Dairy Goats in Missouri

C. W. Turner, A. C. Ragsdale, and E. R. Garrison

The Toggenburg goat originated in Switzerland. This breed exceeds all others in number in the United States.
Many people in Missouri are becoming increasingly interested in dairy goats. This interest is widespread, inquiries concerning the feeding and management of goats coming from all parts of the state. There are a number of reasons why Missouri is well suited for the raising of goats. In cities and towns dairy goats may be kept to provide the family milk supply, thus utilizing vacant lots, waste space along roadways and fences, lawn clippings, and table scraps. The mild climate and long pasture season provide outside range during a large part of the year. The foraging qualities of goats makes them ideally fitted for the utilization of hilly and even rocky land. Goats may be kept by those who desire a family supply of milk and who do not have the room for or cannot afford to buy or keep, a cow.

Dairy goats are kept by some to provide a milk supply for infants and others who are unable to properly digest and assimilate cow's milk. As goats are kept in small groups, they are usually quite healthy and free of disease.

The purpose of this bulletin is to answer some of the common questions which are being asked about dairy goats.

BREEDS AND BREEDING OF GOATS

What are the common breeds of dairy goats? The five most common breeds of dairy goats are the Toggenburg, Saanen, Nubian, French Alpine, and Rock Alpine.

Which of these is best under Missouri conditions? There is no best breed of dairy goats. Well bred individuals of each of these breeds will be found to produce large quantities of milk at a low cost.

What is the appearance of the Toggenburg goat? The Toggenburg goat, which takes its name from the Toggenburg Valley in Switzerland where it originated, rather resembles a deer in its alert expression and active temperament. The color varies from fawn to brown, with two white stripes down the face; white around the ears and tail and below the knees. They may or may not have horns. The does when mature will weigh from 100 to
135 pounds and the buck from 150 to 175 pounds. They were the first purebred breed to be imported into this country and are now present in the largest numbers. (See picture on front cover)

Where do the Saanen come from and what is their appearance? The Saanen goat also originated in Switzerland and is similar in conformation to the Toggenburg except that it is larger, the mature doe weighing 135 pounds or more and the bucks weigh 180 pounds or more. Saanens are white, or cream colored, and usually short haired. Both horned and polled animals occur. Because of their larger size, larger milk production, and hardiness, this breed is very popular in commercial herds. (Fig. 2)

Did the Nubian goat also come from Switzerland? No, the Nubian (also called Anglo-Nubian) is an English goat. It was produced by crossing goats imported from Asia and Nubia in Africa with the native English goats. They are large goats of entirely different type from the Swiss breeds, their chief characteristics being the Roman nose and long pendulous ears. The mature does will weigh 125 pounds or more and the bucks 165 pounds and up. The colors vary from white to red and black, and the markings are usually broken and spotted. As the average percentage fat content of the milk is high, this breed is frequently called the “Jersey” breed of goats. (Fig. 3).
Fig. 3.—The Nubian breed is characterized as the "Jersey" breed of dairy goats because of the quality of their milk. They differ from the Swiss goats in having a Roman nose and long pendulous ears.

Fig. 4.—The French Alpine breed is the latest to gain popularity. The does are large animals and heavy milk producers. Due to their scarcity they are relatively high priced. The Rock Alpine goats are similar in color and conformation.

Are the French and Rock Alpine goats raised in Missouri? Yes, French and Rock Alpines are being raised by a few goat breeders. They are similar in conformation to the Swiss breeds.
The characteristic color is a combination of black and white, or light tan to fawn, with the lighter colors predominating in the forequarters and under parts although the color may vary from pure white to pure black. The animals are of good dairy types. Mature does will weigh 135 pounds or more and the bucks will weigh about 180 pounds. (Fig. 4)

**How do these breeds compare in milk production?** Goats have not been extensively tested officially for production. Good individuals of these breeds have produced as much as 5 to 6 quarts (10 to 12 pounds) daily when they were mature. Smaller individuals should not be expected to produce quite as much as the larger does. Further, the production will increase gradually during the first three or four lactation periods. Individuals of the smaller breeds should not be expected to produce as much as the larger breeds.

