

# GOATS: SUSTAINABLE PRODUCTION OVERVIEW

## LIVESTOCK PRODUCTION GUIDE

***Abstract:** Goats: Sustainable Production Overview provides fundamental information relevant to all goats, especially about feeding, reproduction, and health. An extensive resource list is included. Read ATTRA's Dairy Goats: Sustainable Production and Sustainable Goat Production: Meat Goats for more complete information, including sections on marketing and profitability.*

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### Table of Contents

Selection.....	2
Feeding Ruminants.....	3
Raising Goats on Pasture.....	3
Marketing.....	15
Profitability .....	16
Resources.....	16
References.....	23

The goat was one of the first animals to be domesticated by humans, about 9,000 years ago. Today, there are some 200 different breeds of goats that produce a variety of products, including milk, meat, and fiber (mohair and cashmere). Worldwide, goat meat production is higher than meat production from cattle or hogs. (Holcomb, 1994)

Raising goats can be a valuable part of a sustainable farm. Integrating livestock into a farm system can increase its economic and environmental health and diversity, thereby making important contributions to the farm's sustainability. Goats often fit well into the biological and economic niches on a farm that otherwise go untapped. Goats can be incorporated into existing grazing operations with sheep and cattle, and they can also be used to control weeds and brush to help make use of a pasture's diversity.

Erosion on land used for row crops declines when the land is converted to pasture. Rotating row crops and pasture every year or two offers both fertility and pest control advantages. Goats eat the forages, the goats' manure replaces some purchased fertilizers, and the life cycles of various crop and animal pests are interrupted. Like other ruminant animals, goats convert plant material that is unsuitable for human consumption into high-quality animal products.

**Related ATTRA publications:**  
 Sustainable Goat Production: Meat Goats  
 Dairy Goats: Sustainable Production

# Selection

When selecting animals for your herd you must first decide what traits are important to you and what the animals will be used for. Find a producer with the type of animals that you are interested in. You may locate producers by contacting your local Extension agent, searching classified ads in goat publications, contacting goat clubs or associations, or by attending meetings or seminars for goat producers. Once you have found a producer with goats for sale, visit the farm to observe the herd and the management. The animals will adapt more easily to your farm if their prior management and environment are similar to yours.

To develop a productive herd it is imperative that you select healthy animals. Never build your herd with animals from the sale barn. These are often animals that have been culled by another producer. There is a reason they were culled, and you do not want to bring those problems to your herd.

Listed below are some of the signs of a healthy animal.

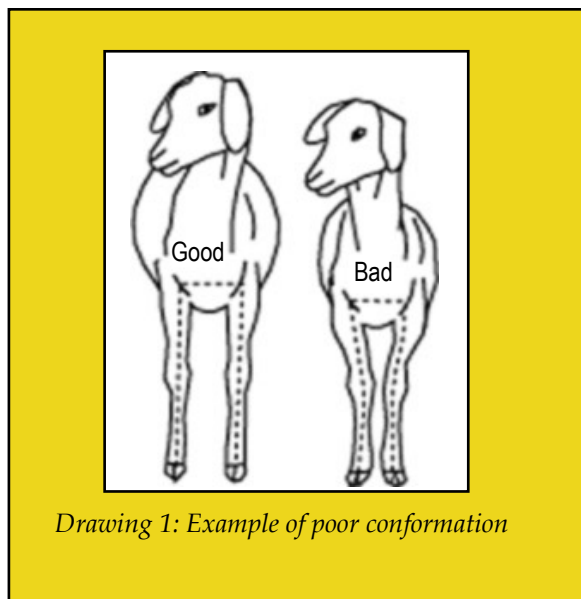
- Shiny coat
- Lively manner
- Easy movement (no limping, no swollen joints or misshapen udders)

- No abscesses
- Proper conditioning (not fat or excessively thin)
- Firm, pelleted manure
- Well-shaped udder and teats

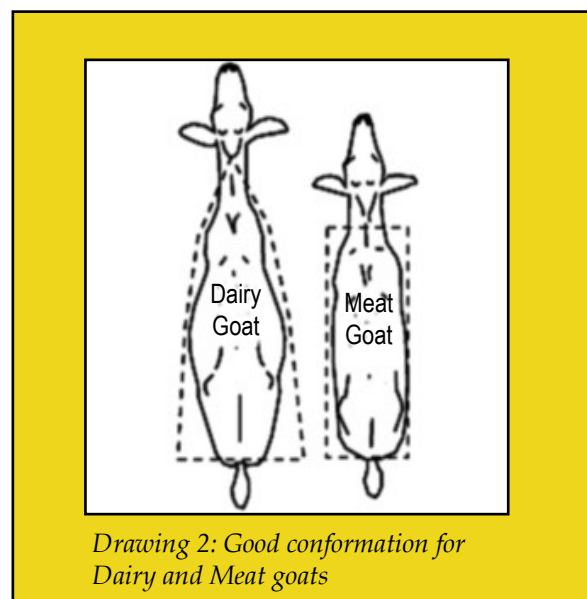
Also, ask the producer questions such as what diseases have been problems in the herd, what is the vaccination/worming protocol, and what criteria are used for selection and culling. You should also ask your veterinarian about diseases that are possible problems in your area. When selecting your animals, also observe their conformation. Drawings 1 and 2 illustrate some of the characteristics of good and bad conformation in goats. Dr. Steve Hart of Langston University points out that for most operations, conformation is a relatively minor concern; health and soundness are much more important. He advises checking to see that the bite is correct (not over-shot or under-shot) and that the legs and feet are sound.

For more details on selection of goats, see the pertinent ATTRA publication for the goats you intend to raise (*Dairy Goat, Meat Goat*).

To run an efficient operation, it is necessary to identify animals (by tattoos or ear tags) and keep records. Breeding, reproduction, and production records are helpful in identifying which animals are most productive and which should be culled.



*Drawing 1: Example of poor conformation*



*Drawing 2: Good conformation for Dairy and Meat goats*

*Drawings from Mississippi State University Extension Service 4-H Club Goat Guide.  
(<http://msucares.com/pubs/publications/p2264.htm>)*

# Feeding Ruminants

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Goats are ruminants; that is, they have a four-compartment stomach designed to digest large quantities of forages. Ruminants eat quickly and swallow their food at first without much chewing. Later, they regurgitate their food and thoroughly chew it and swallow. This regurgitated food is called the cud, and healthy ruminants will spend as much time chewing their cud as they do grazing or eating hay. This is thought to be a predator avoidance adaptation, as the ruminant can find a sheltered place to peacefully chew its cud and be less vulnerable to predator attack than while grazing.

