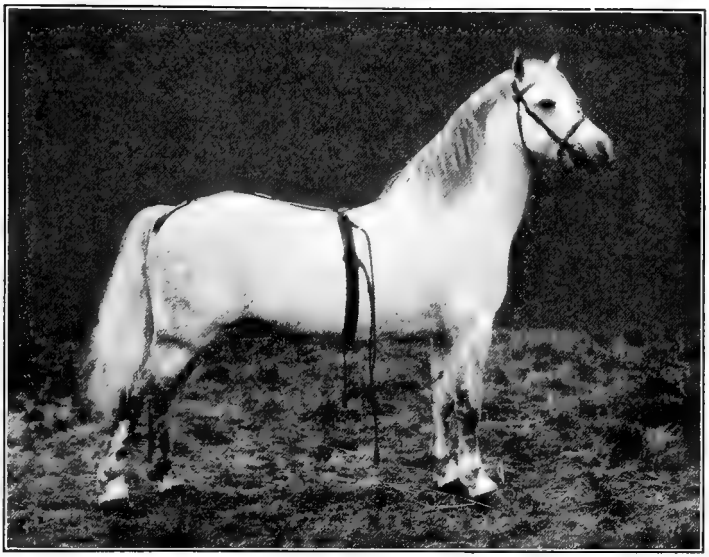


Fig. 28. — Welsh Pony.

THE DONKEY

History. — The donkey or ass, a beast of burden common to southern Europe, was first brought to this country about the time of the Revolutionary War. The best types have come from Spain and France, and are now found in the southern and central parts of the United States, more particularly in Kentucky and Missouri.

Characteristics. — The donkey is distinguished from the horse by its long ears, large head, slender legs, small hoofs, and its peculiar voice. The color sought for in this country is black, with gray points. The feet are very narrow and the joints of the legs are large, although the bones are of good quality. The body is compact and the back is short

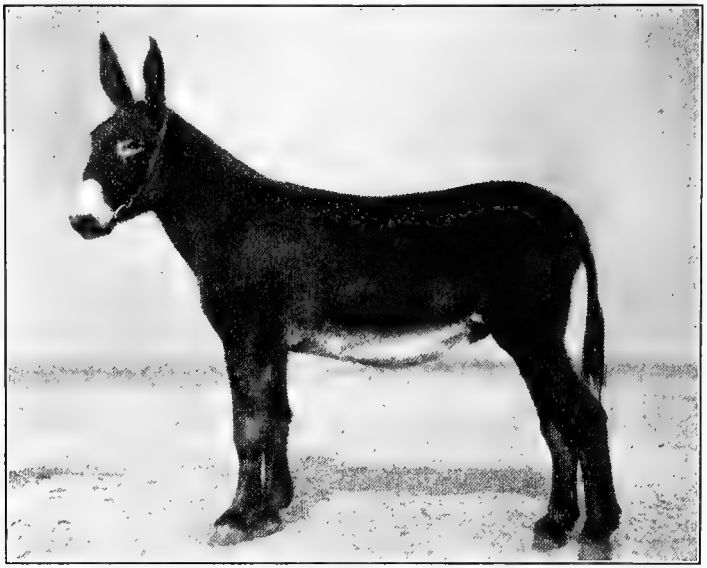


Fig. 29. — Donkey.

and straight. The tail is smooth except near the end, where it has hair similar to that on the tail of the horse.

The burro, a small type of donkey, is popular in mountainous sections of America. It is not much larger than the Shetland pony, and is used chiefly as a pack animal. Its patience, strength, and faithfulness make it especially valuable.

THE MULE

The mule is the hybrid cross of the donkey and horse.

The characteristics of the donkey and the horse are combined in the mule. The mule has long ears like the donkey, brays like him, and has narrow feet quite similar to those of the donkey. However, there is more symmetry

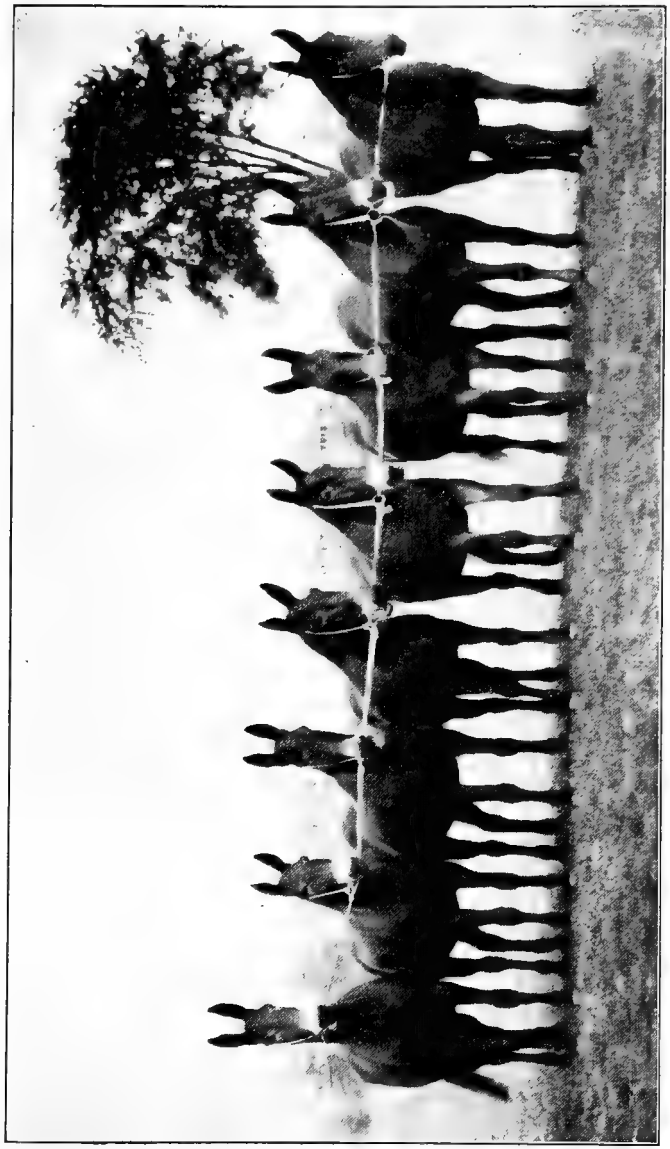


Fig. 30. — Prize mules on exhibition.

of body and quality in the joints and bones of the mule. The mule has a more nearly cylindrical body and is colored more like the horse.

Plantation Mules are the best and highest priced mules on the market. They range from 14 to 16 hands in height and from 1100 to 1400 pounds in weight. They are called "sugar" mules or "cotton" mules according to the use to which they are to be put on the plantation. The sugar mules are the larger and bring the higher prices.

Lumber Mules stand from $15\frac{1}{2}$ to 17 hands high and are used for hard, rough work in the woods. Extra quality is not so essential as strength and ruggedness.

Railroad Mules are somewhat smaller and lighter than lumber mules, being about $15\frac{1}{2}$ to $16\frac{1}{2}$ hands high, and weighing from 1200 to 1500 pounds. They are used for work in grading railroads and must be strong and of good quality.

Levee Mules are of about the same size as railroad mules, but are of better quality. They must be strong and rugged to stand the heavy work exacted of them at the wharves.

Mine Mules are small, ranging in height from 11 to $15\frac{1}{2}$ hands. Since their work is hard they must be chunky and strong. In order that they may work back into the drifts they need to be small.

The mule is resistant to disease and stands hot weather better than does the horse. Female mules are superior to males for all purposes. They mature earlier, are quieter, and fatten more easily.

EXERCISES

1. What are the English breeds of draft horses? How do they differ from the French breed?

2. Classify draft horses as to smooth leg breeds, hairy leg breeds.

3. What are the distinguishing characteristics of each breed of horses?

4. Study the horses on the street to see if you can detect breed characteristics.

HOME PROJECTS

Study the home horses and those of your neighbors and see how many breed characteristics you can detect. By these determine, if possible, their breed ancestry.

CHAPTER VII

BREEDS OF CATTLE

CLASSIFICATION OF CATTLE

ACCORDING to type, cattle are classed as beef, dairy, and dual purpose cattle.

The beef breeds are Shorthorn, Polled Durham, Hereford, Polled Hereford, Aberdeen Angus, Galloway, and West Highland.

The dairy breeds are Holstein, Jersey, Guernsey, Ayrshire, Brown Swiss, Dutch Belted, French-Canadian, and Kerry.

The most common dual purpose breeds are Red Poll and Devon.

SHORTHORN

Shorthorn cattle are sometimes called the reds, the whites, and the roans, because these are the colors common to them. Originating in northern England in the fertile counties of Durham and Northumberland, this breed is sometimes called Durham, but modern usage makes Shorthorn the correct name.

History. — The foundation stock of this breed were called " Teeswater " cattle. They were of no particular color, and not especially uniform in type and quality. The Colling Brothers were among the earliest men to do consistent work in improving the breed. They were followed

by Thomas Booth, who developed large cattle that were wide over the back and hips, but lacked in quality. The next man of note was Thomas Bates, who aimed, by careful selection and mating, to establish a strain of cattle that was large and of good quality. The Bates cattle, as they are called, had very short horns, fine heads, smooth, symmetrical bodies, and were useful for milking purposes. Mr. Bates succeeded in establishing several families of this type, which were eagerly sought after both in England and America. He was a good showman and believed in extensive advertising. The most famous family he ever produced was the Duchess family. One of this family, a cow named "Eighth Duchess of Geneva," in 1873 sold for $40,600 at public auction in New York State, a record-breaking price for a cow.

While the Bates cattle were strong evidence of what can be accomplished in the breeding line, they were lacking in hardiness under unfavorable conditions. In developing the strain, Mr. Bates had done considerable inbreeding and the constitutions of the cattle were thus impaired. Amos Cruickshank was a farsighted Scotchman who looked forward to the time when there would be a large demand for beef cattle on the vast ranges of the western part of the United States, and in the Argentine of South America. So he set to work to develop from the Shorthorns a purely beef strain of cattle. He selected only those of most nearly perfect conformation, and in time developed a beefier strain than were the Bates cattle. The cold climate of Scotland made the cattle hardier than the English cattle were; they matured earlier; and it was not long until the Scotch cattle, as they were called, became popular in the show ring. Sometimes they are called

" Cruickshank " cattle in honor of the man who was the first to develop them.

Shorthorn cattle are the most widely distributed of any breed of cattle and can be found in all parts of the civilized world. As beef animals they are in the foremost rank. Some of the cows are very good milkers. About 95 per cent of the milk produced in the British Isles is from Shorthorn

Fig. 31. — " Roan Queen," a Champion Shorthorn heifer.

cows. In this country milking strains of Shorthorn cattle are held in favor by some farmers, since they produce a liberal supply of milk and a calf that can be sold for beef at a good price. Such animals are known as " milking Shorthorns," and are dual purpose cattle.

Characteristics. — The colors of the Shorthorn are red, white, and roan (a mixture of red and white hairs). The roan color is now much in favor on the market. Good bulls of this breed weigh up to 2000 or 2200 pounds when mature. Bulls have been known to weigh up to 3000 pounds, but

these cases are rare and this great weight is not desirable. Good cows weigh from 1400 to 1600 pounds.

THE POLLED DURHAM

The Polled Durham breed of beef cattle have the characteristics of the Shorthorns, but are without horns. There are two distinct types: the Double Standard and the Single Standard Polled Durhams. The Double Standards were obtained by saving for breeding purposes hornless Shorthorn " freaks " which occasionally appeared. The Single Standard resulted from the efforts of various men to produce hornless cattle that possessed the type of the Shorthorn. Both the Single and Double Standard Polled Durhams can be recorded in the Polled Durham herd book, and the Double Standard Polled Durhams can be recorded in the Shorthorn herd book as well, because they are pure bred Shorthorns according to the generally accepted definition of the term.

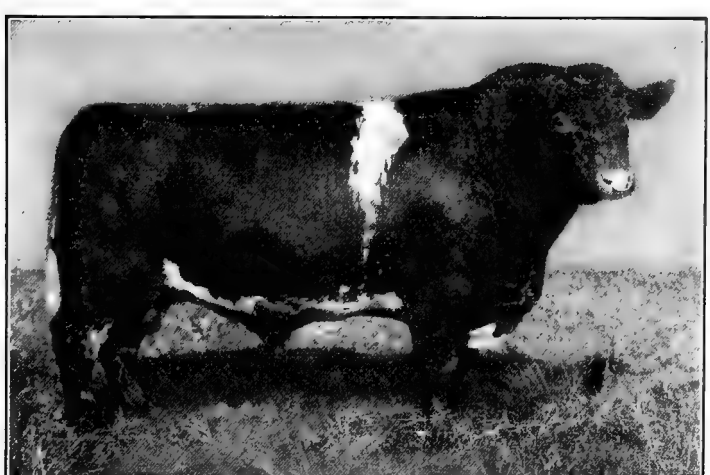


Fig. 32. — Polled Durham bull.

In judging the Polled Durham cattle the same type is desired as is sought for in the Shorthorn. These cattle are now attaining a high degree of excellence and will gradually improve as the number of breeding animals increases.

THE HEREFORD

History. — Hereford cattle originated in the county or shire of Hereford, in the southwestern part of England. They are easily recognized by their color markings. The color is red with white face, white on the underline and on

Fig. 33. — Hereford yearlings.

the neck back to the shoulders. This color is so striking that the cattle are often spoken of as "White Faces." There are, of course, variations from these general color markings, but in a mixed lot of cattle an amateur can easily pick out the Herefords by their white faces and red bodies.

Characteristics. — This breed is strictly a beef breed and the fanciers make no claim to milking qualities, although there is occasionally a cow that is a good milker.

Fig. 34. — Horned Hereford bull.

Herefords are very hardy and have become famous in this country on the ranges. As grazing cattle they are excellent and are said to be the logical successors to the buffalo. Because the man who lives in the corn belt has in the past few years looked to the range to furnish feeding cattle, the Herefords have become very common in the feed lots, where they make good gains on feed, and finish off well. They are now distributed over the world wherever good grazing ground is obtainable, and large herds of them are to be found in Argentina, where they are raised to supply the British demand for beef.

Because they have so long been reared under such natural conditions, they have developed thickness through the fore quarters, and have become somewhat lighter in the rear quarters, a fault, however, not found in the better Herefords.

POLLED HEREFORDS

The Herefords have large horns, a serious objection. Most of them are dehorned before they go into the feed lot. To do away with the dehorning, men have developed within the ranks of the Hereford breed a polled strain. Because there were so few of them, inbreeding had to be resorted to. Thus the type evolved is not so good as the best Here-

Fig. 35. — Polled Hereford bull.

fords, although as the numbers increase, the type will doubtless improve. The strain established within the ranks of the breed is known as " Double Standard Polled Hereford " and is eligible to register in the Hereford Herd Book. The " Single Standard Polled Hereford " was established by crossing horned Herefords with common

hornless cows. The progeny were polled and having the white face of the Hereford were called Polled Herefords. This strain is not eligible to register in the Hereford Herd Book.

THE ABERDEEN ANGUS

History. — The Aberdeen Angus breed, sometimes called "Doddies," developed in northeastern Scotland, and some of the best of them are produced there to-day. They

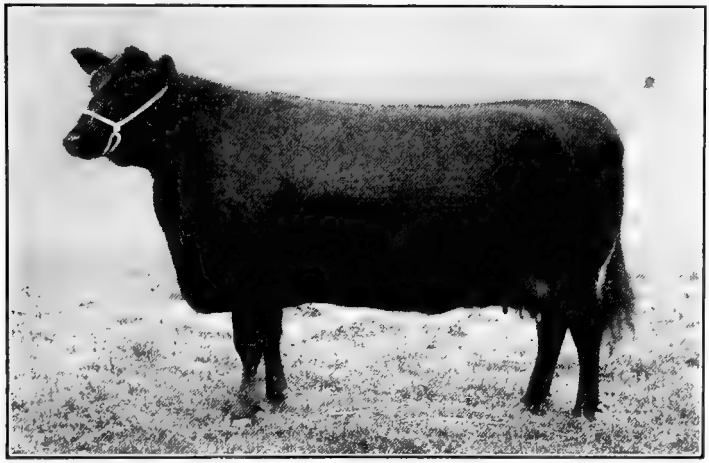


Fig. 36. — Aberdeen Angus cow.

are characterized by their black color and polled heads, and are sometimes confused with the Galloways, — another black, hornless beef breed produced in Scotland. With a little experience, one is able to distinguish between these two breeds, as the Angus is smoother and has better quality than the Galloway.

Angus cattle produce the best meat, and in show yard circles, where all beef breeds compete, carry off more honors

than any other breed. Besides winning over 60 per cent of the grand champion honors, they have won more than half the championship honors for car lots and carcasses at the Chicago International Live Stock Expositions. They are very popular in the feed lot, and have met with much favor on the range, although they are not so numerous there as are the Herefords.

Characteristics. — They are very compact in type; their bodies are cylindrical, and contain great weight in proportion to the surface of the body. When fat, they are deceptive, weighing heavily for their apparent size. When mature, the bulls weigh from 2000 to 2200 pounds and the mature cows weigh from 1400 to 1600 pounds.

THE GALLOWAY

History. — Galloway cattle originated in the southwestern part of Scotland where the best types of the breed are to be found to-day. The early history of the Galloways is not well known, but it is stated that they were found by the Romans when they visited Scotland about the fourth century.

Characteristics. — They have many things in common with the Aberdeen Angus. Both breeds are black, both are polled, but the Galloways are somewhat smaller and have long shaggy coats of hair. They are very hardy, and valuable for a rough country with a severe climate. Their hides, because of the long hair they carry, are valuable for robes and coats. As yet, they have not attained the popularity enjoyed by the Aberdeen Angus cattle.

The Galloways are valuable in the feed lot, and may be on the range. They are very prepotent and readily transmit their characters to their offspring, making them useful for grading up a beef herd.

Fig. 37. — Galloway bull.

THE WEST HIGHLAND CATTLE

West Highland cattle are produced in greatest numbers in the Highlands of Scotland where they originated. They are easily distinguished by the dun color, rugged appearance, long shaggy coats of hair, heavy horns, and the blocky conformation of their bodies.

In Scotland they are well liked for the quality of beef which they produce, and for their ability to thrive at little expense in the mountainous sections. It is said they are the only breed of cattle that will stand and face a storm. They have never attained great popularity in America. There is scarcely any demand for them, so that their importation to this country has not been encouraged. Under natural conditions, they run in the open practically all the year, and this free and open life has made them somewhat nervous and wild when put into the feed lot. Under native

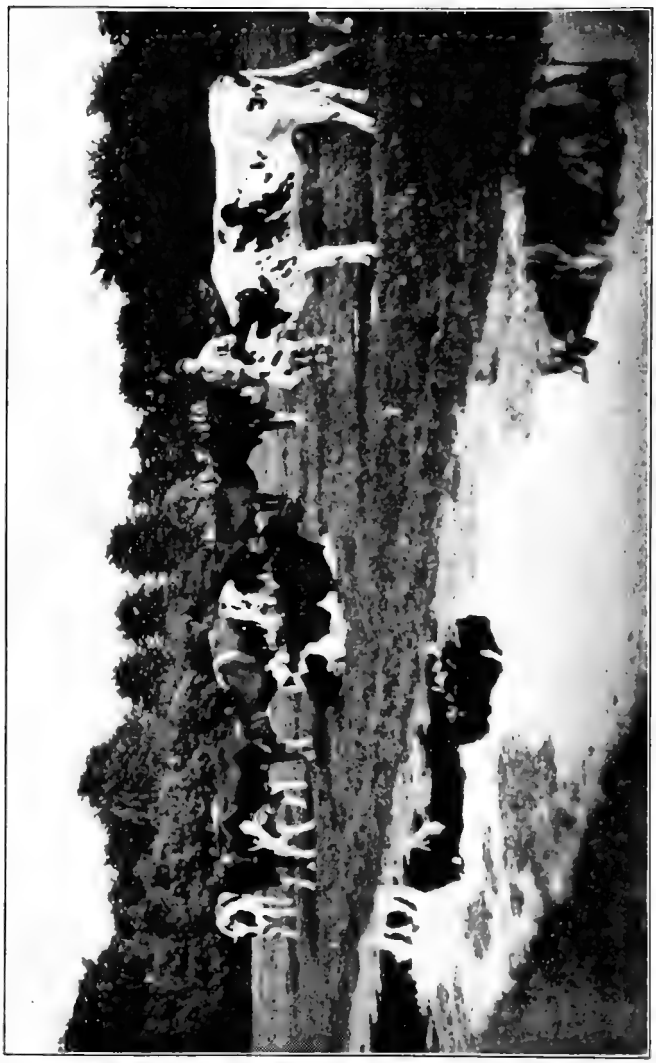


Fig. 38. — Holstein cows in a Netherland pasture.

conditions, they are small, but they have been quite successful in competition with other breeds for show-yard honors.

HOLSTEIN-FRIESIAN CATTLE

Holstein-Friesian cattle, commonly called "Holsteins," originated in the small and thickly settled European country of the Netherlands, a large part of which is below the level of the sea and which has been reclaimed from it. The land is low and wet and the climate is very moist, ideal conditions for the growth of pasture grass.

History. — The early history of the Holstein is not definitely known, but records show that large producing cows were common to that part of Europe over 1000 years ago. From this breed sprung some of the most important breeds of Denmark, Germany, and Belgium. The early Dutch settlers brought some of these cattle to the United States. Large black and white cattle were numerous in the New England States over 200 years ago.

Characteristics. — Holsteins are easily recognized by their black and white color and their great size. Bulls weighing up to 2500 or 2600 pounds in moderate flesh are not unusual, though those weighing around a ton are more desirable. Cows will weigh up to 1800 or 1900 pounds, but the most common weights run from 1250 to 1450 pounds. Holstein calves are very large, and their high birth weights make them desirable for veal purposes.

The cows are the heaviest yielders of milk of any dairy breed. Good cows produce on the average 10,000 pounds of milk annually, while some have produced over 30,000 pounds in a single year. Farmers like the cows because they are large and strong, which gives them the capacity

to consume large quantities of roughage and return large quantities of milk. The objection often raised against Holstein cows is that their milk is not high enough in fat content, the average for the breed running about $3\frac{1}{2}$ per cent. This low test is offset, however, by the large yield, so that the Holstein also makes a good butter cow.

Holstein fanciers make some claims for the beef qualities of the breed, but the markets discriminate against the black and white color. However, one can sell the cows after they have done a life service in yielding milk for more money than can be realized for smaller cows. These cattle are becoming more and more popular throughout the country and good prices for them prevail.

JERSEY CATTLE

The native home of the Jersey is the Island of Jersey, from which the breed derives its name. This island is

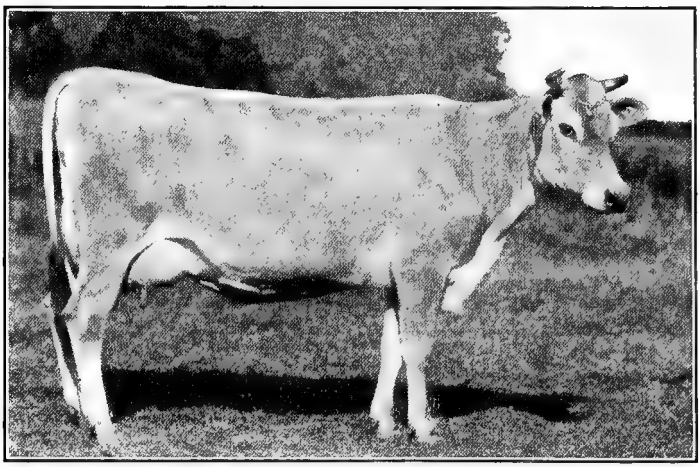


Fig. 39. — Jersey cow.

one of the Channel Islands, located in the English Channel between England and France. The Island of Jersey is only eleven miles long and six miles wide, and contains a population so dense that the size of the farms is very small, and all the possible farming land must be utilized to the best advantage. The climate is temperate and moist, and the people are very industrious. In the midst of such surroundings was developed one of the best butter breeds of the world.

History. — The methods employed by the natives in developing this breed of cattle are interesting. They kept for breeding purposes only those cows that produced a good supply of butter, paying little attention at first to the amount of milk given by the cows. Later, however, they began selecting cows for milk flow as well as for butter production, and in that way developed the milking qualities. Selecting for butter production developed cattle that gave rich milk, and the cows still retain that quality. Another thing the people of the island did was to prohibit the importation of outside breeds into the island, and in this way the cattle were kept pure. The government also helped the industry by placing premiums upon the best cows and bulls, which premium had to be refunded if they were sold to leave the island. Certain good animals were also kept in communities where the poorer farmers could make use of them for the improvement of their herds.

Characteristics. — In size, the Jersey is the smallest of the well-known dairy breeds, the cows weighing from 700 to 1000 pounds and the bulls ranging around 1400 to 1600 pounds in weight. While their small size is often raised as an objection to them, they are very economical producers. Jersey cows have proven themselves able to com-

pete with other breeds in actual production of butter fat for a year's time. Their color is variable, ranging from light fawn to heavy dun or black. Breeders have never paid so much attention to color as they have to form and performance, but broken colors are very undesirable. Black at the extremities is desirable. In form the Jerseys are pretty cattle. The cows have neat heads, and very fawnlike necks. The eye is large and prominent, and the ear is neatly carried. The shoulders are slight, the backbone prominent, the barrel of liberal size, the udder large, well shaped, and proportioned, with the teats well placed and of convenient size. The good animals are quite uniform as to type. The bulls display a great deal of vigor, and are very active and highly organized. This latter characteristic makes them undesired by some, because if not carefully handled, they may become vicious.

The principal weaknesses of the breed are lack of size, and consequent lack of constitution. Some of the American bred cattle, however, have sufficient size and as good constitutions as any other dairy breed.

GUERNSEY CATTLE

Guernsey cattle were developed on the Island of Guernsey, a sister island to the Island of Jersey. Guernsey is smaller than Jersey, and not nearly so many cattle can be produced on it. While Guernsey cattle were introduced into America at an earlier date than the Jersey, they were not so popular, due to the fact that they were not advertised so much during the earlier days, and could not be produced on the island fast enough to fill the demand.

Their development, while similar in essentials to the development of Jerseys, differs in some respects. The

people of the Island of Guernsey are very busily engaged in raising flowers and garden supplies for the big markets of London. The cattle have been allowed for the most part to evolve naturally. Their origin seems to be a cross between the big red cattle of Normandy, and the little black cows of Brittany. The characteristics of the Normandy cattle predominate. For almost a century, no out-

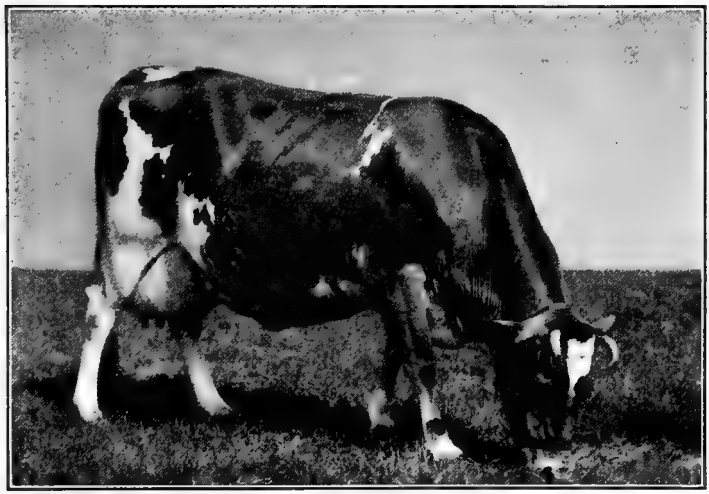


Fig. 40. — Guernsey cow.

side cattle have been imported into the island. Thus they have been kept pure.

The first importation into America was about 1833. No great impetus was given to the breed until the World's Fair in Chicago, when in the public test they took their place along with the Jerseys as economical producers of butter fat, and with the other dairy breeds as producers of total milk solids. Their strongest point is that they yield a finely flavored product of the best natural color.

Characteristics. — Guernseys are somewhat larger than Jerseys. The cows, when mature, should weigh about 1050 pounds, and the bulls about 1500 pounds. The hair is a shade of fawn with white markings, the nose cream colored, and the horns amber colored, curving, and not coarse. The skin should be rich in yellow secretions, indicating richness in the color of the products. In general type they conform closely to that of the Jersey. Great stress is placed on the type and shape of the udder. They have an even temperament, and the bulls are easily handled.

AYRSHIRES

History. — Ayrshire cattle are the dairy breed of southern Scotland and one of the prominent breeds in America. They are a hardy breed that give a liberal supply of milk on grass or scanty rations.

These cattle were brought to America at an early date and remained in the eastern part of the United States, to which section they were confined for many years. The first real impetus that was given to the breed was at the time of the World's Fair in Chicago in 1893. Two types of Ayrshire cattle were shown; one from Canada, the other from the Eastern States. The cattle which came from Canada had straighter backs and their colors were not so badly broken, with white predominating. They were a trifle longer legged, but their bodies were rounder and more symmetrical. The shape of the udder had been given particular attention, and for uniformity in this respect the Canadian type was unsurpassed. The udders were well held up neatly in front and behind, and the teats, while quite short, were well placed at the corners of the udder.

The cows also carried their width well out at the rear, giving them a beautiful form. At this show the Canadian or Scotch type won the favor of the judge and this type of

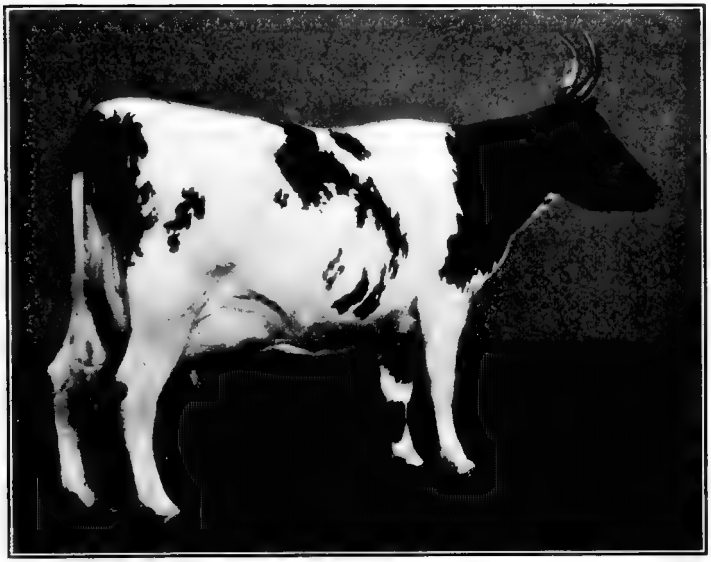


Fig. 41. — Ayrshire cow.

Ayrshire has now become the fashionable one in show-yard circles.

Characteristics. — The colors of the Ayrshire are various shades of red or brown, with white, mahogany and white, or white, with each color clearly defined. Brindle is allowed, but is undesirable. At the present time the white color should predominate. While the dairy type is preferred, it is not so greatly sought after as in the case of the Jersey, Guernsey, or Holstein, particular emphasis being placed upon beauty of form, symmetry, smoothness, straightness of lines, and uniformity of udder and placing

of teats. Ayrshires should also show considerable style, and while they should not be nervous, the eye should be clear, and indicative of health and constitution. Bulls should weigh not less than 1500 pounds and cows not less than 1000 pounds when mature.

BROWN SWISS CATTLE

History. — As implied by the name, this breed of cattle originated in Switzerland. They are said to have descended

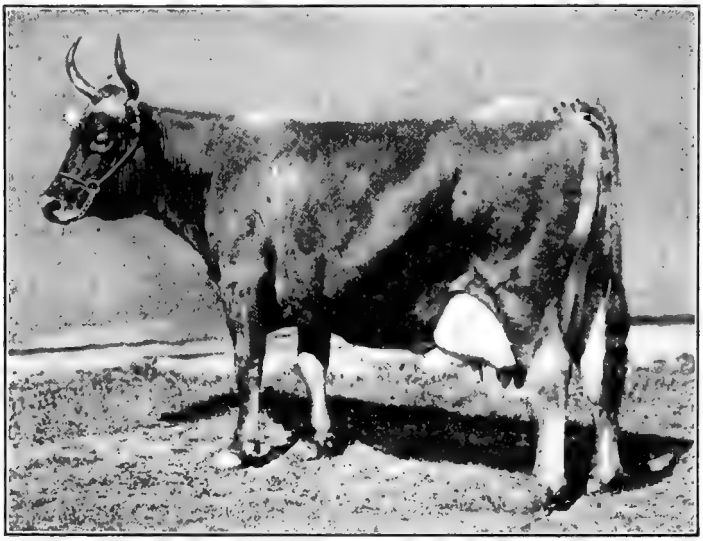


Fig. 42. — Brown Swiss cow.

from the Brown Switzer, an old breed found in the more mountainous sections of this mountainous country. No one man stands out prominently as a developer of the breed. These cattle were evolved by the nation as the breed best suited to the conditions under which they live. Gen-

erally they are grazed on the mountains in the summer and taken back to the valleys in the winter and fed upon hay. The rough topography of the country and the rigors of the climate naturally called for a hardy breed. The cows are also used for work animals, which tends to make them strong and muscular, oftentimes coarse.

Characteristics. — Brown Swiss cattle are quite large, bulls weighing 1800 pounds and cows 1200 pounds when mature and properly developed. The calves are large when born, ranking next to the Holstein calves in weight. At one time the Brown Swiss were classed as dual purpose cattle, but now they are regarded as one of the special dairy breeds. As yet they lack the extreme dairy type of the Jerseys and Guernseys, and are not so uniform. In color they are a light to dark chestnut brown, with a light tuft of hair between the horns on the inside of the ears, and a narrow line along the back. The nose is black with a meal-colored band around it. The horns, while occasionally coarse, are of medium size and length with black tips. The tail is long with a heavy black switch. The hoofs and tongue are black. The legs are heavy and straight. The udder is large and should be well set, carrying large well-placed teats. The ribs are well sprung, and the heart girth large, indicating good constitution.

DUTCH BELTED CATTLE

History. — This breed of dairy cattle which originated in the Netherlands is easily recognized by the peculiar and uniform coloring. The two colors are jet black and pure white, the white encircling the animal as a belt from the shoulders to the hips, hence the name.

While their history is not so well known as that of some breeds, it is said that about 1750 a Dutch nobleman conceived the idea of breeding cattle that would be black in color with white belts around the middle of the body, and from his foundation the breed was perfected. They were first brought to America about 1840, when P. T. Barnum, the great circus man, imported a few to take with his show. After 1850 there were no more importations, the principal reason being that they were difficult to obtain, which accounts for their scarcity in this country at the present time.

Characteristics.—In size these cattle are medium, mature bulls weighing up to 2000 pounds, and mature cows weighing from 900 to 1300 pounds. In type they are of the dairy conformation. They have good dispositions, and make good dairy cows. While they have not secured any great milk records, they are economical producers and do well on rough hilly land.

FRENCH-CANADIAN CATTLE

History. — This breed of cattle originated in Canada, being descendants of cattle from Brittany and Normandy brought over by the early French settlers. They are of the same origin as the Jersey cattle, and in many respects resemble them, although the more rugged climatic conditions under which they have been developed have made them more hardy. They are economical producers, doing well on scant rations.

Characteristics. — These cattle are quite small, the cows when fully mature weighing from 700 to 900 pounds, and the bulls about 1000 pounds. In color, they are black, brown, dark brown, with or without a yellow stripe along

the back and around the muzzle. They may also be fawn or brindle in color, and white under the belly, on the forehead, and switch.

KERRY CATTLE

Kerry cattle originated in the Kerry mountains of western Ireland, and are a natural product of the environment in which they have lived for centuries. They are one of the smallest of all breeds of cattle, the sparse grazing ground and the harsh climatic conditions working together to make the animals undersized. Bulls weigh from 800 to 1000 pounds and mature cows weigh from 500 to 600 pounds. These figures vary according to care and food. While the cows are small, and on this account are not popular, this breed produces milk and butter economically and makes good returns for the feed consumed. The color of the breed is black, but red may occur. In general conformation they incline toward the dairy type, but are not so extreme in this respect as the Jerseys, being short of leg, and strong through the heart.

RED POLLED CATTLE

History. — This breed of cattle is the principal dual purpose breed of cattle in America to-day and ranks very high in both milk and butter production. It originated in the counties of Suffolk and Norfolk, England. Back as far as 1778, there have been hornless red cattle in Norfolk county. It is thought that the "muley" cattle that were at one time common in America, and from which the so-called "muley" natives sprang, came from this source. The Suffolk red polled cattle were of the dairy

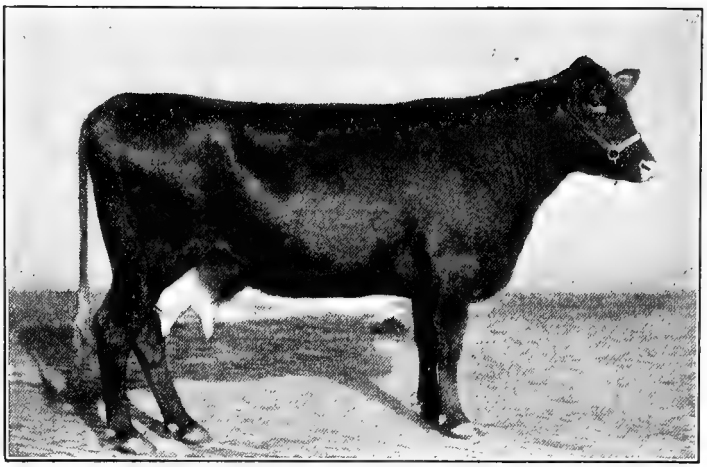


Fig. 43. – Red Polled cow.

type, and were noted for their milk yield, while those that were common in Norfolk had smaller bones, shorter legs, round barrels, good loins, and rather fine heads, which qualities made them good for meat production. In 1846, the two strains were combined to form the dual purpose cattle now known as Red Polled. The first regular importation was made into the state of New York in 1873, and since that time their spread over the country has been rather rapid. While they have never been popular in the corn belt, they are now widely distributed in some of the Western States.

Characteristics. — Red Polled cattle are easily recognized by their solid red color and absence of horns. White is allowed on the belly and udder and the switch of the tail, but a solid color is preferred. In conformation they have not the extreme beef form of the beef breeds nor the pronounced dairy conformation of the dairy cattle. In

this country, they are tending more toward the dairy type than in England, because they are being developed more strongly along the milking lines. Some very good steers are annually shown at the International Live Stock Exhibition, but they have not yet succeeded in capturing any championship honors. For beef purposes, they are somewhat coarse in the neck, high at the tail, thin in the thighs, and high in the region of the flank. From the standpoint of dairy conformation they are heavy along the back, and too thick in the thighs, although some of the cows are excellent milkers. The steers make very profitable gains and their carcasses make excellent meat.

DEVON CATTLE

History. — While Devon cattle are oftentimes classified with beef cattle, they have not been very popular in this country in competition with some of the more pronounced beef breeds. They originated in the county of Devon in western England near the border of Wales, where for many years red cattle have existed. The rough country, and the rather limited supply of food in that part of the island, tended to produce a hardy animal that was well adapted to these adverse conditions. Their history can be traced back as far as any of the improved breeds. The first well-known improver of the breed, Francis Quartly, began his work on these cattle in 1793.

In course of time there have been two well-defined types evolved. The North Devon type is compact, hardy, well adapted to rough country, and the carcass is good for beef. The South Devon type is larger and coarser, and better adapted to the production of both beef and milk.