**How long will the average goat continue to milk?** Goats after freshening will usually increase in milk for the first month or two, then gradually decrease until at nine or ten months after kidding they will dry up. Goats of good milking strains will often milk well right through the second year without being bred. (Fig. 5)

![Lactation Curve of Dairy Goats](image)

Fig. 5.—The lactation curve of about 75 dairy goats.*
Milk secretion increases gradually for some time and then declines slowly.

**What kind of goat should a beginner buy?** When contemplating the purchase of a doe it is ordinarily best to look for a grade animal. After learning how to care for and feed goats he will be in a position to know better whether he wishes to purchase and breed the more expensive pure bred animals.

*The writers are indebted to Dr. H. J. Brooks and Dr. S. A. Asdell of Cornell University, who loaned us the production records from which the above curve was computed.
How much should I pay for a grade goat? In Missouri in 1940 it is possible to buy a grade doe capable of giving about two quarts of milk per day for approximately $10 to $15, a three-quart doe for $20 to $25 and a four-quart doe for $25 to $35.

How does the time required to milk goats compare with the time for cows? In 127 trials at the New Mexico Station by one milker, in which from 5 to 20 goats were milked at each trial, it was found that the average rate of milking was 77.2 pounds per hour. Eight milkers in a large cow dairy milked at an average rate of 135 pounds each per hour.

Can goats be bred any time during the year? Goats differ from cows in that they can only rarely be bred during the spring and summer months, from March to August. During the rest of the year they come in heat about every 21 days, similar to the cow. This is one of the most serious drawbacks to the goat as a dairy animal as it is not possible to secure a uniform milk supply. Goats with high persistency of lactation through the summer and fall should be selected as far as possible. The Missouri Agricultural Experiment Station is beginning a study of the problem of stimulating does to breed during the spring and summer months. (Fig. 6).

![Graph of Date of Birth of Goats]

Fig. 6.—The seasonal variation in the birth of goats in the United States.

When should young does be bred? Some breeders prefer to wait until the does are 15 to 18 months of age before the first service. This allows the animals to attain a greater size. For
greater efficiency of milk production the does may be bred when about 12 months old so that the non-productive period can be kept to a minimum and the productive ability of the daughters of the buck determined earlier.

Do goats come into lactation before becoming pregnant? Yes, it is quite common for goats, especially Saanens, to come into slight lactation during their first year. A few kids have been known which gave a little milk and many animals when sexually mature will begin to "bag-up" and will, if milked, yield from a pint to a quart of milk.

Should such precocious lactators be milked? If milking is begun it is best to milk regularly until there is an indication that the animal is beginning to dry up. If lactation starts in the spring the animals will usually dry up in the fall. Information available indicates that the milk produced is normal and can be used. One objection to milking immature animals is the effect it may have upon growth and subsequent lactation.

What is the duration of pregnancy? Most goats will drop their kids about 5 months, or 150 days, after the service of the buck. Some kids may come a few days earlier or a few days later (145 to 155 days).

Should goats have a dry period? Persistent goats may be milked up to 4 to 6 weeks before parturition. They should then be well fed to build up their reserve flesh. If does do not dry up readily, the feed should be cut in half for a few days, then discontinue milking entirely. The udder will become congested for a few days, then the milk will be resorbed and no further trouble should be expected. The udder will not be injured by this treatment.

How frequently are twins and triplets dropped? Of 115 does over 18 months of age at the time of parturition, 26 does produced one kid, 55 produced two, 30 produced three, and four produced four kids each, which is at the rate of 2104 kids for each 1000 pregnancies. Of 20 does under 18 months of age at parturition, 14 produced one kid and 15 produced two kids, while none produced more than two. At this rate there were 1517 kids per 1000 pregnancies.*

What is the average birth weight of grade and purebred Toggenburg kids? The average weight of 101 kids at birth was 5.7

*Data from the New Mexico Sta. Bul. No. 229.
pounds. Of this number 48 males averaged 6.1 pounds and 51 females averaged 5.5 pounds. The average weight of single kids was 6.5 pounds.

