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# milk goats

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U. S. DEPARTMENT OF AGRICULTURE

Much interest in the raising of goats for milk production has been manifested in this country for the past several years. Correspondence and requests for information on milk goats have been extremely heavy. A good milk goat will supply sufficient milk for the average family and can be kept where it would be impossible to keep a cow. These facts appeal to many people, especially those living in small towns and in the suburbs of larger cities. Although no recent official census data on milk goats are available it is estimated that approximately one million goats are being utilized for milk production in the United States at this time.

Goat's milk differs from cow's milk in that it has certain characteristics which make possible its use by infants and invalids allergic to cow's milk.

Milk goats are well adapted to this country and are being raised in every State. They should become more numerous as people become better acquainted with the advantages in their production.

## CONTENTS

	Page		Page
Present status of the industry	1	Breeding and selection—Con.	
Goat's milk	1	Periods of heat	20
Yield	1	Out-of-season breeding	20
Prices	2	Gestation period	21
Characteristics	2	Number of kids	21
Composition and nutritive properties	2	Feed and management	21
Goat's-milk products	4	The buck	22
Butter	4	The doe	22
Cheese	4	Raising the kids	27
Goat dairies	5	Castration	29
Breeds and types of goats	7	Marking	30
Saanen	8	Dehorning	30
Toggenburg	10	Care of the hoofs	31
Nubian	12	Fencing for goats	32
Alpine	14	Goat meat and goatskins	32
Less important types and breeds	16	Prices of goats	32
Breeding and selection	17	Renting goats	33
Selection of the buck	18	Troubles with goats	33
Selection of the doe	18	Diseases and minor ailments	33
Methods of breeding	19	Parasites	36
Age for breeding	20	Milk-goat registration associations	38



# milk goats

By C. G. Potts, *animal husbandman, Animal and Poultry Husbandry Research Branch*, and V. L. Simmons, *agriculturist, both of Agricultural Research Service*

## PRESENT STATUS OF THE INDUSTRY

The MILK-GOAT industry, although still relatively small, has continued to develop in the United States. Milk-goat organizations and persons acquainted with the use and quality of the products of these animals have contributed much to the progress of the industry. In Switzerland, Italy, Germany, France, Norway, and Spain the domestic goat from earliest times has been an important provider of milk and other food. Immigrants from these and other countries endowed by greater experience and appreciation for the milk goat have emphasized the essential place of the milk goat in our agricultural economy.

The milk goat is adapted to practically all sections of the United States, and there are many high quality individuals and herds. A number of notable foundation animals have been imported and further importations of breeding stock of the highest quality could still be used to advantage for the improvement of herds. However, importations cannot be made from many of the countries where the most desirable goats are produced because of animal diseases in those countries.

Goats are especially useful to those who need a small quantity of milk and do not have the room or cannot afford to keep a cow. A goat can be kept where it is impossible to keep a cow, and the goat will consume considerable feed that otherwise would be wasted. The raising of goats is not limited to family use, however; many commercial dairies have been established successfully in areas where markets for the milk are favorable. The fact that goats are rarely affected with tuberculosis is another point in their favor. Milk goats are exceptionally clean animals and are more fastidious in eating habits than any other type of domestic animals.

## GOAT'S MILK

### Yield

About the first question that most people ask concerning milk goats is, "How much milk will one produce?" This is important, of course, as the value of a doe is estimated largely by her milk production. Even if a doe is purebred, she is of little value from the utility standpoint unless she is capable of giving a good quantity of milk. Many persons, in purchasing grade or even purebred goats, have been

disappointed to find that the milk could be measured in pints and not quarts or gallons, as expected.

A doe that produces 1,000 pounds or about 500 quarts of milk (1 quart equals 2.15 pounds) during a lactation period of 10 months is considered a fair milker. A production of 1,200 pounds of milk is good, and 1,600 pounds and up is excellent provided it is produced in a lactation period of 10 months or less. Good does will produce 8 to 10 months in a year and from 8 to 15 times their weight in milk in a lactation period. Production records of some of the outstanding does in this country, together with records of some of the animals in the Department's herd, will be noted in the sections dealing with their particular breeds.

### Prices

The price to be obtained for goat's milk depends on a number of conditions. The price, of course, will be much higher if a special market is developed. In the past the price has ranged from 35 to 65 cents a quart, and the highest prices have been obtained when the milk has been supplied for the use of infants and invalids. The demand and the cost of production will determine the price. So long as good goats are scarce and high priced, it will be necessary to get good prices for the products if people are to engage in the industry.

### Characteristics

Goat's milk is nearly always pure white in color. The small size of the fat globules and the soft curd are two of its chief characteristics. The cream rises very slowly and never so thoroughly as in cow's milk. This condition makes impracticable the ordinary method of allowing cream to rise. It has been stated that goat's milk will not keep sweet so long as cow's milk, but tests have shown that this is not the case. The keeping quality of any milk depends on the conditions under which it is produced and handled.

In tests made by the Department of Agriculture it was found that goat's milk could be thoroughly separated in a separator. After milk testing 4.4 percent of fat was run through the separator, the milk then tested only 0.03 percent of fat.

### Composition and Nutritive Properties

Goat's milk is a healthful and nutritious food. The milk of Saanen and Toggenburg goats resembles that of Holstein cows in percentage of water, lactose, fat, protein, and ash, although subject to greater variation with the advance of lactation than milk of either Holstein or Jersey cows (table 1). The percentage of total solids in goat's milk ranged from 13.05 in February to 10.78 in August.

The small fat globules and the soft curd of goat's milk contribute to its ease of digestibility. Some persons who are allergic to cow's milk can consume goat's milk readily, due largely perhaps to its easier digestibility. In a great many cases goat's milk has proved especially valuable for infants and invalids.

The U. S. Department of Agriculture in cooperation with Johns Hopkins University conducted a series of studies on the nutritional properties of goat's milk as compared with those of the milk of Hol-

TABLE 1.—*Comparison of the composition of goat's milk and that of two common breeds of dairy cows*<sup>1</sup>

Source of milk	Water	Total solids	Fat	Protein	Lactose	Ash
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Goats <sup>2</sup> -----	88. 02	11. 98	3. 50	3. 13	4. 55	0. 80
Holstein-Friesian-----	87. 50	12. 50	3. 55	3. 42	4. 86	. 68
Jersey-----	85. 31	14. 69	5. 18	3. 86	4. 94	. 70

<sup>1</sup> From Fundamentals of Dairy Science, by associates of Lore A. Rogers, 1935 edition, ch. 1, p. 19.

<sup>2</sup> Average of purebred and high-grade Saanen and Toggenburg does.

stein-Friesian and of Jersey cows. Under the supervision of the University, normal infants were fed milk from the three sources. The milk was boiled for 1 minute and supplemented with orange juice and cod liver oil. No essential differences in health, general appearance, and well-being of the infants were observed, good results being obtained with each milk. The gains in weight were in proportion to the total nutritive content of the milk. In these studies, no attempt was made to use babies with a history of malnutrition.

In one of a series of nutrition studies<sup>1</sup> in Pennsylvania and Texas, a preliminary investigation was made of the value of goat's milk in the diet of growing children. This work has been summarized as follows:

"In an institutional nutritional investigation, 38 children ate the same basic dietary, with the children divided into two equal groups, each consisting of 19 children (10 girls and 9 boys). One of the groups drank 1 quart of goat's milk and the other 1 quart of cow's milk daily, in the 5-month study.

"Numerous medical-nutrition observations and tests were made on the children before the study began and at its close.

"(1) The children who drank goat's milk surpassed those who drank cow's milk to an extent which was statistically significant in the following respects: (a) Weight for the sex, age, body size, and body build; (b) skeletal mineralization, or bone density; (c) blood plasma vitamin A; (d) blood serum calcium; (e) urinary excretion of thiamine, or vitamin B<sub>1</sub>; (f) urinary excretion of riboflavin, or vitamin B<sub>2</sub>; and (g) urinary excretion of F<sub>2</sub>, a fluorescent substance related to niacin.

"(2) The group of children who drank cow's milk exceeded the goat's-milk group by an extent which was statistically significant in growth, although both groups made excellent growth progress.

"(3) The goat's-milk group tended to exceed the other group in the following respects, although the differences between the two groups were not statistically significant: (a) Skin dryness as observed biomicroscopically; (b) hemoglobin concentration in the blood; (c) total protein in the blood serum; (d) reflex action; (e) overall score by the medical examiner.

<sup>1</sup> Mack, Pauline Beery. A Preliminary Nutrition Study of the Value of Goat's Milk in the Diets of Children. Amer. Goat Soc. Yearbook 1952-53, pp. 112-132.

"(4) The two groups showed no difference in their progress from the initial to the final test in the following: (a) Skeletal maturity; (b) condition of the conjunctiva, or normally transparent covering of the eyeball; (c) corneal vascularization; (d) condition of the tongue; (e) condition of the gums; (f) condition of the skin except for unusual dryness (see above); (g) red cell count; (h) packed cell volume; (i) leucocyte or white cell count; (j) differential cell count; (k) blood plasma carotene; (l) blood plasma vitamin C; (m) protein fractions in the blood; (n) blood serum phosphorus; (o) functioning of the heart; and (p) resistance to fatigue.

"This 5-month study must be regarded as preliminary. Whereas the results of this study are strongly indicative of the fact that goat's milk has some superior qualities, the work should be extended before final conclusions are drawn."

## GOAT'S-MILK PRODUCTS

Goat's milk can be utilized for the same purposes as cow's milk, although for some it is not nearly so well suited. For general use, such as drinking or cooking, the milk has proved to be very satisfactory. Where a market exists for fluid milk this is by far the most profitable. Goat's milk is less satisfactory than cow's milk for making butter, but large quantities of goat's-milk cheese are manufactured, especially in Europe.

The milk of some of the largest herds in the country is evaporated and sold in that form. Goat's milk frequently may be purchased at drug or health-food stores in evaporated, dehydrated, or powder form.

### Butter

Good butter can be made from goat's milk, but ordinarily very little is produced. The cream rises very slowly, and only a portion of it reaches the top. By the use of the separator, however, practically all the butterfat can be obtained. Unless artificially colored the butter is very white and resembles lard in appearance. If colored, it resembles cow's butter, although it does not have the same texture. It can be used for the table or for cooking. A good quality of butter with no objectionable features is produced when the milk and cream are properly handled. However, when a good price is obtained for the milk, it does not pay to make butter, as cow's butter is cheaper.

### Cheese

Several varieties of cheese, known under various names, are made from goat's milk. In France, goat's-milk cheese is called Chevrete, or Chevrotin; in Italy, Formaggio di Capra; and in Germany, Weichkäse aus Ziegenmilch (soft cheese from goat's milk). Goat's-milk cheese has a characteristic and individual flavor all its own, depending on the process and cultures used. The products closely resemble cow's milk cheeses made by the same processes. The cheese may be made either entirely of goat's milk or, better with from one-fourth to one-third cow's milk; the mixture materially improves the quality of the product.

Hard cheese may be made by the following method<sup>2</sup>: "A junket tablet is dissolved in  $\frac{1}{2}$  cupful of cold water and stirred into a gallon of milk which has been heated to 88° F. After 30 minutes the curd is cut into cubes about 1 inch in diameter. For this purpose a large knife is used and after cutting in two directions vertically a horizontal cutting is made to complete the cubes. Sometimes it is convenient to make the horizontal cuttings with a bent wire.

"The container with the curd is placed in a pan of water at 100° F. This temperature is maintained so that the temperature of the curd will be 98° F. after 1 hour. The curd is stirred frequently while being heated. In from 30 minutes to 1 hour after heating, the curd is poured with the whey into a muslin bag. After 2 or 3 hours the curd can be removed and placed in a mold formed by rolling the cheese in a small square piece of muslin. This cheese ball is then placed in the container (a cylinder), using an inverted plate as a false bottom. Another plate is placed on top of the cheese. This is weighted down.

"After 24 hours the cheese is removed from the muslin cloth and rubbed in salt. It is rubbed in salt again the following day. These cheeses can then be stored in a cool place and rubbed daily for a week to prevent mold growth and to get a good rind formation. This cheese is ready for eating when 10 days old. If the cheese cracks while it is curing, its surface can be rubbed with a neutral oil or butter."

