dairy goat
production guide

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I. DAIRY GOATS

GOATS were among the earliest animals to be domesticated. Most countries of the world have used goats as a source of meat and milk since the earliest days of recorded history. In America milk goats are found in every state with California, Texas and several eastern states probably leading in goat population.

In Connecticut we have many owners of one or a few milk goats for supplying milk needs in the home. Because of the large number of individual owners, this publication has been prepared to provide information needed to properly care for a small number of milk goats.

Common Breeds of Milk Goats

There are four principle breeds of milk goats in the United States: the Saanen, Nubian, Toggenberg, and French Alpine. A fifth breed, the La Mancha, has been developed recently in this country. Anyone interested in a particular breed is encouraged to subscribe to the *Dairy Goat Journal*, P.O. Box 1908, Scottsdale, Arizona 85252.

The Saanens are of Swiss origin. They are white or light cream in color, white preferred. Black spots are allowed on their skin, but

Adapted by Lynn R. Brown, Professor of Animal Industries, from *Florida Dairy Goat Production*, DY 73-13, by Dr. B. Harris, Jr., Extension Dairy Nutritionist and Dr. R. L. Richter, Extension Dairy Technologist, University of Florida Institute of Food and Agricultural Sciences.
not in the hair coat. Saanens produce from 1800 to 2000 pounds of milk per year when properly fed and managed.

Standard weights and measurements for Saanens: Doe – height at withers, 30 inches and up; weight, 135 pounds and up. Buck – height at withers, 35 inches and up; weight, 185 pounds and up.

The Nubians were developed in England from native goats and bucks imported from India and Egypt. They are characterized by a short, glossy hair coat; large, dark eyes; long, drooping ears; and a Roman nose. They may or may not have horns. Nubians are all colors and combinations of colors from red to tan or black, with or without white. The Nubian breed is one of the best for high milk-fat production. Their average production will vary from 1300 to 1500 pounds per year.

Standard weights and measurements for Nubians: Doe – height at withers, 30 inches and up; weight, 130 pounds and up. Buck – height at withers, 35 inches and up; weight, 175 pounds and up.

The Toggenberg is a Swiss breed that varies in color from light fawn to dark, with no preference for any shade. Markings include white ears with dark spots in the middle, two white stripes down the face from above the eye to the muzzle, and white on legs and rump.

Standard weights and measurements for Toggenbergs: Doe – height at withers, 27 inches and up; weight, 125 pounds and up. Buck – height at withers, 35 inches and up; weight, 160 pounds and up.

The Toggenbergs are reported to have an average production of 1500 to 1600 pounds of milk per year with slightly less milk-fat than the other breeds.

The French Alpine is a French breed and is claimed to be one of the prettier breeds. The colors vary from pure white to shades of fawn, gray, brown, black, red, buff and combinations of these colors on the same animal.

They are characterized by a long, slender neck with no dewlap, graceful, alert heads, and short-haired bodies. They are bearded or beardless.

Standard weights and measurements for French Alpine: Doe – height at withers, 29-36 inches; weight, not less than 125 pounds.
Buck — height at withers, 34-40 inches; weight, not less than 170 pounds.

The French Alpine breed has an average production of 1500 to 1600 pounds per year. The breed is quite large and the does are good milkers. The milk is of medium butterfat content.

The La Mancha was developed from a short-eared Spanish breed crossed with the leading purebreds. They may be any color but are distinguished by their external ears which are either absent or very short and are known as “gopher” or “cookie” ears.

Selecting Family Milkers
The greatest number of goat owners in this country keep goats for family milkers. A survey conducted in 1971 showed that most owners had less than five milkers. Most of the goats are unregistered and seldom seen off the homestead. To many they fulfill a need that cannot be supplied elsewhere.

The selection of milk goats for commercial dairy herds or breeding herds must be accomplished in terms of records, conformation, stamina, and longevity. They may or may not be registered, but must be able to produce milk over a long period of time with a minimum of care. Good herds frequently consist of goats having herd averages of 2500 pounds of milk per goat per year.