**Can the age of goats be estimated from the condition of the teeth?** Goats have eight front teeth on the lower jaw which are small and sharp in animals under one year of age. At about one year the center pair drop out and are replaced by two large permanent teeth. About the 24th month two more large teeth appear, one on each side of the first pair. The three- to four-year-old goat has six permanent teeth and the four- to five-year-olds a complete set. (Fig. 7). It should be recognized that there is considerable variation in individual animals and the teeth give only an estimate of age.

![Diagram of goat teeth](image)

**Fig. 7.**—The age of goats up to about five years can be estimated from the number of permanent teeth present.

**What points of conformation should be considered in the selection of dairy goats?** The does should have a neat feminine head on a long and graceful neck. The body should be long and deep with well sprung ribs. The back should be straight and hips wide apart, with the rump broad and long and not too sloping. The legs should be straight and slender. The udder should be large and neatly attached, both front and rear with the two halves neatly joined.
Teats should be large and well formed. The milk veins carrying the blood from the udder forward on the abdominal wall should be large. (Fig. 8).

How are the horns of goats inherited? Breeding experiments have shown that the hornless (polled) condition is dominant over the horned condition just the same as in cattle. As a result, when pure hornless animals are mated with horned animals, the progeny are hornless. The horned animals are recessive and therefore pure for horns, so that when they are mated together, the progeny are always horned. The hornless goats are of two kinds, some are pure for the polled condition and always breed true when mated together, whereas others are mixed (resulting from mating horned and hornless together) and produce from one-half to three-fourths polled animals.

What is the best method of removing horns? The horns of mature goats may be removed safely by sawing the horns off close to the head with a common meat saw. The wounds should be covered with pine tar to prevent bleeding. It is best to perform this operation when the weather is cool and flies are absent. To permanently prevent the regrowth of the horn, it is necessary to saw very close to the head to remove the growing layer.

Can the horns of kids be prevented from growing? The horns of kids shortly after birth can be prevented from growing by the
application of caustic soda or potash. The end of a stick of caustic about the size of a lead pencil is moistened, and rubbed on the horn button. Care should be taken to prevent the fluid from flowing onto the head or into the eyes by circling the button with petroleum jelly or lard. Many breeders remove the horn button surgically with a knife or clipper. An electric cautery is being used in large herds.

How are the wattles of goats inherited? The inheritance of wattles has been determined. The wattled condition is dominant over the non-wattled condition. When animals without wattles are mated together the progeny will always be free of wattles, but when pure wattled and non-wattled animals are mated the offspring will be wattled but will in turn transmit both conditions to their offspring in the proportion of three wattled to one non-wattled.

Can the milk production of native does be improved by the use of purebred bucks of the recognized breeds of dairy goats? At the New Mexico College of Agriculture, purebred Toggenburg bucks were mated with native does. The improvement in production per year in the succeeding generations is shown in the following table:

<table>
<thead>
<tr>
<th>Breeding</th>
<th>Number</th>
<th>Pounds Milk</th>
<th>Per Cent Fat</th>
<th>Pounds Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native</td>
<td>8</td>
<td>522</td>
<td>5.00</td>
<td>26.14</td>
</tr>
<tr>
<td>1/2 Toggenburg</td>
<td>22</td>
<td>1060</td>
<td>3.99</td>
<td>42.23</td>
</tr>
<tr>
<td>3/4 Toggenburg</td>
<td>20</td>
<td>1169</td>
<td>3.66</td>
<td>42.83</td>
</tr>
<tr>
<td>7/8 Toggenburg</td>
<td>17</td>
<td>1450</td>
<td>3.60</td>
<td>52.49</td>
</tr>
<tr>
<td>15/16 Toggenburg</td>
<td>12</td>
<td>1734</td>
<td>3.69</td>
<td>63.95</td>
</tr>
<tr>
<td>Purebred</td>
<td>15</td>
<td>1578</td>
<td>3.69</td>
<td>58.21</td>
</tr>
</tbody>
</table>

Thus it would appear that the milk production of native goats can be increased very rapidly by the use of a purebred buck and by selection.