Cottage cheese may also be made from goat's milk. By one method<sup>3</sup> "Skim milk is held at a temperature of about 75° F. until it develops a firm curd. When this curd is sufficiently firm, it is cut into pieces about 2 inches square with a long knife or large spoon. Then the vessel containing the broken curd is placed on the edge of the stove or in a vessel of water, and heated very slowly to 100° F. The mass is kept at that temperature for about 45 minutes to firm the curd. During the heating and holding period the curd is stirred gently with a spoon or ladle to prevent it from lumping and to secure uniform heating. When it is sufficiently firm so that the pieces yield no milky whey and do not bind together when gently squeezed in the hand, the curd is poured into a porous sack or a colander to drain. The flavor and the keeping quality of the cheese will be improved if the curd is washed in cold water when the draining is practically complete. After this wash has been thoroughly drained from the curd, about 1 teaspoonful of salt is added for each pound of cheese, is mixed in well, and the product is stored in a cool place."

## GOAT DAIRIES

Numerous goat dairies are in operation in different parts of the country. These dairies have been established both for the production of milk and the manufacture of milk products. One of the largest goat dairies in the country is devoted to the manufacture of condensed milk. If only a few goats are kept it is not necessary to have much equipment, but if a considerable number of does are milked it is best

<sup>2</sup> S. A. Asdell and J. C. Marquardt. *The Dairy Goat*. Cornell Extension Bulletin 414, Ithaca, N. Y., 38 pp. 1933

<sup>3</sup> See footnote 2, page 5.



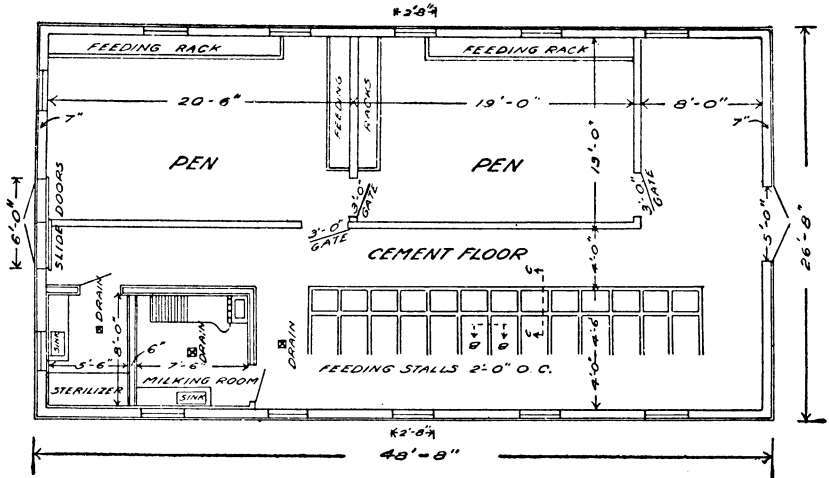


FIGURE 1.—Plan of a practical goat dairy.

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to have the proper equipment for handling the work advantageously. This does not mean, however, that expensive buildings must be provided. Any clean, dry quarters free from drafts may be used. The building should have proper ventilation and an abundance of light, and be so arranged that each goat can be fed and handled properly.

Figures 1, 2, and 3 illustrate a practical goat dairy and show the requirements necessary to handle a medium-sized herd satisfactorily. There are pens in which the does may be handled together, and stalls in which they can be fed individually. If the goats are provided with leather collars or neck chains, they can be tied to the mangers in the stalls by means of a short rope or chain with a snap on the end which fastens to the ring on the collar.

At kidding time small temporary pens can easily be made by the use of hurdles. After the does have kidded they should be transferred to the stalls. Until the kids are at least a month old they should be fed and handled in the temporary pens.

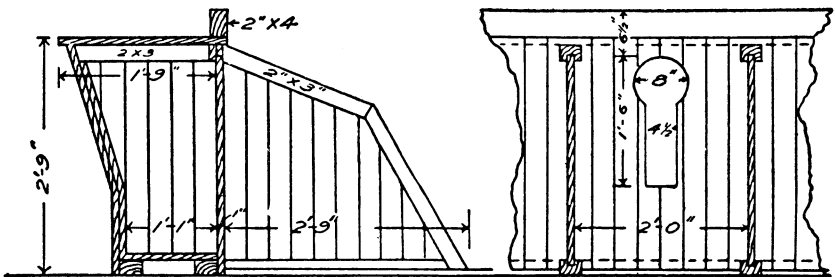
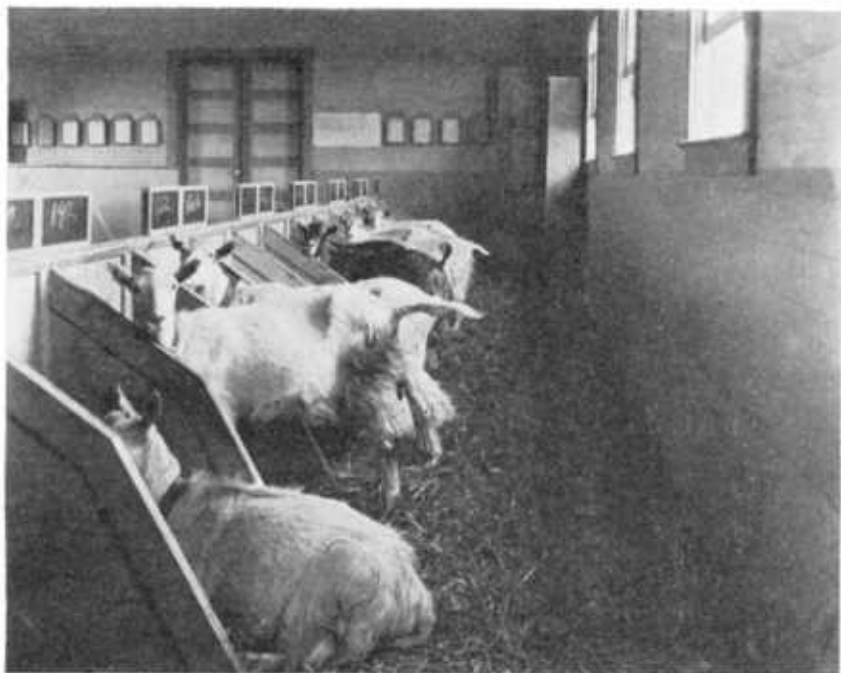


FIGURE 2.—Left, side view of single stall and manger; right, division between stall and manger. The opening allows the goat to feed and prevents the waste of feed.

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FIGURE 3.—Interior view of a dairy constructed according to the plan presented in figure 1, showing does in stalls for individual feeding.

In the plan (fig. 1) the milking room is separated from the main room and has a concrete floor. The walls and ceiling are plastered so that they can be washed with a hose. This room is equipped with a sink, milk scales, and milking stand. The milk is handled in another room, equipped with a cooler, a sink and a sterilizer. The grain is kept in feed bins at the opposite end of the dairy. Space for the storage of hay can be provided either in some nearby building or in a mow above the main dairy barn.

If you plan to operate a goat dairy and sell milk for human consumption, consult the local health department as to regulations and requirements concerning dairy barns.

### BREEDS AND TYPES OF GOATS

Although there are many breeds and types of milk goats in the world, only a few of them have been imported into this country. There has been a quarantine against most of the goat-raising countries. It is not known just how many goats of each breed or type have been imported. In the past, immigrants brought young goats in baskets with them when entering the country. Then, again, the breed or type was not stated on the records of many of the goats that were imported.

The breeds that will be discussed in this publication are the Saanen, Toggenburg, Nubian, Alpine, Murcian, Norska, and the common or

American goat. Of these breeds the Saanen and Toggenburg are the most prominent in the United States at present. A herd of milk goats, consisting of grade and purebred animals of the Toggenburg breed is maintained at the Agricultural Research Center, Beltsville, Md.

The Department's initial work in milk-goat investigations began with the breeding of common American does to bucks of the same type for the purpose of developing through selection a strain superior in milk production. However, progress was difficult and slow. Purebred bucks of the Saanen and Toggenburg breeds were used in grading up the herd to these two breeds. Both breeds were kept separate and distinct from the beginning, no crossbreeding being practiced. The herd was continuously improved by the use of the best purebred bucks available, the retention of the does that were the best milk producers, and the occasional introduction of purebred does from other herds. Over a period of about 25 years, the average length of lactation of the grade does was increased 145 percent and the average annual milk yield 335 percent over that of the foundation animals. In both Saanen and Toggenburg herds, the animals successfully transmitted their color to crossbred or grade offspring and also improved their conformation and mammary development. Differences between families and individuals within each breed appeared to be greater than differences between the breeds in their milk producing characteristics.

### Saanen

The Saanen (figs. 4 and 5) is one of the leading breeds and takes its name from the Saanen Valley of Switzerland. It is said to be the largest of all the Swiss breeds. Although the Saanen is considered a hornless breed, occasionally an animal has horns. The color ranges from a pure to a creamy white. The dairy conformation is especially well developed. The hair is usually short, with the exception of a strip along the spinal column extending to the flanks and the hind-quarters.

The first record of the importation of this breed is in 1904, when 10 head came in through Canada. These goats were selected in Switzerland by F. S. Peer, and were imported for other persons. R. N. Riddle, of New Jersey, imported 20 in 1905. An importation of 19 was made in 1906 by Fred Stucker, of Ohio. Other Saanen importations of note were those by A. B. DeHaan, of Iowa, in February 1920; Mrs. A. L. Bowman, of Vermont, in May 1920; J. C. Darst, of Ohio, in August 1920, and Mr. Dewoyno, of Ohio, in January 1922.

More recent importations have included three purebred Saanen bucks from England; \*B Etherly Mynas S 105835, by A. L. Rogers, Maryland; Mostyn Messenger S 105810, by Mrs. C. P. Horton, New York; and Thundersley Petrol S 94172, by T. Mitchell, Pennsylvania.

During the years when the Department maintained a herd of Saanen goats, the grade and purebred does milked from 8 to 10 months after kidding and produced an average of 5.6 pounds of milk a day. Some of the best does averaged 6.5 pounds a day for 10 months. The butterfat in the milk averaged approximately 3.5 percent.

Authentic records of high-grade and purebred does show this breed to be one of the highest producers of milk and butterfat. A purebred

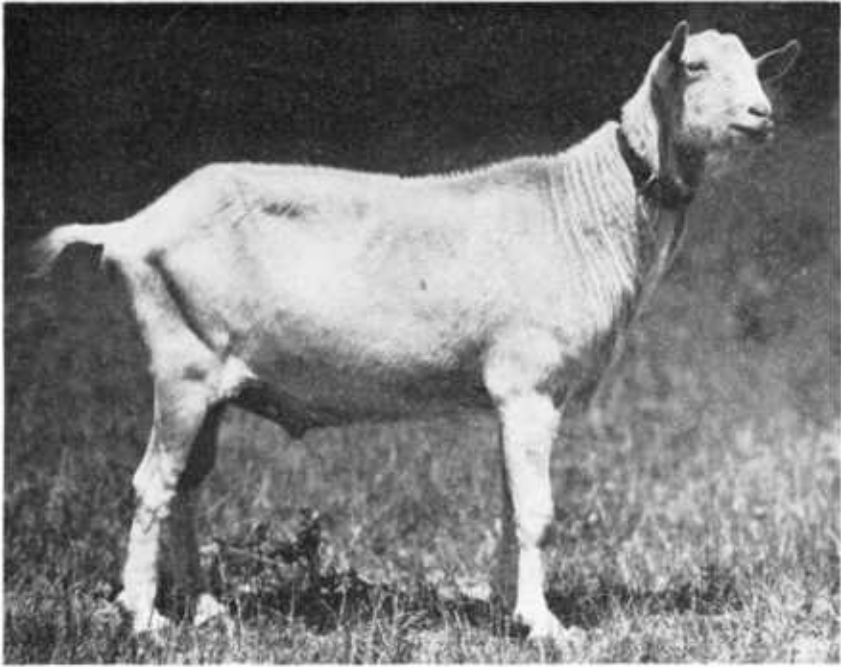


FIGURE 4.—Purebred Saanen buck.