The ruminants get their name from the *rumen*, which is the largest compartment of the stomach and serves as a fermentation vat. The health and productivity of the goat (as with all ruminants) depends on the rumen function; microorganisms in the rumen digest fiber and carbohydrates and protein to supply the animal with nutrients. Without those microorganisms, the goat will become very sick and may die. Therefore, it is of paramount importance that the animal be fed appropriately so that the ruminal organisms stay healthy.

These rumen organisms require fiber, nitrogen (protein), and energy (carbohydrates). Roughages (forages—pasture, hay, browse) have higher fiber content than grains. More mature forages contain more fiber and are less digestible. Energy is provided by good-quality (digestible) roughages and by concentrates (grains).

The rumen microorganisms have preferred pH ranges; those that digest fiber best thrive in a range of 6.0 to 6.8. Rumination (chewing the cud—required to digest roughage) increases the amount of saliva, which buffers the rumen fluid and maintains the favorable pH. However, grain (especially finely ground grains) decreases rumination; which means less saliva reaches the rumen, and the pH decreases. Also, in the process of digesting grain, lactic acid is produced, which can further lower the pH. When a goat eats too much grain, the rumen pH can drop below 5.5, killing the normal rumen microorganisms and resulting in a very sick animal.

The rumen microorganisms are “healthiest” when goats are eating good-quality forages, such as vegetative pasture. However, it is difficult (if not impossible) to provide good-quality forages

year-round. Therefore, supplementation with concentrates may sometimes be necessary (see *Supplemental Feeding* section of this publication).

## Raising Goats on Pasture

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Contrary to the popular image of goats thriving on tin cans, goats actually require a more nutritious diet than do other ruminants. Their shorter digestive system does not retain food for as long, and thus does not digest nutrients fully. This quicker digestion allows them to eat larger quantities of food to make up for their reduced absorption of nutrients, but it is goats’ unique grazing behavior that really enables them to thrive on pasture. With their small mouths and flexible lips, grazing goats are able to select the highly nutritious parts of plants and leave parts that are less nutritious. This gives them an advantage over cattle that graze by taking large mouthfuls; within that large mouthful there might be a great quantity of poor-quality forage, including some that is dead or overly mature.

Each goat is able to consume up to 3 to 5% of its body weight in dry matter daily (perhaps more if the forage is highly digestible). To consume that amount, however, goats must be pastured in an area with a large quantity of available vegetative forage. Goats will eat less when they are moved to poor pastures. Listed below are some of the factors that influence intake.

- Age, size, stage, and level of production of the animal
- Animal’s health
- Animal’s forage preferences (which are influenced by its mother and peers)
- Weather
- Palatability of food
- Digestibility (fiber content)
- Maturity of forage

Goats prefer browsing (eating woody plants) but will also graze on grasses and weeds. Goats are known to stand on their hind legs to reach leaves and brush. Since goats, cattle, and sheep prefer different forages, in many pasture situations these species do not compete for the same food. Therefore, they can be managed quite suc-



PHOTO BY CHARLIE RAHM © NRCS 2004

cessfully in a multispecies grazing system, allowing the land to be used more fully and generate more income. Land grazed by both goats and cattle returns 25% more than land grazed only by cattle. (Holcomb, 1994)

Adding goats to a grazing system will have weed control benefits. Goats will eat such weeds as leafy spurge, multiflora rose, and brambles, decreasing the need for commercial herbicides or mowing. Meat and fiber goats are particularly useful for brush control. For a report on work done in North Carolina using goats alone or with cattle, see "Use of Goats as Biological Agents for the Control of Unwanted Vegetation" (Luginbuhl et al., 1996a), at <[www.cals.ncsu.edu/an\\_sci/extension/animal/meatgoat/MGVeget.htm](http://www.cals.ncsu.edu/an_sci/extension/animal/meatgoat/MGVeget.htm)>. For a concise article that explains some of the management issues pertaining to grazing goats to eradicate multiflora rose, see the Ohio State University Bulletin 857, "Multiflora Rose Control," at <[http://ohioline.osu.edu/b857/b857\\_8.html](http://ohioline.osu.edu/b857/b857_8.html)>. One use of grazing goats in the West is to control leafy spurge; see "Controlling Leafy Spurge using Goats and Sheep" (Sedivic et al., 1995), at <[www.ext.nodak.edu/extpubs/plantsci/hay/r1093w.htm#goats](http://www.ext.nodak.edu/extpubs/plantsci/hay/r1093w.htm#goats)>.

htm#goats>.

When grazing goats, farmers must protect their pastures from being overgrazed. There are several reasons for this. Overgrazing forages

- eventually kills the plants
- reduces the longevity of the stand and exposes more soil to erosion
- means the animals don't get enough food
- increases the chance of goats ingesting internal parasite larvae
- creates bare spots, creating opportunities for undesirable weeds and erosion

The end result of overgrazing is reduced performance of both the pasture and the animals, and health problems for the animals. To prevent overgrazing, farmers should be careful to understock rather than overstock land and always remove animals from a pasture when the pasture is grazed down to about 3 to 4 inches. Browse must be managed so that it is maintained and

not killed. If you want long-term production of browse, you must rotate the animals and not allow the area to become over-browsed.

Fencing is the most critical factor in raising goats on pasture. There is nothing more frustrating than having to constantly chase goats back into the pasture. Fencing will also be the greatest expense, other than the initial cost of the animals. The best permanent fencing is 4-foot woven wire with barbed wire along the top. Some graziers are also successfully using four or five strands of high-tensile electric wire. Goats may have to be trained to electric fences by placing them in a small paddock to "test" the wire. Once they have been trained to an electric fence, goats can usually be controlled with two strands of wire in a cross-fence. Electric netting is also an option for temporary or permanent fencing in management intensive grazing systems; however, several goat producers have lost animals that tangled their horns in the netting. It is very important to keep electric fences charged at 4,500 volts or more. Regular checking and testing are necessary, and any problems must be fixed promptly, or goats will escape.

Goats also need shelter. They can tolerate cold weather, but goats will get chilled by wet, cold conditions. The necessary shelter or shelters depend on the producer's operation. A dairy operation will usually have extensive barn and pen set-ups, while a large meat goat operation may use only trees in the pasture as shelter. Buildings used for shelter may be minimal, but they should be well-ventilated and clean. Barns and sheds are not the only options for shelter. There are portable shelters, moveable shades, and even old hog huts that can be used as shelters for your animals.

Predators are a problem in most areas where goats are produced. For information on how to control predators, see the ATTRA publication *Predator Control for Sustainable & Organic Livestock Production*.