The choice of breed is purely a personal one. We recommend that one study a few pictures and visit a goat dairy prior to making the final decision on breed. Generally the breed you start with will end up being your preference.

Breeding
The gestation period of a doe is 148-154 days, but the expected kidding date may be calculated simply by counting forward five months from the date of service.

The breeding season for milk goats is usually from late August through March. The young doe may be bred at twelve months of age or earlier if good growth has been obtained. During the breeding season bucks have a strong odor and should be kept in separate pens.
at all times. This procedure will aid you in getting the does bred over an extended period of time in order to assure the availability of milk over a 12-month period.

Does usually remain in heat (estrus) for one or two days. The period between estrus is about 17 to 21 days. Milk goats are good breeders.

The signs of heat are usually easily detected; frequent and insistent “talking”, tail wagging, and pink color and swelling in the external genital region – sometimes with a discharge. A milker will usually drop in her milk production. The highest conception rate occurs during the middle of the heat period.

Maintain good records and record all heat periods. Breed to the best buck available if you plan to retain the kids. Any notes of her behavior may help in out-of-season breeding or in detecting estrus early.

The Dry Period

The doe should be bred to freshen once each year with a dry period of two months. The dry period allows the mammary system time to repair, regenerate and gain new stimulation for lactation as a result of parturition (giving birth). The greater her production, the more likely it is that her body has been depleted of the nutrients used in milk secretion, and the dry period required to replenish the losses and store adequate reserves for the next lactation will be longer.

Grain feeding should be reduced or discontinued near the time the dairy goat is turning dry. Also substitute fair quality hay for good quality hay at this time. The dairy goat should be down to about three pounds of milk per day or less. Her milk flow will be reduced quicker if you change her routine at the same time you discontinue milking. After about a week check her udder and milk her out, if needed. If the doe has had mastitis during her lactation, this is the ideal time to treat her. A certain amount of pressure is needed in the udder in order to stop milk secretion and flow.

Treating for internal parasites at the time of drying-off is a recommended practice. Thiabendazole or another suitable preparation may be used to rid the doe of worms. Spray for lice with recommended pesticide, if needed. Have the doe freshen in a healthy condition, so that she will have every opportunity to produce more milk in the next lactation.
The dairy goat should be maintained in good condition during the dry period because then she will freshen in a healthy state. A good mineral mixture should be available. A commercial mineral mixture may be used or a combination of defluorinated phosphate and trace mineral salt. A purchased mineral should contain from 12 to 18% calcium, 8 to 10% phosphorus and 25 to 40% salt, and trace minerals.

During the last 3 to 4 weeks of gestation, nutrition becomes more important to the doe. She should receive a good quality hay and about the same type of ration she will receive after kidding. If the doe’s udder fills too tightly with milk before kidding, milk her out and save the colostrum. Failure to milk her out may result in udder damage to the supporting tissues.

**Raising the Kids**

It is important that the kid receive colostrum as soon as possible the first two days after birth. Colostrum is important because it provides antibodies which give the kid resistance to diseases. In addition to providing antibodies, colostrum acts as a mild laxative which aids in cleaning the digestive residue from the newborn kid. Colostrum is also high in nutrient value, especially vitamin A, B-vitamins, proteins, and minerals. The protein content of colostrum is about 20% as compared to 3.5% for normal milk.

Overfeeding colostrum or other milk to kids can cause loose bowels and possibly scours. The extra colostrum should be placed in the refrigerator and fed later at about body temperature. The kid must be handled gently and not forced to drink. After a few hours the hungry kid will readily drink. The kid may be changed to cow’s milk or powdered milk after a few days on colostrum or goat’s milk. The kid should receive 2 to 3 pints of milk each day in 3 to 4 feedings the first 3 to 5 days and twice per day thereafter.