How should the buck be cared for? To keep the buck in good breeding condition, he should have an opportunity to exercise, should not be overfed so that he becomes sluggish, and should not be allowed to run with the does. In Missouri the climate is such that bucks can be kept out almost all the year if a shed is provided
which gives shelter from the rain and wind. The hay and grain fed the does will be satisfactory for the buck.

**At what age is the buck old enough for service?** Many buck kids become sexually mature when three or four months of age and should be separated from the doe kids. If they are not to be used for breeding purposes, the surplus bucks should be castrated and later killed for meat. When the bucks are 6 to 8 months old, if well grown, light service may begin.

**How many services are required?** A single service is sufficient for a doe, two services simply dissipate the bucks energy. If several does require service the same day, it is preferable to breed some in the morning and others in the afternoon.

**What factors should be considered in the selection of the buck?** If milk production is to be increased, it is necessary for breeders of purebred dairy goats to carefully select the sires used. In the past too much emphasis has been placed upon the production of the dam of the sire. Breeders of dairy cattle have learned to their sorrow that such sires frequently do not transmit to their daughters the high production of their dams. The method to be preferred is to use sires which have proven their ability to transmit high production to their daughters. Such “proven” sires should be continued in service throughout their life. If a proven sire is not available, then an effort should be made to secure a son of a proven sire and out of a high producing dam or a daughter of a proven sire.

**What kind of milk and fat production records should be obtained on goats?** When dairy cattle were first tested, the short time test was used extensively. It was soon discovered that such records measured the production of milk and fat the animals were capable of at their prime, but did not measure the rate of persistency or how long the animals would continue in milk, which is also a very important characteristic. As a result, the number of lactation tests has increased.

A short-time test is a valuable test and many more should be made, but it would be far better to continue to weigh the actual milk production each day through the lactation period and test the milk for its fat content at monthly or bi-monthly intervals. Information on the method of conducting official tests can be
obtained from the Superintendent of Official Testing at the Department of Dairy Husbandry, University of Missouri, or by writing to the dairy goat record associations.

**FEEDS AND FEEDING OF GOATS**

**What are the best roughages for milking does?** Good pasture legume hays supplemented with succulent feeds such as silage, root crops, and soaked dried beet pulp, when available at moderate prices, are the most satisfactory roughages for use when pasture is not abundant.

**What grain mixture should be fed with alfalfa, clover or other legume hay?** If legume hay is the sole roughage, a grain mix with from 12 to 13 per cent crude protein (8.5 to 10 per cent digestible protein) is suggested. A typical mix would consist of 300 pounds ground corn, barley or wheat (or some combination); 100 pounds wheat bran or ground oats; 25 pounds linseed oil meal, gluten feed or other high protein feed.

**What changes should be made in the grain mix when a combination of legume and non-legume roughages is fed?** The crude protein content of the grain mix should be increased to approximately 14 to 16 per cent (11 to 13.5 per cent digestible). A typical mix would be 400 to 500 pounds ground corn, barley or wheat (or some combination); 200 pounds ground oats or wheat bran; 100 pounds linseed oil meal, soybean oil meal, cottonseed meal, gluten feed or other high protein concentrate.

**When feeding non-legume hays, silage, soaked dried beet pulp, or fodder, how much protein should the grain mixture contain?** A grain mixture with about 20 per cent crude protein (16 to 17 per cent digestible) is recommended. The following grain mix is typical—100 pounds ground corn, barley or wheat (or some combination); 100 pounds ground oats or wheat bran; 100 pounds linseed oil meal, soybean oil meal, cottonseed meal, gluten meal or gluten feed.

**Should salt be added to the grain mixture?** It is well to add about 1 to 1.5 per cent of salt to the mixture and in addition supply a salt block which should be constantly accessible to the goats.

**What mineral mixture should be fed?** The inclusion of 1 to 2 per cent steamed bone meal or ground limestone in the grain ration will supply ample minerals. Complicated mixtures of minerals or tonics are not necessary.
How much roughage should be fed to lactating does? Feed all the roughage they will clean up. This will usually approximate 3 pounds of hay or other dried roughage, or 2 pounds of hay and 2 to 3 pounds of silage, roots or soaked beet pulp daily.