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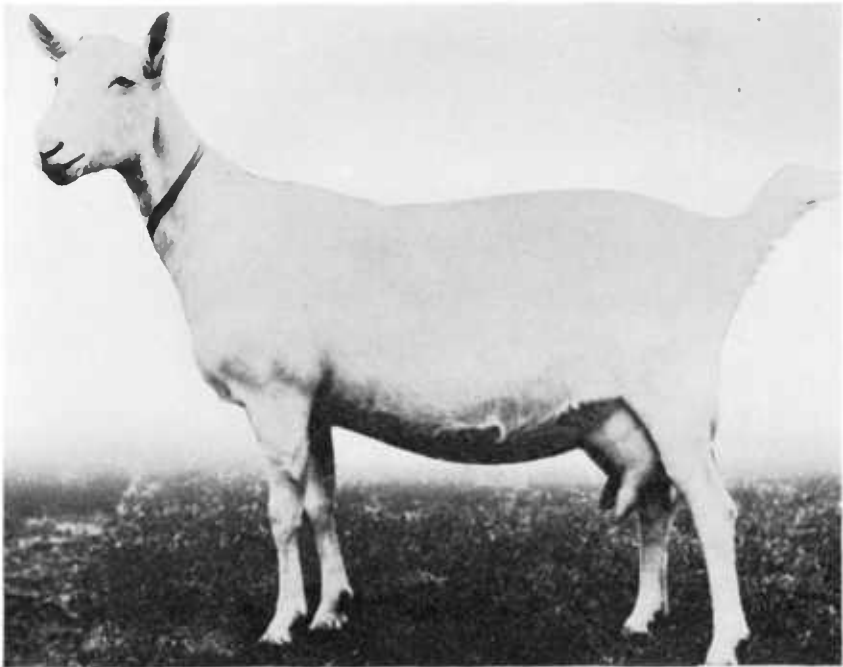


FIGURE 5.—Purebred Saanen doe.

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Saanen doe on official test in California produced 4,161.7 pounds of milk and 138.5 pounds of butterfat in 9 months and 10 days; this is the highest official milk record in the United States for this breed.

The Saanen is without question one of the most beautiful and valuable breeds. Many producers have successfully graded-up herds of common or grade does by using Saanen bucks. Saanen does at maturity and in good flesh will usually average 120 pounds and bucks 185 pounds in body weight.

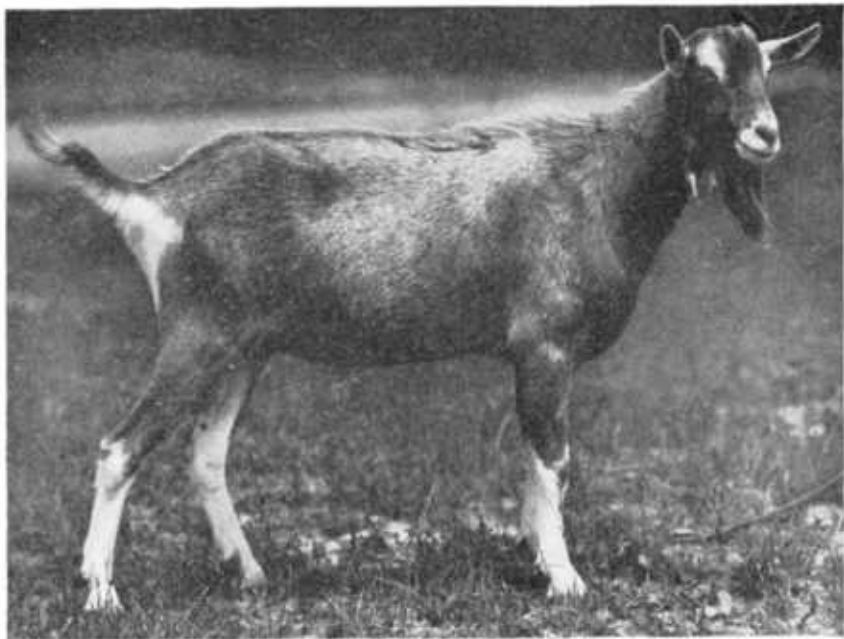


FIGURE 6.—Imported purebred Toggenburg buck.

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### Toggenburg

The Toggenburg (figs. 6 and 7) is one of the leading breeds of Switzerland and takes its name from the Toggenburg Valley. Although some consider this a hornless breed, Toggenburg goats genetically horned are numerous. The color of the Toggenburg is brown or chocolate with a light stripe or bar down each side of the face. The legs below the knees and hocks are light gray or almost white. The wattles or appendages, two in number, attached to the under side of the neck are generally characteristic of this breed. Length of hair varies from short to long.

The first recorded importation of the Toggenburg into the United States was in 1893, when W. A. Shafor, of Hamilton, Ohio, imported 4 from England. In 1904 F. S. Peer imported 16 from Switzerland; in 1905 he imported 9 more. One of the largest importations of milk goats ever made to this country was in 1905, when R. N. Riddle, of New Jersey, imported 119 Toggenburgs. These goats were sold over a wide territory. In 1906 Fred Stucker imported 13.

Other Toggenburg importations of note were those by A. B. DeHaan, of Iowa, in February 1920; Mrs. A. L. Bowman, of Vermont, in May 1920; J. C. Darst, of Ohio, in August 1920; and H. S. Greims, of New Jersey, in September 1934. A more recent importation was the purebred Toggenburg buck Fink D. A. 53650 by Don Allen, New York.

The Toggenburg is one of the most popular of the breeds of milk goats in the United States. Good stock is usually available in most sections of the country. It is said that in Switzerland Toggenburg does produce from 5 to 6 quarts of milk a day, and some of the best even more. Reliable breeders in the United States report does that produce from 4 to 6 quarts a day during the best period of lactation,

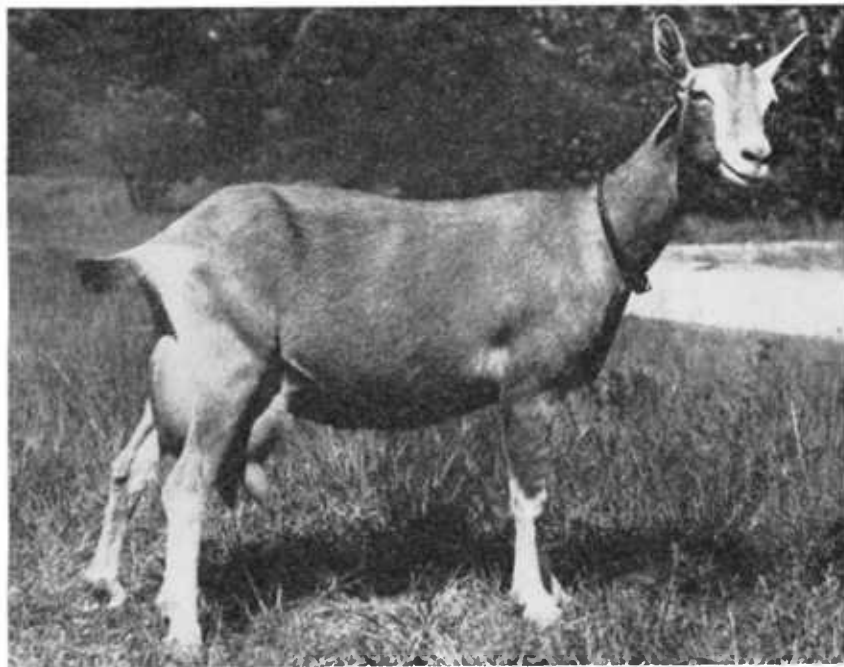


FIGURE 7.—Purebred Toggenburg doe.

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and a few does have averaged from 4 to 5 quarts for a period of from 8 to 10 months. A purebred doe of this breed has made an official record of 4,422.5 pounds of milk and 151.97 pounds of butterfat in 10 months.

Records kept on the Department's herd show that the grade and purebred Toggenburg does have milked from 7 to 10 months after kidding and produced an average of 4.1 pounds of milk a day. Some of the better does have averaged 5.5 pounds a day for 10 months, while one  $\frac{3}{8}$ -purebred doe produced 1,789.9 pounds of milk in one lactation period of 10 months. In the last few years the butterfat content in the milk has averaged about 3 percent.

The average weight of the mature grade and purebred Toggenburg does in the Department's herd during a 3-year period was 96 pounds.

This weight is an average of monthly weights taken during the entire periods of lactation.

Owing to the fact that Toggenburg goats are more plentiful in this country than other breeds, a good many grade goats of the Toggenburg type are found. In fact, many herds have been established by crossing Toggenburg bucks on does of the American type, and the Toggenburgs have been prepotent in transmitting their characteristics to their offspring.

### Nubian

The Nubian (figs. 8 and 9) is considered a valuable breed. It is a native of Nubia, upper Egypt, and Ethiopia. Its important peculiarities consist in the length of the large drooping ears and the shape of the head. The outline of the face is convex, the forehead being especially prominent and there is a depression at the nostrils. The ears are wide throughout the lower extremity and of such length that they hang below the jaw and turn slightly upward at the ends. The Nubian is considered a hornless breed, but bucks occasionally develop horns. It is one of the largest breeds of goats, but is less hardy than the leading European breeds. The hair is short and fine. The color is black, dark brown, or tan, with or without white markings. The distinct odor so prevalent in the males of other breeds is somewhat less pronounced in the Nubian.

The Nubian breed is one of the best for quality milk production, the milk testing especially high in butterfat. One doe on official test has a record of 3,200.9 pounds of milk and 161.2 pounds of butterfat in

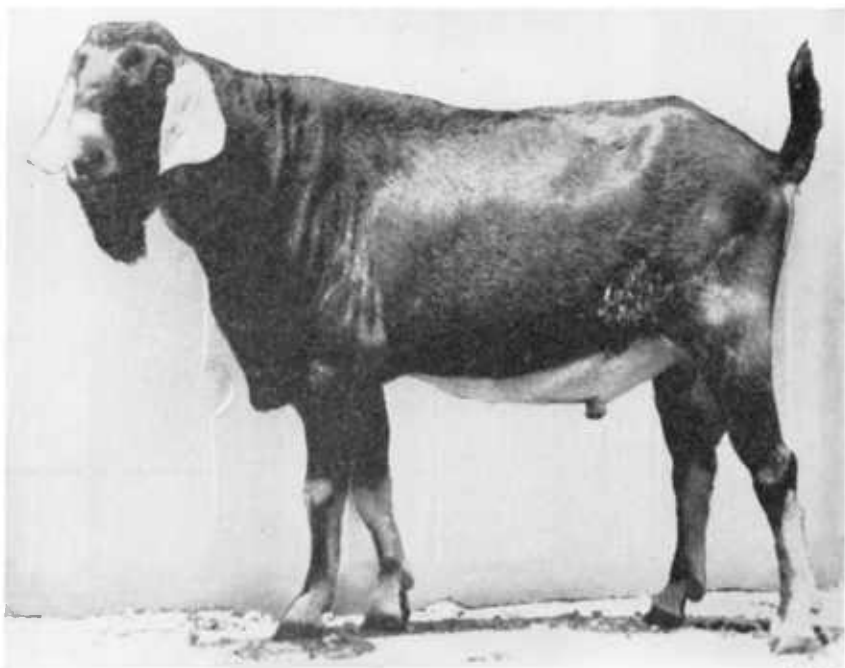
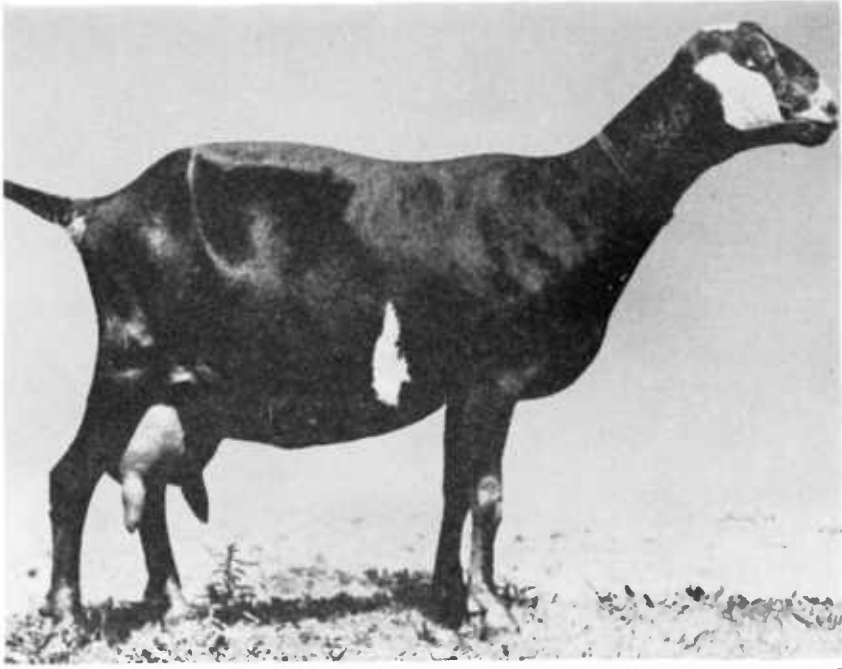


FIGURE 8.—Nubian buck.