They were introduced into America at an early date, the English colonists bringing them over as early as 1623. For many years they met with favor, and they are still raised in some of the Eastern States. The exhibits made at some of the fairs throughout the country show them to be a breed of great possibilities, but the fanciers have not made rapid progress in developing them and bringing their merits before the public.

Characteristics. — The Devons are quite easily recognized by their solid red color, which may range from light to dark. They have orange rings around the eyes, with white on the tip of the tail and on the udder occasionally. The score card calls for a three-year-old weight of not less than 1400 pounds for the bull, and 1000 pounds for cows. In conformation the American animal is neither of extreme beef nor dairy type.

EXERCISES

1. What breeds of dairy cattle have black noses, tongues, horns, and hoofs?
2. Name all breeds of cattle either partially or wholly black.
3. Make a list of the red breeds.
4. On what breeds of cattle is white found?
5. Make a complete list of the hornless breeds of cattle.
6. Classify the breeds of cattle as to the country from which they come.

HOME PROJECT

Study the home herd and those in the neighborhood for breed characteristics. See how many breeds are thus suggested in your neighborhood. It must be remembered that characteristics of two or more breeds may often be found in the same animal.

CHAPTER VIII

BREEDS OF SHEEP AND GOATS

SHEEP are classified according to their wool into the fine wool, the medium wool, and the long wool breeds. The medium wool and the long wool breeds constitute the mutton breeds. The breeds commonly belonging to the fine wool class are the American Merino, the Delaine Merino, and the Rambouillet. Those belonging to the medium wool class are the Shropshire, Oxford, Hampshire, Southdown, Cheviot, Suffolk, Dorset, and Tunis. The breeds belonging to the long wool class are the Lincoln, Leicester (pronounced *Lester*), Cotswold, Black Faced Highland, and Kent or Romney Marsh.

Fine wool sheep do not mature until the age of three years, but the medium wool breeds are mature at the age of two years.

THE FINE WOOL BREEDS

American Merino. — This is the name applied to one type of the Merino sheep which originally came from Spain. In form, these sheep are of poor mutton type, having been bred for the fineness of wool alone. They are narrow over the back, sharp at the withers; and the legs, which stand close together, are crooked and often long. The skin is wrinkled and lies in folds, especially on the neck and in the region of the flank. In the western part of the country

Fig. 44. — Merino ram.

they have been bred to Mexican sheep to improve the quality of the wool of the latter. Merinos are hardy and can endure both the heat of the south and the cold of the north. They can be handled in large flocks, which is a decided advantage on the range. The rams have strong twisted horns, while the ewes are hornless. Rams weigh from 100 to 175 pounds and ewes weigh from 80 to 100 pounds.

The Delaine. — This breed has been developed in America by selecting from the larger Merinos the smoothest sheep with longest and coarsest wool.

The wool has less oil and coarser crimp or kink than that of the American Merino. However, the quality of the mutton is higher and the lambs fatten and mature much better. The horned rams weigh from 140 to 200 pounds, while the hornless ewes weigh from 100 to 150 pounds.

Breeders of Delaines frequently select breeding stock from the ranks of the American Merino to obtain improvement in wool and from the Rambouillet to increase the size of their sheep.

The Rambouillet. — This breed of sheep was developed in France near the village of Rambouillet, hence the name. The work of improvement was first carried on by the French Government. From France some good specimens were taken to Germany, where large flocks are now established and considerable improvement is still being made. These sheep are larger and smoother than the American Merino and have a mutton carcass superior to the other fine wool breeds.

In America the Rambouillets were received from the first with much favor. The breed has made considerable headway on the ranges because they can be herded in large

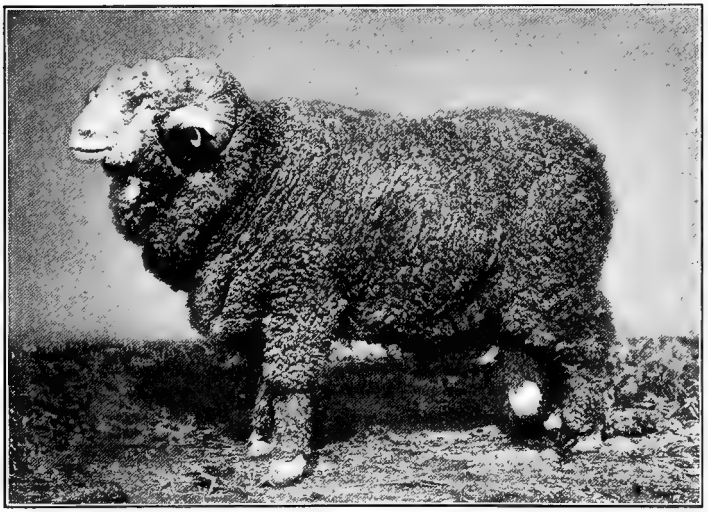


Fig. 45. — Rambouillet ram.

flocks, produce a liberal clipping of good wool, and give a mutton carcass of fair quality. Rams of this breed weigh from 170 to 185 pounds and may be either horned or hornless. The ewes are hornless and should weigh from 140 to 165 pounds. Individuals, both male and female, may run much heavier than these weights.

THE MEDIUM WOOL BREEDS

The Shropshire. — The Shropshire is the most popular of the English breeds of sheep and is found not only in England, the United States, and Canada in large numbers, but wherever the influence of British agriculture is felt. The sheep are valuable for the mutton which they yield, and their heavy clippings of medium wool. So well developed are both these characters in this breed, that Shropshire are often called dual purpose sheep. The rams

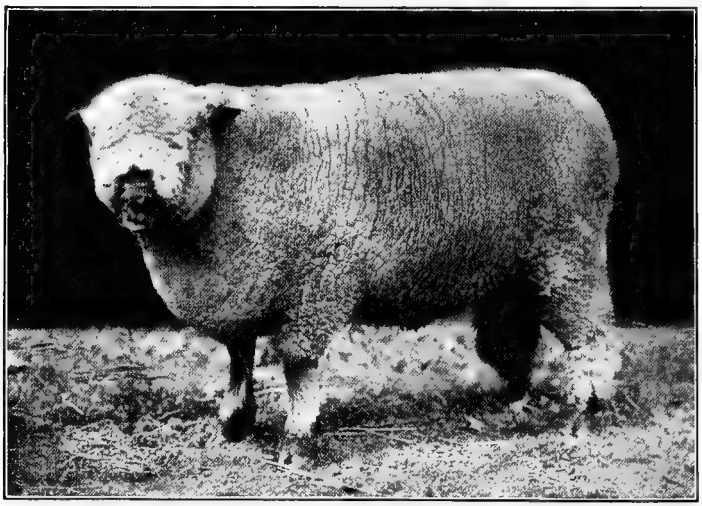


Fig. 46. — Shropshire ram.

weigh about 225 pounds and the ewes about 175 pounds when mature. Ewes yield about 8 pounds of wool and rams about 12 pounds of wool at each clipping.

The form of the Shropshire is that of a typical mutton sheep. The most distinguishing features of the breed are

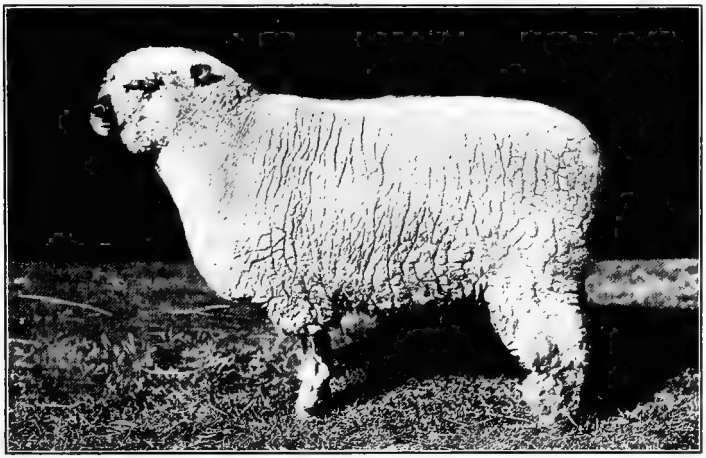


Fig. 47. — Shropshire ewe.

the head and face. The wool grows down over the face so that the only parts of the head exposed are the ears and the tip of the nose. The wool also grows down on the legs, so that "Shropshire sheep are wool from the nose to the toes." The ears are small, short, and straight. The thickness of the wool around the head gives the ears the appearance of being shorter than they really are. The color of the exposed hair is dark brown and the skin is of a very healthy, bright pink color. The wool, while of medium thickness, is quite dense, and should have no tendency to part in clusters and curls. Shropshires have straight, strong, wide backs; short, wide, thick loins; and long,

level, wide rumps. A good development of the "leg o' mutton" is also necessary in good types. They do not thrive well in large flocks, but under reasonable care are quite hardy. They are sometimes called the farmer's ideal sheep.

The Oxford. — These sheep originated in Oxfordshire, England, and were not recognized as a distinct breed until

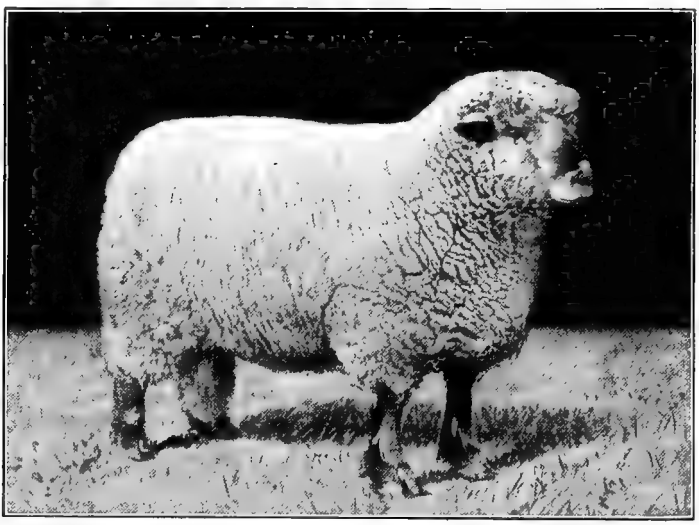


Fig. 48. — Oxford ram.

1862, the first year they were awarded prizes at the Royal Show of England. They were developed through a desire on the part of some men to establish a breed that would combine high quality with large size, which was accomplished by crossing the long wool Cotswold with the medium wool Hampshire and adding a slight infusion of Southdown blood. The result is a breed whose wool is the longest and coarsest of all the medium wool breeds

and whose weight is the heaviest. They have never yet succeeded in defeating the Southdown and the Shropshire breeds in carcass competition.

Oxfords have longer legs than other medium wool sheep. The color of the hair on the face is brown, sometimes with gray spots, somewhat lighter in color than the Shropshire; and the wool, while covering the head, does not meet on the face below the eyes. The ears are also much longer and coarser than those of the Shropshire.

These sheep are distributed over the United States, particularly in the section east of the Mississippi and north of the Ohio River. They are not popular on the range, because they do not do well in large flocks and are not hardy enough for range conditions, but they are quite popular with the farmer who keeps a small flock. The ewes are prolific, and the lambs develop rapidly and attain a good weight at an early age, which makes them much admired by the stock buyer. Rams should weigh from 250 to 350 pounds and ewes from 180 to 275 pounds.

The Hampshire. — Hampshire sheep originated in Hampshire, England, and rank next to Oxfords in popularity. Rams weigh about 250 pounds when mature, and ewes from 185 to 195 pounds. These sheep are not so long-legged as the Oxfords. They have fine and compact fleeces, which are short and do not yield a great deal of wool. The hair is black, and the skin is deep purple in color. A great many of the lambs are born black, but after the fleece grows they become white. The face, not covered with wool, is black. The heavy Roman nose gives this sheep a coarse appearance.

The breed is meeting with great favor in America because the lambs mature early. They are prized highly for

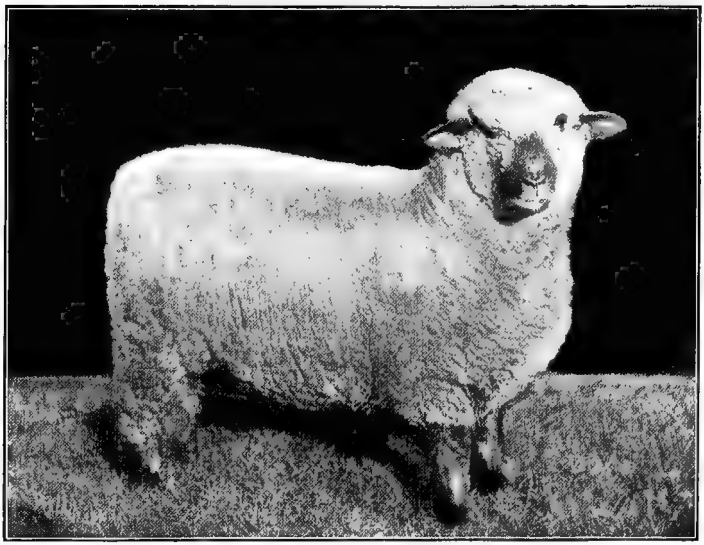


Fig. 49. — Hampshire ewe.

early spring trade and bring good prices. The mutton is of good quality and the ewes are very prolific and good milkers. On the range they are frequently desired for crossing with the Merino. Hampshire sheep are quite widely distributed over the world wherever sheep are raised.

The Southdown. — The Southdown is the oldest established breed of mutton sheep. They originated in southeastern England upon the thin chalk soils in the low hill or down country. Over one hundred years ago these sheep existed pure, and through the efforts of two progressive English farmers, John Ellman and Jonas Webb, they were improved, and became the favorite sheep of royalty, which distinction they have held to the present day. Some of the best sheep are produced near the city

of Cambridge, England, the home of Jonas Webb, where stands a large monument erected to his memory, because of the valuable work he did in improving both sheep and cattle.

Southdowns are the smallest of all the mutton breeds, and produce the finest quality of mutton. Both in this country and in England, they have captured more championship carcass prizes than any other breed of sheep. In their own country, reared under natural conditions, they are the hardiest of the medium wool breeds.

In form, they are very plump, low down, and compact, and weigh very heavy because of their solidity. The wool is very dense and of good quality, being the finest of all the medium wools. It covers the top of the head and the forehead, but does not meet on the face below the eyes. The color of the hair on the face is a dingy gray, white

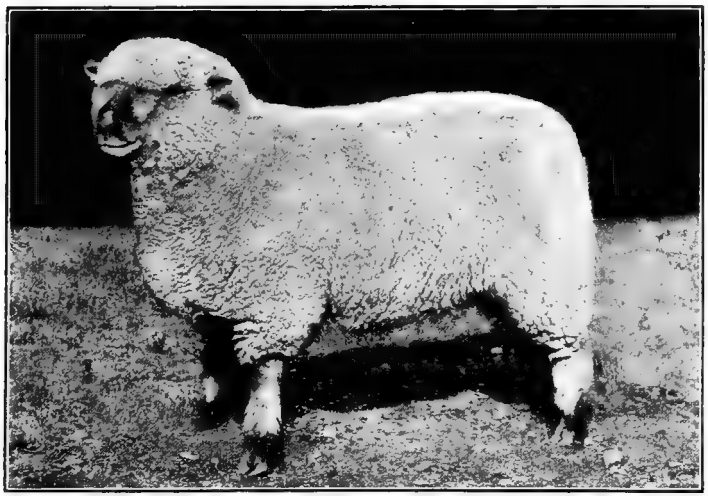


Fig. 50. — Southdown ewe.

being very objectionable. No wool is found on the legs below the knees.

These sheep are quite widely distributed over the world. They are valuable for improving the common stock of the country and for producing very fine mutton, but are not always popular with the farmer, because of their small size.

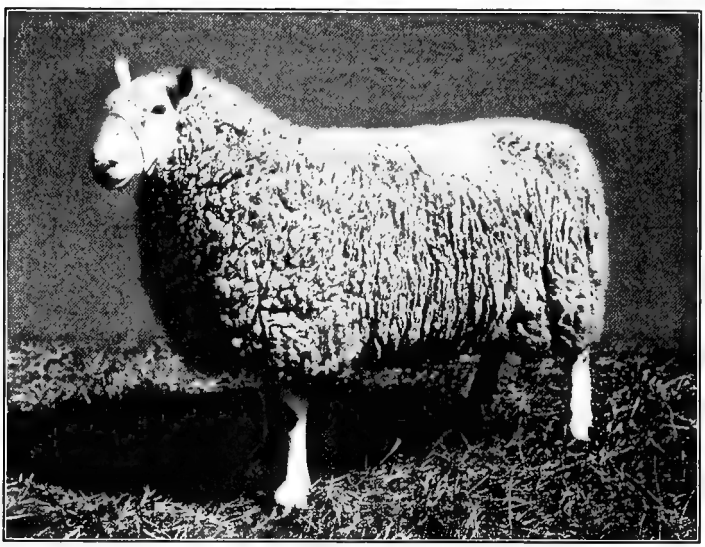


Fig. 51.— Cheviot ewe.

The Cheviot. — This breed developed in the Cheviot Hills of Scotland. Reared under natural conditions upon these rugged hills, sheep of great thrift and hardiness have resulted. Having been bred pure for generations, they come true to type and are very prepotent.

The distinguishing features of Cheviots are clean, white faces of medium length; bright eyes; erect alert bearing; short, compact bodies covered with compact fleeces

of clean, white color. The legs are short and straight, and the bones are flat, not rounded as is the case of the down breeds of England. The wool covers the neck very compactly, but leaves the ears, head, and face exposed and clean. The ears are held very erect, which gives to the sheep an alert appearance.

Cheviots produce a fair clipping of very desirable, clean wool of medium quality and length. They are also prized for their mutton. While their meat does not possess the quality of the Southdown, it is much superior to that of some of the coarser down breeds of England. They are valuable for crossing with common stock and their hardiness makes them favorites where their good qualities are known. The ewes are prolific and make good mothers.

Rams, bred in America, should weigh from 175 to 200 pounds, and ewes about 150 pounds. Imported stock will weigh somewhat less. The American breeders have been selecting the more compact sheep, and have been paying more attention to their mutton than to their wool qualities.

The Suffolk. — This breed originated in the county of Suffolk in the eastern part of England and is the result of a cross between native sheep and the Southdown breeds. The distinguishing features of the breed are the black, smooth face free from wool; the hornless head; the long, black, smooth legs, and long, rangy body covered with fine wool. They can easily be distinguished from the Hampshire sheep, which have heavier noses and a bolder and more alert appearance.

The Dorset. — These sheep originated in the county of Dorset in the south of England. They are easily distinguished from the other medium wool breeds by their horns. This is the only breed of sheep in America in which

both sexes are horned. In size they rank between the Shropshire and the Southdown, but have longer legs, and are not so uniform in conformation and quality. In their native country they have been kept pure longer than most breeds of English sheep. The rams weigh about 200 pounds and the ewes about 160 pounds each.

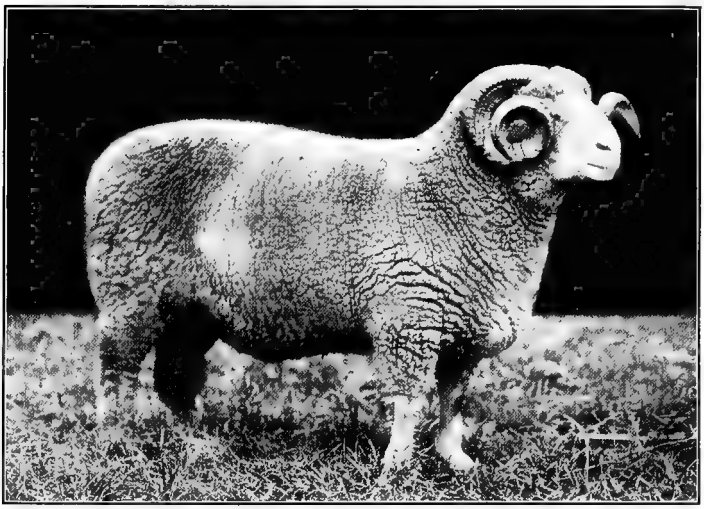


Fig. 52. — Dorset ram.

The hair of this breed is pure white, the skin pink, and the wool which is short but of good quality covers the body closely and compactly, the head and face only being free from wool.

They are well distributed over the world. In this country they are popular because the ewes are very prolific, and will produce two crops of lambs per year. The mothers are good milkers and the lambs grow rapidly. They are very useful for producing winter lambs which

may be ready for market at a time of the year when fresh lamb is a delicacy and brings high prices.

The Tunis. — This breed originated in the upland region of Tunis in northern Africa. They are sometimes called "fat-tailed" sheep because the tail is broad, being five to ten inches wide. They were once raised for that reason, and very fat tails were sought in the breeding stock. They were first brought to this country in the latter part of the eighteenth century. The breed is generally hornless and the legs are brown or of tawny color. The wool is of variable color, and scant in quantity. It is for this reason that they are not received with great favor. The ewes are quite prolific, and the lambs are good for mutton purposes.

At present they are being exploited for use in some of the semiarid sections in the southwestern part of the United States.

THE LONG WOOL BREEDS

The long wool breeds of sheep are larger and coarser than the medium wool breeds, and have longer legs. While they fatten readily, the meat is coarser and lacks the marbling found in the carcasses of the medium wool sheep. The body is long and rangy and the fleece, while having longer staple, lacks compactness. The long wools are generally developed in low flat regions where there is an abundance of rainfall and luscious pasture. They are not so hardy as the medium wool breeds and the openness of their fleeces makes them poorly adapted for climates where much cold rain and snow falls.

Lincoln Sheep. — The Lincoln sheep originated in the county of Lincoln, one of the richest agricultural sections in all England, where the land is very low and flat. The

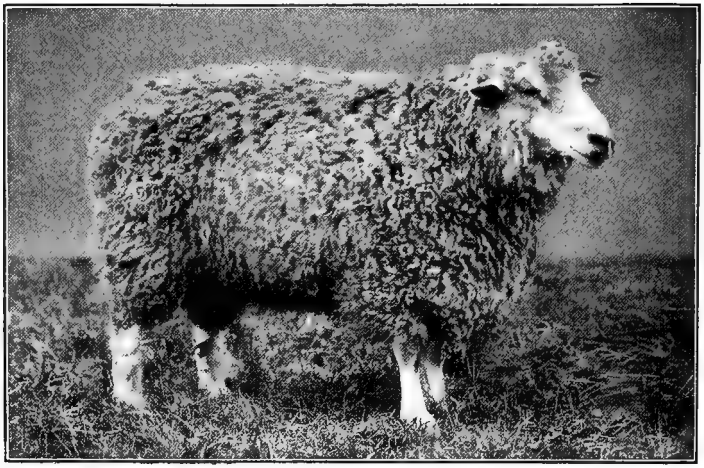


Fig. 53. — Lincoln ewe.

breed of Lincoln sheep is noted for the length, strength, quality, and luster of its wool.

They are one of the largest of the long wool breeds. Mature rams weigh not less than 250 pounds, and the ewes not less than 200 pounds. The color of the hair is white, the head is large and hornless, the feet and legs are large and coarse. The wool which forms in ringlets is not found on the belly but covers the body, and forms a tuft upon the top of the head.

They were imported to America at an early date but are not widely distributed. Their mutton qualities are not the best, the tendency being to produce too much fat which makes a soft, blubbery carcass.

Leicester Sheep. — Leicester sheep originated in the county of Leicester, near the central part of England, and were one of the first breeds of sheep to receive systematic improvement by selection and breeding. Robert Bakewell,

a man who did much to improve cattle, was an improver of the Leicester sheep.

There are now two types of Leicester sheep: the Bakewell, or Dishley, type and the Border Leicester.

The Border Leicester are the most favored in this country. They developed near the border line between England and Scotland, and are tall sheep that fatten readily. Mature rams weigh not less than 250 pounds and ewes 200 pounds. The face and legs are free from wool and the hair is white. The fleece, while quite long, is of good quality and hangs from the body in ringlets.

The Bakewell, or Dishley, type has a tuft of wool on the forehead, and the skin has a bluish tinge. Both types of Leicesters are hornless.

The wool produced by Leicesters is medium fine and of fair length, but the mutton is inferior. They can be crossed

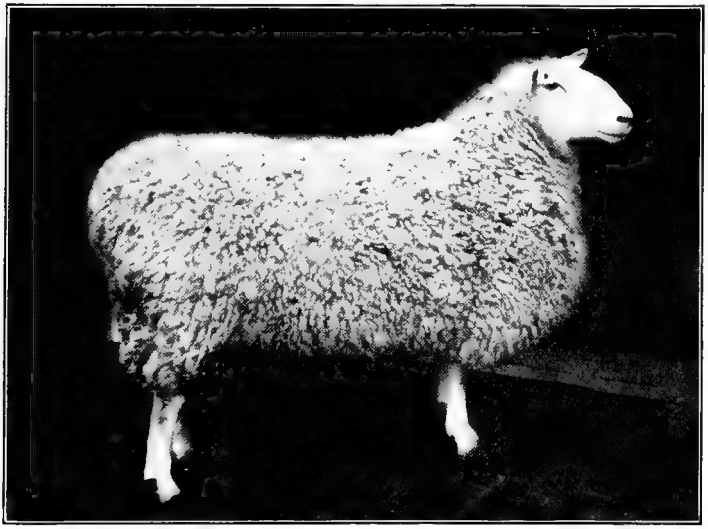


Fig. 54. — Leicester sheep.

with some of the medium wool breeds to good advantage. They are not good rustlers, neither are they good grazers, nor hardy. They were imported into this country at an early date and have received much improvement at the hands of American breeders.

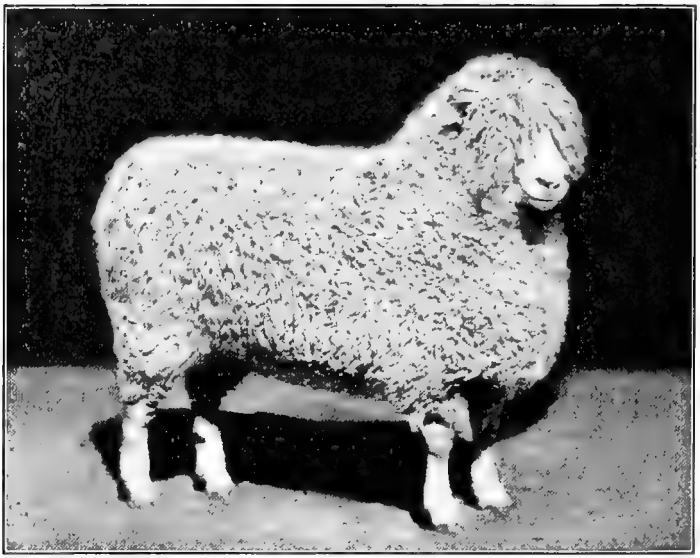


Fig. 55. — Cotswold ram.

The Cotswold. — The Cotswold is one of the oldest breeds of English sheep. They are a heavy breed, the mature rams weighing not less than 250 pounds, and the ewes not less than 200 pounds. They are easily distinguished from the other long wool breeds by the locks of wool which hang down over their faces. The fleece is very long and hangs from the body in ringlets. They are quite hardy and do well on good pasture land. Their bodies are compact and they fatten readily, but the mutton is not of the best quality.

These sheep were early imported to America and met with considerable favor, because of their ruggedness, prolificacy, the amount of wool they produce, and the size of the lambs. Good Cotswolds will shear from 16 to 18 pounds of wool, and the lambs will weigh over 100 pounds at the age of 12 months.

The Black Face Highland. — The Black Face Highland sheep, sometimes known as " Black Face," are to be found in the Highlands of Scotland where they originated, and in the mountains of Ireland to which country they have been

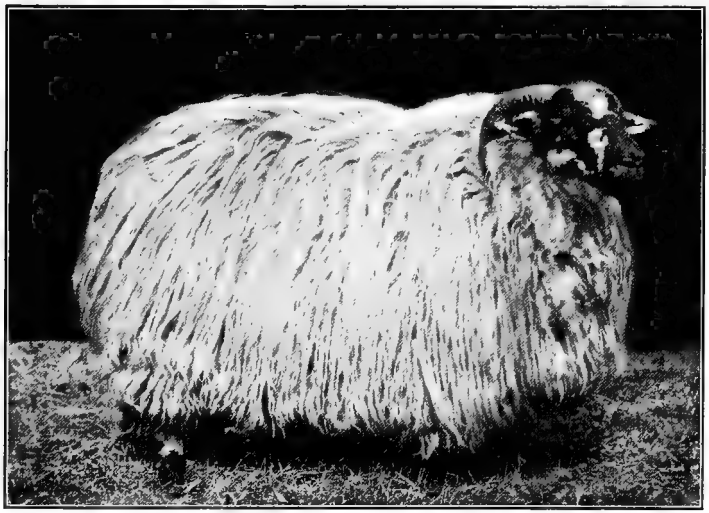


Fig. 56. — Black Face Highland ewe.

imported. They are said to be one of the oldest breeds of sheep in Scotland and are particularly adapted to withstand the hardships of the regions in which they live. They are easily distinguished by their long shaggy fleeces of wool, which although compact is generally coarse. The hair

Fig. 57. — Angora goats.

on the face is black or mottled gray and black and both males and females have horns.

These sheep are remarkable for their constitutions; even the young lambs, as soon as born, are able to withstand the inclemency of the weather because of the fleece which covers them at birth. They live in the mountainous sections, out of doors all of the time in all sorts of weather, but seek shelter behind crags and projecting rocks when bad storms prevail. The mutton which they produce is said to be of good quality. Although they have much to commend them, they are not very common in this country.

Kent, or Romney Marsh. — This is one of the largest breeds of sheep and originated in the lowlands of the county of Kent in the southeastern part of England. They are remarkable for their ability to thrive upon low, wet land. Under these conditions they attain great size, being surpassed in this respect only by the Lincoln sheep. They are long and rather rangy sheep, having white, broad faces. They are low set on short, thick, strong legs and strong feet. The wool although long is rather fine.

GOATS

In general characteristics, goats resemble sheep. They are not so generally raised in America as in foreign countries, but will probably be more common as the country becomes more thickly settled and the rougher sections more generally used.

In this country, goats are raised both for their fleeces and for milk production. More are raised for the former than for the latter purpose.

Angora Goats. — While the Angora goat is grown primarily for its fleece, the better the form of the body the

more desirable is the goat. The color of the skin is a bright pink and the hair is white. The face is free from fleece with the exception of a tuft upon the forehead. The fleece forms in lustrous ringlets, and may grow to a length of ten inches. The offensive odor of the common goat is absent in the Angora breed; and the odor in a fleece of mohair is even milder than that in a fleece of common wool. This fleece or mohair is useful for the manufacture of felting material and coarse plushes. Practically all the cushions of car seats are made from mohair, the best of which comes from the younger goats. There is also a considerable demand for the meat of the Angora goat.

Goats are useful in the clearing of brush land. They have good digestive systems and will thrive upon young twigs and shoots as well as upon grass. The skins of goats are used for robes and rugs. Leather made therefrom is used in the manufacture of gloves, purses, shoes, and other articles.

Milch Goats. — The milch goat, often called "the poor man's cow," is used in many foreign countries. Milch goats can be fed and cared for more cheaply than cows, and for the feed given them, they return liberal amounts of milk. The milk is used for immediate consumption and in the manufacture of cheese. One who is used to drinking cow's milk does not relish the milk of goats because of its strong smell and taste.

There are several breeds of milch goats which derive their names from the localities where they originated. Some of these breeds are Nubian, Maltese, New Mexican, Spanish Maltese, Toggenburg, White Appenzeller, White Saanen, and Black-necked Valaisan. The last four are Swiss breeds.

EXERCISES

1. What breeds of sheep have black or dark faces? Dark legs? Covered faces? Bare faces?

2. How do you distinguish a Hampshire from a Southdown?

3. What are the essential points of difference between an Oxford and a Cotswold?

4. Arrange some scheme of classification by which you will be able to distinguish the various breeds of sheep on sight.

5. What are the principal breeds of sheep raised in your locality?

HOME PROJECT

When lambs are less than four weeks old, select and mark two that are apparently the best mutton types and two of the poorest for this purpose. Weigh all four animals every two weeks and keep records of their growth as a test of your judgment in selecting young stock.

CHAPTER IX

BREEDS OF SWINE

SWINE breeding is widely distributed throughout the United States. The principal breeds of the lard type are the Poland China, the Duroc Jersey, the Berkshire, and the Chester White. The minor breeds of this type include the Small Yorkshire, Victoria Swine, Suffolk Swine, the Essex, and the Cheshire. Berkshires are sometimes classified as belonging to the bacon breeds, but in the United States they are distinctly of the lard type. The breeds of the bacon type are the Large Yorkshire, the Tamworth, and the Hampshire or Thin Rind Hog.

THE POLAND CHINA

History. — America is responsible for the development of most of the breeds of lard hogs. This is because of the large amount of Indian corn produced and fed to hogs in this country, since the feeding of Indian corn tends to produce much fat, the distinguishing characteristic of this type. The Poland China, which originated in Ohio about 1840, is one of the most popular breeds. In its early development, a great many breeds of swine were called upon to furnish blood, the commonest ones being the Berkshire, the Irish Grazier, and the China. The final product was a hog that matured early, fattened off at almost any age, and did well on the one-sided ration of corn and water.

Characteristics. — This breed is the accepted type for the lard hog and is characterized by a compact form; a well-arched, wide back; wide, thick loins; long, wide, and rather rounding rump; and deep, well-developed hams.

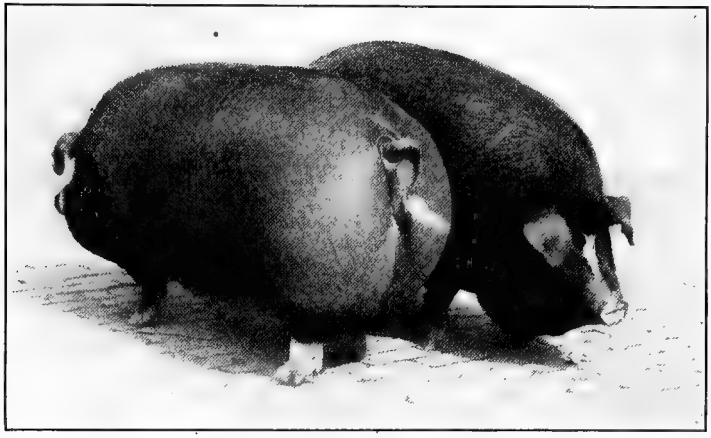


Fig. 58. — Poland China hogs.

The face is short and slightly dished. The ear is one of the marks of perfection and a point to which breeders pay considerable attention. This should be of good quality, erect at the head, and should break downward about one third of the distance from the tip. Six white points, a white face, white tip at the end of the tail, and four white feet, are also considered essential. In the show yard, the type sought is a blocky, compact hog of medium to large size that carries much flesh and gives evidence of being an early maturing animal.

THE DUROC JERSEY

History. — This breed of hogs originated in New Jersey, where they were called " Jersey Reds." They were orig-

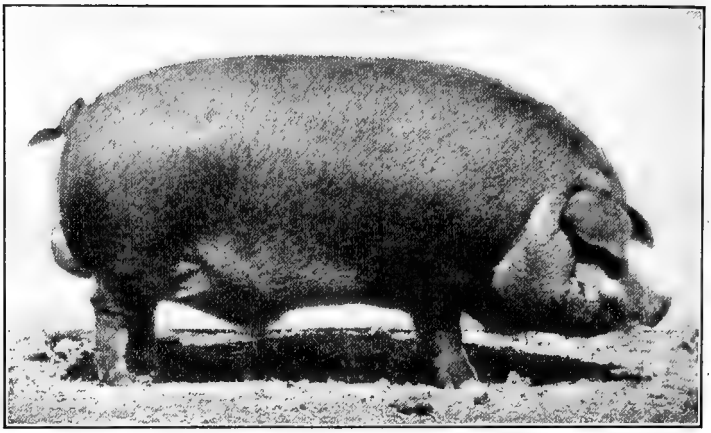


Fig. 59. — Duroc Jersey hog.

inally large and coarse, with large pendulous ears. Later, they were crossed with a strain of red hogs developed in New York state, that were called Durocs. When the two breeds were blended together, the new breed was called Duroc Jersey.

Characteristics. — At the present time, they are the only red breed of lard hogs in this country. In type, they are similar to the Poland China, and it might be said that Duroc Jerseys are red Poland Chinas, although the fanciers of both breeds would not like the comparison. The color preferred is cherry red. Pigs that are exposed to the sun in the summer time become sandy in color. Black spots over the body are objectionable, and if found in too large numbers, they disqualify the animals in the show ring.

Duroc Jersey hogs are good grazers and are also well adapted to following cattle in the feed lot. For hogs of the lard type, they are prolific and they cross well with other breeds.

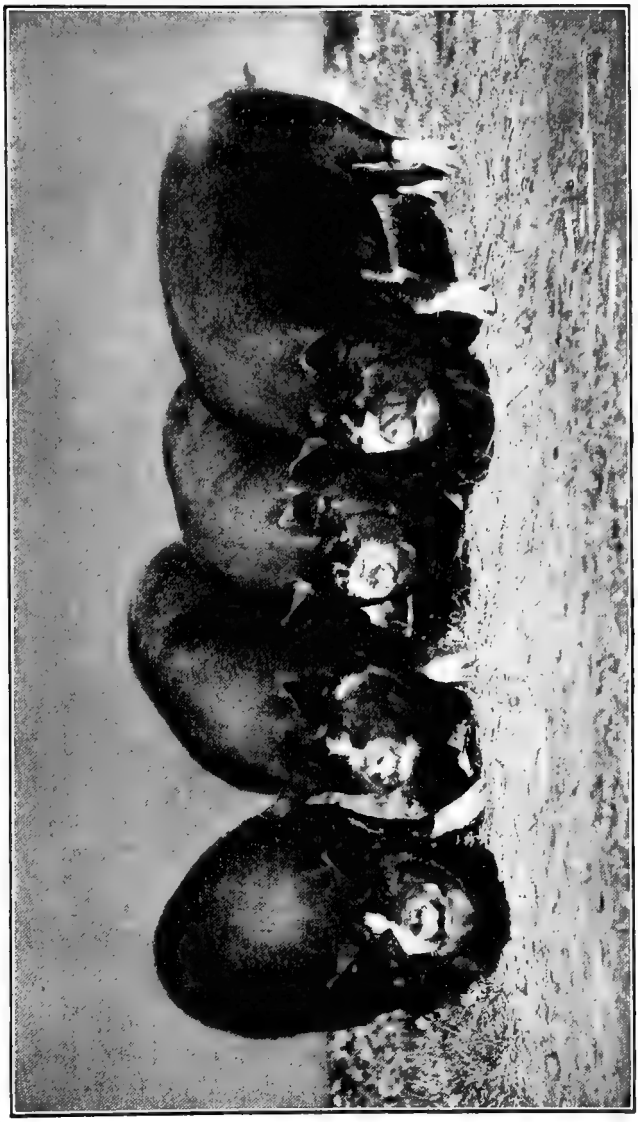


Fig. 60. — Berkshire hogs.

THE BERKSHIRE

History. — Berkshire hogs derive their name from Berkshire in England, where the breed originated. In 1823 they were introduced into the United States, and were brought into Canada in 1838.