Is the grain mixture fed the same way? No, the grain is fed according to the amount of milk produced. This will usually approximate 1 to 2 pounds daily, with a heavy producing doe requiring slightly more. Grain is usually fed twice daily, at the time of milking.

How can the cost of feeding goats be kept at a minimum in Missouri? Good pasture not only produces milk of the highest nutritive value but is the cheapest source of feed as well. It has been found possible to provide a series of pasture crops which will produce practically year-round feed under Missouri conditions.

What crops will provide year-round pasture? Three crops—bluegrass, Korean lespedeza, and winter grain crops, mainly wheat and winter barley, form the basis of an all-year pasture system and will treble the amount of pasture feed.

At what season of the year do each of these crops provide feed most abundantly? The bluegrass will provide good pasture in late spring, early summer, and the September-October growth for winter pasture. Korean lespedeza pasture will furnish feed during the summer. Winter barley or other grain pasture is excellent during the fall and early spring.

Where can further details about year-round pastures be obtained? Missouri Agricultural Experiment Station Circular No. 186 and Missouri Agricultural Extension Service Circular No. 313, which can be obtained from the Missouri College of Agriculture, give further details.

What should be the feed and care given the doe at parturition? A few days before parturition provide a box stall and reduce the amount of feed. After kidding, the first day or two feed a mash of bran or ground oats. Take a few days to return her to the regular grain ration and gradually increase the amount of feed as the yield of milk increases.
How should the newborn kids be fed and managed? Some breeders prefer to remove the kids from their mothers and hand feed them from the start. With a little patience the kids can be taught to drink out of a pail. Other breeders allow the kids to remain with their dams for two or three days. In either case it is important to let the kids get the first milk or colostrum. While milk is being fed, it is important to keep the buckets clean. The kids should be fed whole milk for about a month, then, if well developed, skimmilk or dried skimmilk can gradually be substituted. The mixture of one pound of dry skimmilk with 10 pounds of water makes a good feed. If kid meals are to be fed, the directions provided for feeding should be followed.

As a supplement to the milk or milk substitute, a roughage preferably a legume such as alfalfa or clover, should be available at all times. In addition whole oats or cracked corn (yellow) will be eaten in increasing amounts. Bulletin 377 on “Raising Dairy Calves” which can be obtained by writing to the Missouri College of Agriculture gives many suggestions that are also applicable to dairy goats.
COMPOSITION AND PRODUCTION OF QUALITY MILK

How does goat’s milk compare with cow’s milk? Goat’s milk is almost pure white in color and the fat globules small in size. As a consequence the cream rises slowly and never as completely as in cow’s milk. The fat however, can be removed rather completely with a cream separator. The fat content varies from under 3 to over 5 per cent. Other constituents of goat’s milk are quite similar to cow’s milk.

Table 2—Composition of Goat’s Milk Compared with Human Milk and That Produced by Farm Animals

<table>
<thead>
<tr>
<th>Species</th>
<th>Fat %</th>
<th>Protein %</th>
<th>Lactose %</th>
<th>Ash %</th>
<th>Total Solids %</th>
<th>Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goat</td>
<td>4.09</td>
<td>3.71</td>
<td>4.20</td>
<td>0.78</td>
<td>12.86</td>
<td>Frahm</td>
</tr>
<tr>
<td>Cow</td>
<td>4.00</td>
<td>3.50</td>
<td>4.90</td>
<td>0.70</td>
<td>13.10</td>
<td>Computed</td>
</tr>
<tr>
<td>Mare</td>
<td>1.59</td>
<td>2.69</td>
<td>6.14</td>
<td>0.51</td>
<td>10.96</td>
<td>Linton</td>
</tr>
<tr>
<td>Sow</td>
<td>6.77</td>
<td>6.22</td>
<td>4.02</td>
<td>0.97</td>
<td>17.98</td>
<td>Hughes &amp; Hart</td>
</tr>
<tr>
<td>Ewe</td>
<td>6.18</td>
<td>5.15</td>
<td>4.17</td>
<td>0.93</td>
<td>16.43</td>
<td>Konig</td>
</tr>
<tr>
<td>Woman</td>
<td>3.70</td>
<td>1.63</td>
<td>6.98</td>
<td>0.21</td>
<td>12.57</td>
<td>Gardner &amp; Fox</td>
</tr>
</tbody>
</table>