## Controlled Grazing

In the U.S., continuous grazing is a common practice, characterized by giving the animals unrestricted access to the pasture throughout the season. This works well for goats. However, feeding goats in a sustainable and economical way is better accomplished by a controlled, rotational

grazing system, also known as management intensive grazing (MIG, commonly pronounced "mig"). The MIG systems have been used more extensively with cattle than with sheep or goats. Much work has been done recently with goats using MIG, although it is not yet widely published. However, for a review of studies of goats and grazing, see "Meat Goats in Land and Forage Management" (Luginbuhl, 1996b), at [www.cals.ncsu.edu/an\\_sci/extension/animal/meat-goat/MGLand.htm](http://www.cals.ncsu.edu/an_sci/extension/animal/meat-goat/MGLand.htm).

The basic principle of MIG is to allow animals to graze for a limited time and then move them to another pasture or paddock (a subdivision of a pasture). The pasture forage plants can then grow back without using up all of their root reserves. Even brush will need a recovery time if it is being used as forage for goats. In fact, woody plants may need to be rested a full year to remain a forage source in the pasture. Without this rest period, the goats can kill the brush through continuous browsing. Under MIG, legumes and native grasses may reappear in the pasture, and producers often report that the pasture plant community becomes more diverse. Management intensive grazing can be used to improve the pasture, extend the grazing season, and enable the producer to provide a higher quality forage at a lower cost with fewer purchased inputs. MIG can also be useful in reducing internal parasite problems, *if* farmers are careful to move the goats to a new pasture before the forage plants are grazed too short (too short is less than about 4 inches – see **Health** section for more about parasites). While the benefits of MIG are substantial, it does require increased management skill and adequate fencing and watering facilities. For more information on pastures and grazing, see the list of ATTRA publications in the **Resources** section.

The goal of MIG is to have paddocks small enough that they can be grazed in a few days (usually one to ten). The time will depend on the number of goats and the quality and quantity of the forage. How long a herd remains in a paddock will vary, depending on the intensity of management, time of year, and stage of growth of the forage. When beginning with MIG, make big paddocks and use long rotations. As producers become more familiar with the pasture plants and the goats' grazing habits, they usually subdivide paddocks with electric fence. Temporary subdivisions allow the grazer to define the pad-

docks in response to different growing conditions and the goats' changing feed requirements.

Fresh, clean water must always be available. In a MIG system, the animals either have access to a central water source available from every subdivision, or water is provided separately to each of the pasture's subdivisions. This can be a challenge, and it is another capital expense. Feed intake will decrease more for goats than for cattle or sheep if clean water is not readily available.

Along with water, minerals need to be available to your animals at all times. It is best to feed calcium, phosphorous, and trace minerals in a salt mixture to ensure that the animals actually eat them. Test your forages to determine their mineral content and adjust mineral supplementation as needed. Your local Extension agent can have your forage analyzed. Mineral content of forage is quite variable across the country, and the type, stage, and level of production of the animals influence mineral requirements; therefore, no one mineral supplement formula is right for all locations or situations. For instance, a heavy-producing dairy goat will need more calcium and phosphorus than a dry (non-lactating) meat goat. Consult a livestock nutritionist for help in identifying a good mineral mix for your operation.

It is very important that you consistently offer this mix (preferably in a loose form), monitor its consumption, and ensure that all the goats are in fact eating adequate amounts of the mineral

supplements.

In some operations – particularly dairies – goats are raised in confinement, and all their feed is brought to them. However, allowing goats to graze can lower costs in the following ways.

- By reducing purchased grain costs
- By eliminating forage harvesting costs
- By eliminating manure removal costs
- By lowering fertilizer costs as manure nutrients are returned to the soil

Goats have the ability to select the more nutritious parts of a plant. Therefore, they typically will consume a higher quality diet if they have the opportunity to be selective. With the exception of lactating dairy goats, goats grazing a high-quality pasture can usually meet their protein requirements without supplemental feeding. In some cases an energy supplement (grain) may be necessary. More information on pasturing goats is provided in ATTRA's *Dairy Goats: Sustainable Production* and *Sustainable Goat Production: Meat Goats*.

## Supplemental Feeding

While good quality forages are usually adequate, goats may sometimes need supplemental feeding, especially during the winter. Goats need a proper balance of energy in the form of

roughage or grain, as well as protein, vitamins, minerals, and clean water. Protein and energy requirements vary, depending on the type of goat and its stage of production (see Table 1).

There is a rule of thumb for all goats: browse and pasture in the summer, hay and grain in the winter, trace-mineralized salt at all times. (The mineral mixture should be fortified with selenium if you live

TABLE 1. DIETARY PROTEIN AND ENERGY REQUIREMENTS OF GOATS*.			
CLASS OF GOAT	AVG. FEED INTAKE / DAY, LB <sup>1</sup>	% CRUDE PROTEIN	%TDN <sup>2</sup>
GROWING DOELING, 45 LB <sup>A</sup>	2.4	8.8	56
GROWING MALE KID, 66LB <sup>B</sup>	2.9	9.0	57
YEARLING DOE, 90 LB <sup>C</sup>	4.6	10.0	56
3 YR. OLD DOE, 110 LB <sup>D</sup>	5.0	11.7	69
MATURE BUCK, 220 LB <sup>E</sup>	5.3	9.0	55
DAIRY DOE, 150 LB <sup>F</sup>	7.5	11.6	71
*APPROXIMATIONS; BASED ON DRY MATTER IN THE FEEDS EATEN			
<sup>1</sup> CALCULATED ON BASIS OF THE DRY MATTER IN THE FEEDS EATEN			
<sup>2</sup> TDN = TOTAL DIGESTIBLE NUTRIENTS			
<sup>A</sup> GROWING AT THE RATE OF .25 LB/DAY			
<sup>B</sup> GROWING AT THE RATE OF .33 LB/DAY			
<sup>C</sup> YEARLING FEMALE, LAST TRIMESTER OF PREGNANCY AND GROWING			
<sup>D</sup> MILKING 2 QT/DAY - ENOUGH FOR TWINS			
<sup>E</sup> NOT GAINING WEIGHT, MODERATE ACTIVITY			
<sup>F</sup> NUBIAN, MILKING 1 GALLON/DAY OF 4.0% BUTTERFAT			

(PINKERTON AND PINKERTON, 2000)