Characteristics. — The Berkshire can be easily recognized by the shape of the face and snout and the erect ears. The face is decidedly dished and the snout is rather short, giving the animal a " pug-faced " appearance. The color is black with white feet, white face, and white at the tip of the tail. There may be an occasional splash of white on the arm or thigh, but more white than this is considered objectionable. Berkshires vary more or less in type. To a great extent the type is determined by the market demands of the countries in which they are bred and by the methods of individual breeders. The Berkshire in this country is decidedly a lard hog, although in Canada, where corn is scarce, it is more of the bacon type.

Berkshires are quite popular with swine fanciers. They are somewhat longer and straighter along the back than the Poland Chinas and the Durocs, and, being more active in disposition than these two breeds, are good rustlers on pasture. Berkshires of the accepted type are quite prolific. The litters are large and the females are good mothers. In some animals there is a tendency to be somewhat weak around the heart girth and in the pasterns. In selecting Berkshires, one should guard against these weaknesses.

Berkshires mature at an early age. Pigs one year old weigh about 300 pounds. They fatten readily and are capable of making gains cheaply. The meat of Berkshires is of good quality and has a large proportion of lean to fat.

THE CHESTER WHITE

History. — Chester White hogs originated in Chester County, Pennsylvania, where large white hogs were common for many years and from which region the breed derived its name. The breed was improved by crossing with a strain of more refined Chinese hogs. There are now two strains known as Todd's Improved Chester Whites and the Ohio Improved Chester Whites, both of which have been developed by selecting and mating some of the best of the breed.

Characteristics. — This breed is the largest breed of lard hogs. In the show ring, judges favor the compact, low down, smooth type, but farmers throughout the country who favor the Chester White for breeding purposes, select the coarser and more rangy animals, because hogs of this type raise larger litters of pigs.

These hogs should be pure white, no black hair being permissible, although bluish spots are often found on the

Fig. 61. — Chester White boar.

skin; these are considered objectionable. The body is long with a tendency to be high on the legs, and the bones and hair are often coarse. The head is quite long and the ear is long and pendulous. These coarse characteristics do not appeal to the judge in the show ring.

MINOR BREEDS

The Small Yorkshire. — The Small Yorkshire is a breed which originated in England, where the hogs are known as the Small White. They are the smallest breed in America, and while they mature quite early, they are not very useful for improving other breeds. Their bodies are compact, their legs are short, the coat is white and curly, and the nose is upturned giving the face a decidedly dished outline.

Victoria Swine. — These swine originated in the United States, but have never attained much popularity. They are white in color and of medium size. The hair is smooth and straight, the face dished, and the ear, which is of medium size, is erect and straight. The Victoria is a lard hog, and while it may be as useful as any other breed for the production of meat and for crossing purposes, it has not attained wide popularity.

Suffolk Swine. — This is another English breed. Like the Small Yorkshire, it is white, small, and of the lard type. It has never attained much popularity in this country.

The Essex. — The Essex, developed in the county of Essex, England, is one of the smallest breeds of lard hogs. It is coal black in color, has fine bones and hair, and matures very early. While it may be useful for crossing with coarser breeds to produce quality, it is not very popular with the American farmer.

The Cheshire. — The Cheshire is a lard hog of medium size. The color is white, the face slightly dished, the ears small and erect, and the shoulders and hams are usually well developed. The quality of meat is quite as good as that from any of the breeds of lard hogs. This breed originated in the northern part of New York and is simply a development of the Yorkshire hogs that were early introduced into that state.

THE LARGE YORKSHIRE

History. — The Large Yorkshire, or the Large White as it is sometimes called in its native country, England, is the most popular hog of Great Britain. It possesses the finest bacon qualities and stands first among the bacon breeds of swine. The superb bacon of Ireland and Denmark comes from these hogs. They are found in large numbers in Canada, to which country they have been imported to improve the bacon qualities of the Canadian hogs In the United States, they are not so numerous as

Fig. 62. — Yorkshire boar.

some of the lard type breeds. In this country, where swine producing centers have been extended beyond the corn belt, these hogs are increasing in numbers.

Characteristics. — This is one of the largest breeds of hogs. The color is pure white, black or blue spots in the skin being objectionable. The hair is smooth and straight; the sides are long, straight, and free from wrinkles, and the back is straight and of medium width. The face is dished like that of the Berkshire, but is not so short, conforming more to the bacon type. Although of large size, the Yorkshires retain a great deal of quality and smoothness. The shoulders are smooth, the chest strong, and the bones fine but strong. The females are very prolific and are good mothers.

THE TAMWORTH

History. — The Tamworth, which ranks well with the Large Yorkshire in size and ability to produce bacon of the best quality, also originated in England. While these hogs have not received so much recognition in the bacon producing centers of Europe, they are quite extensively raised in Canada, and to a lesser degree in the United States.

Characteristics. — After once being seen, the Tamworth hogs are easily recognized. They are red in color, a cherry red being preferred, although some of them become chestnut, and in some cases the color is so dark as to appear almost black. The face is very different from that of the Large Yorkshire, being long and narrow, and the nose is exceptionally long and straight. Its appearance has much to do in prejudicing many farmers against the breed. The ears are long and inclined slightly forward with no tendency to droop. When compared with lard hogs, the legs of the

Fig. 63. — Tamworth boar.

Tamworth appear abnormally long and the hams small. The sides are long with firm flesh, and the back, while not especially wide, is well covered. General smoothness throughout characterizes the animal.

They are a late maturing breed, but are very prolific, producing large litters of healthy, active pigs. The crossing of a Tamworth with one of the lard breeds increases the size of the litters and improves the quality of the pork.

THE HAMPSHIRE OR THIN RIND HOG

History. — The Hampshire breed is of English origin, being first developed in Hampshire, England. In this country these hogs are becoming quite popular in parts of the corn belt, where the tendency seems to be to develop them more and more toward the lard type.

Characteristics. — This breed is easily recognized by its peculiar markings. It is black with a wide white band

Fig. 64. — Hampshire hogs.

around the middle of the body, the white belt including both front legs. The animals are usually classed as bacon hogs, but because they are shorter than the Large Yorkshire and the Tamworth, they do not furnish such long sides of bacon. Because of their shortness and their thinness of covering they are sometimes classed between the bacon and the lard types. Besides their peculiar markings they have other distinguishing characteristics. The face is straight and narrow; the ear is straight and inclines forward slightly. The legs are longer than those of the lard type hog, and they are deficient in the region of the ham. The back is slightly arched, but lacks the width shown in the lard hog. The flesh of the Hampshire is of high quality. It is fine grained and has considerable lean. Hampshires are hardy and they are good grazers.

EXERCISES

1. What breeds of swine have dished faces? Straight faces? Long noses?
2. Name the black breeds of swine; the white breeds; the red breeds.
3. Name the principal breeds of the lard type; of the bacon type.
4. Why are most of the hogs of the United States of the lard type?
5. In what respects does the lard type of swine differ from the bacon type?
6. Which breeds of swine are raised in your home locality? Which breed is most popular?
7. How do you distinguish between the Chester White and the small and large Yorkshires?
8. Make a list of the breeds of swine having erect ears; drooping ears.

9. Arrange a table of breed characteristics by which you can recognize the various breeds of swine at sight.

HOME PROJECT

From a litter of pigs select two that give promise of being the best in the litter.

By frequent weighing of these animals and recording the weights, check your judgment in comparison with all the rest of the pigs in the litter.

CHAPTER X

JUDGING CATTLE

THE judging of cattle should be considered under three main heads, namely, beef, dairy, and dual purpose cattle. The dual purpose type of cattle falls naturally between the beef and the dairy types.

JUDGING BEEF CATTLE

The profitable beef animal is one that will return the largest amount of good meat in proportion to its live weight. The market will pay more for some cuts than for others, because the meat consumers have preferences for particular cuts. Experience of the butcher has taught us that a good beef animal must have a conformation upon which is possible the greatest development of high priced cuts of meat.

High Priced Cuts. — The highest priced meat is on the back in the region of the loin, that part of the animal immediately in front of the projecting hip points. Next to this just back of the shoulders is another cut of good meat. The hindquarters also produce meat that sells for a good price.

Cheap Cuts. — The head is practically all waste material. The neck forms cheap meat, and that in the region of the belly or underline is also sold for a low price.

Waste Material. — The legs are waste material so far as meat is concerned, and a great deal more waste material

comes from the digestive tract and its contents. When an animal is slaughtered, the part that is retained for meat is termed the " carcass," and the waste material is termed " offal." The butcher is interested in getting an animal that will produce, when slaughtered, a high percentage of carcass and a low percentage of offal. The producer of the beef animal is interested in fulfilling, in so far as is possible, the demands of the butcher.

What the Butcher Demands. — The butcher desires an animal that has a small head, small bones, short legs, and a small paunch. The animal should also have a wide thick back, a wide deep loin, and well-developed hindquarters. The man who is to feed the steer to sell to the butcher looks for an animal that promises to fulfill these demands.

What the Feeder Demands. — The form of the animal sought by the man who feeds beef cattle will vary somewhat from the standard of the butcher. While the feeding steer should possess such desirable qualities as a straight back and well-developed quarters, it of necessity differs from the ideal of the butcher in that it should have a well-developed, wide head; thick neck; large heart girth; a roomy paunch, and rather strong bone. The feeding steer must possess these points, because the feeding period is trying to the health of the animal, and strength and constitution are essential. The feeding steer must have a large paunch so as to have sufficient capacity for feed.

What the Breeder Demands. — The breeding animal should not only conform in type to the accepted type for the butcher, but sex and breed characters should also be emphasized in the breeding animal. In the bull the head and neck should be strong and somewhat heavier than the butcher demands, and the development of bone and muscle

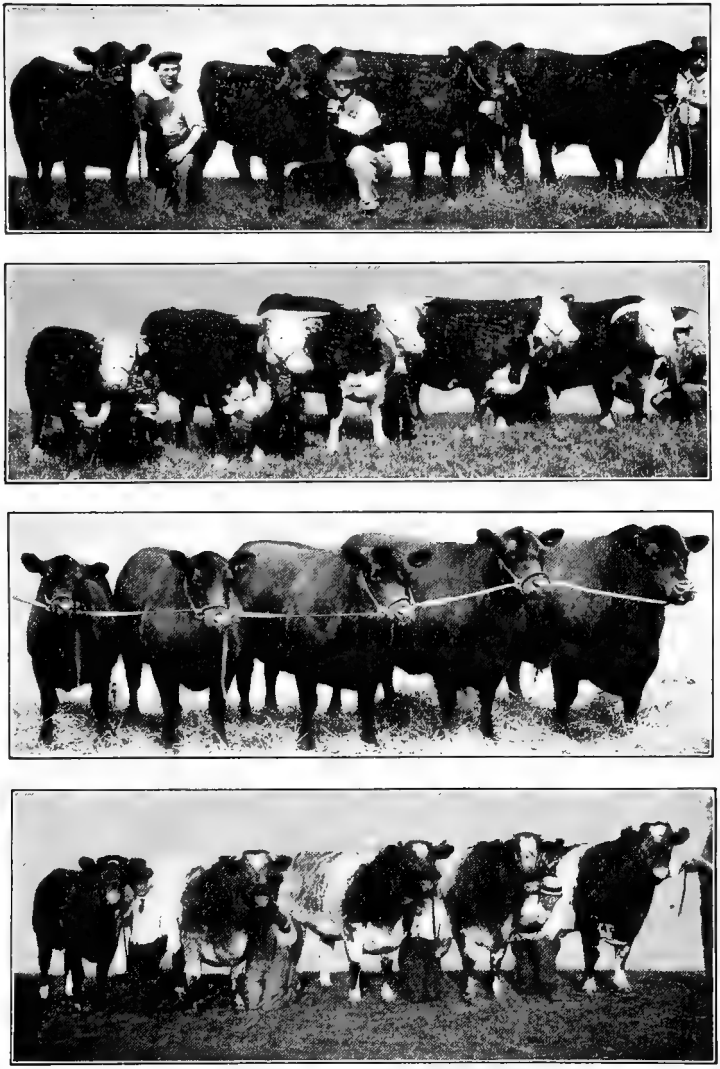


Fig. 65. — Beef breeds. From top to bottom: Galloway, Hereford, Aberdeen Angus, Shorthorn.

should be greater. These features indicate ability to transmit these attributes to his offspring. Besides his masculine features, the bull should have a straight wide back, wide thick loin, good rump, and be well let down in the thigh, low set and deep.

The cow should be somewhat refined about the head and neck, and show refinement also in the bone and muscular development. She should also be wider in the rear quarters than the bull. Besides all the good characteristics that belong to the cow, she should also have the attributes of the butcher animal.

Besides the special sex characters which distinguish the cow from the bull, breeding animals should also conform in type to some particular breed, and as each breed has special characters of its own, it remains for the judge to learn the attributes of each particular breed before he can lay claim to proficiency in judging breeding animals.

The Form of the Beef Animal. — The form of the good beef animal should be deep, broad, and low set, with straight top and underline. Viewed from the side, the top line and the bottom line should be parallel; the vertical line at the rear from the pin bones to the hocks and that in front from the brisket upward should be parallel, so that viewed from the side, the steer should show a rectangular form. Viewed from the rear, the back should appear broad and flat, and the sides of the steer should be parallel so that a cross section of the body would appear as a somewhat flattened circle. The general form should be one that contributes to the greatest compactness.

Quality. — Every beef animal, whether it be already fattened or a feeder, must have general or inherited quality which is indicated by the fineness of bone and the fineness of

Fig. 66. — Grand champion steer. International Live Stock Show.

skin and its pliability. A fine, heavy, mossy coat of hair is also desirable, as it indicates thrift and constitution. Fineness of skin indicates fineness of meat fiber. Pliability of skin indicates that the animal is in a good thrifty condition, that it will do well on a fattening ration and finish off well. Fineness of bone shows that the animal has fine fiber throughout the body, and that the animal will have less waste when killed. While the butcher desires fine bone, the feeding steer may be too refined and not strong and vigorous enough to feed out well.

Finish. — Quality is also used to mean " finish " in the animal. The feeder says that finish is the quality one must feed into the animal. The market offers more money per pound for the " finished " animal than for the thin animal, because the finished animal will not only dress a higher percentage of salable carcass, but the meat itself is more

palatable and nutritious. Fat tissues contain less water than lean meat tissues, so that as the animal gets fat the percentage of water in the carcass decreases. The buyer can afford to pay more for the fat animal than for the thin one, because he pays for less water; and his customers prefer to eat the finished meat which has been made tender by the fattening process.

In looking for finish the judge "handles" the animal. If the flesh is soft and spongy he decides that the animal is yet unfinished or has been overdone. The value of a carcass depends upon the "marbling" of meat, which means a mixture of fat and lean somewhat resembling streaks in marble. If the animal is overdone, there will be too high a percentage of fat, which is undesirable and which lowers the value of the carcass. The animal should be evenly covered and the flesh should be firm because this means that the flesh will make good meat. Often the animal is inclined to be "patchy," that is, its fat will be deposited in patches. These patches are often found around the tail head, and on cattle of poor type the flesh collects around the points of the hips.

Style and Temperament. — In style the steer should be active and upstanding, and not sluggish in temperament. The laying on of fat is dependent upon the activity of the animal, and if he appears sluggish or inactive it may indicate poor physical condition and inability to utilize the ration to the best advantage.

A great deal is said concerning the temperament of the beef animal. While the animal should be quiet, this does not mean that he should be sluggish. If too nervously inclined, the animal may move about too much, yet some of the best feeders are most nervous and finish the cheapest

and best if quietly handled. The beef steer must have what is known as a phlegmatic temperament. This means that he must be docile enough so that he will consume great quantities of food and place the surplus in the form of fat upon his body. This in turn depends upon type and quality. In the case of the beef animal as well as the dairy animal, temperament is secondary to type and quality.

Head and Neck. — The head and neck of the beef animal are peculiar to the type, and experienced judges can almost determine the value of the animal by looking at its head and neck. The muzzle should be of good size, indicating strength; a large mouth indicates capacity, thin lips indicate quality, and large nostrils indicate breathing capacity and constitution. The eyes should be clear, indicating health, and placid, indicating a quiet disposition. A short face indicates that the body of the animal is short and compact. Ears of moderate size indicate that the animal is free from coarseness, and fine texture of the ear shows that the quality of the animal is good. A short neck indicates compactness and lessens the amount of cheap meat. Thickness of the neck, while it increases the weight, is essential because it is always associated with the desired thickness of body.

Forequarters: Shoulders. — In the region of the forequarters, one looks for smoothness and compactness. The neck should blend gently into the body of the animal. The region where the shoulder and neck meet is known as the "shoulder vein," and fullness in this region means that the neck and shoulder blend well. The shoulder should be well covered, smooth, and compact on top. Width at the top of the shoulders is desirable, but it often happens that the shoulders are too wide. This gives the animal an appearance of coarseness, and the shoulders are likely to be too

loosely knit at the top. Width in the region of the breast is desirable also in the beef animal.

The brisket is the name applied to the point of the breast bone together with the flesh covering this region. While the

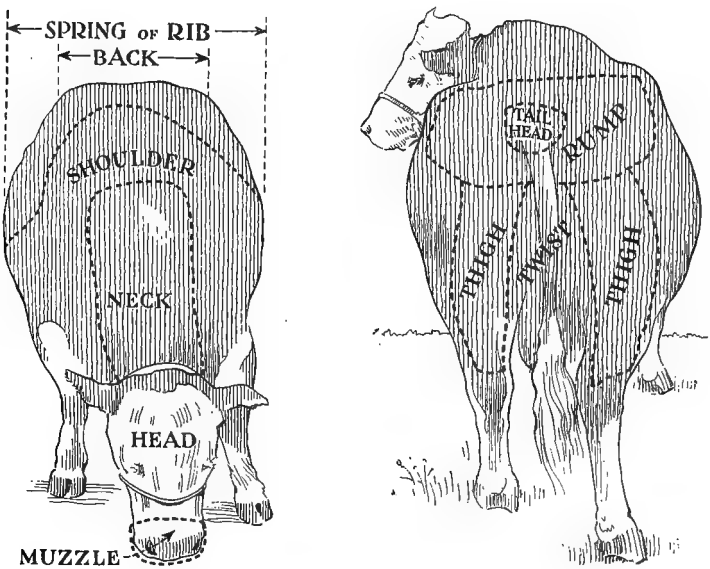


Fig. 67. — Parts of a heavy steer.

brisket is one of the cheaper parts of the animal, fullness and prominence in this region is desired, because if the animal is deficient in one part it is likely to be deficient in other parts. Dewlap is the term applied to the loose skin that is found on the lower side of the neck extending from the lower jaw to the brisket. The amount of dewlap varies with the breed. A light dewlap is desired. The front legs should be short and straight and set wide apart. They should be fine without appearance of weakness. Coarse bones are undesirable.

The Body: Chest. — In the region of the chest the animal should be full, deep, and wide, providing space for the heart and lungs located therein. The chest is one of the most important points in the make-up of the animal. An animal

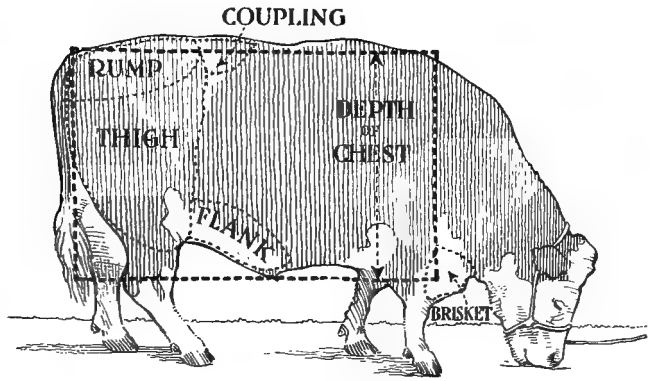


Fig. 68. — Side view of a heavy steer.

with a small chest is unable to thrive so well through the feeding period.

The girth is the distance around the body measured just back of the shoulders. The larger the girth the better the animal.

The fore flank is located immediately back of the fore legs. In the well-finished steer, the elbow joint is almost concealed.

The Crops. — The crops[1] is the region immediately back of the top of the shoulders. This region should be well filled up so that there is no depression.

[1] The Americans and the British do not agree as to the location of the crops. The Scotch and English schools state that the crops refers to the outcropping of the tops of the shoulders of the animal. What the Americans call crops is called *chine* by the British. The usage as accepted by the American schools has been accepted and employed here.

Ribs. — The ribs spring from the backbone and in the beef animal are well arched and extend well out from it, making a round and deep barrel. The ribs should be close together and well covered with flesh. Since upon the arching of the ribs depends the amount of meat the back will carry, the spring of the ribs is very important. The flat ribbed animal is never a good feeder.

Back. — The back is the most important part to be considered in judging the steer. Here are located the best cuts of meat, and here the judge gets his first impressions of the value of the animal. Breadth and straightness of back should be carefully considered. The broader the back the more meat the animal will be able to carry. Straightness of back indicates strength, and the covering of flesh upon the back denotes the finish of the animal.

Loin. — The loin is the region that lies between the last ribs and the points of the hips. This is the region of the highest priced cuts of meat, and great width and thickness of loin is desirable. The loin should be short and compact. An animal long in the coupling is never a good feeder and seldom produces a large proportion of high-priced cuts.

Flank. — The flank lies in front of the hind legs. This should be well let down so that the underline will be straight. If the animal is high in this region he is not only a poor feeder but the rear quarters will not be large enough to produce a goodly amount of round steak. Thickness of flank indicates finish. This region is one of the last places to fatten, and if the steer is well filled in this part he is carrying considerable flesh.

Hindquarters. —The hips of the steer should be smoothly covered. Projecting hips belong to the dairy cow and are

undesirable in the meat producing animal. Steers with projecting hips are hard to fatten and do not finish smoothly.

The rump lies back of the hips. From this region some very good cuts of meat are obtained. Length and width here are desirable. A sloping rump is objectionable, because it detracts from the form of the animal. If too high at the tail head, the rump is likely to be narrow and the tail head patchy and prominent.

The sharp bones at either side of the tail head are called pin bones. These should be far apart to conform to the general width of the animal, and should be smoothly covered with flesh.

The thighs consist of the thigh bones and the meat on the outside of them. In this region, the steer should be plump, wide, and deep. Even in the thin animal, one should look for well-developed muscles.

The twist is the name applied to the muscles on the inside of the thigh bones. In this region look for plumpness and depth. The thighs and twist taken together constitute the quarters of the animal from which the round steaks are cut. Fullness in the quarters is very desirable.

USE OF THE SCORE CARD

The score card is always made use of by the student of live stock judging, but it is seldom used by the expert in the show ring. The total score for any animal is 100. While animals may approach perfection, none attain it, so that a score of 100 is impossible. In scoring live stock no cuts should be less than one fourth of one point for imperfections.

When the points and their relative value have once been fixed in mind the score card may be dispensed with and the animals judged by direct comparison.

BEEF CATTLE

SCORE CARD FOR JUDGING BEEF CATTLE

SCALE OF POINTS	POSSIBLE SCORE	POINTS DEFICIENT	
		Student's Score	Corrected
GENERAL APPEARANCE — 25 POINTS			
Weight, estimated in lbs.			
Weight	6		
Form, straight top line and underline; deep, broad, low set	8		
Quality, firm handling; hair fine; skin pliable; fine bone: evenly covered with firm flesh	8		
Style, active, upstanding	1		
Temperament, quiet, docile	2		
HEAD AND NECK — 8 POINTS			
Muzzle, good size, mouth large; lips thin, nostrils large	2		
Eyes, large, clear, placid	1		
Face, short, quiet expression	1		
Forehead, broad, full	1		
Ears, medium size, fine texture	1		
Neck, thick, short, throat clean	2		
FOREQUARTERS — 14 POINTS			
Shoulder Vein, full	3		
Shoulder, covered with flesh, compact on top, snug	5		
Breast, wide; brisket prominent	2		
Dewlap, skin not too loose and drooping	1		
Legs, straight, short; arm full; shank fine, smooth	3		
BODY — 28 POINTS			
Chest, full, deep, wide; girth, large; fore-flank full	6		
Crops, full, even with shoulders	3		
Ribs, deep, arched, thickly fleshed	5		
Back, broad, straight, evenly fleshed	6		
Loin, thick, broad	5		
Flank, full, even with underline	3		
HINDQUARTERS — 25 POINTS			
Hips, smoothly covered; distance apart in proportion with other parts	4		
Rump, long, even, wide; tail head smooth, not patchy	6		
Pin Bones, not prominent, far apart	2		
Thighs, full, wide, deep	6		
Twist, deep, plump	4		
Legs, straight, short; shank fine, smooth	3		
Total	100		

JUDGING DAIRY CATTLE

It is harder to become a good judge of dairy cattle than of beef cattle. While one may judge quite accurately the percentage of carcass a steer will return, and the quality of the same by the general quality and condition of the animal, he can only guess as to how much milk a cow will give and what will be the percentage of butter fat in her milk. The scales and the Babcock test are the two best means of judging dairy cows, but these appliances are not used in the show ring, where animals are judged according to type. Carefully selecting and retaining for breeding purposes cows with good records for a great number of years has developed animals of a certain type that are best suited for the production of milk and milk solids. The type of these animals is the "dairy type," and the man who is most proficient in recognizing the points making up the dairy type is the man who is the good judge of dairy cattle. However, a great deal of a cow's worth depends upon her individuality, and there are no points on the surface of the animal that can be made to indicate the animal's individuality. This is why the best cow in the show ring is often second best in yield of milk.

What Determines Dairy Type. — Milk production is a function of the cow performed by certain organs. The four principal systems upon which milk production depends are: the digestive system, the circulatory system, the nervous system, and the secreting system. It is important that the organs of these systems be well developed. Those characters that show fattening tendencies should be repressed so far as possible, because it is impossible to find extreme development of both milk and beef

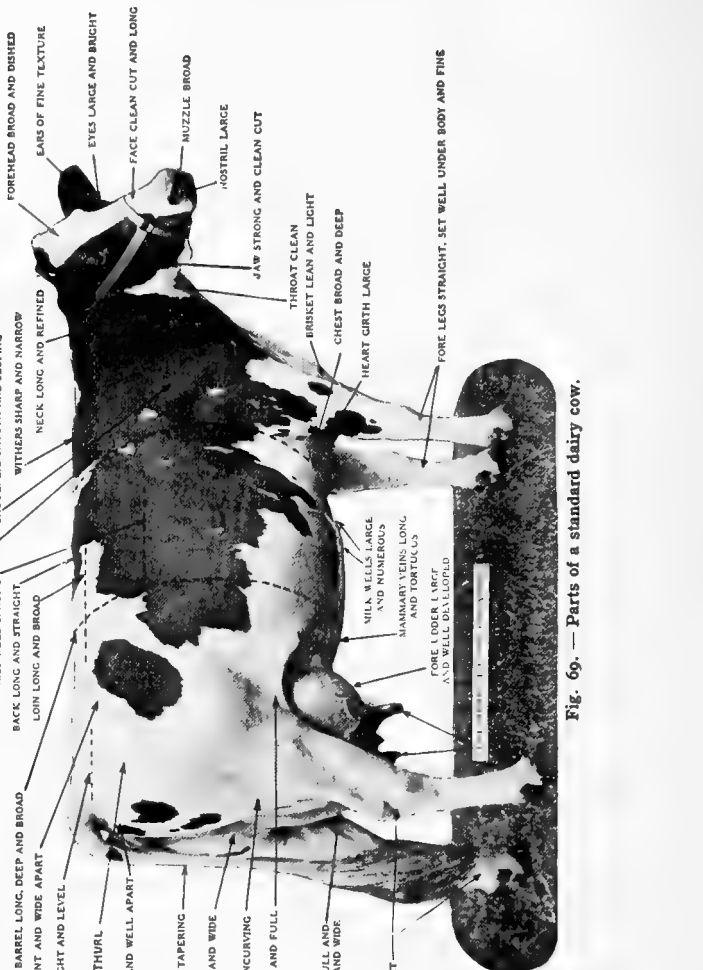


Fig. 69. — Parts of a standard dairy cow.

qualities in the same animal. Except in the case of a few of the points, such as constitution and capacity for feed, that should be well developed in all animals, the form of the dairy animal is strongly in contrast with that of the beef animal.

Form of the Dairy Cow. — In general form the dairy cow should present wedge shapes when viewed from three different positions, the front, the side, and the top. Viewed from the front the point of the wedge appears at the top of the shoulders, and the butt of the wedge appears at the points of the shoulders. This wedge indicates a cow free from fatty tendencies on the back and wide through the region of the chest. Viewed from the top, one sees the point of the wedge at the shoulders and the butt at the points of the hips. Freedom from fleshiness over the shoulders and great capacity in the region of the hips and pelvis are here shown. From a side view of the cow one should note the great depth from the top of the hips to the bottom of the udder, which distance constitutes the butt of the wedge. One should also note the gradual decrease in depth as he carries his eye forward to the shoulder. This means that the barrel of the cow is large, giving capacity for feed, and that the udder is well developed.

Fig. 70. — Wedge shaped back of a dairy cow.

Fig. 71. — Wedge shaped shoulder and back of a dairy cow.

Quality. — Quality is indicated by clean, fine bones, free from roughness and coarseness; fine, soft hair; and loose, mellow skin of medium thickness with an abundance of yellow secretion. Coarseness of any kind means plain breeding or lack of breeding for any particular purpose. Coarse, rough cows are poor mothers, and poor mothers make poor dairy cows. The yellow secretion means that the secreting glands of the body are in good, healthy, active condition. Well-fed and cared-for cows show more secretion than those that are poorly kept. The amount of secretion varies with the breed of the animal, and it may also vary with different individuals within the breed. The amount of secretion and the color of it is said by some to be an index to the quality of the fat content of the milk.

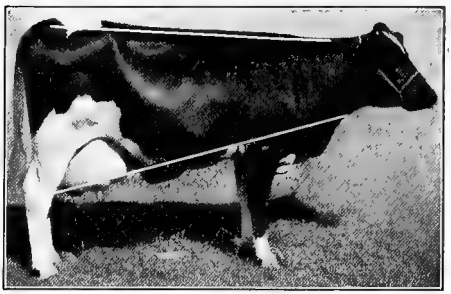


Fig. 72. — Wedge shaped side of a dairy cow.

Temperament. — The term temperament includes, in our generally accepted meaning of the word, disposition, but it means more than disposition. Dairy temperament might be defined as the inherited attributes of the dairy animal which make it possible for her to change large quantities of food into milk and milk solids, and to transmit those qualities to her offspring. The temperament of the dairy animal is spoken of as "nervous." This does not mean that the dairy animal should be erratic, according to our often accepted meaning of the term "nervous." The term is used here to mean just what the derivation of the word

explains, viz., full of nerves, or having nervous force, or a strong nervous system. The points which indicate dairy temperament are a refined head and neck and a strong prominent backbone, providing plenty of room for good nerve development. One might properly include all the points that constitute dairy type as points that indicate dairy temperament.

Head and Neck. — Marked refinement should be portrayed in every feature of the head and neck. The face should be long, indicating that the body is long. The expression should be quiet and the eye clear. A large muzzle, indicating feeding capacity, and large nostrils, indicating lung capacity, are desirable. The eyes should be large and clear, indicating vigor and health. Breadth of forehead indicates brain and nerve capacity; and ears of fine quality with an abundance of secretion indicate quality. Refinement of neck is an indication of inherited maternal instinct.

Forequarters. — The shoulders should be wide at the points to give plenty of chest room, and thin at the top, indicating refinement and freedom from fleshiness. Too great width should be avoided. The breast should be full and capacious, and the legs should be short, fine, and free from any indication of coarseness.

Body. — An examination of the body of the animal should show a deep chest of moderate width, which indicates constitution. Constitutional vigor and endurance are the two most essential points of the milk-producing cow. The ribs should spring gently from the backbone and extend well down, with the spaces between them roomy, making the barrel as large as possible to give great capacity. The backbone should be prominent, indicating room for a strong

spinal cord, the main line of the nervous system from the brain to different extremities of the body. The backbone should be open-jointed, as would be expected if the ribs were well spaced. The loin should also be large and roomy, and all these parts should be free from fattening tendencies.

Hindquarters. — Liberal development of the hindquarters of the cow is essential. The hip points should be far apart and prominent, the rump should be long, wide and level, with the pin bones far apart. A short drooping rump is a serious objection in the dairy cow. The setting and length of the tail are important. The tail should be set high, and it should reach at least to the hocks. It should be thin, and is one of the indications of quality. The thighs should be thin and curving on the inside to give plenty of room for udder development.

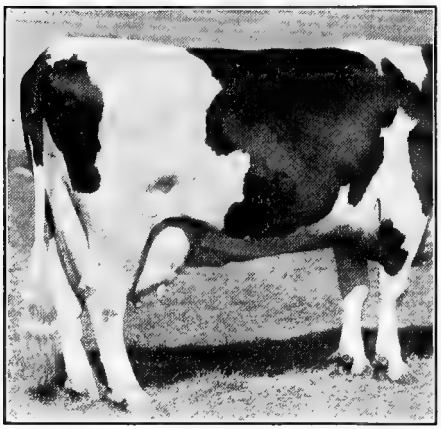


Fig. 73. — Large capacity to produce milk.

The escutcheon is that part of the cow's udder and the space above it marked by the hair growing upward or outward instead of downward. It is sometimes called the "milk mirror," and was believed at one time to be an index to the milking qualities of the animal. The ideal escutcheon should be wide and high. There are good milkers with ideal escutcheons and good milkers whose

escutcheons are far from ideal. There are also poor milkers that bear good escutcheons, so its importance is questioned. It is well to make a careful examination, and to become familiar with escutcheons, since considerable emphasis is placed upon them by many breed associations.

The udder is the most important part of the dairy cow, and should be given careful examination. It is here that the secretion of milk takes place. If an animal has a poorly shaped udder, or one that is fleshy, diseased, or defective in any one of its quarters, her chances of being a good milk cow are poor. The udder should be broad, and the quarters symmetrical and evenly placed. A long pendulous udder or a fleshy one is very undesirable. One that is carried well forward and well held up between the thighs is ideal and most desirable. Oftentimes the cow with the large udder is not the cow that returns the most milk. The cow with the small udder of good quality is better equipped than the cow with the large fleshy udder. On the other hand heavy-producing cows have large, well-developed udders. Milk is secreted by the glands of the udder largely at milking time. The udder is not a huge cistern to carry milk that is being constantly secreted, as is often supposed, but is the gland which secretes the fluid.

The teats of the cow are very important. Their size and placing have much to do with the ease of milking. Teats should be evenly placed at the four quarters of the udder, and should hang plumb. Teats that are too large are ungainly, and small teats are hard to milk. The milk should be easily drawn from the teats.

The Mammary or Milk Veins are the large blood vessels on the cow's belly that extend from the udder forward and enter the body cavity near the fore legs. It should be

remembered that these vessels are carrying the blood away from the udder and not toward it. They are an index to the amount of blood that has been taken to the udder, and for this reason they are worthy of careful consideration on the part of the judge. All good record cows have had large, tortuous, branching milk veins. Oftentimes there are poor producing cows that are well equipped with good veins, but they are the exception rather than the rule. The milk veins enter the body cavity through holes that are called "milk wells." These should be large, allowing room for large veins. There is always one on each side, but if there are two or even three on a side it is better.

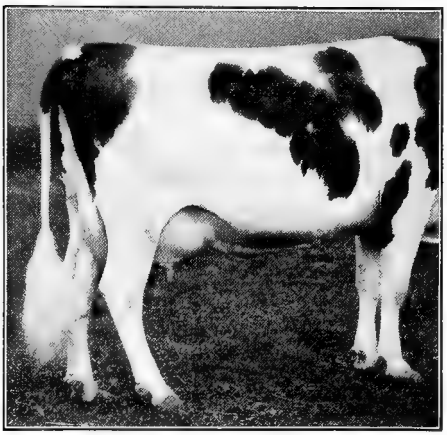


Fig. 74. — Prominent milk veins.

The hind legs should be short, straight, and strong, as opposed to crooked, weak legs. Placed well apart they allow room for a wide udder and show capacity in the cow.

Importance of Dairy Score Cards. — While there are a great many things about the dairy cow that do not appear on the surface, it is well to remember that the cows of dairy type that conform to the dairy score card are better producing cows than those that are opposite in type. Milk records are, of course, very important, and a great deal of consideration should be given them, but it is likewise

SCORE CARD FOR JUDGING DAIRY CATTLE

GENERAL APPEARANCE — A dairy cow should weigh not less than 800 pounds, have large capacity for feed, a dairy temperament, well-developed milk organs, fine quality and perfect health, and be capable of a large production of milk and butter fat.

Scale of Points	Perfect Score	Points Deficient	
		Student's Score	Corrected
INDICATION OF CAPACITY FOR FEED — 25 POINTS			
Face, broad between the eyes and long; muzzle clean cut; mouth large; lips strong; lower jaws lean and sinewy	5	.....	.....
Body, wedge shape as viewed from front, side, and top; ribs, long, far apart and well sprung; breast full and wide; flanks, deep and full	10	.....	.....
Back, straight; crops, broad and open; loin broad and roomy	5	.....	.....
Hips and thurls, wide apart and high	5	.....	.....
INDICATION OF DAIRY TEMPERAMENT — 25 POINTS			
Head, clean cut and fine in contour; eyes, prominent, full, and bright	3	.....	.....
Neck, thin, long, neatly joined to head and shoulders and free from throatiness and dewlap	4	.....	.....
Brisket, lean and light	2	.....	.....
Shoulders, lean, sloping, nicely laid up to body; points prominent; withers sharp	4	.....	.....
Back, strong, prominent to tail head and open jointed	3	.....	.....
Hips, prominent, sharp and level with back	3	.....	.....
Thighs, thin and curving on the inside	4	.....	.....
Tail, fine and tapering	1	.....	.....
Legs, straight; shank fine	1	.....	.....
INDICATION OF WELL-DEVELOPED MILK ORGANS — 25 POINTS			
Rump, long, wide, and level; pelvis roomy	3	.....	.....
Thighs, wide apart; twist, high and open	3	.....	.....
Udder, large, pliable, extending well forward and high up behind; quarters, full, symmetrical, evenly joined and well held up to body	15	.....	.....
Teats, plumb, good size, symmetrical and well placed	4	.....	.....
INDICATIONS OF STRONG CIRCULATORY SYSTEM, HEALTH, VIGOR, AND MILK FLOW — 25 POINTS			
Eyes, bright and placid	2	.....	.....
Nostrils, large and open	3	.....	.....
Chest, roomy	5	.....	.....
Skin, pliable; hair, fine and straight; secretions abundant in ear, on body, and at end of tail	7	.....	.....
Veins, prominent on face and udder; mammary veins, large, crooked, and branching; milk wells large and numerous	7	.....	.....
Escutcheon, wide and extending high up	1	.....	.....
Total	100	.....	.....

necessary to consider the type. It is imperative in dairy circles to maintain uniform standards, and there is no question but that one gets very close to the relative value of cows in the order of their possible production when using type as a standard.

EXERCISES

1. By the use of the score card system select the best beef animal on the home farm.
2. By using the points on the score card select the best cow in the home herd.
3. Test your judgment by weighing the milk of the three best cows.
4. Further check your judgment by testing the milk of all these animals and calculating butter fat production.

HOME PROJECT

Keep an accurate record of the milk production of all the dairy cows in the home herd for one month and test the milk of each in order to determine by actual test the best cows.