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FIGURE 9.—Nubian doe.

10 months. The present Nubian record holder for the United States produced 4,248.3 pounds of milk and 184.61 pounds of fat in 10 months. This is an outstanding production since this breed seldom gives as much milk as the Swiss breeds. Nubian bucks have been crossed on common does with very satisfactory results.

An importation of four Nubians was made to this country from Mexico by W. W. Carr, of Virginia, in 1909. These goats came to Mexico from France.

It is probable that nearly all of the so-called Nubian goats in the United States are Anglo-Nubian, a breed developed in England. British breeders used the offspring of European female goats that had been bred to Indian and African males, as foundation does. Thus the Anglo-Nubian derives from European, Asiatic, and African goats. In usage the term "Anglo" was dropped from the name Anglo-Nubian a good many years ago in the United States.

In 1896 G. Howard Davison, of New York, imported four English goats. It is probable that they were of the Anglo-Nubian type. In 1909, four Anglo-Nubians were imported from England by R. I. Gregg, who also imported two from England in 1913. In 1906 D. C. Mayers, of Virginia, imported seven grade goats from Barbados. Some of these goats were of Nubian breeding.

More recent importations of Anglo-Nubian goats from England included the doe Malpas Merridew 69100 by Miss E. T. Fell, Pennsylvania, and four bucks; \*B Malpas Ambassador 60328 by H. V. Bale, Illinois; \*B Budletts Brutus N83388 by A. L. Bommer, Missouri;



Harleo 53247, by Mrs. E. Tantum, New Jersey, and \*B Berkham Evans N 103978 by A. L. Rogers, Maryland.

### Alpine

A considerable number of Alpine goats are raised in the United States and include French, Swiss, and Rock Alpines.

The French Alpine (figs. 10 and 11) is an imported breed which has gained rapidly both in numbers and in general popularity in the last 2 decades. This breed is one of the largest, is quite hardy, and shows great capacity for milk production. The animals are alert in appearance, more closely resembling the Saanen in general conformation than any of the other more prominent breeds. The color ranges from pure white to pure black although some white spotting is usually present, generally on the neck, legs, or underneath the body.

There is often a mixture of white and dark hair forming dark markings of bluish gray or brownish gray in combination with pure white.

This breed was developed in the mountains of France and has been selected for heavy milk production for generations. A purebred doe in Texas made a production record of 4,632.3 pounds of milk and 132.74 pounds of butterfat during an official test of 10 months. The breed is comparatively heavy of bone and presents a general appearance of ruggedness, which is partly responsible for the great popularity it enjoys.

All purebred French Alpines in the United States trace directly to the original importation selected by Charles DeLange in France.

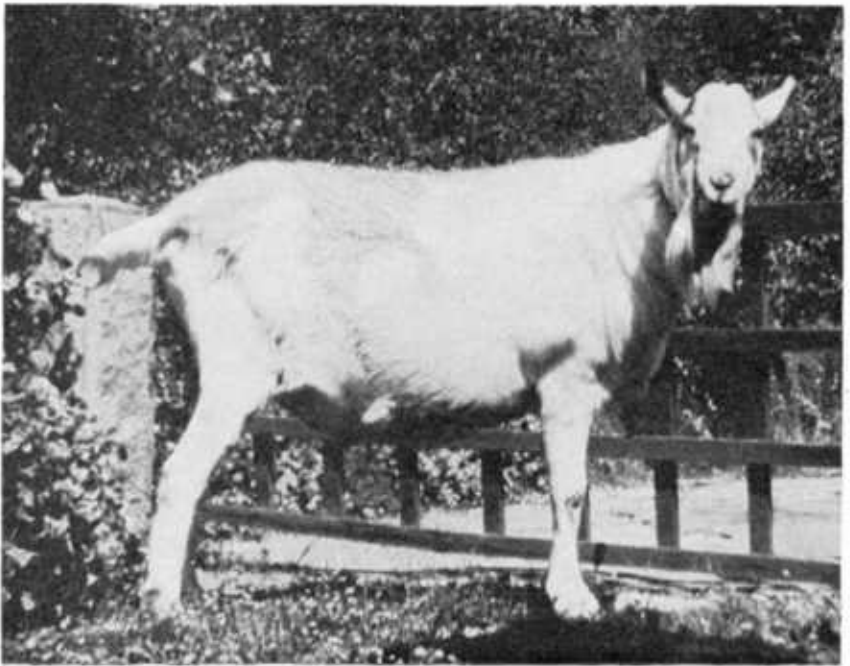


FIGURE 10.—Purebred Alpine buck.

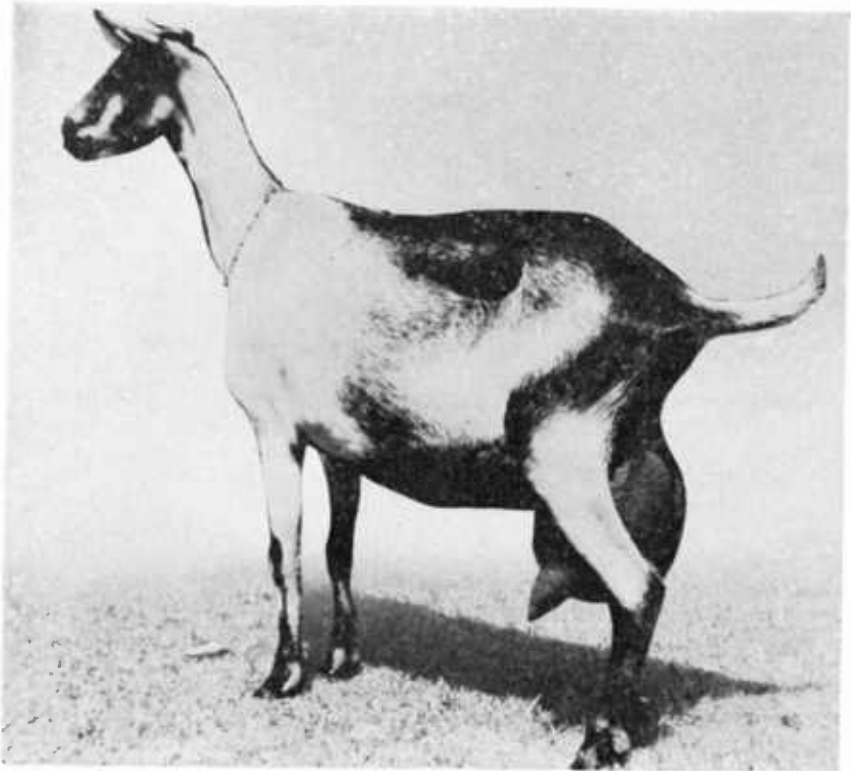


FIGURE 11.—Purebred Alpine doe.

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This importation, which arrived in California in 1922, consisted of 3 bucks and 18 does which were especially selected for heavy milk-producing inheritance. It is reported that animals of this breed are very prepotent and have been crossed with grade goats and other pure-breds with good results. They are usually hornless, but horns occur more often than in some of the other breeds.

The Swiss Alpine as the name indicates originated in Switzerland. The color is principally a rich seal brown with black markings and the coat is short, sleek, and glossy. Goats of this breed are usually hornless and their milk is ample in quantity and quality for any reasonable purpose.

The Rock Alpine is an American developed breed and according to TeWalt<sup>3</sup> is based upon the first two Swiss importations, then topped by continuous use of pure French Alpine bucks and bred up to a point recognized through resolution by the American Milk Goat Record Association as being worthy of a standing as an independent breed reproducing true to type. They show the same range of colors as the French Alpine. Their type, size, and general quality are characteristic of high-class milk goats.

<sup>3</sup> TeWalt, Will L. Improved Milk Goats. Orange Judd Publishing Co., Inc., 1942.

A Rock Alpine doe in New Jersey has produced 2,703.4 pounds of milk and 95.0 pounds of butterfat in 10 months on official test.

A small number of British Alpine goats have been imported to the United States from England. These goats resemble the Toggenburg in that they have a light stripe down each side of the face, but they are black instead of brown. The legs below the knees and hocks are also white. The British Alpine is a product of the general crossbreeding that was practiced in England in the early years of this century to produce a better goat irrespective of type. Swiss blood such as the Saanen and Toggenburg predominated. It is similar to the Toggenburg in milk production.

### Less Important Types and Breeds

There are also small numbers of goats of other breeds and types in the United States that are of little economic importance at the present time.

The Murcian was introduced from Spain. It has had some part in the development of a few herds in California and the Southwest. Its adaptation to hot temperatures has been of value in these areas. The predominating color of this breed is seal brown and the coat is short and silky. They are largely hornless, have a well-developed udder, and produce milk that is usually high in butterfat.

The Norska is a large goat brought over from Norway many years ago but like the Murcian was never promoted. It is short-legged with long hair and a rugged constitution. The predominating color is white with some variation.

The common or American goats (fig. 12) found in many sections of the United States and especially in the South are of mixed origin. In many sections these goats have been bred for a great many years without the introduction of outside blood, so that in general conformation they are very nearly uniform. They are of medium size and are somewhat short legged, rather meaty in appearance, and do not show the conformation of the Swiss breeds. Although occasionally a few goats of this type are good milkers, the quantity of milk produced is usually small, and the lactation period lasts only a few months. One of the greatest objections from the standpoint of utilizing this type of goat for milking is that the teats are usually short and small. Both sexes as a rule have horns, those on the buck frequently attaining a good size. This type of goat is of various colors; brown of various shades, brown and white, black and white, bluish gray, and white predominate. These goats are very prolific.

The common or American type of goat properly selected offers a good foundation for grading up with the Toggenburg, Saanen, Nubian, or Alpine breeds.

Since it would require many years to build up a good milking type by use of the common goats alone, and such excellent results were obtained by crossing Saanen and Toggenburg bucks on them, the Department strongly recommends this practice.

Large numbers of goats have been brought in from Mexico, and no doubt they have had some influence on the type in many parts of the South and Southwest. These Mexican goats in many cases, show considerable influence of the imported Spanish types.

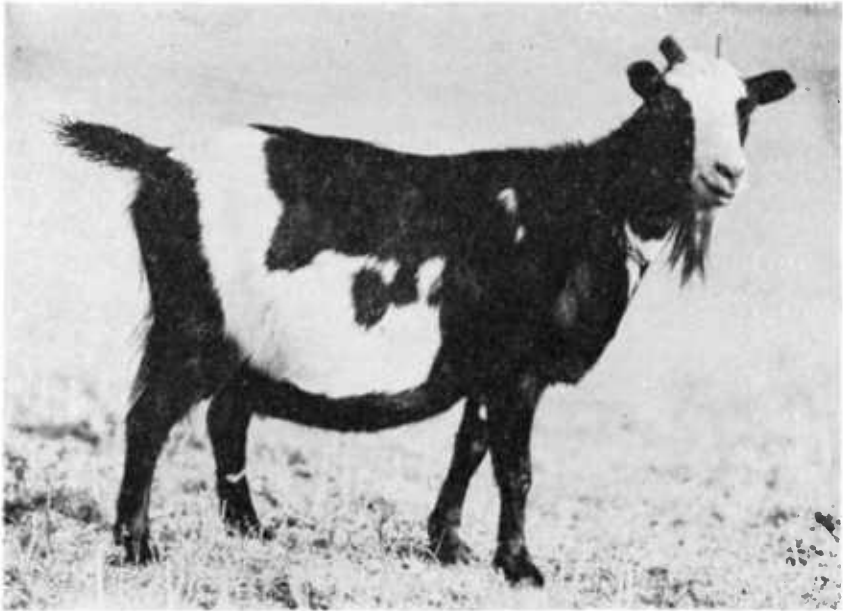


FIGURE 12.—Common American doe.