What is the value of goat’s milk for infants and invalids? While cow’s milk is quite generally very satisfactory for infant feeding, there are many cases on record where goat’s milk has been found especially valuable. The small fat particles are believed to be more readily digested and the curd of goat’s milk is finer and more flocculent than cow’s milk, thus permitting more rapid penetration of the digestive juices.

How do the fat globules of goat’s milk compare with those of cow’s milk? The fat globules in the milk from Holstein cows are the smallest of the dairy breeds with about 23 per cent below 2 micra (2/25,000 inches) in diameter. The samples of goat’s milk examined show that about 57 per cent of the fat globules are below 2 micra in diameter.

Table 3—Diameter of Fat Globules in Goat’s and Cow’s Milk (Percentage Distribution)

<table>
<thead>
<tr>
<th>Kind of Milk</th>
<th>Below 2 micra*</th>
<th>2 to 4 micra</th>
<th>4 to 6 micra</th>
<th>6 to 8 micra</th>
<th>8 to 10 micra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goat</td>
<td>57.0</td>
<td>34.0</td>
<td>7.0</td>
<td>2.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Holstein</td>
<td>23.3</td>
<td>61.7</td>
<td>3.0</td>
<td>1.9</td>
<td>0.1</td>
</tr>
<tr>
<td>Jersey</td>
<td>6.8</td>
<td>56.8</td>
<td>29.3</td>
<td>6.2</td>
<td>0.7</td>
</tr>
</tbody>
</table>

*A micron is 1/25,000 of an inch.
Does goat’s milk have a disagreeable odor? If goat’s milk is properly produced and handled it should have no disagreeable odor or flavor. When off-flavors exist in fresh milk they are usually caused by particles of dirt or hair that have fallen into the milk or by the consumption of certain pasture weeds or feeds by the doe. Oxidized or tallowy and rancid or bitter are the most common off-flavors that develop in milk when held in a refrigerator for 18 to 48 hours. An oxidized flavor occasionally develops in milk that has been produced and handled in a satisfactory manner but it is sometimes caused by contact of the milk with copper or iron or from exposing the milk to light. A rancid flavor is usually due to the presence of an abnormal amount of a fat-splitting enzyme which breaks down the milk fat thus releasing free fatty acids that have a bitter taste. Heating the fresh milk to a temperature of 140°F, or above for 10 minutes will inactivate the enzyme and prevent the development of the rancid flavor.

Fig. 10.—For convenience in milking, a milking stand can be constructed as shown above. By placing a little feed in the box, the milking animals will soon learn to jump up on the stand and will eat quietly during the milking process.

What type of milking stand is suitable for milking goats? The milking stand shown in Fig. 10 has been found convenient in milking the goats of the Experiment Station herd.
What precautions should be taken in order to produce clean milk? Material falling from the body of the goat into the milk pail when the animal is being milked is the principal source of dirt in milk. This can be largely prevented by brushing the body of the doe and wiping the udder and flanks with a damp cloth before milking. Clean lots and barns for the does will also help in this respect. The use of a covered top milk pail will also be of considerable aid in reducing dirt contamination of the milk (Fig. 11).

Other factors to be considered are clean quarters in which to do the milking and freedom from dust in the air where the milk is handled. It is also important that the utensils be stored between milkings where no dust will fall upon their surface.

![Fig. 11.—A well tinned milk pail which is easily cleaned is a necessity in the production of quality milk. The above standard milk pail has a removable side which furnishes complete protection from hair and dirt.](image)

What are the principal sources of bacteria in milk? Some bacteria are found in all milk. They may gain entrance into milk from a number of sources. A few bacteria are present in milk when it leaves the udder but the number is never large unless the udder is infected. Milk that is freshly drawn from a healthy udder usually contains less than a few hundred bacteria per cubic centimeter, but if the udder is infected the milk may contain several thousand bacteria per cubic centimeter.