CHAPTER XI

JUDGING SWINE AND SHEEP

SWINE are produced for meat alone; and the ideal animal is the one that will produce the maximum percentage of good meat. The lard hog is a low-down, thick, compact animal that has been developed on fattening foods; while the bacon hog has been developed on foods that tend to produce more bone than muscle. The fat hog is a product of the corn belt, where corn is the cheapest ration grown and the one most commonly fed. The bacon hog is a product of regions outside the corn belt. The market favors the corn-fed hog because it dresses a higher percentage of carcass, averaging from 80 per cent to 85 per cent of the live weight. The bacon hog dresses about 10 per cent less than the lard hog.

The average consumer prefers meat from the bacon hog, notwithstanding its higher cost, because it contains a larger proportion of lean meat.

JUDGING LARD HOGS

In form the lard hog is deep, broad, low, long, symmetrical, and compact, standing squarely on its legs. The ideal lard hog gives one the impression of great weight in the smallest possible space, and is the type sought by the butcher. In this respect it closely resembles the beef steer and the mutton sheep.

Quality. — Quality is indicated by clean bones, free from coarseness; fine, smooth hair, free from swirls; and soft skin, indicating fineness of flesh. The head and ears should be refined, indicating a low percentage of waste. If the body is evenly covered with firm flesh, the judge will know that the fat and lean are well mixed in the carcass. Flabbiness, which is undesirable, indicates too large a proportion of fat meat in the carcass.

Disposition. — In disposition, the hog should be quiet, because the quiet hog will consume large rations, lie down, and thus fatten more readily than the animal that takes a great deal of exercise.

Head and Neck. — In the examination of the head and neck, one should look for a snout of medium length, not too coarse. A long snout indicates a long frame and a reversion to wild ancestry. The face should be short, with full, plump cheeks. The short face indicates a compact body, and the full cheeks, fleshing tendencies on the part of the animal. Breadth of forehead indicates width of body and liberal capacity. The eyes of hogs are small, and in the case of the extremely fat hog they are almost entirely concealed, but they should be as large as possible and wide apart. The ear is a good index to quality, the large coarse ear indicating coarse meat. The ear of medium size and fine texture is desirable as it indicates a carcass of good quality. If the ear hangs too limply, it indicates sluggishness, which is undesirable. The jowl, which is the flesh beneath the lower jaw, should be neat and well tucked up, and at the same time it should be full and wide. The hog's neck should be short and thick, blending smoothly into the shoulders and connecting nicely with the head. A long, thin neck on a lard hog is very undesirable.

Shoulder. — From the shoulder, some very good meat is obtained. This part of the carcass is usually trimmed, packed, and cured separately. The so-called "picnic hams," which are in great demand, come from the shoulder. This should be deep, broad, and well covered with flesh. On top, the shoulders should be compact and well knit, leaving no depressions, which may occur if they are wide and too far apart. If the shoulders on the male hog are too coarse, they may develop "shields," which are great thickenings of the skin over the shoulders and are very objectionable.

Breast and Chest. — The breast should be prominent, wide, and well let down. If the animal is tucked up or deficient in the breast, he will be deficient in the region of the chest and will lack constitutional strength.

The chest of the hog is one of the most important points to be considered. "Dropping" back of the shoulders and "tucking in" at the heart girth are quite common faults. The modern lard hog lives under unnatural conditions which tend to produce a poor constitution, so that one cannot be too careful in guarding against weakness of the chest.

Sides. — From the sides of the hog is obtained some of the best meat. In bacon hogs this point is most important, and in lard hogs the sides are valuable for packing. In order to insure the maximum amount of side meat, select the animals that have deep, long sides, which are well filled out, indicating thickness and weight. Smoothness of sides is also desired; wrinkles indicate poor quality.

Back. — As is the case with all meat animals, the back is very important. The judge should get his first impressions of the animal from its back, and if the animal is deficient in this region, it should be given low rank. The back should be wide, strong, well arched, and well covered. Fat

backs are required for packing purposes, and the amount of spare ribs also depends upon the size of the animal's back.

Loin. — The loin is the region from the last rib to the hip points, and here the hog should be thick, wide, and strong. Some of the finest cuts of pork come from the region of the loin, and the market is willing to pay a higher price for the strong loined hog than for the one deficient in this region.

Belly and Flank. — In the lard hog the belly is cheap meat, and the less of this the better. In the case of the bacon hog the belly goes in with the side, and is thus of greater value. In either case, it should be well held up and free from flabbiness.

In the region of the flank, the lard hog should be well let down, making the underline level and straight, with no depression in front of the hind leg. Fleshiness in this region indicates fleshiness throughout the carcass.

Hip and Rump. — The hips, which should be wide apart, conforming with the other parts of the body, should be smooth and well covered with flesh. The rump should be long, level, and wide. Some breeds have more sloping rumps than others. In the case of the hog that has the nicely arched back, there is a tendency for a somewhat more sloping rump than in the case of the hog that has a more level back. If the back of the hog is well arched, one should expect to find a long rounding rump, evenly fleshed and smooth.

Hams. — The hams of the lard hog form one of the most valuable parts, and in judging swine careful examination should be made of this region. The hog with low flanks and a long, well-shaped rump will usually have a well-shaped ham. In this region there should be depth, fullness, and width. While the hams should carry as much flesh as pos-

sible, the judge should guard against flabby hams. The value of the hams depends in great measure upon the mixture of fat and lean meat. Flabby, blubbery hams are undesirable.

Legs. — The legs of the hog should be short and strong without coarseness, and should be well placed under the body. Breeds that are good grazers stand up on their legs better than those of the extreme lard type, because they exercise more and become better developed in those parts. Weak pasterns should be guarded against, and the animal with a tendency to drop down on its dewclaws should be rejected. In the case of fat animals, however, this may be disregarded.

JUDGING BACON HOGS

In recent years there has developed a great demand for bacon, to be sold in cured and smoked form. The consumers of bacon demand firm meat without too much fat. To produce this meat, the bacon hog has been evolved. The best bacon comes from the sides of the hog, so in judging bacon hogs, one should pay particular attention to the animal with long, deep, firm sides, and firm flesh throughout the carcass. These are the points worthy of particular study in the bacon hog.

Condition and Quality. — The thin or lean hog is not the best for bacon purposes. The covering of flesh is very important, and this should be firmer than that of the lard hog, but not so thick. The animal should be smooth throughout and entirely free from wrinkles. The bones should be fine and the skin and hair soft and pliable.

Form. — In form, the bacon hog should be longer and deeper than the lard hog, without the extreme thickness and

width. The animal must be uniform in width throughout, and all tendency toward thickness in some parts should be avoided. The snout of the bacon hog is longer and more slender than that of the lard hog, and the animal stands up higher on its legs.

The shoulders should be smooth and free from coarseness, compact on top, and well knit together.

The hindquarters of the bacon hog should be well filled and carried down well toward the hocks. Instead of the extremely thick and fat ham found on the fat hog we here find a compact, neat, and firm quarter. The term " gammon " is applied to the hams of the bacon hog.

Bacon hogs are more active than lard hogs. They are more prolific, and produce large litters of very active and healthy pigs.

JUDGING BREEDING CLASSES

To be a judge of breeding animals one should be familiar with the standards of excellence for the various breeds, and should also be experienced in handling them so as to become familiar with their important points.

In judging, allowance should be made for sex differences. Males are uniformly heavy in the forequarters, so that the evenness of lines called for on the score card will not be found in the case of the male. Females are lighter in the forequarters than males, but are proportionately wider in the hindquarters. Males are coarser about the head and neck than females. In disposition, the male is aggressive, active, and sometimes more or less vicious, while the female is generally quiet and docile. The male has coarser bone, skin, and hair, and is about 20 per cent heavier at maturity.

SCORE CARD FOR JUDGING SWINE

Scale of Points	Possible Score	Points Deficient	
		Student's Score	Corrected
GENERAL APPEARANCE — 25 POINTS			
Weight,.... ....estimate.....actual lbs....	6	.....	.....
Form, deep, broad, low, long, symmetrical, compact, standing squarely on legs.....	8	.....	.....
Quality, bone clean; hair silky; skin soft; head and ears refined, evenly covered with firm flesh.....	6	.....	.....
Disposition, quiet, docile.....	5	.....	.....
HEAD AND NECK — 10 POINTS			
Snout, medium length, not coarse.....	1	.....	.....
Face, short, cheeks full.....	1	.....	.....
Forehead, broad.....	1	.....	.....
Eyes, large, mild, full, bright, wide apart.....	1	.....	.....
Ears, medium size, fine, soft.....	1	.....	.....
Jowl, strong, neat, broad.....	2	.....	.....
Neck, thick, medium length.....	3	.....	.....
FOREQUARTERS — 13 POINTS			
Shoulder, symmetrical, broad, deep, full, compact on top.....	6	.....	.....
Breast, wide, prominent, well let down.....	2	.....	.....
Legs, straight, short, feet and pasterns strong..	5	.....	.....
BODY — 32 POINTS			
Chest, deep, broad; girth large.....	7	.....	.....
Sides, deep, lengthy and full.....	8	.....	.....
Back, broad, straight, thickly and evenly fleshed	7	.....	.....
Loin, thick, wide and strong.....	5	.....	.....
Belly, straight, even, and firmly fleshed.....	3	.....	.....
Flank, low and well fleshed, girth large.....	2	.....	.....
HINDQUARTERS — 20 POINTS			
Hips, wide apart, smooth.....	3	.....	.....
Rump, long, wide, evenly fleshed, smooth.....	4	.....	.....
Hams, firm, heavily fleshed, deep and wide....	8	.....	.....
Legs, straight, short; feet, and pasterns strong	5	.....	.....
Total.....	100	.....	.....

JUDGING SHEEP

Next to horses, sheep are the most difficult class of live stock to judge. The sheep is covered by a coat of wool which, in the show ring, is generally long and dense enough to hide the form of the animal's body. The skillful shepherd by the clever use of the shears can trim the wool so that the appearance of the animal is very deceptive. In judging sheep, the judge must rely upon his hands to discover the exact form of the animal. He who would become skilled in the art of judging sheep must train his hands to determine accurately the form and covering of flesh on the animal's body beneath the covering of wool. To avoid the possibility of leaving any part of the animal unexamined, the judge should adhere to a regular routine of handling and follow it closely in the examination of the sheep.

The Form of the Mutton Sheep. — The form of the sheep sought for mutton purposes should be, in general, the same as that looked for in the beef animal and the lard hog. Good development in the parts of the animal upon which the best meat is obtained is required in the good mutton sheep. Were the demands of the butcher entirely satisfied, the sheep would have a peculiar form indeed, because butchers call for an animal that is heavily developed in the region of the leg of mutton and along the back, and slightly developed in the region of the head, neck, and legs. This form of animal, however, is an impossibility, and the man selecting sheep knows that in actual practice the butcher's ideal can only be approximated. The judge's ideal is an animal that is well developed in all the essential parts.

Form. — The mutton sheep should be low, blocky, and squarely set upon short legs, with the body as long as possible

without sacrificing the compactness essential in the meat animal. Symmetry, or the correct proportioning of parts, is necessary in the good sheep. An even covering of firm flesh is important. Other things being equal, the thicker the covering the sheep carries, the higher will be the killing percentage, and the firmer the covering the better will be the quality of the mutton. Softness of flesh indicates that the animal's carcass does not possess the correct " marbling" or distribution of fat and lean, and in this case one may suspect that the carcass carries surplus fat.

Quality. — The quality of the animal is indicated by the silkiness of the hair found on the nose, by the refinement and clear definition of the tendons at the back of the foreleg, and by the fineness and cleanness of the bone. Refinement in these parts indicates that this same fineness exists in the muscles and meat of the sheep.

Disposition. — In temperament the animal should be quiet. The nervous, restless animal lacks fattening tendencies and has a poorer appetite than the animal of the opposite disposition.

Head and Neck. — The face of the sheep should be short and the forehead wide. This is of so much importance that the good judge can often select the best feeding sheep by the appearance of the head alone. A strong, wide muzzle indicates breathing capacity and constitution, while thin lips indicate quality. Full clear eyes indicate health and vitality. The neck should be short and thick, blending well with wide, compact, well-covered shoulders, making the shoulder vein full and smooth.

Chest. — The chest should be deep and wide, giving a large girth, which indicates sufficient room for the vital organs and for feeding capacity as well. The animal should

be low at the brisket, and this part of the sheep should be full and prominent.

Legs. — The legs should be short, to reduce the waste in this part of the body to the minimum. They should also be straight, strong, and placed wide apart.

Body. — The back and loin of the sheep are very important. It is from this region that the judge should get his impressions of the worth of the sheep. A short, strong, straight, wide back, well covered with flesh, indicates at once a good animal. Width and thickness of loin are very essential, as in this region some very choice cuts should be found. Well-arched ribs with good depth indicate that the sheep has room not only for the consumption of feed but also for the deposition of fat upon the body. A full, well-let-down flank indicates that the sheep is carrying flesh and makes a straight underline.

Leg of Mutton. — Since the leg of mutton is the most valuable portion of the carcass, development in the region of the twist and thigh is especially sought for.

Wool. — Although the butcher is not especially interested in the wool, no sheep is completely judged for breeding purposes until a careful examination of the wool has been made. One should also bear in mind the general rule, that the finer and more compact the wool, on a mutton sheep, the better will be the quality of its meat. In judging the fine-wool breeds which are raised primarily for their wool this examination is of the first importance.

The thickest and the best quality of wool grows in the region of the shoulder, while the poorest grade grows along the belly. When examining the fleece, part it with the palms of the hands, not with the finger tips, in the region of the shoulder near the heart girth. Do not break the

wool clusters so as to leave the fleece open, but examine it where the fleece seems to part naturally. The fleece should also be examined in the region of the thigh, because a very poor quality of wool grows here and is much more easily examined than on the belly. It is a good plan to examine the wool on the belly because an animal in poor condition is often poorly covered in this region.

Fig. 75. — Examining wool on a sheep.

The judge should look for both quantity and quality of wool, although it is generally true that the finer the quality of the wool the shorter will be the fiber, and the longer the fiber the coarser will be the wool. The factors that determine the quantity of wool are density, length of fiber, and evenness of the fleece over the body of the animal.

By *density of fleece* is meant compactness of its fibers. To one seeking market wool this means a much heavier fleece, and to the breeder it indicates better constitution and protection against inclement weather. The sheep with the compact coat can shed rains better than the animal with an open fleece. A heavy, dense coat of wool also prevents the

radiation of heat from the surface of the body and thus enables the sheep better to withstand the cold.

The *length of the fiber* not only indicates the amount of wool but also determines the use to which it will be put by the manufacturers. In the making of worsted goods, a long fiber is sought, while for broadcloth the manufacturer seeks a shorter staple.

The *quality of wool* is indicated by its soundness, purity, crimp, luster, brightness, and the amount of yolk to be found in it. Softness may be determined by pressing the flat of the hand upon the surface of the fleece. Harshness of fleece is generally due to a lack of yolk or oil in the wool. Poor feeding or exposure to the weather may cause a harsh fleece. Soils also have a marked influence upon the softness of fleece. The effect of good care cannot be overestimated in its influence upon the fleece as well as upon the carcass of the sheep.

The *soundness of the fleece* depends upon the uniform strength of the fibers. Fibers with weak spots in them are not worth so much to the manufacturer as are uniformly strong fibers. Soundness may be determined by taking a small bundle of fibers from the fleece and twisting it into yarn. If the fleece is sound the yarn cannot be broken. Unsound fibers will break at the weak spot. Unsoundness of fleece also indicates the care which the animal received. A period of poor feeding or of poor health will produce a weak place in the wool.

Crimp refers to the little waves or kinks that are found in wool. These kinks are caused by the flatness of the fibers. Crimp distinguishes a wool fiber from a fiber of hair, which has no crimp. In fine fleeces of good quality these kinks are numerous and uniform in size. In coarse fleeces the

crimp is open. The waves or kinks should be of uniform size throughout the entire length of the fiber.

The condition of wool depends upon luster, brightness, purity, and character of the yolk, and is influenced by the care and management of the flock as well as by the breeding.

In examining for purity look for dead hairs, commonly called kemp. These can easily be detected, because they are straight with no crimp. They are usually found upon poorly kept sheep, and are partly due to exposure. The manufacturer does not want kemp, because it will not take the dye well.

The terms *luster* and *brightness* are often confused. Luster refers to the peculiar sheen found upon all wool and is as common upon the darker-colored wools as upon the lighter ones. Lustrous wool takes the dye somewhat better than wool that possesses little luster. Brightness, on the other hand, refers entirely to the color of the wool. White, clean fleeces are spoken of as bright, while dark-colored, dirty fleeces are said to be dark. Cleanliness, then, improves the brightness of the wool. Dirty fleeces are found in places where sand storms fill the fleeces with wind-blown sand. Sheep that are forced to live around straw stacks, or are kept in muddy lots with steers or other cattle, where they are forced to lie down in filthy places, get dirty and their fleeces lack brightness.

The *yolk* is the oil in the fleece. It is of no particular importance to the manufacturers of woolen goods, since it is all washed out before the wool is used, but to the breeder presence of yolk indicates that the animal is in good physical condition. Feeding has a great influence upon the amount of yolk that the sheep secretes; the better the feeding the greater is the quantity of yolk.

SCORE CARD FOR JUDGING MUTTON SHEEP

Scale of Points	Possible Score	Points Deficient	
		Student's Score	Corrected
Age..... **Teeth**.....			
GENERAL APPEARANCE — 24 POINTS			
Weight.....estimated.....actual pounds according to age.....	6	.....	.....
Form, low, long, symmetrical, compact, and evenly covered with firm flesh.....	10	.....	.....
Quality, clean bone; silky hair.....	6	.....	.....
Temperament.....	2	.....	.....
HEAD AND NECK — 9 POINTS			
Muzzle, fair size; nostrils large; lips thin; mouth large	2	.....	.....
Eyes, full; bright.....	1	.....	.....
Face, short, bold expression.....	1	.....	.....
Forehead, broad.....	1	.....	.....
Ears, fine, erect.....	1	.....	.....
Neck, thick, short; throat clean.....	3	.....	.....
FOREQUARTERS — 13 POINTS			
Shoulder Vein, full.....	2	.....	.....
Shoulders, covered, compact.....	3	.....	.....
Chest, deep, wide, large girth.....	3	.....	.....
Brisket, full, prominent; breast wide.....	2	.....	.....
Legs, straight, short, wide apart, strong; forearm full, shank smooth.....	3	.....	.....
BODY — 13 POINTS			
Back, straight, wide.....	4	.....	.....
Loin, broad, thick.....	4	.....	.....
Ribs, deep, arched.....	3	.....	.....
Flank, low, thick, making underline straight..	2	.....	.....
HINDQUARTERS — 17 POINTS			
Hips, smooth, far apart.....	3	.....	.....
Rump, long, level, wide.....	4	.....	.....
Thighs, full, well fleshed.....	3	.....	.....
Twist, plump, deep.....	4	.....	.....
Legs, straight, short, strong; shank smooth....	3	.....	.....
CONSTITUTION — 10 POINTS			
Girth, large.....	3	.....	.....
Skin, pink color.....	3	.....	.....
Fleece, dense and even over body, yolk abundant.....	4	.....	.....
WOOL — 14 POINTS			
Quantity, long, dense, even.....	6	.....	.....
Quality, fine, soft, pure, even.....	4	.....	.....
Condition, bright, strong, clean.....	4	.....	.....
Total.....	100	.....	.....

EXERCISES

1. Indicate the various steps in their proper order that you would take in selecting the best animal from a herd of swine.
2. What are the principal defects to be noted by the show ring judge when judging swine?
3. Show how you would pick out from a mixed flock the best mutton sheep.
4. What would be your method of selecting breeding ewes for wool production?
5. What are some of the tricks used in the show ring for deceiving the judge of sheep?

HOME PROJECT

From the home herd or flock select the two best animals and fit them for show. Discard the poorer of the two just before entry.

CHAPTER XII

JUDGING HORSES

JUDGING horses is the most difficult and at the same time the most fascinating task of the live stock judge. The judge should be familiar with the variations in type due to the many different uses to which horses are put; the various breed types; the blemishes and unsoundnesses; and the "tricks of the trade" in showing horses. All these combine to make horse judging the highest art in the judging of live stock.

BLEMISHES AND UNSOUNDNESS

An unsoundness is a defect of a horse, a predisposition towards which is inherited from its ancestors. Blemishes are defects caused by injury, such as bruises and wire cuts. While blemishes are disfiguring, undesirable, and hurt the sale of a horse, they do not disqualify the breeding animal.

Horses should be carefully examined for unsoundness, because in the judging of all classes no unsound horse should be awarded a place. If in the detailed examination in the show ring, any of these defects are discovered, the defective horse should be retired from the competition. The common unsoundnesses which every one who judges horses should very readily recognize are: poll evil, fistula of the withers heaves, bad wind or roaring, ringbone, sidebone,

thoroughpin, bone and bog spavins, curb, stringhalt, and defects of the eyes or other organs.

Poll Evil. — This is a suppurating sore located on the top of the head just back of the line drawn between the ears.

Fig. 76. — Parts of a horse.

1. Poll
2. Forehead
3. Face
4. Muzzle
5. Throatlatch
6. Windpipe
7. Jugular groove
8. Point of shoulder
9. Chest
10. Arm, from shoulder point
11. Forearm
12. Knee
13. Fetlock
14. Pastern
15. Neck
16. Crest
17. Withers
18. Back
19. Shoulder
20. Elbow
21. Loins
22. Coupling
23. Hip
24. Croup
25. Flank
26. Stifle
27. Hip joint
28. Thigh
29. Quarter
30. Point of hock
31. Hock joint
32. Gaskin or lower thigh
33. Coronet

It discharges pus and is very painful to the animal. The difficulty in curing the trouble lies in the fact that the sore cannot be well drained because no outlet can be made from

below. Horses that have been afflicted with this trouble show scars, and object to being handled about their heads.

Fistula of the Withers. — This trouble, of the same general nature as poll evil, is located on top of the withers or at the top of the shoulders. Horses that have been affected with fistula generally show scars. The neck may show a depression and is often sensitive to the touch.

Heaves. — This disease affects the lungs of the horse and is generally noticeable after eating too greedily of bulky hay or dusty feeds, or after a heavy pull or violent exercise. The affected horse breathes in a peculiar fashion, most noticeable in the region of the flank, the air being expelled from the lungs in two short jerks. Horses with this disease are generally shorter of breath than are sound horses, and cough after exertion.

Roaring. — Roaring is a disease which affects the larynx or windpipe. When the horse is exercised at a rapid rate or worked under a heavy pull, loud breathing or roaring results.

Ringbone. — Ringbone affects the pastern bone of the horse, and appears as an enlargement encircling this bone.

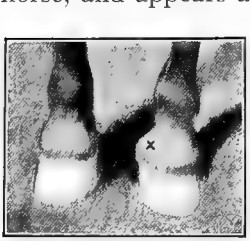


Fig. 77. — A prominent sidebone. The cross marks the location of this defect.

Sidebones. — Sidebones affect the feet of the horse. The lateral cartilages beneath the skin at the hoof head above the heel become ossified, or turn to bone. Horses with narrow feet, or low or too prominent at the heels, are most susceptible to this trouble. Predisposition to sidebones is inherited, and animals with them should not be used for breeding purposes.

Thoroughpin. — This is found just above the hock of the horse. It appears as a swelling or filling between the lower

thigh bone and the large tendon back of it. By pressing with the fingers either on the outside or the inside of the enlargement, the swelling may be made to oscillate back and forth.

Fig. 78. — Unsound hock joint, showing bog spavin.

Spavin. — Spavins are of two kinds, bone spavin and bog spavin. The bone spavin affects the bones of the hock, and generally appears as an enlargement at the lower inner aspect of the hock joint. When forming, they are small and painful, and are called "jacks" by some horsemen.

The bog spavin appears as a swelling of the entire hock joint. The swelling generally appears on the inside of the hock, although the entire joint may be affected.

Fig. 79. — Unsound hock joint, showing large curb.

Curb. — Curb shows as a swelling at the back of the hind leg just below the hock. It is usually associated with "sickle" or crooked hocks. Sometimes curb appears upon well-formed legs, and may be due to a hard pull or a sudden strain.

Stringhalt. — This is a disease of the nerves, that usually appears in only one of the hind legs. In the case of affected animals, the feet are lifted quickly from the ground, raised abnormally high, and set down with the same vigor. If the horse is "warmed up" it is often not noticeable, but if the animal is allowed to stand quietly for some time and then sud-

denly started forward or backward, the trouble can be detected.

Defective Eyes or Other Organs. — The horse should be examined for blindness, and to see that the eyes are of the same color. In examining for defective sight, care should be taken not to get the hands too close to the eye, as breezes from the waving of the hands, or the touching of long hairs that are found about the eyes may cause the horse to close its eyes, even though the animal may have good sight. A sound eye appears translucent. A blind eye is opaque. One should notice if the horse hears well. If the ears appear too alert or move too much, defective ears should be suspected.

The horse's mouth should be examined for poor teeth. The upper row of incisors should strike the lower row. The horse may be parrot-mouthed, in which case the upper jaw protrudes beyond the lower one; or it may be undershot, in which case the lower jaw extends beyond the upper.

JUDGING DRAFT HORSES

The draft horse is used to draw heavy loads at a slow rate of speed, and is so built that the greatest strength may be obtained without regard to speed. The bones and muscles of the horse are short and strong. The whole build of the animal is such that the load is brought as nearly as possible to the power.

Age. — The age of the horse is usually indicated by its teeth. The horse's teeth are classed as incisors or cutting teeth, canine or tearing teeth, and cheek teeth which are made up of premolars and molars. There are 12 incisors, 6 on both the upper and the lower jaw; 12 to 14 premolars, either 3 or 4 each side in the upper and

3 on each side in the lower jaw; and 12 molars, 3 on each side in both upper and lower jaws, making a total of 40 or 42 permanent teeth in the mouth of the mature horse. The colt does not have a "full mouth."

Changes take place quite uniformly in the number of temporary and permanent teeth found in the mouth of the young horse, and in the appearance of the permanent teeth as the horse advances in age. To determine the age of the animal, it is necessary to examine and note the appearance of the incisor teeth only. Permanent teeth are much larger than the colt's temporary ones.

At about the age of $2\frac{1}{2}$ years, the central pair of temporary incisors in both upper and lower jaws is replaced by permanent teeth, so that if there is present in the mouth of the horse one pair of permanent incisors the animal is between $2\frac{1}{2}$ and $3\frac{1}{2}$ years of age. At about the age of $3\frac{1}{2}$ years, one incisor on each side of the central pair in both the upper and the lower jaw is replaced by new permanent teeth, so that the presence of two pairs of permanent incisors and one pair of temporary incisors indicates that the horse is from $3\frac{1}{2}$ to $4\frac{1}{2}$ years old. At about the age of $4\frac{1}{2}$ or 5 years, the remaining temporary incisors are replaced by permanent teeth, so that at this age the horse has a full mouth of permanent incisors and is spoken of as having a "full mouth." Up to five years of age there is not much difficulty in determining the age of the horse, because the temporary incisors, which are white and smooth with a restriction about the neck of the tooth near the gums, are not hard to distinguish from the permanent incisors, which are much longer, broader, harder, and stronger.

The teeth of horses are constructed differently from those

of any other animal in that they have a deep cavity in the center of the wearing surface. This cavity, which is partly filled with a sort of cement, becomes darkened with deposits of food, and is usually called the " cup " or " mark " of the tooth. As the horse advances in age, the tooth wears down about the cup, and in time it disappears from the tooth. It takes about three years for the cups to disappear from the teeth of the lower jaw, and about six years for them to disappear from the upper jaw, because in the upper teeth the cups are deeper. From the age of five years the principal changes in the appearance of the teeth are as follows. At about the age of six years the cups or marks have disappeared from the lower central incisors, at the age of seven years the cups disappear from the lower incisors next the central pair, and at the age of eight years the cups have disappeared from all the lower incisors. At about the age of nine years the cups disappear from the upper central incisors; they disappear from the incisors next to the central upper pair at the age of ten years, and at the age of eleven years no cups are to be found on the incisor teeth of the horse. As the horse advances in age the teeth seem to project forward as viewed from the side, and the wearing surface of the teeth becomes triangular in form with the base of the triangle next to the lips of the animal.

In judging, it is well to be able to tell the age of horses by the teeth up to the age of five years, so that a horse will not be allowed to enter a wrong class according to age. The teeth of horses are often " bishoped " or chipped out, and made to appear like those of young horses.

Height. — The height of the horse is reckoned in " hands." A " hand " is four inches. The height is measured by a vertical line let fall from the top of the withers to the ground

just back of the heel. The horse should be led on to a hard floor and so stood that all four feet are under the body in normal position when the measurement is made. A draft horse should be at least 16 hands high. The desirable height is 16½ to 17 hands. Horses above that height are somewhat difficult to care for, and are hard to match.

Weight. — The score card allows four points for the weight of the draft horse. If all the horses competing are above 1500 pounds in weight this allowance is sufficient, but weight is the factor that determines whether or not a horse belongs in the draft class. Without weight, the animal lacks the power to start heavy loads with ease. The point is well illustrated in the case of the railway locomotive, which is dependent to a great extent upon its weight, giving it power to grip the rails.

The market price of the draft horse depends largely upon its weight. Statistics show that a price of $25.00 is received for every hundred pounds of weight above 1400 pounds. Men often take advantage of the difference in price between light and heavy horses, and buy thin horses possessing good quality and large frame on the market, feed them until they have increased in weight from 100 to 300 pounds, return them to the market, and make a good profit on the increased price offered for the increase in weight and the improved appearance and condition of the horses. There is always a strong demand for heavy horses, but there is a limited demand for extremely heavy horses, because they are hard to match and must either be worked alone or as middle horses in three-horse teams.

Form. — The form of the draft horse should be such that the greatest weight is compacted into the least space, and the center of gravity thus brought close to the ground.

The working parts of the body should be so arranged that the levers will give the animal the greatest power to pull. Great breadth and massiveness in all parts of the horse indicate strength and give the animal required weight. Symmetry, or correct proportion of the parts of the body to one another, lends beauty of appearance and increases efficiency as well. The animal should be blocky, short legged, and close to the ground.

Quality. — Quality is a term used to designate degree of refinement in physical make-up. Over-refinement should not be sought for in the draft horse. Weight and refinement are two opposite characters, and extreme refinement is obtained only at the sacrifice of weight, which is the first and most important essential. The bones of the animal, while large and strong, should be free from roughness. The tendons, wherever they may be seen on the body of the horse, should be large, strong, and clearly defined. The skin should feel soft and pliable beneath the touch of the hand, and the hair should be fine and silky. This is especially true of the " feather," which is the hair that grows from the back of the cannon bone from the knee to the fetlock joint in the hairy-legged breeds.

Action. — Although strength is the primary requisite and great speed is not essential, good action is an important qualification of the draft horse. Judgment should not be passed until the animal has been made to move. Free, strong movement indicates vigor and good condition, while listless action indicates sluggishness. Action also serves to bring out defects in the structure and working parts of the body which might otherwise be hidden.

In examining for action, the horse should be led straight away from the judge and viewed from the rear. The feet

should be carried forward in a straight line. Paddling, or throwing the toes outward as they are carried forward, and winging, the opposite defect, are both equally bad. The hocks should also be carried straight forward. If the points of the hocks turn outward, carrying the toes of the hind feet too close together, the horse cannot get so much strength for pulling and is classed as defective in the hocks. In action, the feet should be lifted from the ground with a snap, and the joints near the feet should be so flexed that the horse will show the sole of each foot when viewed from the rear.

The horse should also be led straight back toward the judge, so that a front view of action may be obtained. From this view, the judge can get an impression of the carriage of the horse's head, and obtain a better view of the movement of the feet. The style and life of the horse can also be observed from the front. The judge should also obtain a side view of the horse in action. The stride should be long and springy. " Interfering," or " forging," which is the striking of one foot with another, should be watched for while the horse is in action.

The walk of the draft horse is somewhat more important than the trot. The walk should be free, elastic, springy, snappy, regular, and straight away. The trot should be free and bold, springy without lifting the body too high from the ground, and should be straight away in the line of draft. The action of a horse should never be passed upon until both walk and trot are observed.

Temperament. — The draft horse should be energetic, but the fiery disposition of the fast horse is not expected. In temperament, the animal should be quiet, or phlegmatic, as opposed to the more nervous disposition of the horse

developed for speed alone. A peaceable, quiet disposition is desired, and the animal that will conserve its strength for work, even in the midst of most exciting surroundings, is the horse best suited for draft purposes.

Head. — The head of the draft horse should be large enough to be in proportion with the rest of the body. The proper size can only be learned by experience. It should be well carried to give style and finish to the animal's appearance. A straight profile is generally found on the horse of greatest intelligence; the rounding profile, which gives the Roman nose to the animal, may indicate stubbornness, and the incurving profile is usually found on the horse that is easily controlled, but of small capacity for training. Profiles of horses vary with the breed.

Forehead. — The forehead covers that part of the head extending from a line drawn between the eyes back or up to a line drawn between the ears. It should be broad and full, indicating intelligence.

Eyes. — The eyes should be bright, full, clear, and of the same color. Clearness and brightness of the eyes indicate intelligence and a generally healthy condition. The eye is a good index to the disposition of the horse. Small eyes usually indicate a mean disposition; large mild eyes, a good one. The judge should examine carefully for cases of blindness, as these are disqualifications.

Ears. — The ears should be of proportionate size, which is best told by experience. The way a horse carries his ears is a good index to the disposition of the animal. Alertness of the ears shows vigor and life. While movement of the ears generally indicates spirit, it may also indicate defective eyesight, a condition which should be carefully inspected.

Muzzle. — The nostrils, lips, and external mouth parts are included in the muzzle. The nostrils should be large, giving room for free and easy breathing; but if they are distended too much it may be an indication that the animal at one time suffered from overheating. The lips should be fine and firmly held together, indicating a tense muscular system. Flabby and drooping lips are usually found on sluggish horses.

Lower Jaw. — The lower jaw should be wide to conform with the general width desired throughout the body. The spaces between the two parts of the lower jawbone should be wide and free from fleshiness or lumps of any sort.

Neck. — The neck of the draft horse should be well muscled, neatly arched, and blend gracefully into the shoulder. A " ewe neck," or one that curves downward, is very undesirable, detracting greatly from the appearance. The throatlatch should be clean and free from swellings. The windpipe should be large, for free breathing.

Shoulders. — The shoulders should slope gently and be smooth, blending well into the neck in front and the body at the rear. Very steep shoulders are undesirable, because in pulling too much of the weight will be borne near the lower point of the shoulder. If they are too sloping, however, the reverse condition obtains.

Arm. — The arm of the horse, extending from the shoulder joint to the elbow joint, should be strong and well muscled.

Forearm. — The forearm, which extends from the elbow to the knee, should be long and muscular, indicating great strength.

Knees. — The knees should be free from puffiness, should be flat and large, allowing plenty of room for articulation

of the joint and attachment of muscles. Knees that are slightly flexed and held forward when the horse is standing are called " buck knees."

Cannons. — The cannon bones are really round, but when properly supported by sufficient tendons, appear flat.

Fig. 80. — Unsound knees.

They extend from the knee to the fetlock joint and should be short and free from enlargements. Splints, which are small, bony growths, sometimes appear on the inside of the front cannon bones. While they seldom cause lameness, they are undesirable, especially upon light, fancy driving horses. Clean, strong tendons are desired, and any tendency toward puffiness is objectionable. If the cannon bones are too small the knees have the appearance of being set back too far. This defect is called " calf kneed."

Fetlocks. — The fetlock joint is located between the cannon and the pastern bones. These joints should be large, strong, and free from puffiness.

Pasterns. — Although only three points are given to pasterns on the score card, the setting and length of the pastern bones are very important in the conformation of the horse. These bones should be moderately long and slope at an angle of about 45°. If the pasterns are short and steep, the horse will have a stiff, stilty action. The horse's foot receives a heavy blow when his weight is brought down upon it during action. If the pastern is sloping, a great deal of the force of the blow is broken or absorbed. This is not so in the case of the horse with the short steep pastern, in

which the force of the blow is transmitted undiminished through the joints to the animal's body. The horse with the moderately long and sloping pastern will have better action, and will also be better able to endure the shocks of hard city streets. Too long and sloping pasterns are likewise objectionable because they are likely to be weak.

Fig. 81. — A good type of draft-horse pasterns.

Feet. — It has been said that in examining a horse, one should begin at the ground and work upward, and then work down to ground again, meaning that the part of the horse that supports it at the ground is the most important part. In judging horses, strict

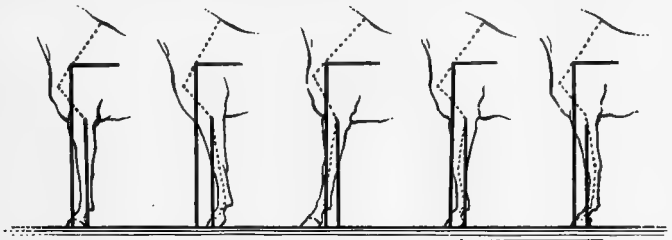


Fig. 82. — Side views of forelegs. The drawing at the left shows correct conformation. The others show common defects.

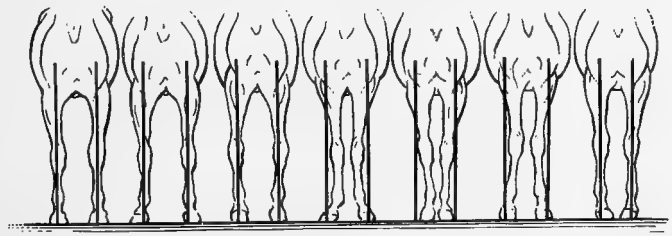


Fig. 83. — Front views of forelegs. The drawing at the left shows correct conformation. The others show common defects.

attention should be paid to the feet. The larger the foot, the more of the shock will it be able to absorb, and the less will there be transmitted to the upper parts of the body. The foot should be large at the hoof head, so as to give greater freedom for articulation in the movement of the foot, and thus lessen the susceptibility of the horse to foot troubles.

The feet should be of the same size, and point straight forward. In front they should slope gently from the top to the ground. A very flat foot is too low at the heel. On the other hand, if the foot is very steep, the pastern of the horse is usually steep, which has already been noted as an objectionable feature.

The quality of the foot is very important. The horn, of which the outside is composed, should be dense and waxy, not dry and flaky. The condition of the foot can be greatly influenced by the treatment. If kept on hard floors, and worked on paved streets, the feet will appear flaky, and will be more likely to crack than if the animal is kept on a dirt floor and worked a part or all of the time on soft earth. A poor horseshoe may also work great injury to a horse's feet.

Chest. — The chest is that part of the body that contains the heart and lungs. Its capacity is measured by the length of the girth, the distance around the body of the horse, back of the shoulders. At this point, the animal should be deep and wide, indicating that there is sufficient room for large, vigorous organs. The breastbone should be low, providing ample chest space and giving the low-down, blocky appearance so essential in a valuable draft horse.

Ribs. — The form of the body depends to a large degree

upon the shape of the ribs. The ribs should be well arched, springing out from the backbone. This will make a broad back, furnishing room for the attachment of strong muscles. They should be well carried down, forming a roomy cavity for the digestive organs, and giving to the animal a cylindrical appearance. The distance from the last rib to the hips should be short, forming what is called a "short couple." The round-ribbed, short-coupled animal is stronger, healthier, and more easily kept in good condition thereby.

Back. — The back, extending from the shoulders to the hips, should be short, wide, and strong. Low and long backs are weak ones. The male should have a shorter back and shorter coupling than the female, in which more length is allowable.