**TABLE 2: SUPPLYING PROTEIN NEEDS FOR LACTATING GOATS**

% PROTEIN IN ROUGHAGE, DRY MATTER BASIS	% PROTEIN NEEDED IN CONCENTRATE
15% AND OVER EXCELLENT LEGUME HAY OR EXCELLENT PASTURE HIGH PRODUCTION (OVER 4 QUARTS/DAY) LOW PRODUCTION	14 12
12 TO 15% LEGUME-GRASS MIXED HAY OR GOOD PASTURE HIGH PRODUCTION LOW PRODUCTION	16 14
10 TO 12% GOOD GRASS HAY OR FAIR PASTURE HIGH PRODUCTION LOW PRODUCTION	18 16
BELOW 10% FAIR QUALITY GRASS HAY OR POOR PASTURE HIGH PRODUCTION LOW PRODUCTION	20 18

(PINKERTON, 1993)

in an area of the country with selenium-poor soil. Check with your Extension agent or veterinarian.) When breeding begins in the fall, producer Sue Drummond feeds her angora goats not only hay, grain, and salt but also vitamins (A, D, and E) and di-calcium phosphate. (Drummond, 1995) Kelp, a seaweed high in minerals, is sometimes used as a supplement, though it is expensive. Alternative feeds such as roots and tubers (sugar beets, mangels, sweet potatoes, turnips) may be fed for the energy content of the roots or the nutritious green tops. Various milling by-products are commonly fed to goats as well.

Grain is the concentrate most often fed to goats; cereal grains such as oats, corn, barley, and wheat are high in energy (carbohydrate/fat). Less commonplace grains such as amaranth and buckwheat are also sometimes used. Soybean meal and cottonseed meal are high-protein supplements. The choice of concentrate is determined by the composition of the forage. High-quality forages usually have adequate or even excess protein; animals eating these will need a higher-energy concentrate to utilize the protein present in the forages. Lower-quality pastures or hays will require feeding a higher-protein supplement to meet the goats' protein requirement.

Dairy goats need both high-quality forage and supplemental grain to reach their full potential, especially during peak lactation or growth. More information on supplemental feeding of dairy goats is available in ATTRA's *Dairy Goats*:

*Sustainable Production.* Fiber goats, on the other hand, may not do well with supplemental grain, because feeding too much protein to angora goats can make mohair fiber coarser and reduce its value, and feeding beyond maintenance requirements will not improve the fiber production of cashmere goats.

Goats can be picky eaters, and they may not immediately accept new feeds. Any feed changes should be made gradually to avoid upsetting the rumen microflora. Feeding very high levels of grain can also upset the rumen. Grain should never be more than 50% of the total diet, except for heavily-producing dairy goats. Adult meat goats should be fed a maximum of 1% of bodyweight in supplemental grain, with lactating does reaching a maximum of 1.5%. Feeding an animal a large amount of concentrate (grain) causes acidosis: the rumen pH will drop and rumen motility will decrease. Usually the animal will go off feed, have diarrhea, and show signs of depression for a couple of days. In severe cases, acidosis can cause death. If you know an animal has consumed too much grain, you can treat it with an antacid (sodium bicarbonate). Call your veterinarian for help, and offer only forage and water until the animal recovers.

Enterotoxemia can also occur if there is a sudden change in diet that stimulates certain rumen microbes to overpopulate and produce toxins that cause symptoms similar to acidosis. Enterotoxemia usually results in death. To prevent this

disease, all animals should be vaccinated for enterotoxemia (see **Health** section) and their access to grain or lush pasture should be controlled (increase access cautiously).

There are programs available to help goat producers determine rations for their herd. Langston University has developed a calculator (available on-line) that will be helpful in

#### Score 1 Very poor body condition

- Deep cavity under tail and around tail head. Skin drawn tight over pelvis with no muscle tissue detectable in between.
- No fatty tissue felt at loin. Pins, hooks, and short ribs can be seen; edges feel sharp.

#### Score 2 Poor body condition

- Cavity around tail head is evident, but less prominent. No fatty tissue felt between skin and pelvis, but skin is supple.
- Ends of short ribs are sharp to the touch, but individual ribs can no longer be seen. While bones are less prominent, they are still angular and can be easily distinguished by touch.

#### Score 3 Good body condition

- Slight cavity lined with fatty tissue apparent at tail head. Area between pins has smoothed out.
- Ends of short ribs can be felt with moderate pressure. Slight depression visible in loin area. Hooks and pins can be felt but have some covering of flesh. Hook, pin, and back bones appear smooth.

#### Score 4 Fatty body condition

- Depression between pins and tail head filling in. Patches of fat apparent under the skin. Pelvis felt only with firm pressure.
- Short ribs cannot be felt even with firm pressure. No depression visible in loin between backbone and hip bones. Back and area between hooks and pins appear flat.

#### Score 5 Grossly fatty body condition

- Tail head buried in fatty tissue. Area between pins and tailbone rounded, skin distended. No part of pelvis felt, even with firm pressure.

(Fredricks, 1993)

balancing rations for any class of goat. See **Contacts** section for Langston University's Web site. The Ohio Dairy Goat Ration program is available by contacting a local county office of Ohio State University Extension or

Ms. Cheryl Hall  
Department of Animal Sciences  
2027 Coffey Road  
Columbus, Ohio 43210  
614-688-3143

Some county Extension offices may have access to software that is helpful, or your agent may refer you to a ruminant nutritionist.

## Body Condition Scoring

Your goal in feeding your animals is to meet their nutritional requirements (economically) and to keep them in a productive condition. One way to monitor the animals' condition is to assign body condition scores (BCS). Body condition scoring evaluates the body fat reserves of your goats and is an easy method to evaluate the effectiveness of your feeding program. Scores range from one to five and are determined by looking at the tail-head and loin areas. Use the following guidelines to determine each goat's score.

A good source for meat goat body condition scoring can be viewed at <http://bedford.extension.psu.edu/agriculture/goat/Body%20Condition%20Scoring.htm>.

When scoring your herd, take into consideration the herd average; every herd has individuals that are too fat or too thin. If the herd average is under or over optimal condition, usually a score of three, you need to change your feeding regimen. Body condition will vary depending on the time of year. You should try to have your animals in good body condition before winter, so they can tolerate the cold and still have adequate reserves at kidding season. The animal's stage of production also influences body condition; for example, a doe in early lactation will almost always lose condition.