At birth the kid weighs 7 to 9 pounds, heart girth is 14 to 15 inches, and height at withers 14 to 15 inches. The kid must be treated as a “simple stomach” animal such as the dog or cat; that is a milk diet is needed for the first few days of life. A small amount of
grain such as a calf starter or goat chow may be introduced to the kid at 2 to 3 weeks of age. In general the grain should contain about 14% crude protein with added minerals and vitamins.

As soon as the kid starts eating, the rumen starts developing and eventually the kid will start chewing its cud. This is an indication that all four compartments (rumen, reticulum, omasum and abomasum) are fully developed. Animals having four-compartment stomachs are referred to as ruminants.

Clean, fresh water and salt blocks should be available at all times and especially as the kid is weaned from receiving milk at 8 to 12 weeks of age. Start the kids drinking from a bucket as you discontinue milk feeding. Also, be sure the kid has started eating some grain and hay.

A good practice is to dehorn kids when only a few days of age. Electric dehorners are frequently used with excellent success. Instructions may be received from your County Extension Agent or a local dairyman. The process appears painful but is brief and causes no harm. Vaseline may be applied to the burned area.

Feeding Milk Goats
Milking goats should receive some grain in addition to hay and pasture. The exact amount needed will vary with pasture quality and variety.

The maintenance needs for dairy goats are quite small because of their small size. The nutrient requirements for producing milk are similar to the requirements of a dairy cow producing similar quantities of milk. The nutrients required per pound of 4.5% milk is 0.082 pounds of total protein, 0.054 pounds of digestible protein and 0.355 pounds of total digestible nutrients (TDN). The maintenance needs are estimated at 0.10 pounds of digestible protein and 1.0 pound of TDN. The following table may be useful in feeding your goats:
Table 1. Daily Nutrient Needs of Dairy Goats

<table>
<thead>
<tr>
<th>Lbs. Milk</th>
<th>Body wt. (lbs.)</th>
<th>4.5% Milk Fat</th>
<th>Complete Feed Needed</th>
<th>Grain with Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.08 (1 pt.)</td>
<td>125.150</td>
<td>0.19</td>
<td>1.38</td>
<td>2.0</td>
</tr>
<tr>
<td>2.16 (2 pt.)</td>
<td>125-150</td>
<td>0.27</td>
<td>1.77</td>
<td>3.0</td>
</tr>
<tr>
<td>3.24 (3 pt.)</td>
<td>125-150</td>
<td>0.37</td>
<td>2.15</td>
<td>3.5</td>
</tr>
<tr>
<td>4.32 (4 pt.)</td>
<td>125-150</td>
<td>0.45</td>
<td>2.53</td>
<td>4.0</td>
</tr>
<tr>
<td>8.60 (1 gal.)</td>
<td>125-150</td>
<td>0.80</td>
<td>4.05</td>
<td>6.0</td>
</tr>
</tbody>
</table>

*Goats producing at higher levels should receive grain and forage free choice. High producing individuals will not be able to eat enough at the peak of lactation and will have to use body reserves to maintain production.

A complete feed contains both roughage and grain. The composition of a complete feed is usually about 13% crude protein, 9-10% digestible protein, 62-64% TDN, 15-18% fiber, 0.6-1.0% calcium, 0.4-0.5% phosphorus, 6 to 10 million units of vitamin A per ton, and 0.5-1.0% salt with added trace minerals.

In general, good producing dairy goats on good to excellent pasture will need from 1 to 2 pounds of concentrate or grain per day. The concentrate mixture should be similar to those used for dairy cows.

Since goats require such a small amount of grain, added minerals should be supplied in the pasture. As discussed earlier, trace mineral salt and defluorinated phosphate mixed in equal quantities make a suitable mineral mixture, or a commercial mineral mixture may be purchased.