Loins. — The loin is the region between the last rib and the hips, constituting what has been referred to as the "coupling." One should look for a short, wide, muscular loin. When the back of the horse becomes weak the attack generally affects the loin first, and most violently; the horse sustaining an injury of this kind often losing the power to move.

Underline. — The underline should be long and low, and the legs short. The horse with the long belly and the short back is the best-shaped animal. In the region of the flank, the animal should be low with no tendency toward "tucking up," as this indicates an unthrifty animal. Deficiency in the region of the flank also means weakness of the thigh, a point in which the draft horse should be especially strong.

Hips. — From one hip point to the other, the horse should be wide, level, and well covered with muscle. The female

is usually wider and roomier in this region than the male. In the mare width and roominess between the hips indicate good breeding qualities.

Croup. — The croup of the horse corresponds to the rump of the meat-producing animal. It extends from the hips

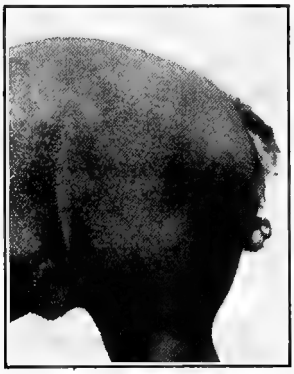


Fig. 84. — A croup of good draft type.

Fig. 85. — A steep croup.

back to the tail, and on the good horse is long, level, and wide. Steepness and shortness of the croup are common defects of horses. The horse with the short, steep croup can turn quickly. This is especially desirable in the case of the cattle pony. On the other hand, the horse with the long, flat croup can move with the greater rapidity in a straight line.

Thighs. — The thigh bones extend from the hips to the stifle joints. The region below the croup and to the rear of the flank is known as the thigh. The thigh should be long, deep, and well covered with muscle. A horse that has strong thighs is a much stronger horse than the one that is deficient in this region.

Quarters. — The flesh and muscles between the thigh

bones are called the quarters. In this part of the body the horse should be plump, and well let down. The scant, shallow quarter indicates a weak horse and a poor feeder.

Stifles. — The stifle is the joint between the thigh bone and the lower thigh or gaskin. In this region the horse should be well muscled, the joint large and strong and held up close to the body.

Gaskins. — The gaskins, or lower thigh bones, extend from the stifle to the hock joints. They should be long, wide, and heavily covered with muscle, on both the outside and inside of the legs.

Hocks. — The hock joint, located between the gaskin and the hind cannon bone, is the most important joint

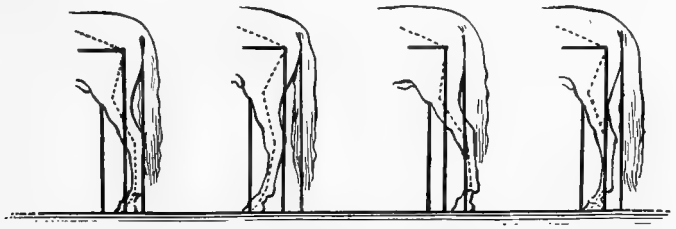


Fig. 86. — Side views of hind legs. The drawing on the left shows correct conformation. The others show common defects.

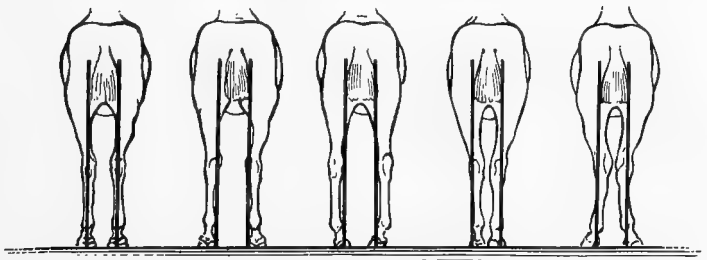


Fig. 87. — Rear views of hind legs. The drawing on the left shows correct conformation. The others show common defects.

in the structure of the horse. It is the fulcrum of one of the principal levers of the animal's body, and through it must pass all the power utilized by the horse in pulling or moving about.

The hocks should be large, to allow for perfect freedom of motion and for the attachment of muscles. From the front to the rear they should be deep, giving more power to the levers. They should be clean and free from puffiness, and it is of equal importance that they be free also from the unsoundnesses common to these parts, namely, spavin, curb, and thoroughpin.

The proper setting or conformation of the hock may be determined by dropping a plumb-line from the point of the buttock down the rear of the hind leg as shown in Fig. 86 and Fig. 87. If the hock is properly shaped, the line will pass down the rear of the hind cannon bone from the hock to the heel, dividing the heel in the middle. Viewed from the side, the line should be parallel to the direction of the hind cannon bone.

If the hock is too rounding, forming what is known as a "sickle hock," it is prone to unsoundness, especially curb, and is not so strong as a hock that is properly set. The hock may also be set too straight.

Cannon Bones, Fetlocks, Pasterns, and Feet of the Hind Legs. — The cannon bones of the hind legs should have clean, strong tendons. The fetlock joints should be strong and free from puffiness. Special care should be given to examining the setting and length of the pasterns which should be moderately long and slope at an angle of 45°. The size and quality of the hind feet should be noticed for the same points that have already been discussed in the treatment of the front feet.

SCORE CARD FOR JUDGING DRAFT HORSES

Scale of Points	Possible Score	Points Deficient	
		Student's Score	Corrected
Age	.....	.....	.....
GENERAL APPEARANCE — 29 POINTS	.....	.....	.....
Height, estimated.....hands; actual.....	.....	.....	.....
Weight, over 1500 lb. estimated.....lb., score according to age.....	6	.....	.....
Form, broad, massive, evenly proportioned, symmetrical, blocky.....	4	.....	.....
Quality, refined; bones clean, large, strong; tendons clean, defined, prominent; skin and hair fine; "feather," if present, silky.....	6	.....	.....
Action, walk, fast, elastic, regular, straight; trot, free, springy, balanced, straight.....	10	.....	.....
Temperament, energetic; disposition good.....	3	.....	.....
HEAD AND NECK — 8 POINTS			
Head, proportionate size, clean cut, well carried; profile straight.....	1	.....	.....
Forehead, broad, full.....	1	.....	.....
Eyes, bright, clear, full, same color.....	1	.....	.....
Ears, medium size, well carried, alert.....	1	.....	.....
Muzzle, neat; nostrils large, flexible; lips thin, even, firm.....	1	.....	.....
Lower Jaw, angles wide, space clean.....	1	.....	.....
Neck, muscled, arched; throatlatch fine, windpipe large.....	2	.....	.....
FOREQUARTERS — 22 POINTS			
Shoulders, moderately sloping, smooth, snug, extending well back.....	3	.....	.....
Arm, short, strong muscled, thrown back, well set.....	1	.....	.....
Forearm, long, wide, clean, heavily muscled.....	2	.....	.....
Knees, straight, wide, deep, strong, clean.....	2	.....	.....
Cannons, short, wide, clean; tendons clean, defined, prominent.....	2	.....	.....
Fetlocks, wide, straight, strong, clean.....	1	.....	.....
Pasterns, moderately sloping, strong, clean.....	3	.....	.....
Feet, large, even size, sound; horn dense, waxy; soles concave; bars strong, full; frogs large, elastic; heels wide, one half length of toe, vertical to ground	8	.....	.....
BODY — 9 POINTS			
Chest, deep, wide; breastbone low; girth large.....	2	.....	.....
Ribs, deep, well sprung, closely ribbed to hip.....	2	.....	.....
Back, broad, strong, muscular.....	2	.....	.....
Loins, short, wide, thick muscled.....	2	.....	.....
Underline, low, flanks full.....	1	.....	.....
HINDQUARTERS — 32 POINTS			
Hips, broad, smooth, level, well muscled.....	2	.....	.....
Croup, wide, heavily muscled, not markedly drooping	2	.....	.....
Thighs, deep, broad, strong, muscular.....	3	.....	.....
Quarters, plump with muscle, deep.....	2	.....	.....
Stifles, large, strong, muscular, clean.....	2	.....	.....
Gaskins (lower thighs), long, wide, clean, heavily muscled.....	2	.....	.....
Hocks, large, strong, wide, deep, clean, well set.....	8	.....	.....
Cannons, short, wide, clean; tendons clean, defined, prominent.....	2	.....	.....
Fetlocks, wide, straight, strong, clean.....	1	.....	.....
Pasterns, moderately sloping, strong, clean.....	2	.....	.....
Feet, large, even size, sound; horn dense, waxy; soles concave; bars strong, full; frogs large, elastic; heels wide, one half length of toe, vertical to ground	6	.....	.....
Total.....	100	.....	.....

JUDGING LIGHT HORSES

In the light horse, long and slender bones and muscles are found. The levers and angles in the conformation of the light horse are all so arranged as to give the maximum speed, which is attained only at the loss of strength. The light horse is rangier and less compact in conformation than the draft horse. It is more refined as to quality, having finer and cleaner bones, and more clearly defined tendons.

Weight. — The weights of light horses range from 1000 pounds or less in the case of light roadsters to 1500 pounds in the case of the heavy harness or coach horse.

Height. — There is also great variation in the height of light horses, but horses less than 14 hands high are considered as ponies.

Form. — In form, the light horse should be symmetrical and stylish; and instead of the blockiness of the draft horse, ranginess should be sought.

Quality. — The quality of the light horse is easily studied because there is less flesh upon it than upon the heavy horse. When the hand is placed upon the animal, the coat should feel soft and silky, and the skin fine. When rubbing down over the cannon bones, one should feel no superfluous meat beneath the skin, which should appear to fit the limbs of the horse much as a glove fits the hand.

Action. — Attention to action is more important in judging light horses than in judging draft animals. The trot is, in this case, more important than the walk, and in the roadster types speed is sought as well. The walk should be fast, elastic, and straight, and the stride should be long. In the trot, great freedom of motion and " snappiness " are required. In action, the body should not be raised too high

from the ground, deviations from a straight line forward being objectionable.

Temperament. — In temperament, the light horse should be active and alert with no tendency toward sluggishness, as is occasionally the case with the draft horse.

Head and Neck. — The head of the light horse is proportionately smaller and more refined than that of the draft horse. The ears are smaller and more active and alert, and the eye generally shows signs of more life. The forehead should be broad and full, and the muzzle large, with large nostrils for furnishing sufficient air. The neck does not require the extreme muscularity seen in the draft horse, and is longer and more slender.

Shoulders. — The shoulders should be slight, sloping gently, and carried back well at the top with high withers. Height at the withers is essential in a horse built for speed, as it gives a better carriage to the head, and enables the animal to lift its front feet higher from the ground, thus lending style to action.

Arm, Forearm, and Knees. — The arm should be well muscled and long, throwing the elbow joint well back. The forearm should be strong and long from the elbow joint to the knee. The knees should be flat and broad, without coarseness or extra flesh. A common tendency to be slightly " buck kneed " or weak kneed should be guarded against.

Cannon Bones and Fetlocks. — The cannon bones should be short in comparison with the length of the forearm. They should be well supported with strong tendons, and free from all roughness or tendency toward splints. The fetlock joints should be strong and free from puffiness, which is very objectionable but quite common in light horses.

Pasterns. — Long and gently sloping pasterns, which are conducive to rapid, springy, and enduring action, are essential in light horses.

Feet. — For work upon hard roads the feet should be of the best material. Large size is also very essential. Small, contracted, flaky hoofs are undesirable.

Body. — The body of the horse should show the points that indicate stamina and endurance without too much tendency toward fleshiness. The chest should be roomy, giving capacity for the vital organs. Since thickness is undesirable, depth should be sought in this region. Deep, well-sprung ribs furnish capacity for food. The back should be broad, providing place for attachment of muscles, but great breadth may give the animal a " drafty " appearance, which is undesirable. The loin should be wide, thick, and short from the last rib to the hip. The flanks should be well let down and full, making the underline straight. A horse too high in the flank will be hard to keep and will have poor endurance.

Hindquarters. — The hindquarters should be studied very carefully, because upon the shape of these depends the speed ability of the horse. The hips should be level and wide without losing sight of the type of the animals. The croup should be well muscled, long, wide, and level, carrying out the symmetry of the horse. The long, level croup is found on the speedy horse. The thighs should be deep, strong, and muscular, without the plumpness found in the draft horse. The angle formed by the junction of the thigh bone and the hip bone should be large and open so that greater freedom for articulation may be obtained. The quarters should be well muscled and deep without the fleshiness found in the same region in the draft horse. The

stifle should be well muscled, clean and large, insuring a strong joint; and the gaskins or lower thighs should be well muscled and long. The hock of the light horse is as important as that of the draft horse; and if not sufficiently strong and well set is very prone to bog spavin, bone spavin, or curbs. Unsoundnesses show more on the light horse than they do on the draft animal. Since many of the light horses are used for fancy driving purposes, it is of great importance that the hocks should be well set, strong, and free from puffiness.

The rear cannon bones should be short, wide, strong, and clean, with clearly defined, hard, prominent tendons. The hind pasterns should be long and slope gently.

All that has been said concerning the front feet applies with equal force to the hind feet.

JUDGING CARRIAGE HORSES, ROADSTERS, AND SADDLE HORSES

The carriage horse is one that can pull a fair-sized load with some speed. Such horses should weigh 1250 to 1450 pounds, and have round, well-muscled bodies and strong, hard, flat, muscular limbs. The pasterns of carriage horses should be strong and sufficiently long to give the animal a springy, stylish action. These horses should also possess all the marks of endurance, such as a deep round chest; strong wide back; short couple; depth at the flank; clear bright eyes; and large muzzles.

The roadster is designed for speed. This type has been developed by selecting and mating the speediest horses without regard to conformation, so the type evolved is the result of selecting those that made the best records. The roadster weighs about 1000 pounds, and has speedy action,

without regard to style. The roadster and trotting horses are extreme types of light horses, and while endurance is the main consideration, the horse should be free from all fleshiness. The limbs should be flat, long, and strong, the pasterns gently sloping and long, and the feet large and of good quality. The body should be rangy and closely ribbed up to the hip. The animal should be refined, the hair fine and silky, the skin thin and of fine quality, and the veins prominent.

The Saddle Horse. — The American saddle horse is a distinct type. The saddle horse is stylish, and strong, with an easy, springy gait. In judging the saddle horse particular attention should be paid to his gaits, and the readiness with which he performs. The gaits of the saddle horse are: (1) walk, (2) trot, (3) rack, (4) canter, (5) slow pace, (6) running walk, (7) fox trot.

Gaits. — The three natural gaits of the horse are the walk, the trot, and the gallop. Occasionally there are natural pacers, but they are not common. In the walk, the hind foot on one side is brought forward and is placed upon the ground near the spot where the front foot of the same side was placed and almost immediately after it had left the ground. The trot is an angular gait, the front foot of one side and the hind foot of the opposite side being carried forward at the same time. In the pace the front foot and the hind foot on one side are carried forward at the same time. This gives the horse a swaying motion. In the single-foot or rack each foot touches the ground at a different time. It may be called a "slow gait," but is somewhat faster than the walk, and is one which the horse can keep up for a great length of time. The canter is a slow gallop, a very easy riding gait, easily

Fig. 88. — Combination harness and saddle horse.

taught to the horse. The running walk is faster than the walk, but slower than the pace or trot, and an easier riding gait than either. The slow pace is a somewhat similar gait, but is more like the pace than the running walk. The fox trot is a sort of jog trot, and is not so desirable as the slow pace and the rack. If a horse has five of the above gaits he is a gaited saddle horse; and the breeding, conformation, and style of the horse, together with the manner in which he performs these gaits, determine his value.

JUDGING PONIES

All the rules for judging horses apply to the judging of ponies, which are in reality small horses. In this country ponies are kept mainly for pleasure purposes. Americans

SCORE CARD FOR JUDGING LIGHT HORSES

Scale of Points	Possible Score	Points Deficient	
		Student's Score	Corrected
GENERAL APPEARANCE — 30 POINTS			
Weight, estimated in lbs.			
Height, estimated in hands.			
Height, 15 hands or over.	2		
Form, type — symmetrical, smooth, stylish.	5		
Quality, refined; bone clean, fine, tendons clean, defined, prominent; hair and skin fine.	5		
Action, walk long, fast, elastic, regular, straight; trot rapid, regular, straight, balanced.	15		
Temperament, active, disposition good.	3		
HEAD AND NECK — 10 POINTS			
Head, proportionate, well carried, features well defined, profile straight.	2		
Forehead, broad, full.	1		
Eyes, full, bright, clear, large, same color.	2		
Ears, medium size, pointed, well carried, alert.	1		
Muzzle, neat, nostrils large, flexible; lips thin, firm, even.	1		
Lower Jaw, angles wide, space clean.	1		
Neck, muscled, arched; throatlatch fine; windpipe large.	2		
FOREQUARTERS — 20 POINTS			
Shoulder, long, sloping, smooth, extending well back	3		
Arm, short, strong muscled, thrown back, well set.	1		
Forearm, long, wide, clean muscled.	2		
Knees, straight, wide, deep, strong, clean, strongly supported.	2		
Cannons, short, clean, wide, tendons large, hard, clean, prominent.	2		
Fetlocks, wide, straight, strong, clean.	1		
Pasterns, lengthy, sloping, strong, clean.	3		
Feet, medium size, even, sound; horn dense, waxy; soles concave; bars strong, full; frogs large, elastic; heels wide, one half length of toe.	6		
BODY — 10 POINTS			
Withers, high, extending well back.	1		
Chest, deep, low; girth large.	2		
Ribs, deep, well sprung.	2		
Back, broad, strong, muscular.	2		
Loins, short, wide, thick muscled, close coupled.	2		
Underline, low, flanks full, well let down.	1		
HINDQUARTERS — 30 POINTS			
Hips, smooth, wide, level.	2		
Croup, long, wide, muscular, not drooping.	2		
Tail, attached high, well carried.	1		
Thighs, deep, broad, strong, muscular.	3		
Quarters, deep, plump with muscle.	1		
Stifles, strong, muscular, clean.	2		
Gaskins (lower thighs), long, wide, muscular.	2		
Hocks, large, strong, wide, deep, clean, well set.	7		
Cannons, short, clean, wide; tendons large, hard, clean, prominent.	2		
Fetlocks, wide, straight, strong, clean.	1		
Pasterns, strong, sloping, springy, clean.	3		
Feet, medium size, even, sound; horn dense, waxy; soles concave; bars strong, full; frogs large, elastic; heels, wide.	4		
Total.	100		

desire more style and action in the small ponies than is required in the countries to which the ponies are native. Cleanness of bone, freedom from all unsoundnesses, symmetry of body, and all the other essentials of a good horse should be found in ponies.

JUDGING MULES

The mule is produced for work in warm climates and should be judged as a work animal. The mule type, however, is different from that of the work horse. Height is one of the most important factors in determining the value of a mule, size being very important. Quality is also given great consideration, mules of good quality selling better than rough ones. The same relationship of parts that obtains in the case of horses should be found in mules. The feet of the mule are long and narrow like those of the ass, and should be of as good quality as horses' feet.

JUDGING BREEDING CLASSES

In judging breeding classes, the judge should first be familiar with the type sought for by the best breeders. This presupposes a knowledge of the breed and breed requirements. Even though one animal may be better fitted for market and may be more useful than another, it is not eligible for highest rank in the show ring if it lacks the type set forth in the standard established by the breed association.

Unsoundness and poor conformation should be looked for with great care, because, while unsoundnesses are not inherited directly, the predisposition toward them is inherited. Blemishes that would lower the market price of the animal are not so serious in breeding classes, although they are

objectionable. Breed types should be given precedence over blemishes in the selection of breeding animals. Animals that are so defective as to impair their breeding powers should be disqualified.

EXERCISES

1. What is the first thing to be sought in judging heavy draft horses? Driving horses?
2. What unsoundness disqualifies for either class of horses?
3. How does the show ring judge go about to "throw out" the poorest animals? To "place" the rest?
4. Describe how you would "show" the action of a horse. How would you judge it?
5. Name and describe the various kinds of defective action.

HOME PROJECT

Select the best colt or horse on the home farm and fit it for show. Show the animal yourself in the judging ring.

CHAPTER XIII

CARE AND MANAGEMENT OF HORSES

Stables. — The horse barn should be roomy, well lighted, and ventilated, and should be kept free from chickens or other animals that may introduce parasites to infest the horse. The stable should be thoroughly cleaned at least twice daily, morning and evening, and fresh bedding provided at the evening cleaning.

Grooming. — Horses should be thoroughly groomed every morning. In the spring of the year especial care should be given to this work. During the winter they grow heavy coats of hair. When put into the work harness in spring their profuse sweating loosens the hair. If this loose hair is not removed by currying, it will make the horse both uncomfortable and unsightly. Their shoulders and necks should be carefully watched. It is a good practice to wash them after each day's work. For harness galls, an ounce of prevention is worth a pound of cure. The best cure for sore shoulders and necks is rest and removal of the cause. In the spring it is well to clip the hair from the fetlocks, so that the animal's legs can be more easily kept clean.

Food Requirements of the Work Horse. — A work horse more nearly resembles a machine than any other animal kept on the farm. The hard-worked horse needs energy-giving and tissue-building material in its feed to supply

power and to repair the great waste that goes on during a siege of hard work. The horse may start in the spring fat and sleek, and before the heavy fall work is completed, the cellular structure of the body may have been torn down and rebuilt many times. This calls for protein in the ration; and the energy that must be supplied necessitates carbohydrate and fat material.

A good grain mixture for the horse consists of 3 parts of oats, 2 parts of corn, and 1 part of bran by weight. In feeding horses, a safe rule to follow is to allow one pound of grain daily for each 100 pounds of live weight of the animal, and to increase this amount if the horse is hard at work. The horse at extra hard work will require about 50 per cent more grain than is called for by the above rule. Draft horses weighing 1600 pounds will therefore require 8 pounds of grain three times daily when at hard work.

Roughage. — A horse will consume daily about 1 pound of roughage for each 100 pounds of live weight. Timothy hay is the roughage most commonly fed. Clover hay of good quality, bright, and free from dust, may be fed safely. Mixed hay consisting of blue grass and timothy, or other grasses, is excellent. Alfalfa hay is fed almost entirely in western sections, and horses work well on it in spite of the fact that it makes them sweat freely and causes a larger secretion of urine. If corn silage is fed, it must be of good quality, free from mold, and must be fed in moderate amounts.

Precaution. — When the work horse gets a day or two of rest, the ration should be decreased. During a resting time the horse accustomed to hard work will, if allowed to do so, eat more feed than can be utilized by the body. A great many cases of a disease known as "Azoturia,"

sometimes called " Monday morning disease," result from feeding horses heavily when they are idle over Sunday and are given no exercise. Farm horses should be turned on to a short pasture when not at work. This gives the animal an opportunity to roll, get a bite of grass, and sufficient exercise to prevent disorders due to overfeeding. The animal will not need the noon feed, and in the evening a lighter feed than usual may be given. If horses are not used to it, too much grass may produce colic.

In case horses cannot be turned out, a good plan is to give the regular grain feed at breakfast time and cut the noon and evening meals in half. The old custom of feeding a bran mash on idle days has been quite generally abandoned. A small allowance of bran in the daily ration is nutritious, and its mild laxative effect will keep the animal's digestive tract in good condition. Horses should not be fed or watered when very hot. It is often fatal to the animal; or founder and stiffness may result, from the effects of which horses seldom recover.

The Brood Mare. — The brood mare should be treated with more consideration than the work horse. It is better to work the brood mare than to deprive her of the opportunity to get sufficient exercise. She should not be allowed to " rough it " in winter. It is not necessary to keep her in a warm stable if she is given sufficient wholesome, nourishing food, but good colts should not be expected from dams forced to go through the winter on hay and straw alone. The dam must be fed tissue-building materials. A good grain mixture consists of 3 parts of oats and 1 part of bran. Good timothy or mixed hay is satisfactory for roughage, and some cut hay may be introduced into the grain ration.

Working the Brood Mare. — If the brood mare is needed as a work horse, she should be given some light work. Such service as fast driving on the road or plowing in a four-horse team should not be expected from her. The brood mare should at all times be handled quietly, carefully, and kindly.

Feeds for the Young Foal. — Grain should be supplied in a separate box to the young foal as soon as it has learned to eat grain from its mother's feed box. Oats is the best grain for the young colt, and this should be fed in small amounts at first. A safe rule to follow in supplying grain to the foal is to allow from 2 to 3 pounds of grain daily up to the age of one year; 4 to 5 pounds daily between the ages of one and two years; and 7 to 8 pounds of grain daily between the age of two and three years. The same amount of roughage may be allowed the young horse, though these allowances are subject to wide variation.

The young horse should be liberally fed so as to acquire one half its mature weight at the age of twelve months. Only during the growing period can the animal be properly developed, so that it may later attain its greatest possible size. At this time feeds rich in protein and mineral matter should be given to develop muscles and bones. After being weaned the foal should be fed liberally on such feeds as oats, bran, and linseed oil meal. Cut alfalfa hay, cowpeas, soy beans, and skim milk may also be introduced into the ration at this time to good advantage.

Orphan Foals. — Orphan foals are often reared upon modified cow's milk. Cow's milk is higher in fat and lower in sugar and mineral matter than mare's milk, and when fed to the young foal limewater and sugar should be added. At all times the milk should be fed warm, and

strict attention should be given to cleanliness and sanitary conditions in preparing food for the young foal.

Colic in Horses. — Colic causes more deaths among horses than any other single complaint. It is of two kinds, spasmodic or cramp colic, and flatulent or wind colic. Spasmodic colic is the more violent and comes on more rapidly. Injudicious feeding, standing in drafts of air, and drinking too much cold water are some of the causes of spasmodic colic. The horse tramps in the stall, paws, bends the knees, turns the head around to the side, has a worried look, lies down and rolls, and shows other signs of distress. The pain comes periodically; the horse for a few minutes seems well, then the symptoms of the trouble suddenly reappear. Flatulent or wind colic comes on more slowly, and is caused by fermentation of food in the large intestine. Proper feeding and care will prevent most of the attacks of colic.

In all cases of colic it is much better to call a reliable veterinarian than to resort to home treatment.

EXERCISES

1. Does fast driving have any effect upon the amount of feed required by horses? If so, what?
2. What special attention does the farm work horse require in spring?
3. Why do horses need more concentrated feeds than cattle? Can a work horse be kept in condition on rough feed? Why?
4. Describe a good method by which a young foal may be raised by hand.

HOME PROJECT

Take entire care of the farm work horses or the driving team for any given period, using the best of methods in this work.

CHAPTER XIV

CARE AND MANAGEMENT OF BEEF CATTLE

The Cattle to Keep for Beef. — The cattle to keep for beef should be of the beef type. Such animals produce the greatest amount of high-priced meat from a given amount of food.

Care of the Cow and Calf. — In rearing calves for beef purposes on high-priced land, there are several methods that may be followed. One practice is to milk the cow and raise the calf upon skim milk and grain. This method is the cheapest. The calf will eat a grain ration after it is weaned and will do well, with very little shrinkage. This method presupposes, however, that the cows are good milkers. It is not advisable to follow it with calves from the dairy breeds.

Rearing Two Calves with One Cow. — Another practice is to place two calves with one cow and milk the extra cows, or buy calves to place with them. The two calves do well, but at weaning time they shrink more than calves reared on skim milk and grain. When two are reared by one cow, they should not be allowed to run with the cow in the pasture, but should be turned with her night and morning. The calves should be watched while feeding; otherwise the stronger one will rob the weaker. In addition to the milk from the cow, the calves should have a liberal feeding of grain. They should be started

upon the grain ration while quite young, because they will have to be weaned at the early age of four or five months.

If single calves are allowed to run with the cows, it reduces the labor bill to the minimum, but is advisable only upon very cheap land, or in the production of high-priced breeding stock. Such calves should be weaned at the age of five or six months. In exceptional cases, when calves are being fitted for show, they may be allowed to nurse until they are fifteen or eighteen months of age. Any of the above methods will produce good beef cattle, provided the animals have the proper breeding.

Care of the Beef Sire. — On the farm where cattle are kept for the production of beef, the sire should receive just as good care as on the dairy farm. He should have a pen with a paddock in connection where he may exercise. While he should receive sufficient feed to keep him in good condition, he should not be kept fat. Alfalfa or clover hay with a limited amount of silage of good quality for roughage, and a grain ration made up of corn, oats, and bran, if not fed in excess, will keep him in a healthy condition.

" Baby Beef " Production. — The production of " baby beef " requires great care and intelligent feeding. The industry has arisen because of the scarcity of feeding cattle, due to the high price of western land upon which feeders are now produced.

In this method, the beef producer feeds the calves liberally from the time they are born until they are marketed. " The calf is not allowed to lose its calf fat." These animals are sold at from 12 to 18 months of age. They should weigh from 800 to 1000 pounds each, and they should be fat, and smooth, and of good quality.

The advantages of " baby beef " production are:

1. The cattle are not kept so long on the farm. This makes it possible to maintain a large breeding herd to produce more calves.

2. Capital is turned over faster.

3. The percentage of weight given by the dam is greater.

4. The market favors the lighter animal that will produce smaller cuts of meat.

5. The young animal gains more economically than the older one.

The disadvantages of the method are:

1. Young animals require greater care and more skill in feeding.

2. The animals must be well finished when sent to the market, or they will be turned back again to the country as " feeders," for which a lower price is paid.

3. The animals must be very uniform in conformation and quality to command a good price.

4. To fatten them requires a long feeding period, because young animals have a tendency to grow instead of fatten.

In the summer time it is poor practice to allow the calves to eat too heavily of grass, because grass has a tendency to produce scours. The grain ration may consist of corn. With this some bran should be fed, and toward the end of the feeding period some cottonseed meal added. If possible either alfalfa or clover hay should be given for roughage. Timothy hay is undesirable, although, if nothing better can be furnished, mixed hay will prove quite satisfactory. Corn silage helps to cheapen the gains and keeps the animals in good condition.

Feeding Older Cattle. — A common practice is to buy cattle at about the age of two years and feed them until they are fat enough for the market. These cattle may be fed from 60 to 90 days, known as "the short feeding period," or from 120 to 180 days, called "the long feeding period." Cattle that have been fed for the short feeding period are called "short fed cattle," and those fed the long period are called "long fed cattle."

Starting Cattle on Feed. — Cattle should be started on feed gradually. Only a small allowance of concentrated feed should be given. The coarser and cheaper the feed stuffs given at the beginning, the easier it is to get the cattle up to "full feed."

Full Feed. — Cattle are on "full feed" when they are consuming the maximum allowance of heavy concentrated feeds such as corn and cottonseed meal. It takes from two to four weeks to get cattle on full feed, depending upon the kind and condition of the cattle. Young cattle go on to full feed somewhat more slowly than older cattle, and the feeder should be more cautious with young cattle because they get "off their feed" more easily. Cattle in good flesh and used to feeding will go on to full feed more quickly than will thin cattle unused to being fed.

The Feeds for Beef Cattle. — For feeding beef cattle, corn should form the principal part of the fattening ration. When on full feed, the steer will consume from 12 to 15 pounds of shelled corn per 1000 pounds of live weight daily. In connection with corn the steer should get from $2\frac{1}{2}$ to 3 pounds of cottonseed meal or linseed meal. The general rule for the feeding of cottonseed meal is to give 3 pounds daily per 1000 pounds of live weight. The animals should be watched carefully to see that they do

not overeat on the meal. The amount of the meal should be decreased after the steers have been fed for a period of about 100 days, and in some cases it may be taken out of the ration entirely. For roughage, well-cured clover hay is excellent. Where it can be obtained at a reasonable figure alfalfa is probably the best roughage for fattening cattle. However, care should be exercised in feeding it, or bloat may result. This is especially true when the alfalfa is damp or wet. Timothy hay is an expensive roughage. Besides being high in price it does not produce the gains that are obtained from the alfalfa or clover. Corn silage should be fed to beef cattle because it reduces the amount of grain needed and keeps the animals healthy. Steers will consume about 15 to 20 pounds of silage and from 6 to 8 pounds of alfalfa or clover, daily, per 1000 pounds of live weight. As steers grow fat, the amount of roughage may be lowered and the amount of grain increased. A suitable day's ration for the 1000-pound steer consists of 12 to 15 pounds of shelled corn, 2 to 3 pounds of cottonseed meal, 6 to 8 pounds of alfalfa or clover hay, and 15 to 20 pounds of corn silage. Steers should average from $2\frac{1}{2}$ to 3 pounds of gain per day on such a ration.

Hogs Following Steers. — The steer feeder always has hogs following the steers to pick up the waste corn. The best way to feed corn to steers is on the ear, with hogs following. A great many steer feeders are content if the steers pay only for the cost of feeding. They make the profit on the hogs which follow the cattle in the feed lot. Active, vigorous pigs weighing from 100 to 150 pounds are the best for this purpose. However, the pigs should have some feed besides what they pick up after the cattle. The number of pigs per steer varies with the condition of

the cattle and the way the feed is prepared. If whole corn is fed, one pig per steer is about the right proportion.

Equipment. — Feeding beef cattle does not require expensive equipment. All tests show that steers do best under conditions where they have plenty of freedom. The fattening steer is protected by a heavy coat of hair, and when he becomes fat, the layer of fat is of itself a protec-

Fig. 89. — Typical heavy load of fat steers.

tion against cold. He is also evolving a great deal of heat in building up tissue and taking care of his food. The experience of feeders is that the steers do better in steady, cold weather than in warm, soft, muggy, or changeable weather.

Barns or Open Sheds. — Barns are handier for feeding, but an open shed, well bedded and dry, with a south and east exposure, gives the best satisfaction. Some feeders prefer to provide the cattle only with windbreaks. This is good practice in the southern part of the corn belt, but on its northern edge the cattle are better off if provided

with cover to protect them from snows and cold rains. These sheds need not be expensive. The cheapness of equipment is one of the arguments in favor of steer feeding.

Self-feeders or Open Feed Troughs. — Cattle may be fed from open feed bunks or troughs, or they may have their feed given to them in self-feeders. In the self-feeder, the feed is put into a large hopper from which it works down as the cattle eat it out below. The self-feeder saves considerable labor, and if the farmer must employ help incapable of feeding wisely, the self-feeder may obviate trouble which might arise from overfeeding. On the other hand, a good cattle feeder will get better results if the feeding is supervised, as must be the case when open feed troughs are used.

Water. — Fattening cattle require considerable water, which must be fresh, clean, and pure. The supply should be easily accessible so that the cattle may drink at will. In cold weather the chill should be taken from the water by the use of a tank heater, but care should be taken not to heat the water enough to make it unpalatable.

Advantages of Steer Feeding. — The general advantages of steer feeding are:

1. It saves labor.
2. It uses the roughage of the farm.
3. It returns a large amount of fertility to the land.
4. It makes a good return on grain and feed.

EXERCISES

1. Why are Holstein cows frequently found in a beef herd?
2. Can baby beef be produced as economically on the same farm as that from three-year-old steers? Discuss.

3. Which will do better on a wide ration, a fattening steer or a dairy cow? Why?

4. Why do beef cattle do better in open sheds than in warm barns?

HOME PROJECT

Feed a lot of steers until finished for market. Keep accurate records of cost, rations, returns, and profits.

CHAPTER XV

CARE AND MANAGEMENT OF DAIRY CATTLE

The Cattle to Keep for the Dairy. — The dairy breeds of cattle have been improved by the selection of breeding stock from the best producing families. The farmer who engages in the milk producing business will save time by buying representative cows of dairy breeds, or cows that give evidences of dairy breeding. A good pure-bred sire of one of the dairy breeds should be selected to head this herd. In improving the herd, records obtained by weighing and testing the milk of the individual cows of the herd should be studied for the purpose of eliminating the poor cows.

The Advantages of Dairying. — As already stated, the dairy cow is the most economical producer of human food from the coarse materials raised upon the farm. For example, the cow, Missouri Chief Josephine, in a period of twelve months gave 26,861.0 pounds of milk, containing 740.5 pounds of fat. The total solids in her milk weighed 3330 pounds, consisting of 740.5 pounds of fat, 815 pounds of protein material, 1579 pounds of milk sugar, and 195 pounds of ash material. All of this was human food. A steer weighing 1250 pounds was found to contain in its body 548 pounds of dry matter, which included not only the edible portions but also a great deal of bone and other refuse. Of the dry matter in the body of the steer 333 pounds was fat, 172 pounds was protein, and 43 pounds was ash material.

The cow in one year's time produced over six times as much dry matter as was found in the carcass of the steer, over twice as much fat, and almost five times as much ash. She also produced over three fourths of a ton of nutritious milk sugar. In addition she produced a calf, and was as valuable at the end of the year as at the beginning. To get the food material from the steer he had to be fed more than two years before being slaughtered.

Dairying is the most intensive form of animal husbandry that can be practiced on high-priced land. The price of manufactured dairy products is always higher than meat products. There is less waste in handling them, they stand transportation over long distances, and are easily kept over long periods of time.

Equipment. — Successful dairying depends in a large degree upon the care and management of the cows in the herd. The farm of the practical dairyman should be well equipped with good dairy buildings. Roomy, well-lighted, well-ventilated barns that are warm in the winter and cool in the summer are a necessity. Windows should be provided with shades or otherwise equipped so that they may be darkened in the summer during fly time.

Barns should be whitewashed on the inside at least twice annually, and if possible the ceiling of the stable should be covered so that no beams are exposed where dirt and disease germs can find lodgment. The stables should be kept clean, and if it is not possible to drive through the barn to clean it, a litter carrier should be provided. Whether the cows should stand facing each other or not is a matter of opinion. The feeding operation is simplified when they face each other, and if more time and labor are devoted to feeding than to cleaning the barn it is more economical. If a litter

carrier is used, it should have direct communication with a covered pit so built as to save the manure.

Care of the Cow. — The cow is the unit of the herd, and the success of the whole depends upon the care of each unit. During all operations in the handling of dairy cows cleanliness should prevail. The cows should be brushed daily. Their udders should be wiped with a damp cloth previous to milking. It is also good practice to use milk pails with small tops, so that the amount of dust and dirt falling into the pail will be reduced to the minimum. Milkers should practice " dry hand " milking, and should change from their dirty field clothes to clean outer garments before beginning to milk. All these precautions not only tend to keep the milk clean, but also help the dairyman to improve conditions generally.

The cow should be well cared for at all times, fed liberally, and should receive utmost kindness from the hands of the herdsman. All unnecessary excitement, fright, and injury should be carefully avoided. In commercial dairying it is well to separate the calf from the cow two or three days after birth so that she will not become attached to it. However, if one is raising valuable pure-bred calves, they may be allowed to remain for a week or more if desired.

If the cow is a heavy milker she should be watched for milk fever. The farm should be provided with an outfit for the treatment of this malady. The most effective method is that of simply inflating the udder with air.

In the case of young cows, the first milking period determines the future persistency of the cow. The heifer should be milked by a competent milker, and should be kept in milk as long as possible. This will tend to lengthen her future lactation periods.

Feeding the Dairy Cow. — It must be remembered that the dairy cow uses a part of her ration for maintenance. Only that portion of the food which she receives in excess of that needed for maintenance can be used for the production of milk, the nourishing of the calf, or the laying on of fat. Nature, however, in providing for the young animal, made the milking function so strong in the cow that she will rob her own system in order to provide for her young.

Maintenance and Production Requirements. — Maintenance requirements are not heavy. The most food is required to supply the heat of the body. Heat may be furnished by roughages. In the feeding of dairy cows, the roughage part of the ration, therefore, should be considered as the part that the animal is using for her own maintenance.