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### BREEDING AND SELECTION

The development of superior individuals or lines of breeding in milk goats as with other animals is dependent upon the interactions of heredity and environment. Good breeding will develop outstanding individuals only if the right kind of feeding and management practices are followed. Similarly, the best feed and management possible will not produce a desirable type of goat with high milk and butterfat yields unless the individuals carry the breeding for these characteristics.

Improvement in goats is brought about chiefly through hereditary factors transmitted through the germ cells. Effort, therefore, should be concentrated toward improvement by so mating the animals as to recombine these factors in more desirable forms. The various recombinations which may take place are the hope and despair of animal breeders. Without such variations, there is no opportunity for improvement; with them there is no assurance of fixing a type without constantly selecting animals with desirable characters and discarding those with undesirable ones.

Through selection, the goat breeder has the means of controlling the inheritance of his animals. He can decide which of his animals shall have many offspring, which shall have few, and which shall have none. As a guide in estimating whether an animal has the hereditary factors that will enable it to approach the desired ideal, certain procedures are of value and should be used in practical breeding. Individuality, ancestry, and performance must all be taken into account. Each has its value or its limitations, and no single formula for the amount of attention to give to each can be generally prescribed.

### Selection of the Buck

The buck is usually considered half the herd and, in order to make progress in breeding, care should be exercised in making this selection. As good bucks are scarce, it is not always possible to get the type desired, but the best obtainable should be procured even if the cost is a little greater. Select a buck from a good-producing doe that is a persistent milker. There is nothing more important in the matter of breeding than evidence that the entire family to which the sire belongs is especially good in performance and in conformation. The success of breeding any class of animals depends largely on the selection of the sires. The selection of a single sire has made many herds famous.

A buck should be masculine in appearance, of at least medium size for his age, and of good conformation. As regards the latter, a good depth of body is one of the most important considerations. The masculinity of the buck can be determined by the size and conformation of the head, amount of bone, and the quality and length of the hair on various portions of the body. The legs should be straight and well placed. Always select a vigorous buck. Thinness is no objection if the buck is healthy and a good feeder. A good buck is seldom in good flesh, especially during the breeding season.

Most breeders at the present time prefer bucks that are naturally hornless. The kids of such bucks are usually without horns. The type of doe to which the buck is bred will, of course, have some influence in this respect.

When only a few does are kept, it is cheaper and more convenient to send them away to be bred. A buck is usually a troublesome individual, and must be kept away from the rest of the herd. The charges made for outside breeding are usually reasonable.

Many small breeders are compelled to use crossbred or grade bucks; in such cases selection should be made upon conformation and breeding. Always use purebred bucks when available.

### Selection of the Doe

Although it is not always possible, it is much more satisfactory in making selections to see does during their lactation period. This not only gives an opportunity to study their conformation when they are producing, but the udder development, which is so important, can be better observed.

A good doe should have a feminine head, thin neck, sharp withers, well-defined spine and hips, thin thighs, and rather fine bone. The skin should be fine and thin over the ribs. She should have good digestive capacity, as shown by the spring of rib and size of stomach. The so-called wedge shape of the dairy cow is clearly defined in a good milk doe. The constitution, an important item, is indicated by the depth and width of the chest. The udder should be of good size when filled with milk and very much reduced when empty. A large udder does not always indicate a high milk yield unless it is of the so-called "genuine" type. The teats should be large enough to make milking easy.

In selecting a doe, the first questions that are naturally asked are: How much milk will she produce and how long will she milk? While

some does milk for only a few months after kidding, others continue producing for 8 to 10 months or even longer.

In selecting does, especially when they are giving milk, avoid those that are fleshy; this is a strong indication that they are not good producers. Select those of the dairy conformation.

Owing to the scarcity of good purebred does and the prices asked for them, it is much more economical to begin a herd by selecting good grade does, such as are found in many sections of the country, and breeding them to superior bucks of the leading breeds. By keeping the best young stock and breeding them back to good bucks selected for high producing offspring, a grade herd can be developed that will out-produce purebreds of the quality most breeders are willing to sell. Another way is to buy the best purebred doe kids that the buyer can afford from reliable breeders.

### Methods of Breeding

Since the ultimate success of the goat breeder in the improvement of his animals depends not only on his skill in their selection but upon the judicious mating of them as well, it is essential that he have at least a general understanding of the systems of breeding used in the improvement of goats and other livestock.

Inbreeding is the mating of animals which have a closer relationship to each other than the average relationship within the species or breed concerned. Only animals of excellent merit and few defects should be used in such a system. Mating of sire to daughter, son to dam, full brother and sister are examples of this system. Animals resulting from such matings are more likely to transmit their good characteristics than animals which are possibly as good individually but which have resulted from outcrossing or random breeding. However, this type of breeding also tends to bring out recessive characteristics not apparent in the parents which may be undesirable and the breeder should be quick to cull rigidly in order to keep only the good qualities.

Linebreeding is mating animals so that their descendants will be kept closely related to some animal regarded as unusually desirable. It is accomplished by mating animals that are both closely related to the unusually desirable ancestor but little if at all related to each other through any other ancestor. Since both parents are related to the animal toward which the linebreeding is being directed, they are related to each other.

This system is used extensively and is recommended when the ancestor to which all offspring trace is of special merit and free from serious defects. However, the chances of getting inferior offspring are too great to employ it on average stock in order to avoid the purchase of a new buck.

Crossbreeding is the mating of two animals which are both purebred but belong to different breeds. The hybrid vigor often results in superior individuals. These are not usually satisfactory as breeding stock due to their complex genetic inheritance. However, on account of the general dominance of genes favorable to size, vigor, fertility, and production, goat raisers interested primarily in milk production employ this system with good results.

Outcrossing is the mating of animals of the same breed but which show no relationship for at least the first 3 or 4 generations. It is a relatively safe system to use, for it is unlikely that two unrelated animals in a breed, selected more or less at random, will be carrying the same undesirable genes and pass them along to the offspring.

Grading up is the practice of using purebred sires of a given pure breed on native or grade females. Its purpose is to develop uniformity and to increase productivity and quality in the progeny. This system of breeding is the most economical way of rapidly lifting the milk production of commercial stock.

### Age for Breeding

Goats are in their prime when from 4 to 6 years of age, but choice individuals and good breeders may often be kept to advantage several years longer. The general practice is to breed young does when they are 15 to 18 months of age, at which time they will be practically grown if they have been well cared for. Most breeders have their does kid in the months of February, March, and April, and breed them but once a year. However, some people who keep only a few goats desire a milk supply during the entire year and breed a part of the does to freshen during the fall or early winter. Well-grown young does can be bred to advantage when from 12 to 15 months of age.

Does will sometimes breed at an early age and care should be taken not to allow them to become pregnant too young. Cases are recorded in which does have kidded when less than 9 months of age.

### Periods of Heat

Does come in heat regularly between September and January, and somewhat irregularly and with less intensity from January to March. After this only an occasional doe can be bred until late in August, when the entire herd will come in heat again. When they come in heat and desire the attention of the buck they make their condition known by uneasiness and constant shaking of the tail. They usually remain in heat from 1 to 2 days. The period between heats is ordinarily about 21 days. From the record kept of the Department's herd, most does have returned in from 17 to 21 days, but sometimes they will return in from 5 to 7 days after service. This, however, may be an indication that something is wrong with the doe. Bucks are continually of use for service from the fall to the spring season. It is during this time that they have such a strong odor. The number of does to breed to one buck depends on his age and condition. An early spring buck kid, if well grown and properly handled, can be bred to a few does the following fall. A buck from 12 to 18 months of age can be bred to at least 25 does, and a mature buck is sufficient for from 40 to 50 does.

### Out-of-season Breeding

Breeders experience much difficulty in getting does to breed during the late spring and summer months. This seasonal restriction in the breeding of does creates a problem of maintaining a fairly uniform

level of milk production throughout the year and is of much concern to goat dairymen and others who would prefer a fairly constant supply of milk. Several possible means of spreading the period over which does come in milk have been investigated by research workers and in some instances applied by breeders. Probably the most practical ones are: (1) Delayed breeding of a part of the does in a herd so that some are bred at different times during the breeding season, (2) pen breeding virgin or dry does during the spring and summer months, by permitting a buck to run with them, and (3) selection of does that tend to come in estrus outside the usual breeding season, thereby increasing the spread in possible breeding dates.

Until other methods can be developed, the first and second ones can be considered the most practical. Even these are not so easy of application in small herds as in large ones where there is more opportunity for separation of animals into groups for early and late breeding. Reserving some does for late breeding may also result in a few dry does since goats do not breed with as much certainty during the latter part as in the early months of the breeding season.

To develop a strain of goats which would consistently breed out of season, if possible, would require many generations of vigorous selection for the trait.

The injection of hormones to produce out-of-season breeding has not proved effective in the Department's herd and in some cases has proved detrimental in retarding the occurrence of natural estrus and thereby delaying the effective breeding. Therefore, this practice cannot be recommended to the practical breeder.

### **Gestation Period**

The gestation period, which is the time between the effective service of the buck and the birth of the kid or kids, ranges from 146 to 152 days. It is usually spoken of as 5 months. The average gestation period recorded for several years in the Beltsville herd of Toggenburg does was 149 days.

### **Number of Kids**

Milk goats are very prolific. The usual number of kids at one time for mature does is 2, but frequently there are 3, and it is not a rare thing, especially among the common American goats, to have a doe produce 4. Yearling Toggenburg does at Beltsville have produced kids at the rate of 168 per 100 does, while the mature Toggenburg does have produced kids at the rate of 196 per 100 does. Records indicate little difference between Toggenburg and Saanen breeds in this respect.

### **FEED AND MANAGEMENT**

Successful goat production, as with other livestock, requires the use of proper feeding methods. The ability to convert feed into milk is inherited. Consequently, one of the most important problems of the goat breeder is to so feed his goats that this inherited ability is utilized to the maximum. Unless feeding permits full development, intelligent selection cannot be made of the animals which can



transmit the desired characteristics. Undernourished does that never had an opportunity to demonstrate their capacity to produce milk, and bucks lacking in growth and vigor, are difficult to appraise accurately.

### The Buck

In handling goats, the bucks are a considerable problem. Their strong odor and disgusting habits cause many people to take a great dislike to goats. Bucks should be kept away from the does except when desired for service. If they are kept in the same barn or room where the does are milked, some of the strong odor is likely to be absorbed by the milk. Place the bucks in a separate barn or shed, with a lot sufficient for exercise and pasture.

The best results can be expected only when the bucks are kept in a healthy condition. During the winter months the ration should consist of a hay—alfalfa, clover, or mixed hay—and corn stover, with some succulent feed such as silage and turnips, and a sufficient quantity of grain.

The bucks in the Department's herd are usually wintered on 3 pounds of alfalfa or clover hay, 1 to 1½ pounds of silage, and 1½ pounds of grain a day, the grain mixture consisting of 100 pounds of corn, 100 pounds of oats, 50 pounds of bran, and 25 pounds of linseed meal. During the breeding season the grain ration for mature bucks is usually increased to 2 pounds per head daily. When the bucks are on good pasture, no grain is necessary.

During the breeding season it is usually necessary to keep the bucks separate, or they will fight and are likely to injure one another. A wood lot with plenty of browse is an excellent place for them during the summer. Goats are browsers by nature and prefer leaves, twigs, and weeds to grass.

It is often necessary to protect the trees in the lots and pastures by putting around them a framework covered with close-woven wire. This is true especially of the young trees. If no lot, or only a small lot, is available for feed and exercise, the buck may be tethered out. Vacant lots can often be utilized to advantage. Fresh feed as well as a variety is thus afforded.

### The Doe

Most of the feeds that are valuable for the production of milk for dairy cows are also suitable for does. From 6 to 8 goats can be kept upon the feed required for 1 cow. When does are in milk, they should be allowed all the roughage that they will consume, such as alfalfa, clover, or mixed hay and corn stover. They should receive a liberal quantity of succulent feed, such as silage, mangel-wurzels, carrots, rutabagas, parsnips, or turnips. The grain feeds best suited for their ration are corn, oats, bran, barley, and linseed meal or linseed cake. Other feeds that are often available and that can be utilized are cottonseed meal, brewers' grains, corn bran, gluten feed, and beet pulp.