Both dairy goats and dairy cows are ruminant animals and can therefore eat the same kind of ration. Common ingredients used are citrus pulp, corn meal, oats, hominy feed, molasses, cottonseed hulls, brewer’s grain, cottonseed meal, soybean meal, wheat bran, and soybran flakes.
Housing

A small barn or shed is needed to reduce the exposure of goats to wind, rain, and the hot sun. The type of housing needed will vary with the number of goats owned and the convenience preferred. A stanchion or box stall with built-in feeder may be advantageous for milking.

Does are usually milked on a stand 12 to 18 inches high — or higher, if preferred. The stand should be long enough for the doe to stand comfortably and about 18 to 20 inches in width. The stanchion should be placed at the front of the stand to engage the doe’s head. A small runway may be constructed to the stand to reduce possible udder injury. It is best to construct in an area that can be cleaned easily.

Internal and External Parasites

Internal Parasites — It is important that your dairy goats live in a clean environment. Nevertheless, after a few months parasites will begin to build-up on closely eaten grassy areas near the barn. Pastures and lots remain contaminated for long periods and goats may pick up the parasites. Inside the animal they can interfere with nutrition, cause diarrhea, or result in an unthrifty condition.

External Parasites — External parasites including lice, ticks, horn flies, house flies, stable flies, horse flies, deer flies and mosquitoes present serious problems during the year. These pests are most prevalent during the spring and summer months.

Lice, both biting and sucking, may present a real problem if not controlled. Since insecticides are frequently changed or taken off the market, contact your local County Extension Agent about current recommendations.

Common Diseases Occurring in Dairy Animals

A number of common diseases occur frequently in dairy animals. While the following information is brief, it may help you detect possible problems and obtain more detailed information.
Mastitis — Mastitis is simple an inflammation of the udder. It may be acute or chronic. Most cases are caused by streptococcus or staphylococcus organisms.

The udder may appear hot, painful, hard and tense. A wide spectrum antibiotic may be needed or penicillin alone may be effective. The disease can be cured if treated early.

Sanitation during milking is important in the control of mastitis and the obtaining of a clean, wholesome dairy product. Many mastitis-causing organisms are present in the environment and can find their way into the udder and milk pail if good sanitation is not maintained. Manure should not be allowed to accumulate in the milking area.

If milking machines are used, the teat cups should be kept clean. They should be dipped into clean water and then a sanitizing solution before the milking of each goat. Teat cup liners should be free of cracks, milkstone, and ballooning. Machines should be properly cleaned, sanitized, and stored after each milking. Clean equipment will reduce chances of mastitis and lower bacteria counts in milk.

Foot Rot — Foot rot can best be prevented by housing your goats in a relatively dry area. The germ which causes foot rot thrives in wet, muddy areas where air is poorly circulated.

Symptoms include a greyish, cheesy discharge and foul odor with lameness and intense pain. Treat by carefully trimming away the rotten area and treating the infected area with 10 to 30% copper sulfate, a suitable ointment, or other treatment as prescribed by your veterinarian. Proper trimming of the feet may help to reduce infection by the responsible organism.

Ring Worm — Skin infections such as ring worm require treatment that includes using a solution of glycerine or tincture of iodine. Daily treatment or application of a mixture of equal parts tincture of iodine and glycerin or a 20% solution of sodium caprylate to the lesion until it disappears often is effective. The antifungal activity of thiabendazole may provide a useful treatment.
II. GOAT’S MILK

Gross Composition

The composition of goat’s milk varies both within and between breeds. Various values for each of the nutrients have been reported.

Table 2 contains the average composition of the milk from several species. Although these values do not necessarily reflect the composition of an individual milk sample, they closely represent the average milk composition for a species. Goat’s milk closely approximates the composition of cow’s milk. The percent water, protein, and total solids are nearly identical. Goat’s milk contains more fat and ash than cow’s milk, but has less lactose.

Generally the composition of goat’s milk can be expected to fall within a specified range for each milk component. Fat, the most variable component, will usually fall between 3.0 to 6.0% in herd samples. However, values outside this range are not uncommon for individual samples. The ranges that can be expected for total solids, protein, lactose, and ash are 12 to 16%, 3 to 4%, 3.8 to 4.8%, and 0.70 to 0.95% respectively.