The production of milk should be regarded as hard work, and the dairy cow should be fed accordingly. All cows do not respond equally well to feeding, because some cows have greater milk-producing possibilities than others. Good cows should be fed liberally because they make good use of their food, and require no more for maintenance than poor cows require. Good cows eat more than poor cows do, but they return much larger results. For milk production, concentrates are usually fed.

How the Ration of the Cow Should Vary. — There are many factors affecting the ration, the more important ones being the weight of the cow, the amount of milk the cow produces, the season of the year, the period of lactation, the quarters in which the cow is kept, and the physical condition and peculiarities of the animal.

The roughage allowance for a 1000 pound dairy cow is generally about 30 pounds of silage, and from 6 to 10 pounds of good mixed clover or alfalfa hay. Timothy hay is not

a good feed for a milk cow. In addition to this roughage allowance, the cow should receive one pound of good grain mixture per day for each pound of butter fat produced weekly. The grain mixture should be made up of at least three different grains or concentrated feeds. It is well to grind feeds for dairy cows.

According to weight the ration should be made to vary directly, heavy cows requiring more feed than light ones.

In the summer time the cows will do well on pasture during the early part of the season, but as soon as fly time comes on and the pasture gets dry, the cows should be kept in the barn during the heat of the day, at least, and be fed fresh-cut green crops or " summer silage," which is simply silage kept over until the summer time. If the cow is an exceptionally good one it pays to feed her about one half of her regular grain ration while on pasture.

Water and Salt. — Dairy cows should at all times have free access to salt and water. Barns are now built equipped with drinking cups and salt licks for each cow. During the period of lactation, a cow will drink much more water than during the period in which she is not in milk.

Tuberculosis in Cattle. — Tuberculosis is one of the worst diseases with which the farmer has to contend. It thrives best where animals are kept in confinement and under unnatural conditions. On the open range very little of it is known. Cattle kept in well-ventilated barns are not as liable to contract the disease as those housed in filthy and poorly ventilated stables. Hence this disease is more dreaded by dairymen than by the producers of beef cattle. It also attacks hogs and chickens, but is most destructive in cattle, and is but little prevalent in horses and sheep.

Tuberculosis is caused by the tubercle bacillus. It may

appear in two forms, the acute and the chronic. An animal attacked by the acute form shows rapid decline and dies in a few months. In the chronic form the diseased animal may live for years and yet show no outward signs. It is the insidious nature of the disease that makes it so dangerous.

The disease is spread by inhaling or swallowing the germs which are given off from the body of affected animals. The disease may also be contracted from the milk of diseased animals, especially if the udder is affected. Human beings, especially young children, may contract the disease from the milk of tubercular cows; and pigs may contract it in like manner, or by consuming waste around infected regions, and eating offal and carcasses of tubercular cattle.

Incipient tuberculosis in animals has no outward symptoms, though in the advanced stages of the disease there is a general appearance of unthrift, such as a staring coat, a listless eye, a hanging head, drooping ears, lack of ambition, loss of appetite, a hacking cough, and general emaciation, even though the animal be well fed and cared for. There are many other diseases that have the same general symptoms, but there is an infallible test for tuberculosis known as the tuberculin test. If the animal responds to this test it should be killed, as there is no absolute cure.

Prevention. — In order to keep the disease out of a herd there are certain rules that should be followed. All new animals brought into the herd should be tested before being placed with the herd. Animals reacting to the tuberculin test should be eliminated from the herd. Well-ventilated and well-lighted stables should be provided and kept well disinfected with some good disinfecting solution.

The tuberculin test should not be applied to a herd except by a skilled veterinarian or other competent person.

Milk Fever. — Milk fever affects the best cared for and apparently the healthiest cows in the herd. It usually appears in the early period of lactation. The cow falls to the ground, holding her head around to one side. Her throat seems paralyzed, and she cannot swallow. The disease is caused by an excess of nutrition in the udder, brought on by overfeeding and lack of exercise. The cow should be given neither food nor medicine.

The treatment consists of inflating the udder with air, either by using a regular milk fever outfit, with which every farm should be equipped, or by inserting a sterilized milking tube into the udder and pumping in air with a sterilized bicycle pump. After the udder is inflated tape may be wound around the teats if necessary to keep the air from escaping. If the air is absorbed in four or five hours and relief has not come to the cow, the inflation should be repeated. Usually the cow recovers quickly after the first treatment.

EXERCISES

1. What special precautions need be taken in the management of the dairy cow?
2. How do the cow and the steer compare in the ability to convert grain and hay into human food? Give figures to prove your answer.
3. Why is cleanliness of such great importance in the management of the dairy herd?
4. Which needs the narrower ration, the heavy or the light milker? Why?

HOME PROJECT

Raise a calf from birth to six months of age by the most approved methods, keeping accurate records.

CHAPTER XVI

CARE AND MANAGEMENT OF SHEEP

Economy of Sheep. — Sheep usually yield as good returns as any other class of live stock. The expenditure for buildings and the capital required to become established in the business are small, the gains made by sheep are economical, and mutton is constantly growing in popularity. Besides the mutton produced, the sheep also yields a crop of wool which is often sufficient to pay for the cost of maintaining the breeding animal throughout the year. Sheep are great weed eradicators. They will rid a farm of weeds if allowed to graze over badly infested fields, leaving valuable manure to enrich the soil. If allowed to remain in the pasture at night, they seek the highest ground. In this way fertility is left on the uplands, where it does the most good.

In parts of England, the farming industry has actually been established and made permanent by the use of sheep, and lands that at one time were practically worthless for producing good crops are now returning handsome profits. So profitable are a few sheep on many farms where they are fed that the animal has justly been termed " the golden hoof."

Sheep Feeding. — Sheep feeding is a popular industry. The breeding flock is kept cheaply on the range, where lambs are produced in large numbers. When they reach

about 60 pounds in weight they are shipped to some of the large central markets and sold to feeders who fatten and return them to the market. There is often good profit in this feeding business, and a great deal of fertility is added to farms where this system is followed.

Another branch of the industry is the production of lambs commonly known as "hot-house lambs." The

Fig. 90. — Lambs of the average mutton type.

majority of the lambs are sold in the fall, weighing from 75 to 100 pounds, and young lambs placed upon the market in the winter and early spring readily command a high price. Dorset sheep produce lambs any time of the year and are therefore valuable for winter lamb production. The winter lamb should be kept in good quarters and should receive careful attention. To bring the best price the lambs should be well fattened and weigh from 50 to 60 pounds when ready for market.

Conditions of the Large Producer. — Where sheep are produced in large numbers on the ranges, pasture forms the larger part of their feed. The cost of production is low, because of the cheapness of the land and the small

amount of labor required. The sheep are handled in large flocks and are generally cared for by herders, who move the flocks with the pasture, going into the highlands in the summer and to the valleys or lowlands for the winter. As the weather becomes warm in the spring the movement begins, and by following near the snow line, fresh and nutritious grasses are obtained. However, the open range is rapidly disappearing, and the cost of rearing sheep in the west is continually advancing. This condition will eventually force the raising of more sheep in other parts of the country.

The Shepherd. —Not every one can make a success of sheep husbandry. The profits from this industry depend in a great measure upon the man engaged in the work. The successful sheep man generally has well-defined qualities without which the handling of sheep would be unprofitable. No domesticated animal appreciates gentleness more than the sheep, and if the industry is to return profits the shepherd must be gentle and kind in the handling of his animals.

Stabling for Sheep. — Quarters for sheep should be dry, clean, well ventilated, and not too warm. These animals are protected from inclement weather by heavy fleeces, and can withstand a great deal of cold, but let them become wet and serious troubles at once begin. Sheep barns should be placed upon high, dry ground so that drainage away from the building is assured. The quarters should be kept well bedded with clean straw. Pure air should be provided at all times, but great care should be taken to prevent drafts. Sheep contract colds easily, and large losses often occur from pneumonia when over-zealous amateurs try to provide sheep with fresh air by leaving barn doors open.

Feeding Racks. — Feed troughs and other receptacles used for feed should be kept clean. A six-inch board placed about a foot above the center of the trough will give the sheep a chance to eat, but will prevent them from getting their feet into the trough.

Preparation of Feeds. — As a general rule ordinary feed stuffs do not require much preparation for sheep. Such grains as peas and beans are best fed ground, especially to young lambs and old sheep with poor teeth. For these animals corn should be cracked. Barley may be improved by soaking, and roots should be sliced or pulped before feeding. For healthy sheep whose teeth are sound, there need be little preparation of feed. To get the best results feeding must be done regularly.

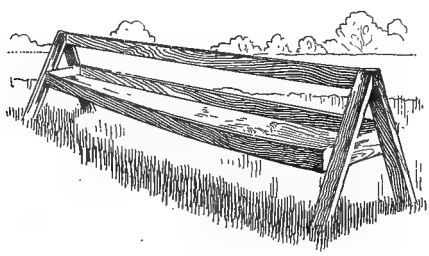


Fig. 91. — Trough used in feeding grain to sheep.

Water and Salt. — It is a good plan to have clean, pure, fresh water accessible to the sheep at all times. They will drink more water with dry feed than when green or succulent feeds are provided, and more will be drunk in summer than in winter. Salt should be kept constantly before them.

Exercise. — Sheep should have plenty of exercise. In cold climates it is often difficult to provide this. They should be turned out in the open every fine day, but not exposed to raw winter winds, snowstorms, and rains. The thrifty shepherd never allows his sheep to remain out in heavy rainstorms, even in the summer time.

Succulent and Rough Feeds. — Sheep should be given some succulent feed. In the winter, this is best provided in the form of moderate amounts of corn silage or roots. Two pounds of rutabagas daily per animal is sufficient. If frozen materials are fed, serious sickness or even death may follow. Moldy silage may also lead to the same results. For roughage, clover and alfalfa hay cannot be surpassed. Cowpeas, or common field peas are also good; and for fattening sheep, pea-vine silage is especially valuable.

Concentrated Feeds for the Breeding Flock. — For the breeding flock, the best concentrated feeds are bran and oats, mixed in the proportion of 3 parts of oats to 2 parts of bran. This ration, fed about one half pound daily with alfalfa or clover hay, will keep the flock in good condition. No grain need be fed until the spring season approaches. Extra feed and care at this time is well paid for in increased returns, and grain given to the ewes and to the lambs is generally economical.

Early Feeding. — If the dam is well fed, the lamb derives the benefit. By the time the lambs are a month old they have learned to eat grain from their mother's feed trough. At this time it is well to provide a "creep," separating the pen of the mother from another pen provided with a trough for the lambs. In this way the lambs can be fed alone. For growth, a good mixture to be fed all through the summer in small amounts consists of 1 part wheat bran, 2 parts oats, 2 parts corn meal, and 1 part oil meal. At about the age of five months the lambs should be taken away to a fresh pasture out of sight and hearing of their dams.

Feeding for Fattening. — If lambs are to be fattened they may be fed a half pound daily ration made up of

cracked corn, peas, and wheat bran. The grain may be gradually increased up to one pound daily. When the time comes to yard them, they should be fed either alfalfa or clover hay for dry roughage, some succulent feed such as corn silage or roots, of which rutabagas are best, and a grain mixture of shelled corn or corn meal, and a small amount of linseed meal or cottonseed meal. Linseed cake

Fig. 92. — Docking a lamb.

and cottonseed cake broken into nut size gives better satisfaction with the lambs than if fed in the finely ground form. The grain ration may gradually be increased up to two pounds daily when the lambs are about ready for market.

Docking and Trimming. — Lambs should be docked at about the age of two weeks. Docking is the removal of the tail. This insures cleanliness, and docked lambs sell better, to say nothing of their added comfort and better gains.

The outside of a sheep's hoof grows faster than it wears off unless the sheep are kept on very rough ground. If not

trimmed, this outside shell turns under the hoof, collects dirt and filth and in time may lead to foot rot. The feet should be trimmed at least twice each year.

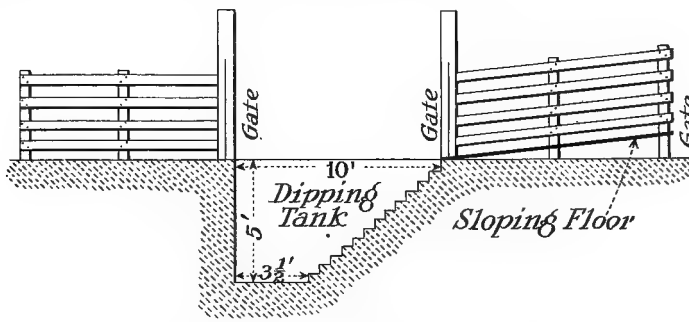


Fig. 93. — Cross section of dipping tank and pens.

Sheep Ticks. — The sheep tick, a wingless fly, is about one fourth of an inch long and of reddish-brown color. The adult tick lays the eggs, which adhere to the wool fibers. These hatch in about four weeks. All sheep are more or less affected, but the long-wool breeds seem to harbor more ticks than the other classes of sheep. At time of shearing the ticks move to the lambs for protection.

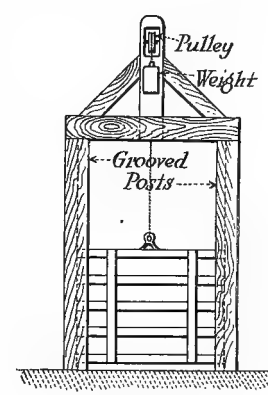


Fig. 94. — A handy lift gate for a dipping tank.

Sheep ticks cause the animals great annoyance. They suck the blood, dry up the wool, produce irritation, and cause emaciation. Every sheep owner should dip his sheep annually, about a week or ten days after shearing time, in one of the standard sheep-dipping solutions.

EXERCISES

1. Can mutton sheep be produced on pasture alone? Give reasons for your answer.
2. Why do sheep protected by a heavy fleece need stabling?
3. At what age should the lambs be separated from their dams to be fed alone?
4. Which need the greater amount of protein in the ration, lambs or pigs? Why?
5. Why is exercise of so much importance in the management of all live stock?

HOME PROJECT

With the consent of your parents take entire charge of the care and management of the home flock.

CHAPTER XVII

CARE AND MANAGEMENT OF SWINE

WHILE the hog has an omnivorous appetite and will eat refuse of all kinds, its habits are exceedingly clean. There is no other farm animal that appreciates more clean and healthful quarters, and that responds better to good care and wise feeding.

Quarters. — While quarters for hogs need not be expensive, they should provide an abundance of sunlight and fresh air. In cold climates, hog houses should be warmly constructed. The large central house should be so arranged that it can be divided into small pens. If possible the doors of the pens should open into small lots or runways to give the animals an opportunity to get out for exercise. In connection with the hog house there should be a feed room, equipped with a stove or heater, where water can be heated and feeds warmed or cooked.

The up-to-date hog plant has individual hog houses, or colony houses, as they are sometimes called. The breeding animals are usually kept in these colony houses all winter, where they have the advantage of plenty of exercise and good air.

All hog houses should be clean, well bedded with straw, and the walls should be whitewashed and disinfected regularly. Feed troughs and other feed receptacles should be kept clean.

Feeding the Brood Sow. — In connection with pasture, the brood sow should receive daily from two to four pounds of a mixed grain ration. This should be rich in protein and mineral matter, to which should be added some roughage such as alfalfa or clover hay. These bulky feeds keep the digestive tract distended and in good condition. Grain mixtures may be made from corn, oats, bran, peas, and soy beans. If skim milk can be obtained it is well to feed five or six pounds daily.

Feeding the Young Pigs. — At about the age of three weeks the pigs should be provided with feed in a small trough of their own. The feed may be the same as that given to the mother. They should have plenty of outdoor exercise. Their quarters should be kept dry and clean. The pigs should be weaned at about the age of six weeks.

By weaning time the young pigs will have learned to eat. A "creep" into a separate pen should be provided so that the young ones may slip into this pen, away from the mother, and eat corn, slop, and skim milk. They should be fed liberally, and if possible should have the run of a grass pasture where there is sufficient shade and running water. It is poor practice to have the small pigs feed with larger ones, or young pigs with older ones. Not more than fifty pigs of the same size should be herded together.

Finishing the Lard Hog. — Hogs are easily fattened if liberally fed. In the corn belt of North America, where lard hogs are more extensively raised than in any other part of the world, corn forms the principal part of the diet of the fattening hog. The number of pounds of pork annually produced depends within reasonable limits upon the number of bushels of corn raised. The states where

corn grows best are the states in which most of the pork is produced.

Wheat middlings fed in a slop ration or tankage fed in the same way will be found a valuable adjunct to corn for pork production. Cottonseed meal should not be fed to hogs. In the later stages of feeding, linseed meal also softens the fat and should not be fed at that time. Bran is too bulky for hog feeding.

Pasture, Soiling, and Preparation of Feeds. — Pasture is a help toward profitable hog fattening. Dry lot fattening is often expensive. In the case of fattening in dry lots it is a good thing to supply the animals with some succulent feed in the form of soiling crops, such as peas, beans, clover, or alfalfa. If grains like barley are soaked at least twelve hours before feeding, better results are obtained. As a rule little preparation of corn is necessary. The best way to feed corn is on the cob. During cold weather slop should be warmed for hogs, but no feeds except potatoes or pumpkins need be cooked for them.

The Relation of Grain to Gain. — The general rule for the relation of feed to gain is that one should allow a bushel of corn for every ten pounds of pork produced. During the fattening period, the hogs should be watched, and as soon as they cease to make gains they should be sold, unless the market is poor. The feeder should study the market and strive to sell when prices are high. During winter feeding, hogs should have warm quarters, but even then more corn will be required to make a pound of gain than in summer feeding.

Feeding for Bacon Production. — In feeding for the production of bacon, less corn is desired. The ration should consist of feeds relatively low in carbohydrate and fat

material, in comparison with corn; such as barley, oats, peas, soy beans, shorts, middlings, and skim milk. Summer pasture is good to furnish green material and give time for the development of the animal, but too much green forage ought not be fed, as it tends to produce a soft carcass. Hogs from one of the bacon breeds should be used for the production of bacon.

Pasture for Pigs. — During recent years much attention has been given to the production of pork on pasture with a self-feeder. This has proven to be a most economical method of pork production. The pigs are farrowed late enough in the spring so that they may be turned on pas-

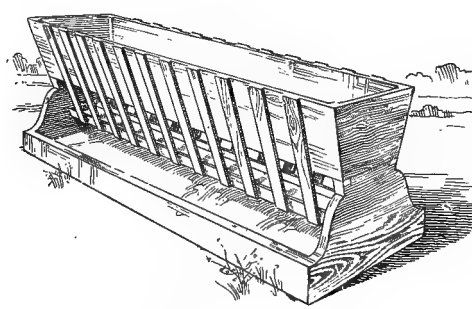


Fig. 95. — Alfalfa rack for hogs.

ture about weaning time. Alfalfa and clover or common blue grass are very acceptable permanent pasture for pigs. Peas, oats and peas, rape, or other especially planted crop, are often preferred. Best results are obtained from pigs fed a small allowance of skim milk and having free access to a self-feeder stocked with corn or other mixed feeds.

Hog Cholera. — Hog cholera is one of the worst diseases with which the swine producer has to contend. It is caused by virulent germs which live for a long time in bed-

ding, straw piles, litter, rubbish, and mud holes. These are carried from place to place by streams, wagons, birds, and on the feet of men and animals.

The disease appears in two forms, the acute, which takes away the victim in a few hours, and the chronic, which may last one or more weeks.

Affected pigs are usually dumpish and listless, lying around huddled together. Their appetite varies, and their digestion is deranged. The skin is reddened and inflamed around the ears, nose, and eyes, along the belly, and inside of the thighs. Violent diarrhœa is the characteristic symptom.

Fig. 96. — Kidneys from a cholera hog. On the surface of the kidney are small blood spots which give them a turkey-egg appearance. The white spot is a blood vessel.

To prevent the spread of the disease in infected areas, all hogs brought to the farm should be quarantined for four weeks. Dogs and other migratory animals should be kept away, and care should be taken not to visit infested farms. Hogs should be pastured at a distance from highways, railways, and streams. Troughs should be disinfected daily and pens weekly with quicklime or some other good disinfectant, and all wallow holes should be filled. Litter should be burned, and old straw piles should not be left standing where pigs

may have access to them. If the disease is in the vicinity, pigs should be vaccinated against cholera by a duly qualified veterinarian.

If the herd is attacked, all pens should be cleaned and thoroughly disinfected, the serum treatment given, all carcasses and litter burned, the hogs kept away from wallow holes and other unsanitary places, and provided with well-lighted and well-ventilated sleeping quarters.

EXERCISES

1. What are the advantages of the colony hog houses?
2. Why should the brood sow with a litter of pigs be given feeds rich in protein and mineral matter? How should her feed differ from that of the pigs after weaning?
3. What is the essential difference between feeds for bacon and for lard hogs?
4. Can hogs be fattened on pasture, rape, or any kind of green feed? Give reasons for your answer.
5. Do bacon breeds ever become lard hogs? If so, under what conditions?

HOME PROJECT

Select and raise a pig to sufficient maturity for the market under the best conditions of feeding, care, and management. Keep an accurate record of cost and returns.

CHAPTER XVIII

GENERAL LIVE STOCK IMPROVEMENT

Heredity and Variation. — "Like begets like." This tendency is known as heredity, and upon heredity are based all the possibilities of live stock improvement. Offspring are the result of all their ancestors, and while they resemble their parents, they are never exactly like their parents nor exactly like each other. It is upon variation that animal improvement depends. Offspring vary slightly from their parents in certain marked characteristics. The breeder selects the animals that have the qualities he desires to perpetuate, and by mating them he produces other animals with characteristics that conform to his ideal.

Selection. — Selection is of two kinds: *natural selection* or nature's selection of animals best fitted to certain natural conditions, and *methodical selection*, or that practiced by the breeder. Natural selection is sometimes called the "survival of the fittest," and while the animal may be the fittest animal for nature's conditions it may not be the best animal under economic conditions set up by man. So the breeder selects his animals methodically, and establishes artificial conditions under which the animals may best thrive.

Atavism. — Atavism is reversion to the original type. Oftentimes animals are born resembling very remote ancestors. Red calves are frequently born to black Aber-

deen Angus parents because years ago there were many red Angus cattle. This reversion is atavism.

Mutants or Sports. — Frequently animals are born that are direct deviations from their ancestors such as a polled animal from horned ancestors. These animals are called "mutants" or "sports," and many breeds of animals have been developed from these "sports." A good example of this is seen in the case of the Double Standard Polled Durham cattle.

Crossbreeding. — Crossbreeding is the mating of animals of the same species, but of different breeds. A calf produced by mating a pure-bred Shorthorn with a pure-bred Hereford would be known as a Shorthorn-Hereford cross-bred calf. Introducing the blood of a different breed for only one generation is known as an "outcross." The crossing of different breeds tends to break up the characters by which any particular breed is known, and is unsatisfactory after the first cross.

Hybrids. — The mating of animals from two different species produces the hybrid. The mule is the commonest and best-known hybrid among farm animals. Hybrids are generally nonbreeders, but cases are on record where they have reproduced.

Inbreeding. — Inbreeding is the mating of closely related animals. It is resorted to by breeders in developing new breeds of animals, or in the fixing of certain characters.

Line Breeding. — Line breeding is allied to inbreeding, except that the animals mated are not so closely related. It generally applies to breeding of animals of the same family that are more remotely related than in the case of inbreeding.

The Pure-bred Sire. — The use of the " pure-bred sire " is one of the shortest cuts to improving the live stock of any community. The value of the pure-bred sire in improving common stock is well shown by the following tabulation from Davenport's " Principles of Breeding."

TABLE SHOWING APPEARANCE OF PURE BLOOD AND DISAPPEARANCE OF IMPURE BY USE OF PURE-BRED SIRE

GENERATION	SIRE % PURITY	DAM % PURITY	OFFSPRING	
			% Purity	% IMPURITY
1	100	0	50	50
2	100	50	75	25
3	100	75	$87\frac{1}{2}$	$12\frac{1}{2}$
4	100	$87\frac{1}{2}$	$93\frac{3}{4}$	$6\frac{1}{4}$
5	100	$93\frac{3}{4}$	$96\frac{7}{8}$	$3\frac{1}{8}$
6	100	$96\frac{7}{8}$	$98\frac{47}{64}$	$1\frac{17}{64}$

This table means that if grade and pure-bred animals of the same breed are mated, consistent improvement is made by the infusion of pure blood.

After six generations there is less than 2 per cent of impure blood in the offspring. This offspring, even though possessing many of the characters of the pure breed, is not a pure-bred and cannot be registered in our American Herd Books. There is no possible way to " grade up " common stock to become absolutely pure bred.

Breed Associations. — Every breed of live stock has its breed association made up of the men who direct the improvement of the breed. The association agrees upon what the type of the animal should be and points out the deficiencies for correction and the good points which the breed possesses. The active associations offer prizes at

the leading shows for the best animals of the breed. They also lay down rules for the registration of animals.

At some of the principal shows and exhibitions, money, set aside by the associations, is used for futurity prizes. Animals to compete for futurity prizes must be nominated some time in advance of the show. This encourages the breeder to strive to get the best breeding stock and to take the best possible care of the progeny.

Registers of merit or advanced registers are instituted by the dairy cattle breed associations. The purpose of these associations is to encourage high production of milk and butter fat and to keep track of the best producers, so that prospective purchasers may select animals from good ancestors, and breeders may breed more intelligently and effectively.

Tests for advanced registration are of two kinds: official and semi-official. The official test lasts for seven days. In this test the tester visits the farm, sees that the cow is milked out dry, sees the milking before the test begins, and then stays on the farm during the entire test, watches every milking, weighs the milk, and makes a butter-fat test. The semi-official test covers one year, or as long as the lactation period of the cow lasts. A representative of a state agricultural college comes to the farm once every month, on days unannounced to the owner, and remains for two days. All feed as well as the milk is weighed and recorded. The butter-fat content of the milk is also found. The weighing of the milk on the other days of the month, and the two days' test of the quality of the milk, is taken as the record for the month.

The table on the opposite page sets forth the Advanced Register requirements of the different dairy breeds.

Requirements for Admission to the Advanced Registers of Breed Associations

Age	Guernsey [1]	Jersey [1]		Ayrshire [2]		Brown Swiss		Holstein [2]
	Year Record	Seven Day Record	Year Record	Year Record		Year Record [1]		Seven Day Record
	Pounds of Butter Fat	Pounds of Butter Fat	Pounds of Butter Fat	Pounds of Milk	Pounds of Butter Fat	Pounds of Milk	Pounds of Butter Fat	Pounds of Butter Fat
2 yrs.	250.5		250.5	6000	214.3	6000 [1]	222 [1]	7.2
3 yrs.	287.0	12	287.0	6500	236.0	6430	238.5	8.8
4 yrs.	323.5		323.5	7500	279.0	7288	271.3	10.4
5 yrs.	360.0		360.0	8500	322.0	8146	304.2	12.0
6 yrs.						9000	337.0	
Requirements increase each day by pounds	0.1		0.1					.00439
Kind of test used	Semi-official	Official	Semi-official	Semi-official		Semi-official		Official

[1] The age is taken from the time of beginning of test.
[2] The age is taken from the time of freshening.
The record must be made within one lactation period.

The Holstein Association admits to advanced registry by official test on the seven-day record of the cow. If the cow qualifies in the seven-day test, she may be run for the year, and the year's record will be published. The Jersey Association admits cows to the advanced register by either official seven-day test, or by the yearly semi-official test. The Ayrshire and the Brown Swiss Associations admit cows to advanced register by the yearly semi-official test only, but they may be admitted on either their milk or their butter-fat production. The Guernsey Cattle Club admits cows to advanced registry by semi-official test only, and on the year's butter-fat record only.

Advanced registry systems have served to stimulate competition among different breeds of cattle, and as a result some very remarkable records have been made. Not many years ago the idea that a cow could produce more than 1000 pounds of butter in 12 months seemed pre-

Fig. 97. — Guernsey cow.

posterous. Now there are many cows on record that have made over 1000 pounds of butter. Some of the cows that have made good records are listed in the following table.

SOME WORLD'S RECORD COWS, JANUARY 1, 1919

NAME OF COW	BREED	LENGTH OF RECORD	POUNDS OF MILK	% TEST	POUNDS OF FAT
		Days			
Duchess Skylark Orensby . .	Holstein	365	27,761.70	4.34	1205.09
Finderne Holinen Fayne . . .	Holstein	365	24,612.8	4.53	1116.05
K. P. Pontiac Lass, 106812 .	Holstein 5–5–20 [1]	7	585.5	6.03	35.32
Creamelle Vale, 73357 . . .	Holstein 7–9–0	365	29,591.0	3.12	924.68
Sophie's Agnes .	Jersey	365	16,212.0	6.12	1000.87
Murne Cowan .	Guernsey		24,008.0		1098.18
May Rilma, 22761	Guernsey 6–4–16	365	19,673.0	5.45	1073.41
College Bravura 2d, 2577 . .	Brown Swiss Full age	365	19,460.6	4.10	798.16
Lily of Willowmowe .	Ayrshire	365	22,596.0	4.23	955.56
Pear	Red Poll		13,160.6		606.8
Rose of Glenside	Shorthorn	365	18,075.2		624.76

[1] Age at which record was made.

NOTE: To find the butter production add $\frac{1}{6}$ to the amount of butter fat.

Test Associations. — A great deal of improvement in dairy cattle is being made throughout the country by the establishment of "Test Associations." In these associations the dairymen of a community band together, and employ a man to go from place to place and weigh and test the milk at each farm once a month. The feed is also weighed. The farmer weighs the milk the rest of the month, and the monthly test is taken as the average for

the entire month. From the data thus obtained the farmer is able to judge the profitable and unprofitable cows in his herd. This makes it possible for him to improve his herd systematically. It is not necessary that the cows be pure-bred or that they belong to any particular breed of cattle. The work is educational, and the results obtained by the different associations have done much to improve dairying.

Subsidizing Sires. — Great improvement in the horse industry has been made in France and Belgium especially by subsidizing the good sires. If a stallion is especially good, the government pays the owner a bonus so that it will be to his interest to keep the animal in the country, otherwise the best horses would be exported. By this arrangement the standard of the horses of those countries is kept high. A similar plan is worked out in Ireland. The government owns good sires and places them in certain communities. At the Agricultural College at Glasnevin fine herds of cattle and hogs are maintained. The young sires produced here are sold to the good breeders at a price that is much less than the real commercial value of the animal. The breeder must agree to return the animal when its period of usefulness on that farm is over. These methods are working incalculable good in Great Britain and other European countries.

Other plans for improving live stock are in use in this country. Breeders' associations in certain localities have done much good. Associated effort makes it possible for the small breeder to get his stock before the public more effectively than he can alone. Prospective purchasers would rather go into a community to purchase than to go to any one breeder, because if there are several breeders

in the same community, a great deal of time and money that would be used for traveling is saved.

On the islands of Guernsey and Jersey, importation of live animals, except for immediate slaughter, has been prohibited for many years. Prizes for the best stock are awarded annually by the local breeders' associations. The result is that their cattle have been kept pure in breeding and the purchaser is sure of it. The possibility of introducing disease has also been eliminated.

Stallion Enrollment. — One of the most effective methods of live stock improvement in this country is the enrollment of stallions, which was established in Wisconsin some years ago and has since been adopted by many progressive states in the Union. This has the effect of eliminating the unsound and unfit, so that only the best types are allowed to perpetuate their kind.

EXERCISES

1. Do you practice line breeding or crossbreeding on the home farm?
2. Do you keep herd records of any sort?
3. Has the trotting horse been improved by the use of records? In what way?
4. Do you know of any one who is now making use of records to secure live stock improvement?
5. Is crossbreeding successful with any class of animals?

HOME PROJECT

Keep milk, butter fat, and feed records of the animals in the home dairy herd, with a view to selecting those best suited for breeding purposes.

CHAPTER XIX

FARM POULTRY

THE hen on the farm may be characterized as the "penny-saver." Each individual hen accomplishes little, but the aggregate saving of a flock of hens is a matter of considerable importance. No other animal is more economical in the consumption and assimilation of food, or can utilize waste products to better advantage.

The Farm Flock Should Be of Pure Breeds. — As the pure-bred animal, which has been especially selected and raised for some definite end, will excel a mongrel or native animal in the special kind of performance for which it is bred, so a pure-bred Leghorn, Plymouth Rock, or Rhode Island Red hen will lay more eggs than a mongrel or scrub hen, because she has been specially bred for this purpose.

But the desirability of raising pure-bred poultry does not end with the gain in number of eggs. Pure-bred market fowls are uniform in appearance, have the same color of skin and legs, the same shape of breast and weigh about the same number of pounds each; consequently the carcasses of pure-bred fowls sell for more on the market.

Pure-bred fowls utilize their feed to better advantage; for the more highly bred an animal is the less food it requires to produce a given product. It has often been stated that pure-bred hens do not require any more to keep them than common or scrub stock. Besides, they have the power

Fig. 98. — White Plymouth Rocks.

of turning their feed into a fancy product at a greater profit to the poultry breeder.

Buyers of spring chickens readily pay more for a coop of uniform broilers than they will for a coop containing the same number of nondescript fowls of various colors and shapes, because pure-bred chickens fatten more quickly and more uniformly and sell for a higher price.

Care of the Flock. The farm flock should be comfortably housed and well fed. The hens should be confined within definite bounds so that, while they are not crowded and hampered, yet they will not have an opportunity to run about the farm, wasting energy, losing eggs, and being a general nuisance. While exercise is necessary to the best health of the poultry, it should be intelligently restricted. During the breeding season, however, it is well to let the breeders have plenty of exercise.

Two Houses Desirable. — On the average farm the pullets are housed with the old hens. When the young pullets are put in the same house the old hens usually annoy

and frighten them so that they cease growing and developing eggs. For this reason it is desirable to have either two poultry houses or one house so divided that the old hens may be kept in one compartment and the pullets in the other.

Poultry House. — The farm poultry house must be dry at all times, with a tight roof which keeps out rains and

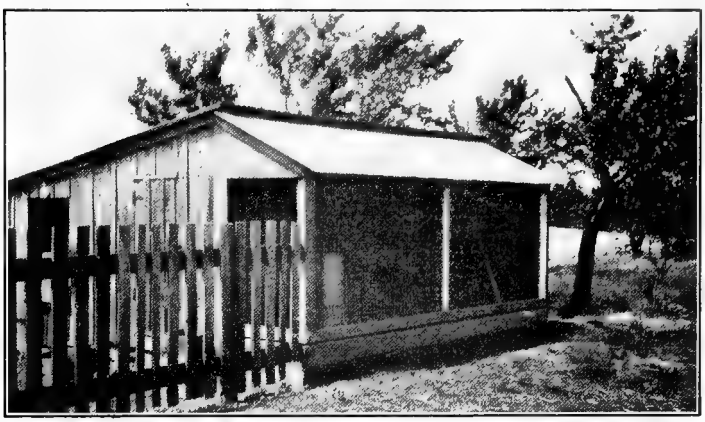


Fig. 99. — Shed type of poultry house.

melting snows, and walls proof against driving storms. The floor must be sufficiently high above the natural surface of the ground to prevent water from running over it. In most locations the floor should be raised so that it is from six inches to a foot above the natural level of the ground.

Air and Light Necessary. — The poultry house should have plenty of light, and should furnish an abundance of fresh air without draft. It should be sufficiently warm so that the hens are not subjected to sudden and extreme changes of temperature, and so arranged that it can be easily and perfectly cleaned.

Two Types of Houses. — There are two general types of houses; namely, the colony house or disconnected unit, and the continuous, or connected type. The latter is really a multiplication of colony houses set side by side under a single roof.

The Colony House. — It is claimed that the hens do better in small flocks than in large groups. Moreover, small houses holding from twenty-five to fifty hens each can be scattered about the farm and moved from field to field as the crops are rotated. This type of house is in special favor in places where the land is too rough for economically building long continuous houses. It is by all odds the best type for the general farmer.

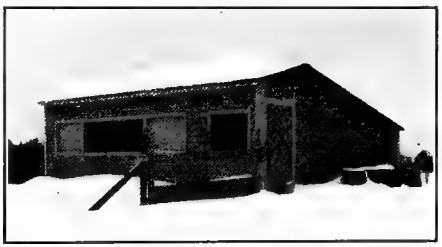


Fig. 100. — Outside of a poultry house in winter.

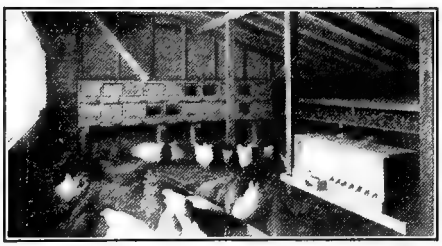


Fig. 101. — Inside of poultry house shown in Fig. 100.

Amount of Floor Space per Hen. — From three to four square feet of floor space per hen is sufficient. The smaller the house the greater should be the allowance per hen, for the reason that the total area over which one hen can roam is very much greater in a large house.

Amount of Yard Space per Hen. — Ten hens can very easily be kept in a yard sixteen feet square, if there is another yard of the same size in which they can be alternated

occasionally, and some green crop grown thereon for the purpose of renovating the soil. The same ten hens can be confined in a space ten feet square if the soil be spaded and renovated frequently. It is better to err on the side of too much space than too little. A safe rule is to make the yard so large that the hens will never kill the grass on it, and then have another yard of the same size into which they can be turned on alternate months.

Renewing the Farm Flock.— It is no easy task to set a hen properly, and many eggs are spoiled annually because people are careless or ignorant in this respect.

First of all, a cozy nest, neither too large nor too small, should be provided. If too large, the eggs will be scattered; if too small, the hen is likely to break the eggs in getting on and off the nest. A box approximately fifteen inches square by eight inches deep is an acceptable size. Earth may first be placed in it, then chaff or cut hay on top of this. The nest should be hollow so that the eggs will not roll around. A quiet hen should be selected, not too large, and placed on a setting of china eggs for a few days to get her accustomed to the nest.

A fussy, flighty hen is a nuisance and ought never be used. If the hen breaks an egg and smears the others, they must be taken out and washed with warm water, for smeared eggs will not hatch. Too many eggs should not be placed in one nest. A far greater percentage of chicks will hatch if a setting of eggs is put under two hens than if all are put under one hen. In cold weather nine eggs is sufficient. The chicks may be placed with one hen after they are hatched.

The nest box should be so arranged that it can be closed except when the hen is to be taken off for feeding and

watering. Closing the nest box prevents other hens from disturbing the sitter or rats from stealing the eggs.

Care of the Sitting Hens. — Best results are obtained when the sitting hens are fed only corn in addition to water and grit. Many poultry men provide a dust bath in the room so that the hen can dust when she is off for feeding, but this purpose can better be accomplished by thoroughly dusting the hen with insect powder before setting her and once or twice during the period of incubation.

Care of Young Chicks. — When the chicks are hatched it is best to raise them artificially, after the third or fourth day. If it is desired to use the hen as a brooder, she should be confined in a slatted coop so that the chicks can wander about and return to the hen for warmth and at night. Chicks do not do so well if allowed to run with the hen. The general care and feeding of the chicks hatched with hens should be the same as for brooder chicks, described later.

Beginners' Mistakes. — It is common for beginners to expect too many chicks from a setting of eggs. A hatch of 50 per cent of the eggs is good and 75 per cent is very good indeed.

A point that beginners do not always understand is that

Fig. 102. — Old-fashioned coop that has many advantages.