A ration that has proved to be very satisfactory for does in milk during the winter season consists of 2 pounds of alfalfa or clover hay, 1½ pounds of corn silage or roots, and from 1 to 2 pounds of grain. The grain ration consists of a mixture of 100 pounds of corn, 100

pounds of oats, 50 pounds of bran, and 25 pounds of linseed meal. When the does are on pasture they receive from 1 to 1½ pounds per head daily of the grain mixture.

There is a great difference in individual goats; one goat may readily eat a ration that another may not like so well. As in the case of dairy cows, each doe should be studied if the best results are to be obtained. It is best to feed separately each doe that is giving milk. This not only affords an opportunity to study each individual but also insures that each one receives the quantity intended for her. A good practice is to feed grain on the basis of a doe's milk production; that is, at a ratio of 1 pound of grain for each 3 or 4 pounds of milk produced, with a daily minimum allowance for all does of 1½ pounds of grain per head.

In the Department's herd of Toggenburg does an average of 1.0 pound of grain is required to produce a quart of milk, on the basis of the daily consumption of grain throughout the entire period of lactation. Approximately 500 pounds of hay and 450 pounds of grain a year are required for a mature doe, provided of course, that good pasture is afforded as much as 6 months of the year. If no pasture is available about twice the amount of hay and 20 percent more grain is required. It is estimated that 1 acre of good pasture is sufficient for 2 to 3 mature goats during a grazing season 5 to 6 months in length. If grain and hay are to be grown for the goats, additional acreage must be provided for this purpose. Goats relish browse, but a doe cannot be expected to produce milk at her maximum level without the addition of good legume hay or other pasture plus a grain ration.

Young does should be kept growing. In the spring, summer, and fall, if they have plenty of browse and pasture, no grain is necessary. If no browse is afforded and the pasture is short during certain months, give them a little grain. In winter they should be fed about 1 pound of grain, 1 to 1½ pounds of silage or roots, and all the hay or fodder they will consume. They should have a shed for shelter and protection from the wind. Goats must be kept dry and out of cold winds for best results.

Some goat breeders make it a practice to gather leaves in the fall and store them for winter use. This practice should be resorted to only in cases of shortage of more desirable feed. Leaves may be used for bedding, but even for this purpose they are only fairly satisfactory. If only 1 or 2 goats are kept, refuse from the kitchen, such as potato and turnip peelings, cabbage leaves, and waste bread may be utilized for feeding. If necessary, does may be tethered out, as described in connection with handling the buck.

All feed offered to goats should be clean. Rations should be made up from the best feeds available and those most relished by the goats. Salt should be provided in the form of medium fine stock salt with trace minerals. Phenothiazine can be mixed with this in the proportion of 12 to 17 parts salt to 1 part phenothiazine without coloring the milk. This provides some protection from internal parasites as the does consume their salt requirement. In order to be sure they get enough phenothiazine to protect them, no other salt should be provided and mixed feed containing salt should not be used. A good supply of fresh water is necessary; goats should not be compelled to drink from pools where the water has been standing.

### Lactation period

The lactation period, which is the time that a doe produces milk, varies considerably in the different breeds and types of goats. It ranges all the way from 3 to 10 months, or even longer. A lactation period ranging from 8 to 10 months is considered very satisfactory. There are certain conditions, such as the breed, individuality, health, feed, and regularity and thoroughness of milking, which may influence it. Purebred does of any of the leading breeds, as a general rule, will milk longer than any of the so-called common, or American type. The breed that has been developed the longest should, of course, excel in this respect if the animals have been properly selected. There are always individuals in a breed that excel along certain lines, and this is especially true as regards length of lactation period.

The health of the does while giving milk is of special importance. When does are out of condition frequently their milk yield shrinks, and in many cases, they have to be dried up. Proper feed and regular feeding have a tendency to extend the lactation period not only by stimulating the production but by causing a more uniform flow during this time. The milking must be done regularly and thoroughly if good results are desired. Irregularity and neglecting to draw all the milk from the udder have a tendency to shorten the period.

### Milking

As goats are small animals, they can be milked more conveniently when on a stand such as that shown in figure 13. As young does usually object at first to being milked, the stanchion arrangement shown in the illustration is an excellent method of handling them. For the first few times at least it is best to give the does a little grain feed in the box attached to the stanchion. Does soon become accustomed to being milked and after a few times will jump up on the stand and put their heads through the stanchion without being assisted.

The doe's udder should always be either washed or wiped thoroughly before being milked. Ordinarily a damp cloth is sufficient to remove all foreign material. The first milk drawn should not be saved, as the openings in the teats may be partially filled with foreign matter which will be removed after a little milk has been drawn. It is best to have a room for milking separate from the main goat barn. This prevents the milk from absorbing any odors in the stable.

There are two systems of milking goats: From the side, as cows are milked, and from the rear. This latter method is largely a European style and is used very little in the United States as there is more opportunity for contamination of the milk from dirt and droppings. Commercial dairies usually make milking arrangements to conform to local health regulations.

There are also two systems of drawing milk from the udder: One consists in pressing the teat in the hand, as is usually practiced in milking cows, and the other is "stripping." The first can be adopted when the teats are of sufficient size to be grasped by the hand. The other method is necessary only for goats with small teats or for goats in their first lactation, before the teats are fully developed. In stripping, the teat is grasped between the first finger and the thumb



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FIGURE 13.—The milking stand. A convenient method for milking goats.

close to the udder and drawn down the entire length, sufficient pressure being exerted to cause the milk to flow freely.

A heavy producer may have to be milked three times a day for a short time, but twice is sufficient for most does. The period between milkings should be divided up as equally as possible. Milk should not be used for human consumption until the fourth or fifth day after the doe gives birth to kids. Some authorities recommend waiting longer, but this is not necessary if everything is normal. Regularity in milking is important, and kindness and gentleness should be regarded as essential. It is advisable that the milking be done by the same person so far as possible. Milking machines especially designed for goats are used in many commercial dairies.

#### Care of the milk

Utensils used in handling the milk may be purchased from goat dairy supply houses. All utensils should be kept clean. A sanitary stainless steel milking pail with detachable hood has been satisfactory at Beltsville. These pails are of 4-quart capacity. As soon as the milk is drawn it should be weighed, strained, and cooled. The weighing is necessary if one is to determine accurately how much a doe produces. Milk records are especially valuable to the breeder in selling stock as well as in selecting breeding animals.

The milk should always be thoroughly strained to remove any foreign matter. The best method is to use commercial filters or

strainers, but it is possible to use a layer of sterilized absorbent cotton between two cloths, or to pass the milk through several thicknesses of cloth. Cheesecloth is best for this purpose.

To check the growth of bacteria the milk should be cooled to a temperature of 40° F. as soon after milking as possible. This may be done by placing the cans in a tank containing cold water. One of the best systems of cooling the milk rapidly, however, is to run it over a cooler inside of which is cold, running water. Milk should be kept cool until wanted for use. Complete information on the production of clean milk is contained in Farmers' Bulletin 2017.

Sometimes undesirable flavors appear in the milk. These may be due to strong feeds such as wild garlic or strong-flavored weeds or vegetables consumed by does too near to milking time. Good flavored milk results from proper handling, such as keeping bucks separate from the milking does, using perfectly clean utensils, cooling the milk rapidly after it is drawn, and keeping it refrigerated. Occasionally, owing to ill health or some systemic disorder, individual does will give poorly flavored milk. Theories have been advanced that individual does vary in the amount of fatty acids secreted in the milk, and thus does receiving the same feed sometimes produce differently flavored milks. Some breeders believe that off-flavored milk is an inherited characteristic. Still others have observed that does milked for unusually long lactation periods tend to produce milk of poor flavor. Experimental study of this problem is needed.

Because pasteurization of goat's milk distributed for human consumption is required by public-health authorities in many localities, its effects on nutritive values are important. Studies by the Department have shown that the solubility of calcium and phosphorus is slightly increased and the curd tension is reduced by pasteurization. This process improves the keeping quality more than the flavor of fresh goat's milk. Pasteurization by holding the milk at not less than 142° F. for 30 minutes caused a decrease of from 33 to 45 percent in the content of reduced ascorbic acid, or vitamin C.

#### Care of the doe during kidding

Ordinarily the doe and kid need no special care during and after kidding. A few days before expected parturition the doe should be given a small stall where she may be alone. Plenty of clean bedding, such as straw, leaves, or shavings should be provided. She may have all she will eat. If she is indifferent about food, adding carrots, beets, or small pieces of apple to her ration may induce her to eat.

Assistance at birth is seldom required. Small or young does kidding for the first time may need help. Parturition may require an hour. If it is not completed by the end of 2 hours, assistance should be given. Wash the hands and arms with soap and warm water and a mild disinfectant, such as a 10-percent solution of therapogen. This is made by taking one part of therapogen and diluting with 9 parts of water.

Examine with the hand the position of the kid in the uterus. Normally the two front feet should be felt first with the nose resting on the front legs. Fasten a stout cord which has been disinfected in the solution to the kid's front legs and pull gently as the doe strains.

The kid's head should move along with the legs. Once the forelegs and head are passed there will usually be no further trouble. If one leg is doubled back, it should be straightened out so that it lies alongside of the other and so that both will come out together. Never pull on the front legs unless the head is coming along with them.

If the kid is in a posterior position, the two hind feet must be expelled together. Attach a cord to them and proceed as in a forward presentation.

In a backward presentation the kid's back is sometimes downward. In this case the kid should be turned in the passage so that its belly will be downward before any pulling is done.

After the kid is out, dry it off with a clean dry cloth and put it near the doe. She will usually lick it clean and otherwise care for it. A second or third kid may be born following removal of the first one. The afterbirth as soon as passed should be burned or buried. If the afterbirth is retained for more than 24 hours, or if there is inflammation of the uterus, 2 to 3 ounces of mineral oil containing one-half dram of iodoform may be introduced into the uterus through a sterile soft rubber tube. This loosens the attachment of the afterbirth to the womb and prevents bacterial infection.

After the kid gets up and starts to nurse, make certain that it is getting milk. Stripping the teats a few times will indicate the presence or absence of milk. If the teat is not open a veterinarian should be called. The kid or kids should receive the first milk, or colostrum. If hand feeding is to be used the kid should not be allowed to nurse the doe at all, but should be fed from a bottle with a nipple for the first few days, then taught to drink from a pan. If the kid nurses the doe, see that both halves of the udder are emptied uniformly. The udder should not be allowed to become hard.

### Raising the Kids

The raising of the kids is especially important when it is desired either to sell or use the milk for family purposes (fig. 14). If the kids are not to be raised, they can frequently be sold for pets or for



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FIGURE 14.—Saanen kids, some of which are half-blood, others three-quarter-blood.

meat when 2 to 3 months old. Kids that are allowed to suckle their dams not only make good growth but require very little attention as compared with those raised by hand. However, hand-raising helps avoid ill-shaped udders which sometimes result from uneven suckling, prevents weaning difficulties, and provides a check on milk production.

The quantity of milk to be fed and the length of time that it should be fed depends on several conditions. Kids dropped in the spring do not require so much milk or need to be fed so long as those dropped in the fall or early winter. The quantity of milk required for a kid can be determined readily from the fact that a doe producing from 3 to 4 pounds of milk a day can easily raise two kids satisfactorily. This means that each kid needs  $1\frac{1}{2}$  to 2 pounds of milk a day, or  $1\frac{1}{2}$  to 2 pints. The Department in an experiment allowed several does with records of a little above 4 pounds of milk a day to suckle 3 kids, feeding the kids also some hay and grain. The kids made a fairly good growth, which shows that the amount of milk can be decreased if other feed is supplied.

Studies in the feeding of kids by hand in the Department's herd have shown that after they have reached 10 weeks of age the milk may be replaced in a large measure by good alfalfa hay and mixed grain without sacrificing body weight and development. During the period from 10 to 18 weeks of age, the kids in one lot were given 60 pounds less of milk than the check lot, and all were fed all the hay and grain they would clean up. The kids on the restricted milk diet consumed on the average 9 pounds more of grain and 2 pounds more of hay during this 8-week period than the kids in check lot. The average weight of the kids in the 2 lots was identical at the close of the feeding test. This substitution of grain and hay for milk in kid feeding is economical, as it takes approximately 1 pound of grain to produce 2.2 pounds of milk.