*Dr. A. J. Durant of the Department of Veterinary Science, who designed and uses this pail in his goat dairy, finds no difficulty in milking into the small opening which is closed with a cap as soon as milking is completed.*
Any dirt, dust, hair, flies or foreign material of any kind that falls into milk will add some bacteria to it. The number of bacteria added in this way will depend upon the amount and nature of the material that gets into the milk. Dried particles of manure and flies are usually heavily seeded with bacteria.

The milk pail and other utensils in which the milk is handled is usually the most important source of bacteria in milk. If properly constructed and well cared for, however, they will contribute only an insignificant number of bacteria to the milk. Milk utensils should have smooth surfaces and be free from grooves and crevices that are difficult to clean.

**How should milk utensils be washed and handled?** All milk utensils should be treated as follows: rinse with cold water immediately after using; scrub with a brush in hot water containing an alkali washing powder such as soda ash; rinse with boiling water or expose to live steam for 2 to 3 minutes; store in a dry place that is free from dust and flies until used. Rinsing each piece of equipment immediately before using with a chlorine solution, prepared and used according to directions of the manufacturer, is a valuable procedure particularly where hot water is not available.

**What is the cause of acidity in fresh goat's milk and how does it vary?** The acidity of fresh milk is due to the proteins, the minerals that combine with alkali and to the carbon dioxide. A high acidity in fresh milk is no reflection on the quality of the milk since it is not due to organic acids. Any increase in acidity that develops while the milk is held is due largely to the development of lactic acid by bacteria from the lactose in the milk. This action is largely prevented by holding the milk at a temperature below 50 degrees Fahrenheit.

Several samples of fresh goat's milk that have been examined at the Dairy Department of the University of Missouri during the last few years had an average acidity of .15 per cent calculated as lactic acid. The range in the acidity of these samples was from 0.10 to 0.17 per cent.

**How can the quality of goat's milk be determined?** Each year, usually in the spring, a state goat's milk scoring contest is sponsored by the Missouri Milk Goat Breeder Association and the Dairy Husbandry Department of the University of Missouri co-
operating. This contest, which is likewise a part of the National goat's milk scoring contest, is open to all goat milk producers in Missouri. By entering a sample in this contest a producer can ascertain the quality of the milk that he is producing and perhaps obtain suggestions for its improvement.

**What factors are considered in scoring goat's milk?** The items on the score card used in judging the quality of milk in scoring contests and the points awarded each of these items are as follows:

- Bacteria ............ 35
- Flavor and odor .... 25
- Temperature ......... 15
- Visible dirt .......... 10
- Butterfat ............ 10
- Bottle and cap ...... 5

In order for a sample of milk to receive a perfect score on each of the various items it must contain less than 500 bacteria per cubic centimeter, have a rich, pleasing flavor and no undesirable flavor, the temperature must not be above 40°F., have a butterfat content of 4.0 per cent or more; contain no visible dirt particles, and the bottle must be closed with a clean, tight fitting cap, properly filled, clean, have an unchipped lip and the pouring lip protected with a cover cap. A deduction in score is made if the different items are not fully complied with, the amount depending upon the condition of the sample. Milk seldom scores more than 97 or 98 points but good milk should always score above 90 points.

**Can butter be made from goat's milk?** While the fat globules in goat's milk are small, cream can be obtained from goat's milk and it will make good butter. The cream can be obtained by the use of a centrifugal separator or by gravity creaming. The best method of gravity creaming is to the place the milk in a deep container held in cold water and remove the cream 24 to 36 hours later. Keep the cream cold until churned and stir when additional cold cream is added. The churning process should require about 30 to 40 minutes when the churn is properly filled and operated. If the butter comes too fast the temperature should be lowered, if it comes too slow the temperature should be raised. The churning temperature should usually vary between 52 to 60 degrees Fahrenheit in the summer and 58 to 66 degrees Fahrenheit in the winter.