## Reproduction

Female goats (does) reach puberty at seven to ten months of age, depending on the breed and nutrition, and should be at 60 to 75% of their



adult weight at breeding to prevent difficult kidding. Does will have higher lifetime production and be more profitable if they are bred to kid as yearlings. Does should kid every year thereafter until at least the age of seven or eight, if they remain healthy. Most goats are seasonal breeders, reacting to shorter days as a cue for breeding. The presence of a buck (uncastrated male goat) stimulates the reproductive cycle (estrous) and the behaviors of the does that indicate that they are in the fertile part of their cycle (in heat). The doe's estrous cycle normally occurs from August or September until January, with October to December being the peak time for breeding. The estrous cycle is normally 18 to 22 days long. Does in heat (estrus) are at the proper stage for breeding; at this time, they will be receptive to the buck. Estrus (standing heat) lasts for 12 to 36 hours. Signs of heat include tail wagging, swollen vulva, mounting behavior, decrease in milk yield if lactating, and a general increase in activity and bleating. Kids are born about 150 days after breeding. Planning breeding so that kids are born during the height of forage production in the spring makes efficient use of the pasture. Keeping accurate breeding records will allow you to know when kids are due and help you prepare for their arrival.

Some goat milk markets demand year-round production. Breeding season may be manipulated through the use of lights and hormone therapy. However, milk production is less for a doe that kids in the fall than when she kids in the spring.

Male goats (bucks) reach puberty earlier than females and must either be separated from them by the age of four months or be castrated to prevent unwanted breedings. Buck kids can be used as herd sires at 8 to 10 months, but should not be used as heavily as mature bucks. Have your veterinarian test them for fertility and soundness before the breeding season. This test is called a breeding soundness exam and is described below.

The most important animal in the herd is the buck. He provides half of the genetics of the herd, and using a sound, high-quality buck can make significant improvements to the herd. Spend time and effort to locate a superior buck, one that has the traits you have identified as important. It is well worth the investment. A buck that has production records (has been on test or has relatives that have been on a production test) is the surest

bet. At the very least, you should observe both the herd and the parents of the buck. When selecting a buck, it is important to perform a breeding soundness exam. A general physical exam can check the buck for structural soundness and abnormalities in the sex glands and organs. The scrotal circumference (at the widest point) should be measured, since this correlates with fertility and semen production. As a general rule, dairy bucks should measure 25 to 28 cm at 100 pounds, meat bucks should measure 26 to 29 cm at 100 pounds, and larger bucks should measure at least 34 to 36 cm. (Mobini, 2003) Have a semen sample taken and evaluated. A normal concentration is 2 billion sperm per cubic centimeter of semen. Of those, 70% should be motile, moving forward. The sperms' morphology should be evaluated to determine whether they are mature and whether there are abnormalities. At least 80% of the sperm should be normal. (Mobini, 2003) Finally, the buck's libido should be monitored. A sound buck is of no use if he will not service does. A full-grown, healthy buck should easily service up to 50 does. Bucks should not be bred to their daughters; inbreeding tends to expose genetic problems and lead to weaker stock.

Some goat producers (especially those who raise dairy goats) use artificial insemination (A.I.) for breeding. This requires excellent heat detection skills and is more labor-intensive than natural service, but A.I. allows the economical use of outstanding sires. The American Dairy Goat Association (ADGA) offers a booklet about A.I., classes are offered by Langston University (Oklahoma) and sometimes by goat associations, and A.I. technicians are available in most areas of the country. For more information, contact your local Extension agent, order the booklet from ADGA (see contact information in the **Resource** section), or call ATTRA.

## Kid Management

Kids are raised for replacement stock, sold as breeding stock, or slaughtered for meat. Therefore, raising healthy, productive kids is essential to the profitability of your operation.

It is crucial that kids receive colostrum (the first milk, which contains antibodies to protect the kid from disease) soon after birth. However, in some herds Caprine-arthritis encephalitis (CAE – see **Health** section) is a concern, and kids



from those herds must be bottle-fed heat-treated colostrum instead of nursing their mothers. Kids raised naturally with their mothers usually grow better than those that are bottle-fed. However, for dairy production, it may be more economical to separate the kids from the mothers, feed kids with a milk replacer, and sell the extra goat milk. It is essential, however, that kids receive colostrum on the first day of their lives.

Males should be castrated at an early age to reduce stress on the animal. Castration with elastic bands should be done within a week of birth. There is some concern that animals may contract tetanus if they are castrated with bands. Male slaughter goats are often castrated, since the meat can have a strong flavor in intact males more than four months old. Some ethnic groups, however, want intact males. It is important for you to know your market, so you can plan for the management of your herd. Disbudding is often done in goat dairies to prevent problems with horns in the milking parlor. Kids are disbudded between three and seven days after birth, using a specially designed disbudding iron that is very hot. Equipment and instructions for use are offered by goat supply houses (see **Resource** list).

## Health Concerns

Few diseases afflict goats, and most producers find even fewer health problems when they use management intensive grazing. Practitioners of MIG see their goats at every paddock move. Observation is the best way to avoid, or at least catch early, any diseases or other problems that might occur.

When people buy goats, they should proceed cautiously.

- Check out the seller's herd.
- Ask the seller questions.
- Learn as much as they can about goats and goat diseases.
- Decide what diseases or problems they can or cannot live with, or which ones they are willing to vaccinate for or treat.
- Know what can or cannot be treated and the consequences of getting the disease in their herd.

Keeping livestock as stress-free as possible keeps their immune systems functioning properly. A healthy immune system is the best disease preventive. Conversely, periods of stress, such as weaning or transporting, may trigger disease. Intensively managed livestock become calmer and tamer, and handling them calmly makes them easier to work with when things such as loading, vaccinating, or other tasks need to be done.

Preventive management is fundamental to maintaining health. Proper nutrition, sanitation, and ventilation, as well as timely treatment or culling of problem animals, helps keep the herd in good health and reduces health care costs. For example, the teats of milking does are usually dipped in disinfectant after milking, while the teat opening is dilated, because bacteria

### Recommended Vaccination Program

Enterotoxemia and tetanus – <i>Clostridium perfringens</i> types C, D, + Tetanus Toxoid in one vaccine	
Adult Males	Once a year
Breeding Females	Once a year (4 to 6 weeks before kidding), or twice a year: 4 to 6 weeks before breeding, then 4 to 6 weeks before kidding
Kids	Week 8, then booster on week 12



entering the teat can cause mastitis. Likewise, regular foot-trimming helps prevent footrot and lameness. Having a good predator control strategy (such as a guardian animal and an electric perimeter fence) will also help prevent losses in your herd.

Check with a local veterinarian to get recommendations for a vaccination and health maintenance schedule for your goat herd. Because so few medications are approved for use in goats, it is imperative to work closely with a veterinarian who can advise you on proper drug use and withdrawal times. It is important to find a veterinarian who is compatible with you and with your management style, and who knows (or is willing to learn) about small ruminants. With time and patience, your veterinarian can become competent in the diagnosis and treatment of small ruminants. You may locate a small ruminant veterinarian by contacting the Association of Small Ruminant Practitioners at <[www.aasrp.org/](http://www.aasrp.org/)>. (See **Resources:** Organizations.)