<table>
<thead>
<tr>
<th>Table 2. Average Composition of Milks of Various Mammals(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Goat</td>
</tr>
<tr>
<td>Cow</td>
</tr>
<tr>
<td>Ewe</td>
</tr>
<tr>
<td>Human</td>
</tr>
</tbody>
</table>

Protein

Goat’s milk contains approximately 3.5% protein (Table 2). The protein can be divided into casein and whey protein. Casein accounts for about 83% of the total protein and is the primary protein fraction in cheese products. Casein will coagulate under certain conditions and can be removed from the milk. Rennet, acid, and a combination of pepsin and acid will all coagulate casein in milk. Each method closely resembles a natural process of casein coagulation. Rennet coagulation is the process that is used in cheesemaking. The addition of acid increases the acidity of milk until the casein coagulates in the same manner as sour milk, and the human digestive process is simulated by the acid-pepsin coagulation of casein.

Whey is the clear liquid that remains after casein is removed from milk. Proteins that remain in the whey are the whey proteins.

Both casein and whey are general categories of proteins. Each contain many individual proteins. Many of these are similar to cow proteins and cause identical allergic reactions. However, there are species-specific proteins in goat’s milk and these are immunologically distinct from proteins in cow’s milk.

Curd formed in goat’s milk with acid-pepsin treatment is apparently softer than the similarly formed curd of cow’s milk. However, curd formed with rennet appears to be stronger in goat’s milk than cow’s milk. Curd strength varies between individual animals and lactation. Curd strength decreases to a minimum in mid-lactation and then increases toward the end of lactation.

Fat

Although the average percentage of fat in goat’s milk is 4.25% (Table 2) it varies with individual animals, breeds, stage of lactation, and type of feed. Table 3 contains the results of research compiled on the percent fat in three breeds of dairy goats. Nubians produce milk that contains more fat than either Toggenbergs or Saanens.

Goat milkfat contains appreciable amounts of caproic, caprylic, and capric fatty acids. Although these fatty acids are not unique to the goat, they are more abundant in goat’s milk than in milk from
other species. They are responsible for the characteristic flavor and odor of cheeses made from goat’s milk.

Goat’s milk contains a higher proportion of small fat globules than cow’s milk, but is similar to sheep’s milk in this respect. This higher proportion of small fat globules has been cited as the reason for the slow creaming of goat’s milk. However, the primary reason for slow creaming is the absence of fat globule clustering. Cow’s milk contains a protein not found in goat’s milk that causes fat globules to cluster, thus creaming at a rapid rate.

### Vitamins

Considerable information has been compiled concerning the vitamins in the milk of various species. Table 4 contains the average amount of several vitamins in the milks of cows, goats and humans.

The primary difference between goat’s milk and cow’s milk is the much lower concentration of vitamins $B_6$ and $B_{12}$ in goat’s milk. However, when considering the use of goat’s milk for infant
food, it bears consideration that goat’s milk is nearly as high in vitamin B₆ and twice as high in vitamin B₁₂ as human milk. Cow’s milk is extremely low in vitamin D and none is listed in the table. However, most commercial milk is fortified with vitamin D.

It is interesting to note that vitamin A in goat’s milk exists exclusively as vitamin A and not in carotenoid pigments. Carotenoid pigments are precursors of vitamin A and are present at varying levels in cow’s milk depending upon the breed. Carotenoid pigments cause fat to have various degrees of yellow coloring. Their absence in goat’s milk causes butter made from goat’s cream to be white.
IV PRODUCTION OF HIGH QUALITY MILK

Care of the Goat
All goats should be clipped closely on the udder and flank area for cleanliness and health reasons. Goats that are not clipped will be hard to keep clean and even harder to clean in preparation for milking. Hair and dirt are not only primary sources of bacteria, but are natural habitats for lice and nits. If goats are not clipped, it is difficult, if not impossible, to prevent hair and dirt from contaminating the milk and lowering its quality.