CHAPTER XX

INCUBATION AND BROODING

Artificial and Natural Incubation Compared. — Hens are used to incubate only on the most limited scale. In fact, artificial incubation has been so improved and perfected in its methods that, all things considered, the work can really be done more satisfactorily by first-class machines.

Another advantage of artificial incubation is that by means of it one can produce greater numbers of chickens than would be possible if it were necessary to depend entirely upon hens for incubation. Then, too, by hatching with a machine one controls conditions; there is no hen to leave the nest at night; none of the eggs become broken and smeared over the remaining ones; the nest does not become soiled. In every way artificial methods admit of better sanitary measures, so that the chances for producing stronger, healthier chicks are very much greater. The incubator can be thoroughly disinfected at the beginning of the hatch, and it stays so until the chicks have popped from the shells. Incubator chicks are free from lice, and can be kept so until they are large enough to run at large with other poultry, when the lice will do little harm.

It is a great satisfaction to care for a flock of artificially hatched chickens, because the brood is so much larger. With the use of the proper appliances 500 artificially

hatched chicks can be cared for just as easily as five broods of hen-hatched chicks.

When incubators are used the directions furnished with the machine for its operation should be closely followed.

Selecting Eggs for Incubation. — Although eggs that are not uniform in size, shape, or thickness of shell apparently hatch as well as more nearly perfect eggs, provided all of a kind are put into the same machine, it is inadvisable to use them. The unsafe feature of promiscuous selection lies in the fact that the eggs of poor shape and shell have been laid by hens with whom the characteristic of producing eggs of this nature is dominant; and so the chicks hatched from these eggs show a tendency to lay eggs of poor shape. Then, too, eggs of different sizes and different thicknesses of shell do not respond to the heat of incubation so evenly as do eggs that are more nearly uniform in size and shell.

It is advisable but not necessary to test out infertile eggs after the sixth or eighth day. It is advisable because removing them obviates crowding at hatching time.

Effect of Chilling on Incubation. — Eggs should not be used for incubation after a sudden drop in temperature. Where thousands of eggs have been incubated, it has been observed that those collected on the day of a sudden change in temperature, or a day or so afterward, do not hatch so well, even when they have not been chilled, as those collected during the period when the temperature was more nearly uniform, regardless of the degree of coldness. It is inadvisable to hold eggs which are to be incubated, for any length of time. The only time when it is advisable is when the flock is extremely small and the incubating facilities are limited.

Effect of Age on Incubation. — It has been stated that eggs should not be held for any great length of time. However, if it is found necessary to hold the eggs from a week to ten days the eggs should be kept in a dry, cool place, free from excessive air circulation. The best results will be obtained if the temperature of the storage room does not fluctuate beyond the extremes of 50° and 60° Fahrenheit.

Effect of Cleanliness on Incubation. — No egg should be used for incubation which was excessively soiled in the nest; in fact best results are obtained where no cleaning has been required. Where eggs are incubated later than the first of April, in middle and northern latitudes they should be disinfected with a weak solution of crude carbolic acid. Farther south, disinfection should be practiced earlier in the year. The trays and all removable parts of the incubator should be thoroughly scrubbed with a three per cent solution of the above disinfectant, using a stiff vegetable brush, and every portion of the interior thoroughly sprayed with the same solution. Every possible means should be used to make the incubator aseptic before the eggs are placed in it. The eggs should be put in the machine while it is still surcharged with this antiseptic vapor. Small pans containing a weaker solution of the above disinfectant may be placed under each tray of eggs, so that throughout the entire hatch the eggs are kept in as nearly an aseptic atmosphere as is possible.

Effect of Temperature on Incubation. — When the temperature can be kept uniform, the resulting hatches are more nearly uniform and the chicks stronger than when a fluctuating temperature is maintained throughout the hatch. The proper hatching temperature is 102° to 103° Fahrenheit.

Testing the Thermometer. — In starting the hatch, no thermometer, however good the make or however reliable its past history may be, should be used without first testing it by comparison with a standardized thermometer. It has been found best to recalibrate or test the thermometer at the beginning of each season, as the readings change from year to year. This is due to the "seasoning" of the glass from which the thermometer is made.

To Test and Recalibrate an Incubator Thermometer. — Provide a large shallow basin of water heated to 110°, place a standardized thermometer and one to be tested side by side in the water with the mercury bulbs about one inch below the surface; compare the two until water has cooled to 96°, making a note of the comparative reading on the two thermometers. Then mark the correction, if any, on the incubator thermometer.

Effect of Moisture on Incubation. — Close watch needs be kept on the relative humidity of air in the machine. Best results are obtained when the relative humidity is not less than 50 per cent. With most machines the addition of moisture is necessary. The surest and safest way to maintain humidity is by the use of the wet sand tray. The water used for moistening the sand should contain about one per cent of some volatile disinfectant. In order to prevent the lowering of temperature within the incubator, this water should be brought to 102° Fahrenheit before being added to the trays.

What Constitutes a Good Hatch. — The real test of the hatch is not the fertility but the number of chicks resulting from the total number of eggs incubated. The total number of chicks should not mean the total number that succeeded in freeing themselves from the shells without help,

but should include only such chicks as dry off nicely, are undeformed, bright, and have "shape." It is a mistake to attempt to raise all of the chicks that hatch. The test of a hatch is the number of perfect chicks taken to the brooder which require no special care over and above what is given to the average of the flock to make them thrive and grow. A poor hatch may be due to poor eggs, weakness of the breeding stock, lack of proper care of the eggs before placing them in the incubator, or bad management of the machine.

Brooding Young Chicks. — The term brooding is meant to include the warming, feeding, care, hygiene, and comfort of young chicks. Eternal vigilance and regularity are the price of success in this work. There should be stated periods for cleaning and disinfecting, and then one's best judgment should be used to detect any additional need.

Before a chick is hatched, one should decide what to feed; at what hours to feed; how often to clean; how frequently to disinfect; with what to disinfect; how soon to feed the chicks; and at what temperature to operate the brooder. Then after once having settled on this routine of procedure, making use of the best information and observation in formulating it, follow it out intelligently, thoroughly, and persistently.

Artificial Brooding Preferred. — Chicks should be brooded artificially wherever it is possible, for by so doing all conditions can be kept under control; more chicks can be handled by one person, and sturdier, more rapid growth can be obtained. If the brooder is cleaned and disinfected before incubator chicks are placed in it, all possibility of their becoming lousy while of a tender age is eliminated.

The brooder should be thoroughly heated and dried out several days before the first chicks are placed in it. Then a slight sprinkling of sand should be spread over the floors to facilitate cleaning and to supply the chicks with some form of grit. A constant supply of clean, cool water, regular heat, and fresh air should be maintained. The temperature under the hover should always be higher than is required to keep chicks comfortable, so that at any time they may go under the hover and be warmed quickly without crowding. During the first three weeks of the chick's life the hover room and feed room of the brooder should be scraped, scrubbed, and cleaned frequently. A 5 per cent solution of a strong disinfectant is used for this purpose. Great care should be exercised in order that the chicks may receive their food free of contamination from the droppings or floor litter.

Sanitary Precautions Necessary. — On the most successful poultry plants strict sanitary measures are observed throughout the period of brooding, so that up to the time the chicks are taken to the open range or, if brooding is done with hens, up to the weaning time, there is no chance for disease to creep in. The brooders are arranged so that each compartment can be quickly and easily cleaned and disinfected. Whenever a dead chick is found, all the litter should be removed and the brooder cleaned and disinfected.

Feeding Brooder Chicks. — In feeding, an effort should be made to attain the happy mean between the two extremes of underfeeding and overfeeding. As a rule more chicks are killed by overfeeding than by underfeeding, and the overfeeding in most cases starts by feeding too soon, while underfeeding results in small, weak chicks. Forty

hours after the chick has dried in the incubator is soon enough to begin feeding it, and it is safer not to feed it until it is seventy-two hours old than to feed it when it is only twenty-four hours from the shell. It is important that artificially hatched chicks should be transferred from hatcher to brooder in the evening, after dusk, so that they will stay under the hover. After they have nestled under the warm hover for a night they learn the purpose of it, and will instinctively return to it at all hours when they require warmth.

There are almost as many good methods of feeding chicks as there are good poultrymen, so that it is only necessary to give the following simple and typical method which exemplifies the principles involved.

The first feed consists of a mixture composed of eggs which have been boiled hard and thoroughly ground, shells and all, with bran and pinhead oatmeal. The proportion of eggs to bran and meal should be such that when rubbed together the moisture of the egg will be taken up by the other ingredients. When feeding is commenced forty to forty-eight hours after hatching, the chicks should have only as much of this mixture as they will eat up quickly and greedily in ten minutes, five times daily. Care should be taken to see that each chick is taught to eat. It is very essential that the chicks have plenty of grit and water for the first few days. It is also well to mix a small amount of charcoal with the egg and bran. After the first or second day, when it is apparent that all of the chicks have learned to eat, a grain chick feed should be given them at two of the feeding periods the first day, and the egg mixture diminished, until at the end of the first week they are receiving only one feeding of the egg mixture, daily at noon.

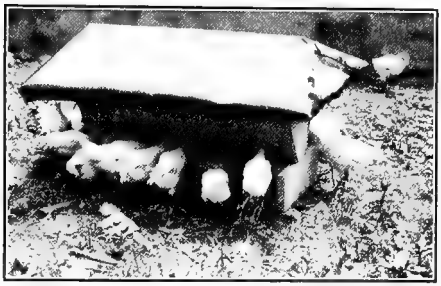


Fig. 103. — Self-feeder for chicks.

A good grain feed is made by mixing equal parts of cracked wheat, pinhead oatmeal, and finely cracked corn.

Beginning the third week, the noon feeding of the egg mixture is changed to a mash mixture made of ten pounds of bran, eight pounds of corn meal, eight pounds of middlings, two pounds of alfalfa meal, and three pounds of good clean meat scrap. Wheat bran with 10 per cent of meat scrap may be substituted for this mixture. When this mash feed is first given it should be slightly moistened with warm water or skim milk, gradually reducing the amount of moisture until the chicks have learned to eat the meal mixture dry. It can then be left before them. If skim milk can be had for mixing the mash, the meat may be omitted. As soon as the chicks have learned to eat the dry mash, the milk may be given to them in a drinking vessel.

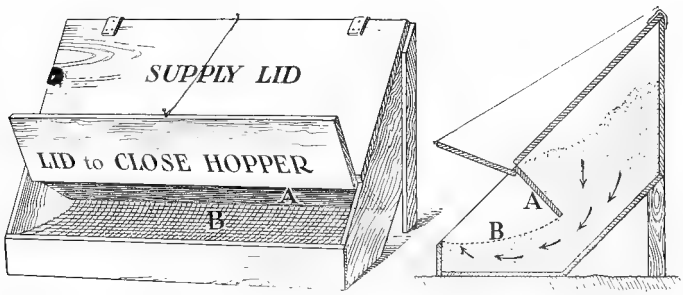


Fig. 104. — A mash hopper.

After the third week the grain food is reduced to three times a day, and coarser grains are added to it until at the end of the fifth week they are receiving about equal parts of chick feed and the whole grain, such as whole wheat, kaffir corn, and small cracked corn. The amount of fine grain or chick feed is then reduced until they are receiving all coarse grains.

The chicks should be allowed to stay in the brooder house until they are thoroughly feathered and the sexes separated. In this way every possibility of their becoming chilled while of tender age is avoided. By having the indoor runs roomy and by supplying fresh untrampled green feed in the form of lawn or rye clippings, sturdier and more rapid growth is obtained, and the mortality is also much less than if the chicks are allowed to run where they choose and are compelled to search for a part of their food.

A Good Brooder House. — A good type of brooder house is one built 24 feet wide. It has a sunken passage 4 feet wide throughout its entire length. It is heated with two hot-water brooding systems. The hover rooms are 3 feet square and open into runways 3 by 7 feet.

All floors are of concrete. All screens, doors, and partitions have removable frames, which are interchangeable, so that any one set of frames can be used for any of the brooders throughout the house.

The watering is done in galvanized iron troughs, located outside the hover rooms and placed in such a way that the chicks drink through openings in the back wall. By this arrangement the water is kept pure and clean.

Near the center of the building is a kitchenette in which the food is prepared for the chicks during the first few weeks of their lives.

No other material is so good and economical for a brooder house floor as concrete. It is rat proof, draft proof, and permits of thorough and easy cleaning.

The Small Flock Best. — Whether chicks are raised on a large or a small scale it is almost imperative that they be started in small flocks if one expects to raise a high percentage of them. The reason for this is that the little chicks do not know how to eat wisely, and must be taught. When they are placed in large flocks some of them are sure to be neglected or overlooked, and die as a result, after the third or fourth day. If they are started in small flocks each individual's chances for proper attention increase in direct proportion to the decrease in the size of the flock.

For the first week the chicks should be placed in flocks of from fifteen to twenty-five; and at the first few feeding periods the attendant should see that each separate chick has tasted its food and submerged its beak in the water, even if they have to be picked up one at a time and fed and watered by hand.

This teaching period may be shortened and facilitated by introducing one or two older chickens, free from lice and disease, into each flock. After the chicks are six or seven days old several shovelfuls of moist earth or muck are thrown into the corner of the runs for them to pick over. It is found that they will eat a great deal of this, as it apparently fulfills some whim of appetite or body need which cannot be supplied in the feed, especially where the chicks are closely confined to yards.

At the end of two or three weeks, and after they have learned to take care of themselves, the number in a flock may be increased.

Many beginners have difficulty in raising late-hatched

chicks, a not uncommon happening even with experienced poultrymen. This condition is explained by the fact that in order to raise chickens successfully the number which is placed in a flock must be diminished as the season grows later, because in any climate where the nights are markedly colder than the days, it matters not what system of brooding is used, the chickens crowd in the brooders and trample each other to death.

Range Raised Chicks. — It has been said that constitutional vigor is nature's stamp of approval upon man's effort at animal breeding and improvement. There is no surer way to foster this desirable character than by developing the fully feathered chicks on free range after they leave the brooder.

The excellent results obtained from range raised chicks illustrate the desirability of putting into the young animal solid bone and sturdy muscle that can come only from unhampered, spontaneous, and instinctive exercise, the exercise of the young animal at play. At ten or twelve weeks the sexes should be separated and the females taken to the range, where they are given liberty to run over fields of growing crops, or under the shade of wood pastures. The cockerels should be carefully inspected for individuals that give promise of developing into superior breeders, and these should be either sold at once or taken to a separate range. The remaining ones should be fattened and sold as broilers.

On the range the chicks should be placed in flocks of one hundred to two hundred and fifty for each range house. They should be allowed to run in small temporary yards for a few days until they learn to go in and out of the house. After this they may range at will, the members of each flock returning at night to their respective houses.

EXERCISES

1. Why select eggs of uniform size, shape, and shell for hatching purposes?
2. Why are white-shelled eggs more easily affected by heat than brown-shelled eggs?
3. Why should soiled eggs be rejected for incubation?
4. Why should eggs for incubation not be held for several days, particularly in warm weather?
5. What is the purpose of disinfection in brooding chicks?
6. Why is it important to keep the air in an incubator moist?
7. Why does sprinkling the eggs in the incubator cool them?
8. Give some good methods of disinfection.

HOME PROJECTS

1. What method of incubation is used at your home, — natural or artificial? Keep count of all eggs set by natural method, the total number of chicks hatched, and calculate the percentage of hatched eggs.
2. Get permission to take charge of the incubator and produce a hatch of chicks, following directions as closely as possible, and calculate the percentage of eggs hatched.
3. Get permission to take full charge of all eggs set and hatched by the natural method at home, if the incubator is not used. Calculate results.
4. Feed young chicks for broilers, and by records ascertain actual cost of production.

CHAPTER XXI

FEEDING, CARE, AND MANAGEMENT OF LAYING HENS

When to Feed. — For heaviest production mature stock should be fed at least three times daily throughout the year, and during certain seasons may be fed five times a day. The first feed given in the morning, regardless of season, is generally a grain mixture, scattered on the floor in deep straw litter. This first feeding should take place at seven o'clock in the morning, or earlier according to season, but always at the same hour, and the amount

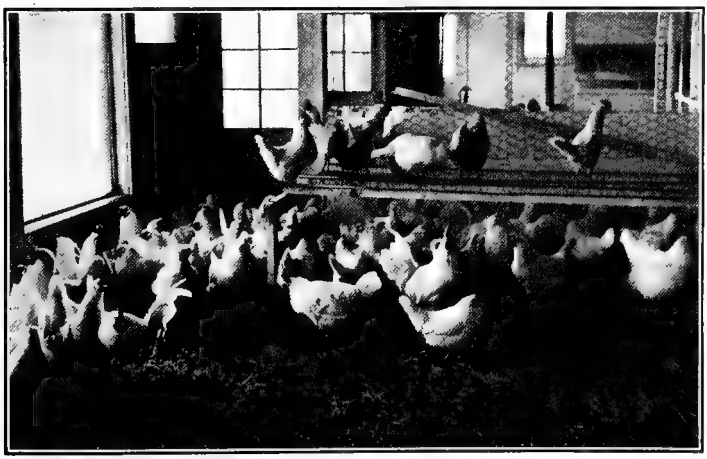


Fig. 105. — There should be plenty of litter on the floor.

of grain should be so regulated that the fowls will clean it up in two or three hours.

How to Feed. — In the spring and summer time, when it is possible for the hens to get green feed in the yards, no other feeding is necessary before noon except filling troughs with skim milk, or buttermilk if it can be had. If, however, there has been a long drought and the vegetation in the yards is withered and parched, green alfalfa or alfalfa hay, cut in short lengths and soaked in water long enough to swell and become succulent, may be placed in the troughs at about ten o'clock in the morning.

At noon more grain is scattered in the litter, and again at four o'clock in the afternoon. At the last feeding an effort should be made to feed just a little more than the hens will clean up, so that there will be something left in the litter for them to start work on again early in the morning.

Importance of Drinking Water. — One of the most important things about caring for hens is to see that they always have plenty of clean, fresh drinking water before them. More than 65 per cent of the egg is water. Water also makes up 55 per cent of the hen's body. Unless a hen has water she cannot produce eggs, nor can she properly digest food. Many a hen, otherwise well fed, fails to lay because she is compelled to go without sufficient water. When laying freely, a flock of five hundred hens will require from forty to eighty quarts of water per day. The warmer the weather, the more water required. The more eggs that are laid the more water is required. Small eggs usually result from a shortage of drinking water or from the fact that the water is so cold that the hens cannot drink their usual amount.

Mineral Matter Necessary. — Laying hens should have more mineral matter than is furnished in ordinary foods. For this reason it is important that crushed oyster shells be supplied in abundant quantities. The desire for mineral matter in some form frequently causes the hen to eat her own eggs. A flock of hens may be broken from this habit by scattering a few china eggs on the floor.

Grit Essential. — Although on most farms there is an abundance of small bits of limestone or gravel about the yards, still grit should be supplied artificially in the form of crushed quartz, or " chit." It must not be forgotten that the only teeth the hen has are those given to her in the form of grit.

Inducing Hens to Eat. — The poultryman's problem is to induce the hen to eat an abundance of raw material so that she can turn out a larger quantity of manufactured product, rather than to see how small an amount of food he can keep her on.

Hens will eat when the attendant is around and makes pretense of scattering grain in the litter. They have a curiosity which causes them to peck at everything brought into the room, and the more things that are brought in, the better the chances are that they will eat. A good many times the quantity of grain scattered at the noon feeding is negligible, but the mere pretense of scattering grain starts the hens to scratching and singing, a condition most conducive to egg production. It has been said, and truthfully, that the " singing hen is the laying hen."

Variety Desirable. — Although standard mixtures should be used, feeding should not be confined to any particular mixture nor to any special ingredients. An effort should be made always to have the food palatable and the

ration of the right proportion, but no opportunity should be lost to take advantage of seasonable fluctuations in the market price of poultry food products. If the price of corn is proportionately much lower than that of wheat, then corn should be used in greater quantity and the ration balanced by using larger proportions of by-products in the form of bran, wheat middlings, oil meal, and the like. However, the general principles underlying the compounding of a good ration for farm animals should not be lost sight of.

Green Cut Bone. — When fresh and untainted, green cut bone can be fed with safety and profit in the proportion of one half ounce daily or one ounce every other day per hen. When tainted or when fed in too large quantities it may cause diarrhœa, oviduct eversion, or poisoning.

Time to Feed Different Ingredients. — The time to feed whole grain is the first thing in the morning and the last thing at night, and in some cases for the noon meal.

If a wet mash is fed, it should never be given before ten o'clock and preferably at noon. The physiological reasons for the above statements are clear: grain in the morning induces exercise; the mash fed in the middle forenoon is a stimulant. Bran has a laxative effect, is a regulator and makes a valuable addition to finely ground foods as it gives them bulk and porosity, making it easier for the digestive fluids to permeate the mash, thus preventing poor digestion and consequent poisoning and general ill health.

Cooking and Grinding Poultry Foods. — It is reasonable to suppose that cooking poultry feeds makes them more digestible, just as cooking food for human consumption does. This holds true with starch foods better than with protein foods. The digestion of ground feed requires less energy and takes place much more rapidly than the digestion of

unground feeds. By grinding grain in a mill we save the fowl the necessity of doing the grinding. However, this practice cannot be continued indefinitely; if it were, the fowls would not get sufficient internal exercise to keep them in the best of condition.

STANDARD RATIONS

20 pounds kaffir corn
20 pounds wheat
30 pounds cracked corn
15 pounds oats
10 pounds barley
5 pounds sunflower seed

This ration may be used as a standard grain ration at all seasons of the year. Its value is not lessened by increasing or decreasing the amount of kaffir corn and by decreasing or increasing the amount of cracked corn accordingly. These two feed stuffs can be used interchangeably, or the amount of corn may be reduced and the amount of wheat increased so that frequently poultrymen may feed the following ration:

60 pounds wheat
30 pounds corn
10 pounds oats

A meal mixture for fattening broilers may be made up as follows:

20 pounds corn meal
20 pounds wheat middlings
20 pounds ground oats
6 pounds meat scrap

This should be mixed with buttermilk to a thin batter and fed twice daily.

Special Care Necessary. — No pains should be spared to keep the hens comfortable and happy. During the molting season and on days when it is cold or damp and the hen's appetite is not likely to be keen, if the attendant will bring to her in the middle of the forenoon and the middle of the afternoon a small amount of hot savory mash, she will welcome it and eat it with such avidity that the whole room will for a moment be transformed into conditions of springtime. Such singing and scratching will be set up as could be duplicated naturally only in the spring of the year. This hot mash in winter not only warms the hen for the moment, but if composed of the right ingredients will so stimulate her appetite and the flow of digestive fluids that she can be made to eat a large amount of other foods and egg production will be increased correspondingly.

In feeding a hot wet mash no attempt should be made to satisfy thoroughly the hen's appetite. Best results are realized when only enough is used to stimulate her appetite so that she will eat more of every kind of food. Only so much should be given at one time as will be eagerly eaten.

Inducing Molting. — It is not best to induce a molt, though this can be done by feeding short rations for a time and then feeding heavily on foods rich in protein and mineral salts. The best practice is to endeavor to get all the eggs it is possible to obtain without injury, keeping careful watch to know just when molting begins. When molting has begun a gradual change in the kinds of foods should be made to hasten the molt and make it uniform throughout the flock. The amount of protein should be increased by adding linseed meal or meat, or by increasing the amount of milk or buttermilk fed. Too much buttermilk, or pro-

tein in any form, will cause diarrhœa, and such foods should be fed with care.

Kinds of Green Foods. — Perhaps one of the best forms of green food for laying hens is stock beets. Other succulent feeds that may be given with good results are enumerated in the order of their desirableness: cabbage, turnips, potatoes, apples. Properly cured clover or alfalfa swollen by soaking equals or exceeds stock beets, but the trouble of preparation is sometimes an objection.

Sprouted oats also make good green food, but require some practice for preparation. Which of these the poultryman uses should be decided entirely by availability and cheapness. Alfalfa is frequently used on account of its being an easy matter to store a sufficient supply without fear of deterioration.

Feeding the Range Stock. — No particular effort should be made to force the young stock on the range other than to keep them growing rapidly. As a rule they should be given grain of the standard mixture fed to the hens, three times daily. Occasionally wet or dry mash should be fed at noon for variety. Under most favorable conditions the ranges are sufficiently supplied with running water, and furnish an abundance of grit or small stone.

When their combs begin to redden and develop, the pullets should be taken to the laying houses and made comfortable before cold weather begins. They should then be fed for early and continuous egg production.

Essential Points of a Good Ration. — According to an eminent authority "the greatest profit is realized when an abundance of food best suited to produce the greatest vigor of the reproductive system is available to the hens." The essential points of a good ration for fowls are that:

(*a*) It should be composed of foods every one of which the fowls like.

(*b*) It should contain a sufficient quantity of digestible nutrients to supply the needs of rapid growth and large production.

(*c*) It should have enough bulk to enable the digestive secretion to act quickly upon it.

(*d*) It should not contain an excess of indigestible fiber (such as oat hulls, corn bran, and alfalfa stems).

(*e*) A certain proportion of the ration should be of whole grain in order to provide muscular activity of the digestive organs. About one third of the ration should be of soft ground food for the purpose of providing quickly available nutrients to supply the immediate demand of rapid growth or heavy continuous egg yield.

(*f*) A good variety of food must be provided, in which are included grain, green food, meat, and mineral matter.

(*g*) The foods in the ration should not have an undesirable effect upon the color or flavor of the product. Onions, barnyard manure, and carrion flavor an egg. When the fowl drinks from pools about the barnyard the yolk of the egg is given an undesirable reddish color.

(*h*) The ration must provide the two classes of food nutrients, protein and carbohydrates, in such proportions that they will supply the daily needs of the fowl's system; provide sufficient and digestible protein to repair the wasted tissue with new growth, and produce eggs; and provide the proper amount of digestible carbohydrate food (starch, sugar, and fat) to furnish heat, energy, and lay on a little surplus fuel in the form of fat.

Shall the Poultryman Raise his Feed? — There seems to be some doubt as to whether persons engaged in special

poultry farming should or should not raise their feed. If one is sufficiently well versed in practice and theory to operate a poultry plant he can spend all of his time to better advantage in raising poultry than in raising feed for poultry. This, however, does not mean that areas should not be reserved for the production of green feeds. Nor does it mean that small areas should not be cultivated for the purpose of renovating the soil and at the same time growing such crops as can well be used as forage for horses or for feeding the hens.

Dust Baths. — The primary function of a dust bath is to gratify the hen's instinctive desire to dust; to keep her contented and comfortable. A secondary purpose, the value of which has been very much overrated, is to rid the hen's body of lice.

Careful observation and close investigation have established the following points:

First, the indoor dust bath, which has its greatest value in allowing the hen to dust in cold weather, when the ground is covered with snow, is generally so cold that the hen will not use it.

Second, when it is warm enough for her to use it, the air of the room becomes so dusty that it is uncomfortable for the attendant and injurious to all the flock.

Third, upon microscopical examination of the throat mucus in some cases of pneumonia, it has been found that the source of inflammation was due to dust particles imbedded in the mucus membrane.

Fourth, the hen's instinctive desire for wallowing or dusting is apparently just as thoroughly gratified by wallowing in the litter thrown upon the floor as it is in a specially devised dust box.

Fifth, hens provided with dust baths are apparently as much infested with lice as hens not so provided.

Preventing Poultry Diseases. — The old maxim that "an ounce of prevention is worth a pound of cure" is a splendid guide for the poultryman. It is far better to prevent disease than to attempt to cure it. Sanitation is the one preventive. The poultry house, the drinking vessels, and the food containers should be kept clean. The drinking water should be made antiseptic by the addition of potassium permanganate in the proportion of one teaspoonful to each ten-quart pail of drinking water, or iron sulphate at the rate of one tablespoonful of crystals to a gallon of water. Mature fowls should be given a small dose of Epsom salts in a wet mash every two or three weeks in the proportion of about five ounces to each one hundred hens.

One should not wait until the spread of disease necessitates disinfection, but should disinfect regularly. It is a good practice to apply to all poultry buildings a heavy coat of whitewash once a year, and to spray the roosts, ceiling, and walls with a good strong disinfecting solution two or three times a year. The perches, nests, and crevices about the dropping board should be sprayed more frequently.

When a sick fowl is found in one of the pens it is, as a rule, too late to attempt to cure that fowl. But it is the signal to begin extraordinary methods of cleaning, so that other fowls will not contract disease. The litter should be removed, the floor thoroughly cleaned, all the dust on the walls and crevices washed down, and then the walls and ceiling should be thoroughly disinfected.

Treatment of Infectious Poultry Diseases. — Infectious diseases may be prevented by cleanliness and proper sani-

tation. Roup, chicken pox, white diarrhœa, cholera, conjunctivitis, and vent gleet are the most common diseases of this class. While the symptoms for each of these are peculiar to the disease itself, the treatment is common. Isolate diseased fowls, kill, and burn their carcasses. In case of large losses, dispose of all fowls and start anew on an uninfected part of the farm. Heavily coat the surface of the old yards with air-slaked lime and plow under. Sow some rank-growing crop. Thoroughly disinfect and whitewash all houses, coops, and equipment.

Poultry Lice and Mites. — Body lice on poultry need not give the poultryman any serious concern, for despite all he can do there are likely to be a few on his hens. They can be partially removed by dusting the hens thoroughly with an insect powder. Repeat the dusting in ten days. If this is properly done it should give several months' freedom from the pest. The little red mite which attacks the hens when on the nest or roost is a very real enemy of the poultryman, but it can be very easily prevented and destroyed by simple and regularly executed disinfecting measures. Simple, cheap, and effective lice and mite killers are made as follows:

Liquid Lice and Mite Killer — 3 quarts of kerosene to 1 quart crude carbolic acid.

Lice Powder — 3 quarts gasoline, 1 quart crude carbolic acid; sufficient plaster of Paris to absorb thoroughly the four parts of liquid. Spread the mixture on heavy paper until all liquid has evaporated. Rub it through a screen or fine flour sifter, and it is ready for use.

Use of Lice and Mite Killer. — For body lice, paint the perches with the liquid just before roosting time; or place a piece of brown paper thoroughly saturated with this

liquid in the bottom of a tight box and confine the sitting hen in the box for ten or fifteen minutes. When this method is used the box should be covered with a bag, through which a hole is made for the hen's head, to prevent suffocation.

For mites, apply the liquid solution with a paint brush to the perches, roosts, dropping boards, and nests, and spray into all the corners and cracks of the house. One or two applications will entirely eradicate the worst infestation of vermin.

The liquid has also been used with splendid success in painting the floors of hen houses and brooders, to eradicate disease.

Use of Lice Powder. — The powder is used on sitting hens or little chicks and will cause the lice to drop off dead almost instantly. The proper method of application is to hold the fowl over the lap by the feet and dust the powder well down through the feathers, using a tin can similar to a salt shaker. The powder can be collected and used repeatedly.

Disinfectants. — Crude carbolic acid, crude creoline, or other cleansing preparations constitute cheap and effective disinfectants. Both of these mix readily with water in any desired proportion and pass through a spray nozzle without clogging.

Wherever the hands are liable to come in contact with the solution do not use stronger than 2 per cent. Where the disinfectant is to be applied with a brush or spray pump, a 5 to 10 per cent solution may be used. The following table for preparing solutions of a given strength is sufficiently accurate to be safe and effective for all ordinary purposes.

TABLE FOR MAKING SOLUTIONS OF VARIOUS STRENGTHS

TO MAKE STOCK SOLUTION — STRENGTH 10%

WATER	DISINFECTANT
5 quarts	1 pint
$2\frac{1}{2}$ gals.	1 quart
5 gals.	2 quarts

STRENGTH	WATER	STOCK SOLUTION
5%	1 part	1 part
$2\frac{1}{2}$%	3 parts	1 part
1%	9 parts	1 part

TABLE FOR MIXING SMALL AMOUNTS

STRENGTH	WATER	DISINFECTANT
1%	1 pint	1 teaspoonful
2%	1 pint	2 teaspoonfuls
5%	1 pint	5 teaspoonfuls

EXERCISES

1. What are the chief reasons for feeding poultry three times daily?

2. Of what should an egg-producing ration be composed, and why?

3. What is the purpose of the deep litter method of feeding?

4. Compound a good ration for laying hens not outlined in the text.

5. Give reasons for each ingredient in the above ration.

6. What is the function of each of the following ingredients in a poultry ration, — grit, lime, water, green food, animal food, and wet mash?

7. Why is sanitation the first requisite in the control of poultry diseases?

8. What are some good disinfectants to use around the poultry plant?

9. Is it better to burn or to bury fowls dead from disease? Why?

HOME PROJECTS

1. What poultry rations are used on the home farm? Do they supply all the necessary ingredients for meat or egg production, as the case may be? If not, try to arrange for new and better rations.

2. By means of accurate records compare the old ration with the new, either for meat or egg production. Also compare cost of each and see which is most efficient.

3. Disinfect the home poultry house and yards, using plan and mixtures given in this chapter.

CHAPTER XXII

TYPES AND BREEDS OF CHICKENS

Types of Chickens. — Poultrymen recognize two distinct types among hens, — the egg type and the meat type. In the nervous, rangy hen is found the egg type; in her plumper, less active sister, the meat type. Heavy layers have the bodies nicely placed on longer, trimmer legs than the meat type, their combs are larger, their bodies longer, and their pelvic arches broader. In fact, the two types are as truly distinct as the race horse and the draft horse, or the dairy cow and the beef animal.

Breeds of Chickens. — The most important breeds of chickens fall into three groups, based on their utility value as follows: Egg Breeds, Meat Breeds, General Purpose Breeds.

The Egg Breeds. — As suggested by the name, the egg breeds are valued primarily for egg production, though of late years the members of this group have won first place as producers of squab broilers. They are very precocious, frequently coming into laying at four and one half months, though the reasonable expectation of the keepers of this group is that the majority of the pullets will mature at five and one half months. These breeds constitute the Mediterranean group. The most popular members of this group are the Leghorns and the Anconas.

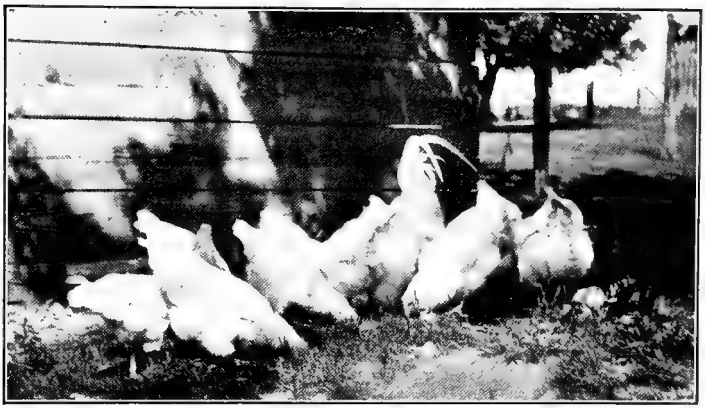


Fig. 106. — White Orpingtons.

Meat Breeds. — This group comprises only the Asiatic class, though contrary to theory more meat poultry is produced from the general purpose breeds than from the special meat breeds. This condition is probably due to the fact that the meat breeds are not so precocious as the general purpose breeds and present the difficulty of fewer eggs and hence fewer chicks. The Cochins, Langshans, and Brahmas constitute this group.

General Purpose Breeds. — This group comprises the American class, the English class, and the French class, and as indicated by the group name are valued for their dual purpose. They produce a reasonable number of eggs and are large enough for use as meat poultry. The English breeds of this group were originally valued chiefly for meat production, but the breed shape has been slightly changed by environment until in America they are regularly classed as general purpose fowls. The most popular members of this group are the Plymouth Rocks, Rhode Island Reds, Wyandottes, and Orpingtons.

A list of the general purpose breeds is as follows: Plymouth Rocks, Wyandottes, Javas, Dominiques, Rhode Island Reds, Buckeyes, Dorkings, Redcaps, Orpingtons, and Houdans.

Poultry Judging. — Poultry judging is taught by mentally comparing an individual with the ideal for that variety and entering the demerits in the schedule of points on a score card authorized by the American Poultry Association.

SCORE CARD FOR JUDGING POULTRY

With the exception of "Remarks" column, this card is arranged to conform to the card adopted by the American Poultry Association. Directions for the use of this score card are given in "The American Standard of Perfection."

.....**Date**

Exhibitor.....

Breed..... **Sex**.....

Entry..... **No. Band**..... **Weight**.....

	Shape	Color	Remarks
Symmetry			Undeveloped, Rangy, Blocky, Carriage
Weight			Under or Over
Size			Large or Small
Condition			Health, Dirty, Broken or Roughed Plumage, Scaly Legs
			Frosted, Injured, Wild
Comb			Large, Small, Serrations, Thumbmark, Coarse, Twisted
			Hollow Center, Smooth, Spike, Large, Small, Telescoped, Lopped
Head			Long, Short, Wide, Narrow, Flat, Snaky, or Gamey
			Face Pale, Red, White, Yellow, Foreign Color
Beak			Long, Short, Straight, Curved, Injured
			Light, Dark, Striped
Eyes			Large, Small, Injured, One Missing
			Light Colored, Not Matching, Greenish, Golden
Lobes			Large, Small, Irregular, Injured, Frosted, Wrinkled
			Red, White, Yellow, Creamy

	Shape	Color	Remarks
Wattles			Large, Small, Irregular, Long, Injured, Frosted
			Wrinkled, Folded
Neck			Long, Short, Undeveloped, Broken Plumage
			Light, Dark Buff, Red, White, Undercolor, Surface, Ticking, Mealy
Wings			Carried High, Low, Broken or Missing Feathers, Undeveloped
			Light, Dark Buff, Bows, Flights, Black, White, Ticking, Mealy, Shafting
			Long, Short, Narrow, Flat, Curved, Cushion, Plumage
Back			Light, Dark Buff, Red, White, Undercolor, Surface, Mealy, Shafting
Tail			High, Low, Pinched, Broken, Maintail, Sickles, Long, Short
			Light, Dark Buff, Black, White, Ticking, Surface, Undercolor
Breast			Undeveloped, Flat, Narrow, Crooked Keel, Low
			Light, Dark Buff, Under, Surface, Mealy, Shafting
Body and Fluff			Long, Short, Low, Too Deep, Shallow, Fat
			Light, Dark Buff, Under, Surface, Mealy, Shafting
Legs			Long, Short, Bowed, Knock-kneed, Scaly, Injured, Down
			Light, Faded, Spur, Missing, Yellow
Toes			Long, Short, Crooked, Nails, Injured, Down
			Faded, Light, Yellow
Crest and Beard [1]			
Sharpness of Feather [2]			
Outs			SCORE

.....

Judge

....

Secretary

The placing of awards in the show room at present is largely done by first scoring the birds according to the score card system, and then comparing the cards, giving the

[1] Applies to crested breeds.

[2] Applies to Games and Game Bantams.

awards to the birds receiving the highest score. However, the direct comparison system of judging is coming into general use, especially in the largest and best exhibitions of the country.

Breed Requirements. — Before judging the birds either by the score card system or by direct comparison it is necessary to know the requirements of conformation, color, feather markings, and carriage of each variety. It is also necessary to know what the customary defects are for each variety. The beginner should consult the various breed books and should use a score card. This card serves the double purpose of aiding the judge to keep in mind the several defects he should look for in each breed and of furnishing to the owner a record of the judge's reasons for putting the bird in any particular section.