In many areas, veterinarians recommend vaccinations for tetanus and enterotoxemia (overeating disease). Certain selenium-poor regions require the use of a selenium and vitamin injection several times a year. In other areas, additional vaccines or injections may be necessary for

other diseases or deficiencies. Your veterinarian can help you set up a vaccination protocol that will protect your herd from some diseases that are problems in your area.

## Parasites

Parasites, especially internal ones, are the major health concern for goats. Not only are goats very susceptible to internal parasites, but the parasites are rapidly becoming resistant to all of the available anthelmintics (dewormers), and no new dewormers are being developed. Therefore, management **MUST** be the primary method for sustainable control of internal parasites in goats.

If ample pasture is available and goats are not overstocked, a herd may have little difficulty with internal parasites. However, forcing goats to graze close to the ground and overcrowding stock will cause an increase in parasite load. Animals on highly-stocked pastures will usually carry a heavier parasite load, due to the increased amount of fecal matter on the pasture. You can reduce parasite problems by having a low stock density and by rotating your animals to different pastures. An understanding of how

parasite infestations happen will help to avoid major problems.

All parasite infestations occur when the animal ingests the infective larval stage from contaminated pasture, hay, or living quarters. The larvae develop from eggs that were passed from an animal through its feces. If there are no adult worms in any goats in your herd, this infestation cannot occur. Even if larvae are present in the pasture, goats are less likely than other ruminants to consume them, because goats prefer to eat at eye-level, and the larvae do not climb up grass blades to eye level. This is one of several good reasons for managing pastures to prevent grazing them too short. Try to maintain a forage height above 4 inches, at minimum.

Symptoms of a parasite problem include weight loss, rough coat, depression, and anemia (evidenced by pale mucous membranes, especially in the lower eyelid or gums). Animals that are carrying a heavy parasite load will produce less and lag behind their herd mates. It is important to realize that heavily infected animals are “seeding” the pastures with parasite larvae, thus amplifying the problem over time by contaminating the environment. Also, there is a great deal of variation in individual animal resistance to parasites. Culling animals with severe parasite problems will decrease the herd’s problems by reducing pasture contamination and by retaining and encouraging parasite-resistant genetics in the herd.

A clinical on-farm system called FAMACHA© was developed in South Africa for classifying animals into categories based upon level of anemia. This is done by monitoring the color of the lower eyelid on a scale of 1 (healthy color, no treatment needed) to 5 (very pale, anemic). A special colored card is used to determine the

score. The system recommends anthelmintics or culling for animals scoring 5 or 4 and sometimes 3. Keep records and use those individuals with fewest parasite problems for breeding, while those with the most problems should be culled. This selects for parasite resistant animals. The FAMACHA© system is only useful in detecting those animals infected with barber-pole worms (*Haemonchus contortus*), which is the primary species that causes problems in goats and sheep. The FAMACHA© system is now available in the United States through the Southern Region USDA-SARE (Sustainable Agriculture Research and Education) group, which tested the system in the United States. Only veterinarians or properly trained sheep and goat producers will be able to purchase the FAMACHA© charts. Veterinarians may inquire about FAMACHA© by contacting <famacha@vet.uga.edu>. A Web site is being developed by the SARE group. In the meantime, further information can be found at <www.vet.utk.edu/departments/LACS/pdf/FAMACHA.pdf> .

Another way to assess the parasite load in your herd is to have a veterinarian check fecal samples for parasite eggs and recommend an appropriate dewormer, if necessary. Since very few anthelmintics are approved for goats, and since many parasites have developed resistance to anthelmintics, the help of a veterinarian is essential to administering effective anthelmintics. For milk-producing goats, it is necessary to consider the withdrawal period that a chemical dewormer may require (in order for the goat to be free of residues) before the milk can be sold for consumption. Be sure to reworm three weeks after the initial treatment to kill any parasites that were ingested the day of the first worming. (It takes three weeks for larvae to mature to adult

The main points to keep in mind about parasite control in goats are that your best defense is

- 1) good pasture management, including use of browse as a forage source, and
- 2) selecting parasite-resistant animals (culling those that suffer most from parasites).

No dewormer will compensate for poor management, and many dewormers are no longer effective in the United States. New dewormers for goats are not being developed, so we must learn to control parasite problems through good management and selection of resistant animals.

worms.) Worming and then moving the goats 24 hours later will leave behind the vast majority of contaminated feces. Pastures are considered “clean” if goats or sheep have not been grazed on them for 12 months, or if they have been hayed or rotated with row crops. In the meantime, cattle or horses may be grazed in the infested area, because they do not carry the same species of worms. Goats and sheep, however, do share the same parasites.

Researchers have found that plants with high tannin levels show anthelmintic properties. The tannin in sericea l1\espedeza has been shown to suppress the egg laying ability of adult worms and inhibits the hatching of eggs that are shed. (Min et al, 2004) This reduces the worm load on the pasture and in the animals. Other plants, including wormwood, may also have anthelmintic properties. Allowing the animals to graze on a variety of plant species will assist in providing better nutrition, and may also help with controlling internal parasites. Not all plant species have been evaluated to determine whether they have anthelmintic properties. In the future, more research may be done in this area.

The complete eradication of livestock pests is not feasible or economically necessary – some level of pests may be tolerable. Goats, like other species of livestock, may develop some immunity to worms, making a low-level infestation sometimes more advantageous than no parasites at all. Lack of immunity is very damaging to Angoras, for example. When they are moved from arid range conditions, where there are few internal parasites, to more humid areas, where parasite populations are higher, serious problems often develop. Some individual goats have a higher natural immunity than others, and those are the animals that you should select. Young goats will be most susceptible to parasites and should always be weaned to a clean pasture.

Coccidiosis, a disease resulting from infection of the intestinal tract by parasitic protozoa called coccidia, causes scours (diarrhea) in goats, particularly in kids. There are several coccidiostats (anti-coccidia medications) on the market, but again, management is key for control. Coccidiosis occurs in damp, crowded areas. Keeping kids away from those areas prevents serious problems. Animals gain immunity to this organism by nine months of age, and clinical disease rarely occurs in adult animals.

See ATTRA’s *Integrated Parasite Management*

for *Livestock* for more information on managing parasites.

## Caprine arthritis-encephalitis

Caprine arthritis-encephalitis (CAE) is the most serious disease facing the goat industry. It is an incurable viral infection that causes arthritis, a hardened udder that produces no milk, and a general wasting away. There is currently no vaccine for the disease, and the only way to avoid its devastating effects is to prevent animals from becoming infected. To keep your herd free of CAE, cull any animals that have tested positive for CAE or are showing signs of the disease.