Herds should be checked for brucellosis and tuberculosis to insure that these potential human pathogens are not present. If these diseases are discovered, the contaminated animals should be removed from the herd.

Milking Procedure
The milking procedure should follow recommended sanitation practices, whether it is hand or machine milking.

Dirt should be removed from the udder and flank area by washing with warm water. The udder and particularly the teats should be washed with warm water (110°F) that contains an appropriate sanitizer. This not only stimulates the animal for milking, but also has the potential of destroying organisms on the teat that might contaminate the milk. The first few strips of milk from each teat should be examined for abnormalities with a strip plate. Milking, whether by machine or hand, should begin within 2-3 minutes of washing the udder. If milking is done by hand, special precautions should be taken to prevent contamination of the milk. A hooded pail is an asset for hand milking. After milking it is desirable to dip each teat in a dairy teat dip. Teat dips have proven quite successful in the prevention and reduction of mastitis.

Milk should be filtered through commercial filters and cooled immediately. If commercially refrigerated milk cooling equipment is available, the milk should be cooled to 35°F as quickly as possible. However, if this is not available, milk will cool much more rapidly if it is placed in circulating cold water than if it is immediately placed in a refrigerator.
Care of Milking Equipment

The production of high quality milk requires strict cleaning and sanitizing procedures for all equipment that contacts milk. Cleaning and sanitization can be done manually or mechanically depending on the type of equipment used on the farm. However, different types of detergents are used for mechanical and manual cleaning. Many types of dairy detergents are available. Most are formulated to work within a wide range of conditions, but each has minimum requirements that must be met if they are to be effective. The most critical factors that affect the efficiency of detergents are the temperature and hardness of water. These factors make it imperative that instructions for each detergent be strictly followed.

Whether manual or mechanical cleaning is used, the basic steps for cleaning and sanitation do not change:

1. Immediately after milking or removal of milk from equipment, rinse the equipment with lukewarm water before the milk dries on the surface.
2. Prepare a detergent solution according to manufacturer’s specifications and be sure the water temperature meets or exceeds the minimum recommended temperature. If manual cleaning is employed, brush all milk contact surfaces thoroughly. All milk contact surfaces that are not cleaned by mechanical cleaning or circulation cleaning must be brushed.
3. Rinse detergent from tank with tap water. Preferably, an acidified rinse should be used to prevent the accumulation of milkstone.
4. Drain rinse water from all equipment.
5. Sanitize the equipment with an approved dairy sanitizer immediately before using it. Either chlorine or iodine can be used at concentrations of 200 ppm chlorine and 25 ppm iodine.
ORGANIZATIONS

American Dairy Goat Association, Don Wilson, Secretary-Treasurer, Box 186, Spindale, North Carolina 28160.

The American Goat Society, J. Willett Taylor, 1606 Colorado Street, Manhattan, Kansas 66502.

National Nubian Club, Mrs. Jean Van Voorhees, Secretary-Treasurer, R.R. 1, Box 416, Glen Gardner, New Jersey 08826.

National Saanen Club, Mrs. Fleta Anthony, Secretary-Treasurer, R.R. 3, Marysville, Ohio 43040.

The National Toggenberg Club, Mrs. Lucy Richardson, Secretary-Treasurer, Box 177A, Strotz Road, Route 1, Asbury, New Jersey 08802.

PUBLICATIONS, CIRCULARS, FACT SHEETS, ETC.

Dairy Goat Journal, P.O. Box 1908, Scottsdale, Arizona 85252.

Dairy Goats Fact Sheet, Cooperative Extension Service, University of Minnesota, St. Paul, Minnesota 55101.

Dairy Goats in Florida, Bulletin No. 37 (Supplies Limited), Florida Dept. of Agriculture and Consumer Services, Tallahassee, Florida 32304.


Your Dairy Goat, 4-H Ag. 26, Cooperative Extension Service, University of California, Davis, California 95616.