Kids to be raised by hand should not be allowed to nurse the doe. They should, however, be given the colostrum or first milk which is so valuable to them during the 2 days following birth. This milk should be fed at frequent intervals from a bottle and nipple.

Kids can be raised satisfactorily on whole cow's milk, and some goat breeders have adopted a system whereby skim milk has been used with a fair degree of success. The kids should be changed from whole to skim milk very gradually, the quantity of skim milk being gradually increased until it makes up the entire milk ration. After this has been done the kids will usually consume from 2 to 3 pounds a day. They should be given just as much as they will drink readily, and until they are at least 6 weeks old they should be fed three times a day. During this time the milk should be warmed and fed at a temperature ranging from 90° F. to not more than 98° F. The kids can be weaned from milk when they are from 3 to 4 months old. At about 8 weeks of age the digestive system of kids is usually sufficiently developed so that they can obtain substantial nourishment from solid feeds. At weaning age they will consume sufficient hay, grain, and pasture to make a good growth. Some of the leading goat breeders do not wean the kids until they are about 5 months of age. The age for weaning, however, should depend upon the system of raising the kids. If raised by nursing the does, they can be allowed to remain in the herd until 5 months of age; but if

they are raised by hand feeding and the supply of milk is limited, they may be weaned much earlier without serious results.

Kids will eat a little hay and grain at an early age, and they should be provided with them. Alfalfa or clover hay should be given in a rack and the grain mixture in a trough. Arrangements should be made to keep the kids out of both the rack and the trough. A good grain ration for the kids consists of cracked corn, crushed or rolled oats, and bran mixed in the proportion of one part cracked corn, one part crushed or rolled oats, and one-half part bran. They should be allowed as much as they will clean up during the 24-hour period until they are eating one-half pound a day. All grain that is not eaten should be removed from the trough each day and fresh grain provided, as kids are very delicate in their eating habits.

If the kids are fed by hand, they can either be given the milk from a bottle with a nipple or a tank with a number of nipples attached, or they may be fed from pans. Most kids can easily be taught to drink from a pan or trough, and this system is less troublesome. Some kids, however, are very slow in learning to drink and do much better when fed from a bottle. Cleanliness is absolutely essential for the successful raising of kids. The pans, pails, bottles, and nipples should be kept clean. After the kids are a few weeks old and have learned to drink, they can be fed from a galvanized-iron trough. Care should be taken, however, to see that each kid receives its share of the milk.

Kids are very playful creatures and require considerable exercise. If they are kept in a small enclosure, it is a good plan to put a box from 18 to 20 inches in height in the center, so that they may run and jump upon it. This will give them plenty of exercise, and they will have keen appetities. Pasture or browse should be afforded as early as possible.

### Castration

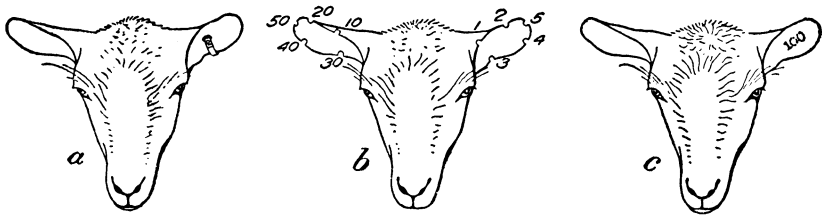
All buck kids not to be kept or sold for breeding purposes should be castrated when they are from 10 days to 3 weeks of age. The older they are, the more severe the operation. The operation of castration is very simple and can be performed by the elastration or pincer methods or by cutting the lower third of the scrotum off and grasping above the testicles forcing them out so that they can be grasped and pulled away one at a time with the spermatic cord attached.

The elastration method is accomplished by expanding a rubber band by an instrument, which is released around the scrotum, above the testicles, stopping the flow of blood to the extremity below the band. The pincer method is performed by clamping pincers, the jaws of which do not come entirely together across the scrotum above the testicles. This pincer crushes the cord but does not sever the outside layers of skin. These are known as bloodless methods of castration.

In case the knife is used when the kids are more than 4 months of age, the cords should not be pulled out but scraped off just above the testicles. The wound should be bathed with some good disinfectant after the operation.

Buck kids should be separated from the doe kids when they are about 4 months of age. Doe kids come in heat when young, and the young bucks worry them a great deal if allowed to run with them. Occasionally doe kids become pregnant when they are only 4 to 5 months of age.





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FIGURE 15.—Methods of marking goat's ears: *a*, metal label; *b*, notching; *c*, tattooing.

### Marking

Each goat in the herd should be marked in some manner for identification. This may be done by the use of metal ear labels, by notching the ears, or by tattooing the ears (fig. 15). In some instances all three of these systems are used. When this is done, the kids' ears are notched as soon after birth as possible, and when they are from 3 to 6 months of age the ear label is inserted and the tattooing done. The ear label is only a fairly satisfactory method of marking and never should be used as a sole means of identification as the label is liable to be torn out. Care should always be taken to insert the label rather close to the head and far enough up into the ear to make it fairly tight.

Notching the ears can be done with the punch used for inserting the ear label. Notches on certain parts of the ears indicate certain numbers, the sum of the numbers represented by the notches being the number of the goat. Numbers up into the hundreds involve a rather complicated system, but they are not usually necessary in a small herd. To avoid a complex system, each crop of kids may be numbered from one upward. The notch system is especially valuable, as it not only serves as a means of identification but it is not always necessary to catch the goats to read their numbers. A person can stand at some distance, and if the goat is facing him the notches can be seen readily.

Tattooing on the inside of the ear is the most satisfactory method of marking goats. There are on the market tattooing instruments having adjustable numbers and letters, with which a combination containing 3 or 4 of either or both can be made. Some breeders tattoo their initials in one ear and a number in the other. Tattooing is an excellent method of recording the identity of goats as the numbers are easily read and when properly inserted are practically permanent. Special nonfading tattoo ink can be obtained from all livestock equipment houses. Care should be used to make sure the ink is rubbed well into the indentures made by the needles.

### Dehorning

Mature goats may be dehorned safely. This is done best by sawing the horns off close to the head with a wire saw such as veterinarians use. The operation should be performed if possible when the weather is fairly cool and when flies are not troublesome. As soon as the horns are removed, apply a little pine tar to the wounds.

The horns on kids can be prevented from developing by using caustic soda or potash sticks, commercial horn removing preparations,

or the disbudding iron. Regardless of the method used it is highly important to make sure that the kid to be disbudded actually requires disbudding; that is, be certain that the kid is not naturally hornless. To determine whether a kid has horn buds, the hair should be clipped closely from the top of the head where the horn buds would be expected. If two shiny hairless spots show up, the size of a pinhead or larger, and if the skin is tightly attached to the skull at these points, it is highly probable that the kid has horn buds. On a naturally hornless kid, the skin can be moved from side to side by pushing with the finger, as the skin is not attached. However, there is an enlargement at the point at which the horn would be attached to the skull. The most favorable time to disbud is the day after the kid is born, provided the kid is of normal vigor, and it has been determined that the kid has horn buds. The sooner the operation is performed the less developed the horn buds will be and the easier it is to stop their growth.

Caustic sticks of soda or potash may be obtained from the drug store. These should be used with care, as they may injure the skin of the person handling them. The stick caustic should be wrapped in a piece of paper to protect the fingers, leaving one end uncovered. Moisten the uncovered end and rub it on the horn buttons. Care should be taken to apply the caustic to the horn button only, but it should be blistered well. This is best effected by clipping the hair close to the head for some distance around the horn button and coating the surface with petrolatum, leaving the skin close to the horn button and the button itself free from the coating.

The caustic may then be applied to the uncoated portion without danger of its burning the remainder of the head or running into the eyes. The application should be made when the kids are from 2 to 5 days old.

The disbudding iron probably gives more uniformly successful results and is easier on both the kid and the operator than the other methods. A disbudding iron can be purchased from goat dairy supply firms or made by anyone handy with tools. It resembles a soldering iron with the tip sawed off. Irons, the ends of which are slightly concave, are preferable to irons sawed off with plain end, although these also give good results. For disbudding the iron should be heated so that at least 2 inches are cherry-red. Having two irons so that a fresh one is ready for the second horn bud accelerates the operation. For small doe kids a 7/8-inch (diameter) iron is sufficiently large, but for large does and especially buck kids a 1-inch iron is better. The iron should be centered on the horn buds, and applied with a rotary motion and light pressure, for from 5 to 10 seconds or more depending on the size and development of the horn buds. When the iron has burned enough the clean skull will show. It is important that the iron be at cherry-red heat, because at a lower temperature a longer time is required which is more exhausting to the kid. Unguentine or carbolated vaseline should be applied to each disc immediately after disbudding.

### Care of the Hoofs

If goats are more or less confined and not allowed to run upon gravelly or rocky soil their hoofs grow out and should be trimmed. A goat should have its hoofs trimmed so that it will stand squarely on its

feet. A sharp pruning or hoof knife is best for this operation. The horny edge of the hoof should be trimmed level with the soft tissue which comprises the sole, and if this tissue is overgrown or unbalanced it may also require a little trimming. This part of the hoof is sensitive and must be trimmed carefully and not too deeply. Excessive horny portions of the heel should be trimmed so that the entire foot will set squarely on the ground. If the hoof is overgrown and badly out of shape, it will be necessary to restore it gradually to normal shape by drawing it to form a little more at each trimming. The need for hoof trimming will vary with individual goats, but examination of the hoofs should be made at monthly intervals.

### Fencing for Goats

A satisfactory type of fence for enclosing goats consists of woven wire mesh at least 32 inches in height and strands of barbed wire to make the total height 54 inches. Woven wire 48 inches high with one strand of barbed wire probably would be the most satisfactory but a 32-inch woven wire with 3 strands of barbed wire would turn them effectively and be more economical.

Electrical fences also can be used satisfactorily and economically with perhaps some preliminary training of the goats. At the Agricultural Research Center, two strands of wire turned mature does satisfactorily but was not entirely adequate for controlling kids. It is necessary to make sure that the current is operating continuously when this type of fence is being used. The goats will soon know it if the charger is not working. One or more wires may be charged at the same time as needed.

### GOAT MEAT AND GOATSKINS

There has always been a rather general prejudice in this country against the use of goat meat as food. However, in some sections a great many goats of the milk type, especially kids, are consumed annually. In some parts of the South kids are considered a delicacy and are in demand. They are sold for slaughter when from 8 to 12 weeks of age. The flesh of young goats, or kids, is palatable and has a flavor suggesting lamb.

The prices of goats sold on the market for slaughter are always considerably less than those received for sheep. Goats do not fatten and carry flesh as sheep do.

The United States imports in normal times about 40,000,000 goatskins annually, so it would seem that there should be a ready market for all skins that could be produced. Skins from the short-haired goats, such as the common type of American goats and the milk breeds, are the kind used in the manufacture of shoes, gloves, book-bindings, pocketbooks, and like articles. However, as a rule these skins have only a small commercial value.

### PRICES OF GOATS

Owing to the excellent demand and the limited supply of quality milk goats, breeders are naturally asking good prices for stock. Purebred bucks of any of the leading breeds cost \$50 to \$75 or more, depending, of course, on the breed, age, conformation, and breeding.

Good bucks from record-producing does are usually held at a higher figure. Grade or crossbred bucks may usually be purchased at from \$15 to \$25 but their use is not recommended for those who are interested in improving the quality of the offspring.

The prices for does not only depend on the breed, age, conformation, and breeding, but on milk production. Purebred does cost from \$50 to \$100 or more, whereas grade or crossbred does range from \$15 to \$50 and higher if they are exceptional producers. Persons who wish to procure a milking doe to furnish milk for an infant or an invalid are only too glad, as a rule, to pay a fair price and do not care so much about the breeding of the goat.

In some herds, where breeders do not care to raise all the kids and desire to dispose of them as soon as possible after birth, the prices range from a few dollars up to \$10 a head.

### Renting Goats

It occasionally happens that a supply of goat's milk is desired for only a short time. Under such conditions does are sometimes rented. Sometimes a breeder would not care to sell a doe but would be willing to rent her out. A fair basis for the charge of renting out a doe would be a reasonable price per quart for the milk she would probably produce during the period wanted.