The most common route of transmission is through the milk, although saliva and possibly semen are two other routes. Heat-treating colostrum and pasteurizing milk will kill the virus, and these are the only known ways of preventing the infection from passing to uninfected kids. Producers who implement a CAE-prevention program face a rigorous regimen that includes observing all births, preventing kids from nursing, feeding heat-treated colostrum and pasteurized milk, and segregating or culling all CAE-positive animals. This is a very labor-intensive method of kid rearing. Anyone purchasing a goat should ask how the goat kid was raised and whether it has had recent CAE blood tests. Because some goats do not seroconvert to CAE-positive for two years, a single negative blood test is not necessarily reliable. When kids are bottle-raised on non-pasteurized milk, the milk is usually pooled for all kids, so that one positive doe can have a disastrous effect on a goat herd’s CAE status. Goat producers who are really conscientious about ridding a herd of CAE will not allow infected goats to have any contact with non-infected goats. It is always easier to purchase non-infected animals than to rid your herd of CAE once it is introduced. (When purchasing goats, it is a good idea to look at the entire herd; swollen knees or emaciated animals may be signs of CAE infection in the herd.)

Some CAE-positive goats never show any symptoms of CAE; a good kid producer or a heavy-milking doe that is CAE-positive may still have a place within the herd. The producer should consider the goals and priorities for his or her enterprise before determining whether a goat should be culled on the basis of its CAE status.

At one time, it was thought that only dairy

goats had a high incidence of CAE. However, with so many kids of all breeds being fed infected milk, the situation has now changed. Anyone buying any type of goat must be just as concerned about its CAE status as someone purchasing a dairy goat.

There are tests available to determine whether an animal has CAE. Testing should be done every year. Positive animals should be isolated or culled. Contact your veterinarian or diagnostic lab for further information on CAE testing.

## Abortion

There are several factors that can cause a goat to abort. A deficiency in vitamin A, iodine, or copper can cause abortions. Parasites, certain drugs, poisonous plants, and stress can also cause a doe to abort.

If abortion is widespread in the herd, there is most likely an infectious cause. *Chlamydia psittaci* is the most common cause of infectious abortions. However, there are other organisms that may be the culprit, and treatment depends on knowing the infectious agent. Therefore, at the first abortion in the herd, send the placenta to a diagnostic lab. Keep the placenta chilled until it arrives at the lab. Also be sure to wear rubber gloves and be cautious; some agents can infect humans as well.

Toxoplasmosis is another major cause of abortion in goats. This is a disease that can also infect humans, and it is particularly dangerous to pregnant women. Toxoplasmosis organisms are carried by cats, particularly young cats, which develop immunity once infected. It may help to keep one or two adult neutered cats for rodent control and to prevent other cats from coming onto your farm. Toxoplasmosis is contracted by goats ingesting cat feces. It can be brought onto your farm in hay or straw, if there were cats on the farm where the hay or straw was stored. Certain feed additives (Deccox, monensin) can help prevent abortions due to toxoplasmosis. Consult your veterinarian for details on how and where to ship the placenta and how to treat the herd if an infectious cause is identified. (Patton, 2003)

## Footrot

Footrot is a contagious disease caused by

the combination of two different bacteria, one of which cannot survive outside of the host for more than two weeks. The other is present in the environment. The infection is generally painful and is characterized by limping and signs of pockets of pus on the hoof. There is a strong, foul odor associated with footrot.

To treat footrot, first trim the feet so they are level and smooth (stop when you see pink in the sole, but remove loose bits from the side). Then soak the animal's foot in a footbath containing zinc sulfate or copper sulfate or formaldehyde. Ideally, it should stand in the solution for five minutes and then move to a dry area. (The lot should include dry areas, because mud and moisture will aggravate footrot.)

Animals that do not respond to treatment should be culled. Many producers cull animals by sending them to the sale barn: yet another reason to avoid purchasing stock there. Always observe animals with the herd before purchasing them, and do not buy any animals that limp. Quarantine all new goats for two weeks before putting them with your herd, and watch closely for signs of limping. Consult your veterinarian for assistance in treating footrot and other diseases.

## Caseous Lymphadenitis

Caseous lymphadenitis (CL) infects animals through breaks in the skin, such as cuts or scrapes from shearing, barbed wire, thorny brush, etc., and becomes localized in a regional lymph node, most commonly in or around the neck. The resulting abscess can be either external or internal. Draining or opening an external abscess can cause reinfection. CL is transmitted by direct contact; therefore, all infected animals should be isolated. CL can be picked up in bedding or by touching some other area that has been contaminated by goats with abscesses, and the infectious organism persists in the environment for several months. Internal abscesses occur when the thoracic lymph duct is affected. Animals with internal abscesses often waste away – or they may have no clinical signs. Do not buy any animals from a herd that has abscesses. Diagnostic testing is available to determine whether an animal has CL. Extreme caution must be used when aspirating an abscess, because CL is transmittable to humans. All infected material (gloves, bedding, towels) must be burned to minimize the risk of spreading disease.

## Contagious Ecthyma

This disease, also known as soremouth or orf, is caused by a pox virus. It is characterized by blisters and scabs on the lips and can spread to a doe's udder by an infected nursing kid. This disease is usually introduced into a herd from a purchased animal or one returning from a show. The disease is highly contagious, including to humans, and the virus can live for several months to years in the environment.

There is a vaccine for soremouth, but it should not be used in a herd that is free from the disease. It is a live vaccine, meaning it will introduce the disease into your herd. Usually, if an animal has been infected with the disease, it will be immune to further infections.

## Scrapie Eradication Program

Scrapie is a fatal, degenerative disease affecting the central nervous system, one of the class of diseases known as transmissible spongiform encephalopathies (TSEs). Other examples of TSEs include BSE in cattle and Chronic Wasting Disease (CWD) in deer and elk. There is no evidence that scrapie can spread to humans, but negative public perceptions and the loss of export opportunities have encouraged the effort to eradicate scrapie from the U.S. The incidence of scrapie in goats is extremely low, so it is highly unlikely that your herd will be affected. Nevertheless, goat producers (and sheep producers) are required to participate in the Scrapie Eradication Program. Details about this program are available from your state veterinarian or by going to the National Scrapie Education Initiative Web site, <[www.animalagriculture.org/scrapie](http://www.animalagriculture.org/scrapie)>. Briefly, you must contact your state veterinarian to request a premises identification number. You will then receive free eartags with your premises ID printed on them, and you must install tags on any breeding animals over the age of 18 months before they leave your farm. Dairy goat producers may use tattoos instead of ear tags; the state veterinarian will assign an ID tattoo that consists of your state abbreviation and the ADGA tattoo sequence assigned to the farm. In addition, any breeding goat (or sheep) that crosses state lines (for shows or to be sold, for example) must be accompanied by an official Certificate of Veterinary Inspection (health certificate) issued by an accredited veterinarian.