Rules for Judging. — Some of the rules which it is necessary for the beginner in poultry judging to fix in his mind are:

a. That place of origin, temperament, and purpose make the class.

b. That shape and size make the breed.

c. That color and marking of feathers and form of comb make the variety.

The four principal class groups into which all standard varieties of poultry are divided, are as follows:

Group I. The Mediterranean class.

Group II. The American, English, and French classes.

Group III. The Asiatic class.

Group IV. The Oriental and Exhibition classes.

The Mediterranean Class. — It is supposed that this class originated in Southern Europe along the shores of the Mediterranean Sea.

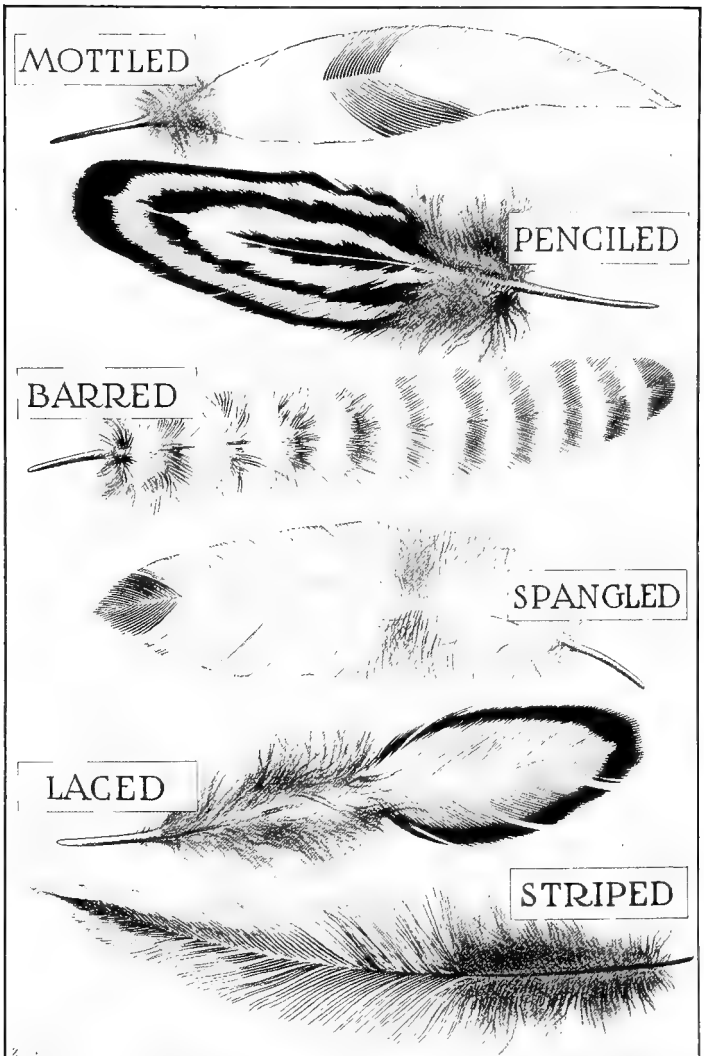


Fig. 107. — Different feather markings.

Members of this group are of nervous, active temperament; non-sitters; good foragers, with close-feathered bodies; unfeathered legs; medium to large comb and head furnishings; extremely precocious. All breeds of this group lay large eggs with chalk-white shell.

They are small to medium in size, set well up on clean legs, and in outline are an oblong oval with small end toward the shoulders. The several breeds of this group are distinguished by shape of back and carriage of tail.

The Mediterranean Class includes five breeds, as follows:

1. Leghorns, 2. Minorcas, 3. Spanish, 4. Blue Andalusians, 5. Anconas. These are the so-called egg breeds. The varieties of all breeds in this group have white ear lobes. The breeds may be distinguished one from the other by comparison of (*a*) size, (*b*) comb, (*c*) back, (*d*) tail.

The varieties of the several breeds in this group are distinguished one from the other either by shape of comb or feather color or feather marking.

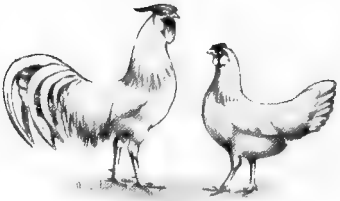
Example of classification by above method:

Group: I.

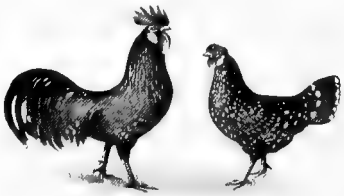
Class: Mediterranean, as shown by sprightly carriage, nervous temperament, and white ear lobes.

Breed: Leghorn, as shown by oval shape of body when viewed from any direction. Small to medium size body. Distinguished from Minorcas by shape of back and shape of comb; and from Anconas by individuality of the Ancona plumage.

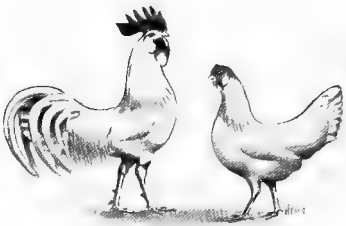
Varieties: Rose Comb White Leghorns are readily distinguished from Single Comb White Leghorns by their different forms of comb, and the Single Comb Brown, Buff, and White varieties of Leghorns can readily be distinguished by color and marking of their plumage.



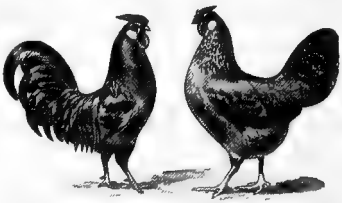
Rose Comb White Leghorns



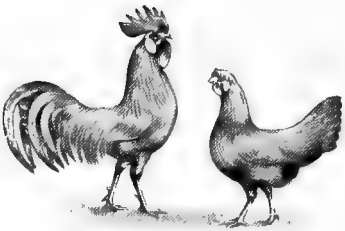
Mottled Anconas



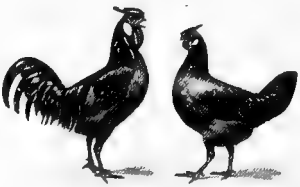
Single Comb White Leghorns



Rose Comb Brown Leghorns



Single Comb Buff Leghorns



Rose Comb Black Minorcas

Fig. 108. — Types of chickens among the egg breeds.

The American, English, and French Classes. — The members of this group are active but not nervous; are fair to good foragers; feathered more loosely than the breeds of Group I; good to excellent sitters and mothers; are not so precocious as Group I, seldom reaching maturity before six to seven months. As a group they are average to

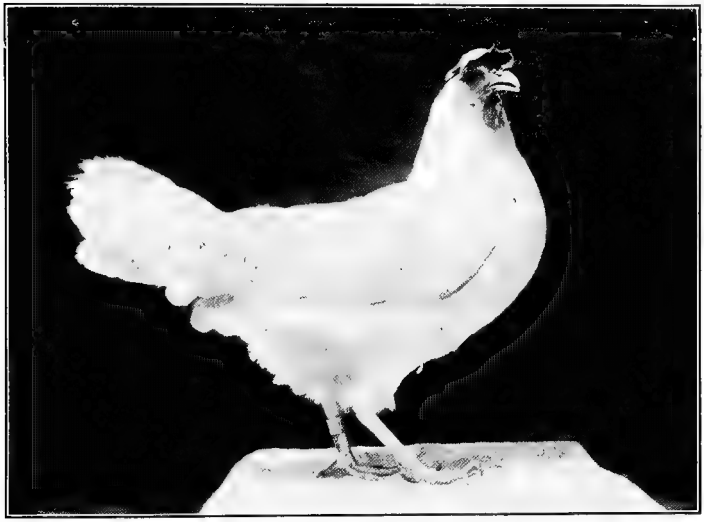


Fig. 109. — A White Leghorn.

good layers of fair-sized brown-shelled eggs, though some individuals of highly specialized strains have made wonderful egg records. The members of this group originated in either America, England, or France, but in all cases have been thoroughly Americanized.

The breeds of this group, already enumerated under dual purpose breeds, are of medium size and stockily built. The shapes of the several breeds in this group when viewed from the side vary from almost round to rectangular, and

this variation in body shape serves as one of the best indexes to the several breeds.

The several varieties of each breed are distinguished one from the other by shape of comb or color of feathers. All of this group have red ear lobes. Nearly all members of the French class have five toes; this is also true of the Eng-

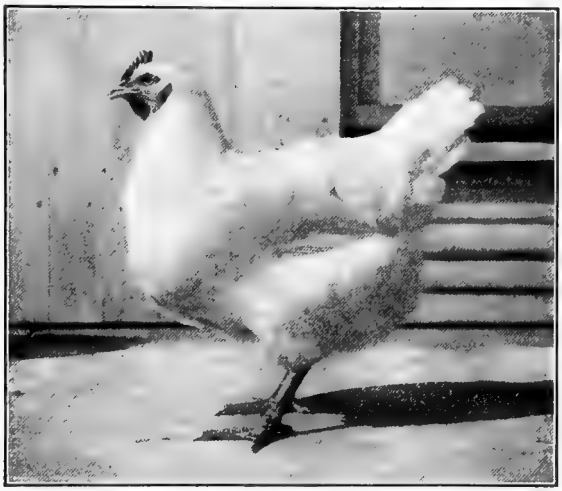


Fig. 110. — A White Plymouth Rock.

lish class, the Orpingtons however being a notable exception. Members of the American class have four toes.

The Asiatics. — Members of this group are of sluggish, phlegmatic temperament, with strong predisposition to broodiness, though their extreme size and heavily feathered legs and toes make them undesirable sitters or mothers. They are poor foragers and indifferent layers. They lay medium to large-sized eggs with brown shells. They are not precocious, seldom reaching maturity before seven and a half to eight months. As indicated by their class

name, it is believed that the different members of this group originated from stock imported from Asia.

This group comprises the Brahma, Cochin, and Langshan, — the largest breeds of fowls. One of the distinguishing characteristics of the group is the feathered legs. The three breeds of the group can be distinguished one from the

Fig. 111. — A Black Langshan.

other by shape of back. Other distinguishing characteristics are form of comb, length of leg, and feathering of legs and toes.

The varieties of these breeds are distinguished one from the other by color of feather.

The Oriental and Exhibition Classes. — For the most part individuals of this group are very small, of various temperaments and sources of origin. However, the grouping is based on the fact that all are bred for their exhibition value on account of fancy color or feather marking. The

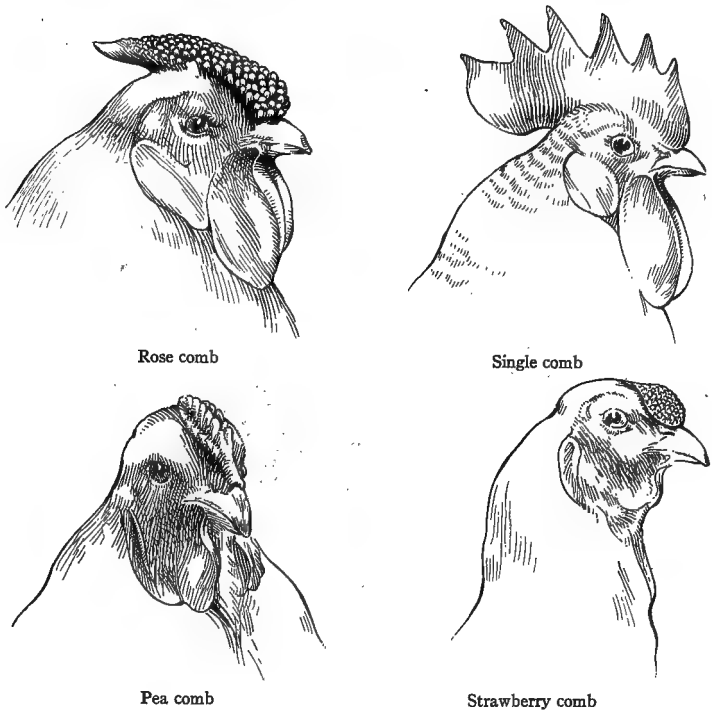


Fig. 112. — Types of combs.

Cornish, Game, Malay, Sumatra, and the several Bantam breeds belong to this group. In addition to the above groups there are the Hamburg, Polish, and several other miscellaneous breeds.

The person learning poultry judging should study the outline on page 313 in order to apply it readily to the individual fowl to be judged. While all of these things cannot be seen or known at once, he will quickly associate them with individuals of the various groups he is judging. After he becomes acquainted with the groups the next thing is to

learn to recognize the breeds in each group. This can be done by learning the requirements of body conformation, comb shape, and tail carriage for each of the breeds. This will come by handling the actual specimens, and can be developed only by practice and a careful study of the characteristics of each breed as outlined in more complete treatises on this subject.

EXERCISES

1. Reproduce from memory the principal points on the poultry score card.
2. Name the characteristics of each of the four great groups of chickens.
3. How does the Asiatic group differ from the Oriental?
4. Arrange the four groups in order of size.
5. Arrange the four groups in order of general appearance.

HOME PROJECTS

1. Study the home flock to determine the group or groups to which the chickens belong.
2. Study the home flock to ascertain characteristics of breed or breeds represented. In making reports give reasons for your decisions.

CHAPTER XXIII

TURKEYS, DUCKS, AND GEESE

ALTHOUGH few poultrymen and farmers care to raise turkeys, ducks, and geese on a large scale, some or all of these fowls are found on almost every farm. A brief outline of the details necessary to success in the production of these fowls is here included.

TURKEYS

According to the American standard of perfection, there are several recognized varieties of turkeys, as follows: Bronze, Narragansett, White, Black, Buff, Slate, and Bourbon. Of these the Bronze is the most popular.

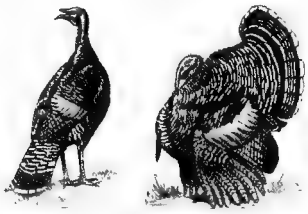
The Bronze is the largest of all the standard varieties, the weight for pullets being sixteen pounds; hens, twenty pounds; cockerels, twenty-five pounds; yearling cocks, thirty-three pounds; and adult cocks, thirty-six pounds. The preferred weight for market at Thanksgiving time is from fourteen to thirty pounds.

The egg yield of a turkey hen is from eighteen to thirty eggs, each of which can usually be counted on to produce a living poult under natural conditions. A common source of trouble in raising young turkeys is brought about by continued inbreeding. There are so few turkeys raised in some localities that all of the turkeys in a neighborhood within a radius of ten or fifteen miles have descended from a single pair. Inbreeding of this sort is entirely too close.

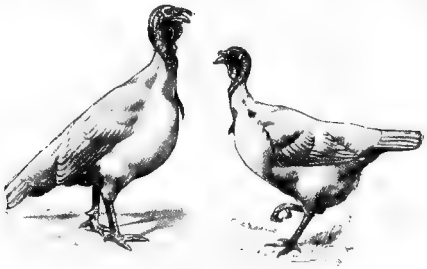
Kind of Hens to Select. — No matter what variety of turkeys may be selected for keeping, they should, above all things, be strong, vigorous, healthy, and well matured, but not akin. Better secure the females from one locality and the male from another to insure their non-relationship, rather than run the risk of inbreeding.

Rangers Are to Be Preferred. — Though turkeys may be yarded and handled successfully, with sufficient care they

Bronze turkeys



Narragansett turkeys



White Holland turkeys

Fig. 113. — Varieties of turkeys.

do best when they have the entire range of the farm. When given free range they pick up injurious insects, weeds, and waste grain that cannot be utilized in any other way. The cost of raising them is thus greatly reduced, and they seem to be in better health where they have free range. Wheat, oats, barley, corn, in fact any grain that makes good chicken

feed can be fed to turkeys. Grit, shell, and water are necessary, as with other poultry.

Turkeys do best if they can roost in the open air, another reason for giving them the range of the farm.

Nesting Provisions. — The turkey hen usually begins to lay in the latter part of March or early in April. If the eggs are likely to be chilled, they should be gathered in order to protect them from the cold. If it is necessary to gather the eggs they should be replaced with some other sort of egg until the turkey becomes broody. If all eggs are removed, she will change her nest.

It is well to provide an old barrel or a box, which may be entered freely by the turkey hen, to protect the nest from the weather. Soft straw or hay is the best nest material, though if these are not at hand clean, dry leaves make an excellent nest. On account of the fact that the turkey hens produce such a very small number of eggs, it is best not to attempt to hatch the eggs with domestic hens or incubators, though of the two substitute methods the hen is to be preferred.

Incubation of Turkey Eggs. — The period of incubation is from twenty-seven to twenty-nine days. The fresher eggs will hatch a few hours sooner than the older ones. The best success attends the hatch when not more than nineteen eggs are given to a turkey hen and not more than ten eggs to a domestic hen. A turkey hen when sitting should be supplied with food and water near by, so that these will be available just as soon as she comes from the nest. Wheat and corn are the best food at this time.

Brooding Young Turkeys. — It is a practice of most breeders to set a turkey hen and a domestic hen at the same time, both on turkey eggs, and then to give all of the poults

to the turkey hen, since the turkey seems to be the more successful of the two in raising the young brood.

After the young turkeys have grown large enough to range the farm they require little attention until fattening time comes, when they can be fattened by the use of the rations given to chickens for the same purpose.

DUCKS

Of the eleven standard breeds of ducks, — Pekin, Aylesbury, Rouen, Cayuga, Call, East India, Crested, Muscovy, Buff, Indian Runner, and Swedish, — raised for fancy or market purposes, the two most popular breeds and the ones most commonly found on the farm are the White Pekin and the Indian Runner, either fawn or white. The Pekin duck is valued primarily for its carcass as young roast duck, or "green duck," while the Indian Runner is valued for its great power of egg production. It is not unusual for Indian Runner females to lay as many as one hundred seventy eggs a year, rivaling in this respect the best strains of domestic hens. The Rouen is a strong rival of the Pekin in some sections.

Quick Growth Necessary. — The quicker the flesh is put on, the more tender it is. The duck grower has his ducklings under absolute control all the time. He keeps their appetites keen and gives them all the flesh-producing food they will eat. They are penned in quarters sufficiently large to allow proper exercise, but not enough to make the flesh hard from too much activity. These pens are kept absolutely clean, as are also the yards. In some sections where the soil is sticky and unsanitary, duck growers cover their yards with straw and care for them the same as for those in the indoor pens.

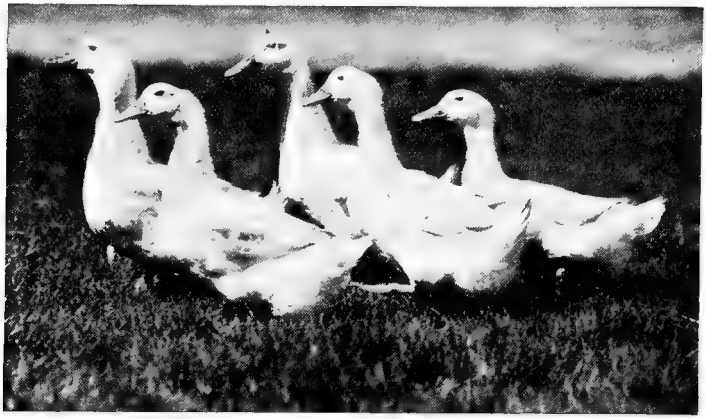


Fig. 114. — Pekin ducks.

Only Drinking Water Necessary.— Ducks are given fresh clean water to drink, which is very essential, but none to play or wallow in. The expert duck grower has his bird ready for market in ten weeks from the shell. It is larger and many times more toothsome than the six months old duck sent to market by the farmer.

Caring for the Eggs. — A good strain of breeding ducks will lay an average of at least one hundred thirty-five eggs per season, which should, with proper feed, be eighty-five per cent fertile. Ducks do not care for nests. They prefer to drop their eggs on the floor. They lay between four and eight o'clock in the morning. They should be fastened in their houses the night before and fed in the yards at 8 A.M. and 4 P.M. daily. The eggs should be collected after liberating the ducks in the morning. If the pens are clean the eggs will be clean. The soiled ones should be rinsed in tepid water and dried with a towel.

Hatching with the Incubator. — As soon as enough eggs have been collected to fill an incubator they should be set.

The incubator must be run at 102° the first two weeks, 102½° the third week, and 103° the last week of hatch. The eggs are turned once a day during the first week, then twice daily until they pip. After that the machine must be kept closed until the hatching is over.

Feeding and Care of Ducklings. — After removal of the egg shells the ducklings are left in the machine until thoroughly dry. They are then ready to remove to a brooder, which should be at a temperature of 90°. Any brooder practical for chickens is good for ducklings, allowing two ducklings the same space as three chicks.

Ducklings ought to have clean, sharp river sand and fresh water before them. They should be fed five times a day with bread crumbs mixed with the boiled infertile eggs from the incubator, which are ground fine in a meat chopper, with enough crumbs to make a dry food. Stale bread is preferable, but it must be perfectly sweet, not moldy or sour.

After the fifth day a growing mash, made of six parts bran, two parts corn meal, two of flour, five of cut greens, ten per cent of beef scrap, sand, grit, and oyster shell, should be fed. They are given all they will eat up clean. After eight weeks of age they are gradually changed to a fattening food, consisting of four parts of corn meal, two parts of low grade flour, one part of bran, twelve per cent of beef scrap; to this should be added a little cut greens, sand, shell, and grit to aid in digestion. Many feed good food, but fail to provide proper grit to digest it. The cut greens may be either lawn clippings, green clover, corn fodder, dwarf Essex rape, or wheat. If ducklings have been carefully fed and attended to they will average ten pounds or more to the pair. At ten weeks they are in the best condition to kill.

If they are now properly prepared for market they will command a price that makes production profitable.

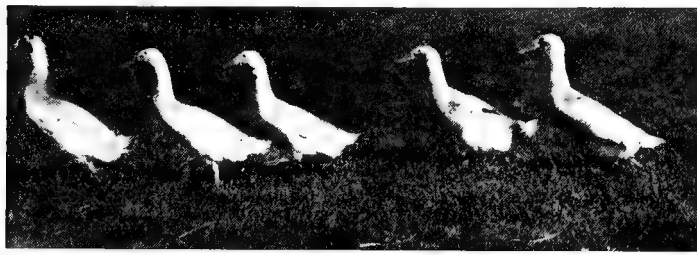


Fig. 115. — Indian Runner ducks.

It costs about a third less to produce one pound of duck flesh than it does to produce one pound of chicken. Ducks are practically free from disease, easy to raise, and readily marketed.

Indian Runner Ducks. — The Indian Runner ducks are so called because they are supposed to have originated in India and because of their peculiar manner of running. They excel many breeds of hens as egg producers.

Indian Runner ducks are the hardiest of all domestic fowls, being practically free from all contagious diseases. They bear confinement well and are especially adapted to limited quarters. It is not necessary to have a pond or a quantity of water to raise them successfully, — just enough for them to drink and so that they can cover their heads.

They are active and will forage for part of their living. They thrive on coarse feed, with little attention and cheap housing, and are very rapid growers.

The Indian Runner ducks possess great laying qualities, and they should be bred with this one object in view, preserving, of course, the standard markings. If

fed for this purpose, they commence laying at from four to six months of age. Ducklings hatched in June or July often lay through the entire winter. They lay well until several years old. Their capacity for winter egg production is their strongest characteristic.

Indian Runner eggs are not quite so large as the eggs of other varieties of ducks, but larger than a hen's egg. They are of a delicate flavor quite unlike that of all the other ducks' eggs. The shell is a beautiful white color with an occasional tint, so that the egg is attractive in appearance.

Care and Management of Laying Ducks. — After the first of May laying ducks do better if allowed to run. They should be shut up in a pen or inclosure, however, until 8 or 9 A.M., when they will be through laying for the day.

For winter protection a warm house is necessary. It need not be costly or large. A tight shed, eight feet high in front, four feet high at the back, open to the south will meet all requirements. An earth floor with plenty of straw for bedding can be used.

Laying ducks require food that will produce eggs and make shell. The same rations that are fed to laying hens are also suitable for the feeding of ducks.

Ducks must have shade in hot weather, exercise, and plenty of fresh air. They prefer to stay outside no matter how stormy the weather, but they may be trained to use a house or shed. Poor sleeping quarters, a lack of bedding, or allowing them to sleep out in bad weather, causes rheumatism, about the only disease to which they are subject. A little care in this one particular will insure against loss of birds. Ducks may be allowed to stay outside except at night during cold or stormy weather. They are hardier

than chickens, and with a little care and with proper shelter they will show most gratifying results.

Feeding troughs and water fountains must be kept clean. Ducklings should be sheltered from rain till well feathered. Shade should be provided for the hot summer weather. They should always have water before them while eating, whether young or old, but should not be allowed to swim in it till feathered.

GEESE

Of the six standard breeds of geese,—Toulouse, Embden, African, Chinese, Wild or Canadian, and Egyptian, — the most popular one is the Toulouse.

A few geese can be kept on a farm without causing much trouble, but if their number is large they must be restrained, fenced far away from the house, the barn, and the farming and pasturing lands. An ideal place for geese is rough upland, slanting down into marshy places where there is at least one pool of water in which the geese may swim. The uplands furnish a change of pasture for them and a dry place for them to rest. If a few shade trees grow upon the hillside, their shelter will be found desirable; if there are no trees, a low, slant-roof shed open toward the south should be built as a protection from sun, rain, and snow. Eggs laid by geese having free access to water are more likely to be fertile than are eggs laid by geese without access to such a pool.

Ranges for Geese. — Geese may live almost entirely by grazing. Marshy lands are suitable pasture for geese, since they furnish a supply of rich, juicy grasses, snails, water beetles, worms, and bugs that grow in such places. Where such pasturage can be had, even though the land may be worthless, it is excellent upon which to grow geese.

Breeding Stock. — For beauty and elegance the Gray Toulouse and the White Embden surpass all other kinds of geese. It is not unusual for adults of these two breeds to weigh from forty to forty-five pounds per pair. Either kind can be made to weigh from twelve to sixteen pounds each when between eight and nine months old, at which age they are best for table use.

Fig. 116. — An African gander crossed with Toulouse makes the finest meat fowl.

Geese lay from sixteen to forty eggs each in a single year, averaging about twenty-five eggs each.

Laying geese do best when not too fat. A mixture of equal parts of corn meal, wheatmiddlings, wheat bran, and ground oats, with a little animal food mixed in, is best for them. This should be moistened and fed in shallow troughs. When corn is fed to them they may be taught to eat dry grain. After the birds become accustomed to this kind of feeding it does not injure them, but they do not thrive so well nor will they make such tender meat as when they receive a meal-mash mixture. Geese are liable to " blind staggers " or choking spells from eating dry grain without

a plentiful supply of water at hand. Their habit is to eat a little and drink a little, and continue doing so until they have enough.

Natural Incubation Preferred. — Geese hatch their own eggs; when they lay more than a nestful the surplus eggs should be hatched under a hen. The incubation period is from twenty-eight to thirty days. The goslings should be

Fig. 117. — White Chinese geese.

left in the nest until they are perfectly dry. When taken outside they should be placed in a small inclosure provided with some kind of shelter. Goslings must be protected from cold and rain until they are at least two weeks old, after which they may be given their liberty.

Feeding Young Goslings. — The first food for young goslings should be bread and milk, made into a moist mash with wheat bran or wheat middlings; or a mixture of one part each of corn meal and ground oats and two parts of wheat bran. This should be moistened with either hot milk or hot water and made into a crumbly mass which the goslings can pick up easily. The food should never be hot, only slightly warm. Goslings, as well as geese, should have a plentiful supply of grass for grazing. They will eat grass

Fig. 118. — Mixed flock of geese.

freely and appear to grow fat on it, but when fed a proper grain ration goslings grow very rapidly.

Fattening Geese. — While being fattened, geese should be kept perfectly quiet and should be fed all the food they will eat. Their food should consist of equal parts by measure of corn meal, ground oats, wheat middlings, and wheat bran, mixed and moistened with either milk or water. Geese so fed will be fit for table use within ten or twelve days. In some localities, when the geese fed in this way are so fat as to quit feeding, they are shut up in dark places and stuffed with specially prepared " noodles " three or four times a day until they become excessively fat. Stuffed geese develop abnormally large livers, which are prized as a great delicacy. In a few regions of the United States, the stuffed-goose industry has developed large proportions.

EXERCISES

1. In growing turkeys, what are the essential points to be remembered in the selection of breeding stock?

2. Why do turkeys do better on the open range than under confinement?

3. What are the essential differences between Pekin and Indian Runner ducks?

4. What are the essential ingredients of the feed for young ducks? Give reason for each ingredient selected.

5. How does the food for market ducks differ from that for layers? Why?

6. What are the essential differences, if any, in the care and management of ducks and geese?

HOME PROJECTS

1. Get permission to produce and market a flock of either turkeys, ducks, or geese. Keep accurate record of cost and returns.

2. Study the home method of producing either of these classes of poultry and report on how it may be improved.

APPENDIX

HAECKER'S FEEDING STANDARD FOR THE DAIRY COW

	Daily Allowance of Digestible Nutrients		
	Crude Protein	Carbo-hydrates	Fat
	Lbs.	Lbs.	Lbs.
For support of the 1000-lb. cow	0.700	7.00	0.100
To the allowance for support add:			
For each lb. of 3.0 per cent milk. . . .	0.040	0.19	0.015
For each lb. of 3.5 per cent milk. . . .	0.042	0.21	0.016
For each lb. of 4.0 per cent milk. . . .	0.047	0.23	0.018
For each lb. of 4.5 per cent milk. . . .	0.049	0.26	0.020
For each lb. of 5.0 per cent milk. . . .	0.051	0.27	0.021
For each lb. of 5.5 per cent milk. . . .	0.054	0.29	0.022
For each lb. of 6.0 per cent milk. . . .	0.057	0.31	0.024
For each lb. of 6.5 per cent milk. . . .	0.061	0.33	0.025
For each lb. of 7.0 per cent milk. . . .	0.063	0.35	0.027

To formulate a ration, according to this standard, for a 900 pound cow, producing 30 lbs. 4 per cent milk, the procedure is as follows:

Digestible nutrients required daily by the 900 pound cow yielding 30 pounds of 4 per cent milk daily.

	Crude Protein	Carbohydrates	Fat
For maintenance . . .	0.63	6.30	0.09
For 30 lbs. 4 per cent milk .	1.410	6.90	0.540
Total	2.04	13.20	0.63

For maintenance, the 900 pound cow requires nine tenths as much of the digestible nutrients as the 1000 pound cow, or 0.63 pound of digestible protein, 6.30 pounds of digestible carbohydrates, and 0.09 pound of digestible fat. For the production of 30 pounds of 4 per cent milk there is required an additional 1.41 pounds of digestible protein, 6.90 pounds of digestible carbohydrates, and 0.540 pound of fat, making the standard for the 900 pound cow yielding 30 pounds of 4 per cent milk daily consist of 2.04 pounds of digestible protein, 13.2 pounds of digestible carbohydrates, and 0.63 pound of digestible fat material. In order to calculate the ration that will satisfy the requirements of the standard, the same method is employed as in determining the amount for the Wolff-Lehmann standards.

AVERAGE DIGESTIBLE NUTRIENTS AND FERTILIZING CONSTITUENTS IN AMERICAN FEEDING STUFFS

Name of Feed	Total Dry Matter in 100 Lbs.	Digestible Nutrients			Fertilizing Constituents in 1000 Lbs.		
		Crude Protein	Carbohydrates	Fat	Nitrogen	Phosphoric Acid	Potash
Concentrates							
Grains, Seeds, and their Parts	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Dent corn	89.4	7.8	66.8	4.3	16.5	7.1	5.7
Flint corn [1]	88.7	8.0	66.2	4.3	16.8	7.1	5.7
Sweet corn [1]	91.2	8.8	63.7	7.0	18.6	7.1	5.7
Corn-and-cob meal	84.9	4.4	60.0	2.9	13.6	5.7	4.7
Gluten feed	90.8	21.3	52.8	2.9	40.0	3.7	0.4
Hominy feed (chop)	90.4	6.8	60.5	7.4	16.8	9.8	4.9
Wheat	89.5	8.8	67.5	1.5	19.0	5.5	8.7
Red-dog flour [1]	90.1	16.2	57.0	3.4	29.4	——	——

[1] From "Feeds and Feeding" by Henry and Morrison.

Name of Feed	Total Dry Matter in 100 Lbs.	Digestible Nutrients			Fertilizing Constituents in 1000 Lbs.		
		Crude Protein	Carbohydrates	Fat	Nitrogen	Phosphoric Acid	Potash
Grains, Seed, and their Parts — Continued	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Standard wheat middlings (shorts)	88.8	13.0	45.7	4.5	27.0	26.3	15.3
Wheat bran, all analyses	88.1	11.9	42.0	2.5	24.6	26.9	15.2
Wheat screenings	88.4	9.6	48.2	1.9	20.0	11.7	8.4
Rye [1]	91.3	9.5	69.4	1.2	18.1	8.6	5.8
Rye middlings [1]	88.2	11.0	52.9	2.6	22.9	12.3	9.6
Barley	89.2	8.4	65.3	1.6	19.2	7.9	4.8
Emmer (speltz)	92.0	10.0	70.3	2.0	18.4	7.6	5.7
Oats	89.6	10.7	50.3	3.8	18.2	7.8	4.8
Oat hulls [1]	92.6	1.3	38.5	0.6	5.3	1.6	4.9
Buckwheat	86.6	8.1	48.2	2.4	17.3	6.9	3.0
Buckwheat middlings	87.2	22.7	37.5	6.1	42.7	12.3	11.4
Buckwheat hulls [1]	86.8	1.2	28.6	0.5	7.3	4.3	14.7
Rice	87.6	6.4	79.2	0.4	11.8	1.8	0.9
Canada field pea	85.0	19.7	49.3	0.4	37.9	8.4	10.1
Cowpea	85.4	16.8	54.9	1.1	32.8	10.1	12.0
Soy bean	88.3	29.1	23.3	14.6	53.6	10.4	12.6
Kaffir corn	90.1	5.2	44.3	1.4	17.9	——	——
Milo maize seed [1]	91.0	4.9	44.8	1.3	17.1	——	——
Flaxseed	90.8	20.6	17.1	29.0	36.2	13.9	10.3
Linseed meal, old process	90.2	30.2	32.0	6.9	54.2	16.6	13.7
Linseed meal, new process	91.0	31.5	35.7	2.4	60.0	17.4	13.4
Cottonseed meal	93.0	37.6	21.4	9.6	72.5	30.4	15.8
Cottonseed hulls	88.9	0.3	33.2	1.7	6.7	4.3	10.4
Dried beet pulp	91.6	4.1	64.9	——	12.9	2.2	3.1
Dried molasses beet pulp	92.0	6.1	68.7	——	15.4	1.5	18.1
Cow's milk	12.8	3.4	4.8	3.7	5.8	1.9	1.7
Cow's milk, colostrum	25.4	17.6	2.7	3.6	28.2	6.6	1.1
Skim milk	9.4	2.9	5.3	0.3	5.0	2.1	2.0
Buttermilk	9.9	3.8	3.9	1.0	6.4	1.7	1.6
Whey [1]	6.2	0.6	5.0	0.2	1.0	1.1	2.0
Tankage [1]	93.0	50.1	——	11.6	86.2	139.0	3.0

[1] "Feeds and Feeding."

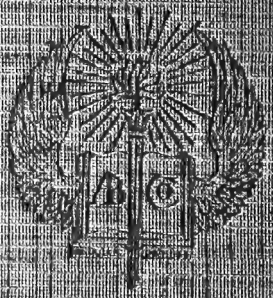
Name of Feed	Total Dry Matter in 100 Lbs.	Digestible Nutrients			Fertilizing Constituents in 1000 Lbs.		
		Crude Protein	Carbohydrates	Fat	Nitrogen	Phosphoric Acid	Potash
Dried Roughage							
Fodder corn, ears, if any, remaining	*Lbs.* 57.8	*Lbs.* 2.5	*Lbs.* 34.6	*Lbs.* 1.2	*Lbs.* 7.2	*Lbs.* 5.4	*Lbs.* 8.9
Corn stover, ears removed	59.5	1.4	31.2	0.7	6.1	3.8	10.9
Timothy, all analyses	86.8	2.8	42.4	1.3	9.4	3.3	14.2
Kentucky blue grass	86.0	4.4	40.2	0.7	12.5	4.0	15.7
Red clover	84.7	7.1	37.8	1.8	19.7	5.5	18.7
Mammoth red clover[1]	78.8	6.2	34.7	2.1	17.1	5.2	11.6
Alsike clover	90.3	8.4	39.7	1.1	20.5	5.0	13.9
White clover	90.3	11.5	42.2	1.5	25.1	7.8	13.2
Soy bean	88.2	10.6	40.9	1.2	23.8	—	—
Cowpea	89.5	5.8	39.3	1.3	14.3	5.2	14.7
Alfalfa, western United States	93.2	11.1	39.1	0.6	24.7	6.1	17.9
Wheat	90.4	0.8	35.2	0.4	5.0	2.2	6.3
Rye	92.9	0.7	39.6	0.4	5.0	2.5	8.6
Oat	90.8	1.3	39.5	0.8	5.8	3.0	17.7
Barley	85.8	0.9	40.1	0.6	7.0	2.0	10.6
Fresh Green Roughage							
Fodder corn, all varieties	20.7	1.0	11.9	0.4	2.9	1.1	3.9
Fresh Green Grasses							
Pasture grass	20.0	2.5	10.1	0.5	5.6	2.6	7.4
Kentucky blue grass[1]	34.9	2.8	19.7	0.8	6.6	—	—
Timothy	38.4	1.5	19.9	0.6	5.0	2.6	7.6
Fresh Green Legumes, Grasses, and Legumes Combined							
Red clover	29.2	2.9	14.9	0.7	7.0	1.5	4.8
Mammoth red clover[1]	20.0	2.0	9.1	0.2	4.8	—	—
Alsike clover[1]	25.2	2.6	11.4	0.5	6.2	1.1	2.0
Crimson clover	19.1	2.4	9.1	0.5	5.0	1.2	4.0
Sweet clover[1]	20.0	2.5	8.4	0.4	6.1	2.4	6.7
Alfalfa	28.2	3.6	12.1	0.4	7.7	1.3	5.6
Barley and peas	20.0	2.1	9.1	0.4	4.5	—	—
Oats and peas	20.3	1.8	10.2	0.4	3.8	1.5	5.0

[1] "Feeds and Feeding."

Name of Feed	Total Dry Matter in 100 Lbs.	Digestible Nutrients			Fertilizing Constituents in 1000 Lbs.		
		Crude Protein	Carbohydrates	Fat	Nitrogen	Phosphoric Acid	Potash
Roots and Tubers	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Potato	20.9	1.1	15.7	0.1	3.4	1.6	5.8
Mangel	9.1	1.0	5.5	0.2	2.2	0.9	3.8
Sugar beet	13.5	1.3	9.8	0.1	2.9	0.8	3.7
Flat turnip	9.9	0.9	6.4	0.1	2.1	0.9	3.4
Silage							
Corn, recent analyses	26.4	1.4	14.2	0.7	4.3	1.1	3.7
Corn, ears removed [1]	26.3	1.1	14.9	0.7	3.5	——	——
Red clover	28.0	1.5	9.2	0.5	6.7	——	——
Brewers' grains [1]	29.7	4.6	11.5	1.8	10.1	4.2	0.5
Corn cannery refuse, husk [1]	16.2	0.4	10.1	0.4	2.2	——	——
Pea cannery refuse [1]	23.2	2.1	13.1	0.8	4.5	——	——

[1] "Feeds and Feeding."

INDEX


Л
С