When the butter particles are about the size of wheat grains the churn should be stopped and the buttermilk drained off.
Wash water of about the same volume and temperature as the buttermilk (or slightly colder) is then added and the churning continued for a few revolutions. The wash water is then drained away and the washing repeated. Remove the butter to a bowl or worker, add $\frac{1}{2}$ to $\frac{3}{4}$ ounce of salt per pound of butter and work well to evenly incorporate the moisture and salt. Place the butter in a bowl or suitable container and store in a cold place until consumed.

How can cottage cheese be made on the farm from goat's milk?
Hold skim milk at a temperature of about 75°F until it develops a firm curd. If desired a small quantity of well flavored sour milk can be added to the sweet milk to hasten coagulation. When sufficiently firm, cut the curd into pieces about 2 inches square with a long knife or big spoon. Place the container of broken curd on the edge of the stove or in a vessel of water and heat slowly to 100°F. Hold at that temperature for about 45 minutes to firm the curd. During the heating and holding period stir the curd gently with a spoon or ladle to prevent it from lumping and to secure uniform heating. When sufficiently firm, pour the curd into a porous sack or a colander to drain. The flavor and keeping quality of the cheese will be improved if the curd is washed in cold water when the draining is practically complete. Add about 1 teaspoonful of salt to 1 pound of cheese and store in a cold place.

What are the essential steps in making American Cheese on the farm from goat's milk? Hold the evening's milk at a temperature of 65 to 70°F. over night and in the morning mix this milk with an equal quantity of fresh milk. Adjust the temperature of the milk to 86°F. by heating on a stove or in a water bath. Dissolve one rennet tablet in one-third glass of water and stir this into 3 gallons of milk. Allow the milk to stand at 86°F. until a firm curd is formed. This will usually require from 30 minutes to 1 hour depending on the acidity of the milk. The curd is firm enough to cut when it will break clean over the index finger inserted at an angle into the curd and gently raised. Cut the curd lengthwise and crosswise into 1 inch strips with a long knife, then cut horizontally with a wire bent at right angles at the ends to serve as handles. After 10 or 15 minutes start heating the curd slowly, raising the temperature about 2 degrees every 5 minutes until a temperature of 100 to 105°F. is reached. Maintain the final heating temperature until the curd particles have shrunk about one-half in size and are sufficiently firm that they will not stick together.
when squeezed lightly in the hand. The curd should be gently and frequently stirred from a few minutes after it is cut on through the heating and holding period to prevent lumps from forming. When the curd is sufficiently firm, drain off the whey, break up the lumps and mix well with 2 tablespoonfuls of salt. The temperature of the curd should be maintained around 90°F. during this time. The curd is then placed in a hoop and pressed. A hoop may be made by melting both ends from a gallon syrup pail and a round wooden block can be cut to fit the hoop for a follower. Pressure can be secured by placing any kind of weight available on the wooden follower. Increase the weight with time until a pressure of 50 to 60 pounds is secured after a few hours. After about 2 hours remove the cheese from the hoop, dip in warm water, place a cheese cloth bandage around the cheese allowing a lap of about 1 inch over the ends, place a cloth cap over each end, then replace in the hoop and press for another 18 to 24 hours. Remove the cheese from the press and store in a cool room to ripen. Turn the cheese daily on the shelf for about 10 days, then cover with hot paraffin.

GOAT ASSOCIATIONS AND LITERATURE

What national associations maintain herd books for the registry of dairy goats? 1. The American Milk Goat Record Association, Vincennes Indiana; Will L. TeWalt, Secretary-Treasurer.


What journals are published giving information about goats? There are several publications devoted to the interests of those raising goats, including the Dairy Goat Journal, Fairbury, Nebraska, C. A. Leach, editor; and the Goat World, Vincennes, Indiana, Will L. TeWalt, editor.

What organization looks after the interests of dairy goats in Missouri? The Missouri Milk Goat Breeders Association has been organized to promote the interests of goat breeders in Missouri. The annual meeting is held in connection with Farmers Week at Columbia. Dr. A. J. Durant Department of Veterinary Science, University of Missouri, College of Agriculture, Columbia, Mo., is the president.