## TROUBLES WITH GOATS

Although considered very healthy, goats are subject to disease and have their troubles as well as any other animal. Goats are less subject to disease than sheep, but the two species are so closely allied that, in general, the treatment in cases of disease is the same for both. Since the diagnosis and treatment of diseases require special knowledge and experience, the services of a veterinarian should be obtained whenever disease problems arise.

A matter of great importance and one on which breeders lay considerable emphasis is the fact that goats are rarely affected with tuberculosis. When confined to close quarters with cows that have tuberculosis, they may, however, contract the disease. Goats that are in good condition are not very liable to contract disease, but some maladies may affect them if they are allowed to get in poor condition.

In the Federal meat inspection the cause of most of the condemnations for goats on both ante mortem and post mortem inspections is emaciation. Emaciation may be due to any one of a combination of factors such as stomach worms, flukes, tapeworms, and abortion. It is necessary, of course, to determine the cause before treatment can be administered.

### Diseases and Minor Ailments

#### Brucellosis

This term covers infection due to germs belonging to the genus known as *Brucella*. Organisms of this class are responsible for brucellosis, also known as Bang's disease and infectious abortion, in cattle and other animals, Malta fever in goats, and undulant fever in



FIGURE 16.—A herd of healthy goats tested for brucellosis.

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man who contracts the disease directly or indirectly from infected animals or their products.

Brucellosis in goats is most frequently caused by the germ, *Brucella melitensis*. Signs of infection may vary considerably. Abortions are common in herds where the disease has been recently introduced as well as in young does from herds where infection has been present for a considerable time. Other symptoms occasionally observed are lameness, retarded milk secretions, and inflammation of the udder.

Suspicion as to the presence of brucellosis can be verified by tests of the animal's blood. In herds found to be infected, repeated tests are usually desirable. The test, known as the agglutination test, is the same as that commonly used for brucellosis, or Bang's disease, in cattle. Milk and milk products from infected animals are dangerous unless pasteurized or boiled. Persons caring for infected animals are exposed to the infection.

The chief method of prevention is frequent blood testing. Newly acquired animals should always be subjected to test, preferably by an authorized agent of the State, before they are added to healthy goat herds (fig. 16). This is especially desirable in goat dairies, and is mandatory in some States. The reacting animals should either be isolated pending replacement or slaughtered under veterinary supervision.

#### Abortion

Goats, like all other species of farm animals, sometimes abort. The abortion may be caused by infection, lack of some necessary element in the diet, or other factor about which little or nothing is known.

If several repeated abortions should occur in the herd, infection of some kind may be suspected. In such a case it would be advisable to have the aborting goats, or even the entire herd, blood-tested for Malta fever. Goats affected with this disease are apt to abort. Malta fever is not likely to appear among goats except in those

restricted localities where the disease is known to exist. The test for Malta fever is the same as that for Bang's disease.

If a doe aborts she should be placed in a pen by herself, away from the herd, and kept isolated until discharges from the generative organs cease and recovery is complete.

The fetus and afterbirth, provided the latter has been expelled, should be disposed of in such a manner as to be inaccessible to the rest of the herd. Similar disposition should be made of the discharges from the genital organs and of contaminated bedding.

Pens in which abortive goats have been isolated should be well cleaned and disinfected before being used again.

Little can be done or is necessary in the way of treatment beyond attention to the comfort and nourishment of the animal. If the afterbirth is retained for more than 24 hours, the subcutaneous or intramuscular injection of diethylstilbestrol or estradiol dipropionate is recommended. This treatment produces contraction of the uterus which aids in the expulsion of fluids and eventual detachment of afterbirth.

#### Constipation

Constipation sometimes occurs, especially in the kids. Simple constipation may be due to digestive disturbances resulting from accumulations of poorly digested dry feed, lack of exercise, or gorging.

A change of diet and adequate exercise may serve to relieve this condition. When medication is required such simple drugs as Epsom salts or oil may usually be safely administered as a drench.

The dosage for mature stock is from 2 to 4 ounces of salts dissolved in 1 pint of warm water. Weanling kids should receive only half that dosage. Castor oil or raw linseed oil in place of Epsom salts will be effective, and the dosage should consist of the same number of liquid ounces.

#### Mastitis, or caked udder

When mastitis is present the udder usually feels hard and is hot and swollen, but an occasional case may be found in which there are flakes in the milk and very little swelling of the udder. The condition is caused very frequently by the presence of bacteria which multiply in the milk and tissues of the udder, and set up inflammatory changes. Injuries, excessive accumulation of milk in the udder, rough milking, chilling, and systemic derangements favor the development of the disease-producing germs. The diseased animal should be promptly removed from the herd and treated. Treatment consists in milking the animal thoroughly but gently every hour or two during the day. The application of hot towels or water as hot as the hand will stand for 20 minutes 4 to 5 times a day will also be of benefit.

Antibiotics and sulfonamides are also useful for intramammary injection in cases of chronic mastitis or parenterally in acute cases. If these drugs are injected through the teat canal then frequent stripping of the udder is not necessary. Treatment by use of antibiotics and sulfonamides should be administered by a competent veterinarian.

#### Sore teats

This condition may be caused by the teeth of the kids, warty growths on the teats, or an injury. After the teats have been washed and dried, carbolated petrolatum should be applied.

### Foot rot

Unless properly managed, goats may have foot rot. The first evidence of this trouble to attract attention is a slight lameness, which rapidly becomes more marked. The foot will become swollen and warm to the touch. There is no specific treatment for this condition. A treatment may be successful under certain conditions and worthless under others. In a treatment sometimes used, the affected feet are first trimmed thoroughly so as to expose the seat of infection, and then soaked in a saturated solution of copper sulphate (2½ pounds to 1 gallon of water) for several minutes. The animal is removed to clean dry quarters and the copper sulphate treatment repeated, when necessary. Pine tar applied to the feet helps to promote healing after the infection has been controlled. Sulfonamides and antibiotics are also used in the treatment of foot rot.

### Parasites

Goats and sheep become infested with about the same kinds of internal and external parasites, and are adversely affected in a similar manner. A detailed discussion of this subject is given in Farmers' Bulletin 1330, Parasites and Parasitic Diseases of Sheep, and only the more important aspects of the problem are discussed herein.

Goats are known to harbor different kinds of parasites, but those concerned in parasitic gastroenteritis cause the greatest economic loss. The most important of these are stomach worms, intestinal hairworms, and nodular worms. Heavy infestations of the common stomach worm produce a severe anemia; stomach hairworms cause an inflammation of the lining of the fourth or true stomach, resulting in gastritis, diarrhea, and loss of appetite. The effects of intestinal hairworm infestations are similar to those caused by stomach hairworms, except that the inflammation is in the small intestine and is known as parasitic enteritis. Nodular worms may produce somewhat similar effects in the large intestine. Emaciation and death of kids and adult goats may result from heavy infestations of one or more of these parasites, unless measures are promptly taken to expel a significant proportion of the worms. Even if death losses do not result from parasitic infestations, there may be serious effects on growth, interference with milk production, and interruptions in breeding activities. Other internal parasites, such as liver flukes, tapeworms, lungworms, and coccidia, also can be troublesome to goats. Certain external parasites also are injurious but, in general, are considered of lesser importance.

Phenothiazine is the most effective drug that can be used for the removal of internal parasites from goats. This drug should be given in doses of 35 to 40 grams (about 1½ ounces) to adult goats, and 20 grams (¾ ounce) to kids under 6 months of age or 60 pounds or less in weight. Treatment with phenothiazine twice a year is recommended in cases where parasitism tends to be troublesome. More frequent treatments may be given if necessary. If goats are in production, the milk should be discarded, or used for other than human consumption, for a period of 4 days immediately following treatment, as phenothiazine imparts a pink discoloration to the milk for a few days after medication.

Phenothiazine may be given as a drench or in capsule. Animals may be treated individually or in groups by mixing the proper amount of the drug in their feed. This method is not recommended, however, for goats in production. In order to obtain an accurate diagnosis, to assure proper dosage, and to avoid injury to the animals, the treatment should be given by, or under the supervision of, a veterinarian.

Other chemicals, such as copper sulphate, nicotine sulphate, a combination of these, or tetrachloroethylene, are used to treat worm parasitism in goats, but none of these is more generally useful than phenothiazine except perhaps in the case of animals in production. Farmers' Bulletin 1330 contains further details on these and other treatments.

Measures other than specific medication can play an important part in effective control of goat parasites. A wide range and dry, hillside pastures tend to prevent parasitic infestation, whereas small, wet low-lying pastures favor the spread of parasites. Enclosures free from vegetation are not as dangerous as lush pastures. Cleaning out the manure frequently and thoroughly is another aid in keeping enclosures safe. Pasture rotation is an important control measure. The longer the pastures are rested the greater is the destruction of the free-living stages of the parasites. If it is not feasible to use these aids for parasite control one must resort to periodic medication with phenothiazine or other antiparasitic drugs.

#### Lice

Goats infested with lice may be treated by dipping, spraying, washing, or dusting with suitable insecticides. The method of choice will depend upon the number of animals to be treated, the insecticide used, prevailing weather conditions, and available facilities. Washing and dusting are probably the most practical methods for most dairy herds, the latter being particularly useful in cold weather. Spraying and dipping are very effective, but they are generally feasible only when large numbers of animals are to be treated. Whatever method is selected, however, all goats in the herd should be treated regardless of the number of animals infested. It may be noted that clipping long-haired goats discourages lice and is an excellent sanitary measure as well.

Suitable dusting powders may be prepared by thoroughly mixing 3 ounces of derris or cube powder (containing 5 percent of rotenone) or 2 ounces of methoxychlor (50 percent wettable powder) with 2 pounds of talc, pyrophyllite, or other similar diluent. The mixtures must be well rubbed into the hair over the entire body surface. Ordinarily, 1 or 2 ounces is sufficient for a single application which can usually be relied upon to protect the animals from serious reinfestation for at least 3 or 4 weeks.

Rotenone wash, or dip, may be prepared by dissolving 3 ounces of soap flakes in 1 gallon of water and adding 12 ounces of derris or cube powder (containing 5 percent of rotenone). The mixture should be prepared just before use, and it should be kept well stirred at all times.

A dip or wash containing 0.5 percent of methoxychlor is also effective against lice. A suitable suspension may be prepared by thoroughly mixing 4 ounces of 50-percent wettable methoxychlor powder in 3



gallons of water. The addition of an ounce of soap flakes to the water makes the wash easier to apply.

These washes are suitable for use during any season of the year except in extremely cold weather. Apply them with a brush or a cloth, spreading a thin, even coating over the entire body surface. Avoid contaminating feed, utensils, and drinking water with these preparations; do not allow pools of the mixtures to form from which the animals may drink; and do not allow the materials to drain over vegetation upon which the goats are permitted to graze.

Other chlorinated hydrocarbon insecticides such as DDT, BHC, toxaphene, and chlordane are also useful in concentrations similar to those of methoxychlor, but they should not be used on or around dairy animals in production since they are eliminated partly in the milk. A more complete discussion of methods of controlling lice may be found in Department Leaflet 308.

### MILK-GOAT REGISTRATION ASSOCIATIONS

The American Milk Goat Record Association was organized in 1903. Objectives of this association are to establish and improve the breeds of milk goats in America; to collect information on the history and pedigree of the best milk goats wherever found, and to preserve such records; to publish as much of such information as is deemed advisable by the board of directors; and to exhibit milk goats at such times and places and under such regulations as the directors decide. This Association had recorded approximately 117,365 purebred animals by December 31, 1954.

The American Goat Society, Inc., was organized in 1935, to preserve and perfect the registration of purebred goats exclusively and to develop and sponsor activities designed to promote the dairy goat industry.

In 1939, the International Dairy Goat Record Association that had been registering milk goats from the time it was organized in 1927, united with The American Goat Society, Inc., which association now represents the consolidation of the two former associations. It continues under the name of The American Goat Society, Inc., and had recorded 49,639 purebred animals by the end of December 1954.

The names and addresses of the secretaries of the organizations mentioned may be obtained on request from the Animal and Poultry Husbandry Research Branch, Agricultural Research Service, United States Department of Agriculture, Beltsville, Md.

There are also numerous State and local organizations which promote the development of a particular breed, or goat raising in general. Through these organizations a beginner may come in contact with outstanding breeders as well as benefit from their experiences. Names and addresses of such organizations may usually be obtained from advertisements in current milk goat magazines.