See the **Resource** section at the end of this publication for information on several excellent books on goat health and diseases.

## Flies

In confinement situations, implement fly control programs early in the season, before the fly population gets out of control. A sustainable approach is Integrated Pest Management (IPM). Parasitic wasps are a biological control for barn flies. These wasps lay their eggs in fly pupal cases; wasp larvae kill the developing flies by feeding on them. Light traps, baited traps, and sticky tapes are physical controls for barn flies. Because moist manure, spilled feed, and damp bedding encourage fly populations, practicing good sanitation on a regular schedule is important, especially in confinement areas. Eliminate drainage problems that allow water to accumulate. ATTRA has more information on alternative fly control and IPM available on request.

### **The following are the keys to maintaining a healthy goat herd.**

- Buy healthy stock
- Keep animals as stress-free as possible
- Use preventative medicine – good nutrition, sanitation, foot care, vaccinations
- Have a relationship with a veterinarian
- Learn about the major diseases that can affect your herd and how to prevent them
- Be observant and responsive

## Marketing

This section should probably be on the first page, because marketing must be thoroughly researched and planned up-front. Before beginning production, it is essential to know what goat products you are going to sell, and where and how you will market them. Goat meat, which is 50 to 65% leaner than beef, will be either the primary product or, in the case of dairy or fiber enterprises, an important secondary one. Called "cabrito" or "chevon," goat meat is considered a gourmet or health food by some, is popular in areas with certain ethnic populations, and is often processed into products such as sausage or jerky. See ATTRA's *Sustainable Goat Production*:

*Meat Goats and Dairy Goats: Sustainable Production* for more information about goat products and their markets.

It may be possible to establish a niche market through direct marketing. Many consumers would like to buy products that have been raised with a minimum of synthetic chemicals and pesticides. With any agricultural enterprise, it is important to determine market potential before making an investment in production. See ATTRA's *Resources for Organic Marketing, Direct Marketing, and Alternative Meat Marketing* for additional information.

## Certified Organic Production

Certified organic products have found a niche market with growing potential. The U.S. Department of Agriculture released the National Organic Program final rule, effective October 2002, that details the requirements for organic certification. ATTRA has information about the rule and the certification process available on request.

An organic goat feeding program will probably require a combination of organic pasture and purchased organic feed grains. A pasture must be free of synthetic pesticides or other prohibited substances for three years prior to organic certification. Producers may want to request ATTRA's *Organic Livestock Feed Suppliers Resource List*. The major difficulty with organic production of goats may be the issue of how to control internal parasites without recourse to anthelmintics. Cost and availability of organic grains, hay, and bedding may be obstacles to organic production as well.

It is expensive and time-consuming to go through the certification process. Make sure your customers require certification before undertaking it. Refer to *NCAT's Organic Livestock Workbook* for organic requirements.

## Profitability

Unless goat production is just a hobby for you, it is vital to do feasibility and business planning. A feasibility study identifies "make or break" issues that would prevent your business from being successful, and answers whether the business idea makes sense. A feasibility study also provides useful information for the business

plan, especially the marketing section. (University of Wisconsin Center for Cooperatives, 1998) If the feasibility study indicates that your business idea is sound, the next step is a business plan. A business plan is an analysis of how the business will work—your competition, the market, your capital and operating expenses, management and staffing needs, manufacturing process, etc. It is also one of the written documents usually necessary for obtaining a loan. (University of Wisconsin Center for Cooperatives, 1998)

While developing a business plan may take time and effort, it will be well worth the effort in the long run. An excellent tool for developing a business plan is *Building a Sustainable Business: A Guide to Developing a Business Plan for Farms and Rural Businesses*, developed by the Minnesota Institute for Sustainable Agriculture. This publication addresses all the steps of developing a plan, from identifying your goals to implementing your plan. This publication can be viewed at <[www.misa.umn.edu/publications/bizplan.html](http://www.misa.umn.edu/publications/bizplan.html)>. To order a spiral-bound copy of this workbook, contact 802-656-0484, <[sanpubs@uvm.edu](mailto:sanpubs@uvm.edu)>, 800-909-6472, or <[misamail@umn.edu](mailto:misamail@umn.edu)>. As of 2004, the cost is under \$20, including shipping.

Producers can make effective use of labor and other resources by processing together, marketing together, buying in bulk, etc. Cooperatives can also help producers gain better access to funding and technical assistance. The USDA Rural Business-Cooperative Development Service provides technical support for cooperative development. Contact them for a catalog of publications and services (see **Resources**).

## Resources

Many states have Extension publications about goats. Check with your local and state Extension offices for titles available in your state. Your Extension agent may also have information on local markets and sources of stock.

Goat experts at Langston University's E (Kika) de la Garza American Institute for Goat Research are valuable sources of information. This is a goat research program with specialists who are willing to answer questions about all types of goats—dairy, meat, mohair, and cashmere. Langston's Web site is <[www.luresext.edu/goats/index.htm](http://www.luresext.edu/goats/index.htm)>.

The University of Florida Cooperative Extension



sion service has a Dairy Goat Production Guide that is very informative and useful. This publication can be viewed on-line at <<http://edis.ifas.ufl.edu/DS134>>.

Caprine Supply and Hoegger Supply Company both sell goat equipment, including veterinary supplies and equipment for disbudding and tattooing, insemination, and milking and dairy equipment, and more. In addition, they sell many of the books available on general goat production and specialty books on dairy, meat, and fiber goats. A list of books is also provided at the end of this publication, along with contact information for suppliers.

A good way to learn about goats is from other producers, either formally or informally. Some farms provide internship opportunities. See ATTRA's *Internships and Apprenticeships* Resource List at <[www.attrainternships.ncat.org/](http://www.attrainternships.ncat.org/)>. There may be an association of goat producers in your area. Associations may focus on a locality, a type of goat, or a particular breed. One way to find an association is to contact your local Extension office. There are goat listserves on the Internet with active producer participation, as well as many sites offering goat information.

## Web Sites

### Maryland Small Ruminant Page

[www.sheepandgoat.com](http://www.sheepandgoat.com)

*This site provides links to many topics about sheep and goat production and marketing.*

### Cyber Goats

[www.cybergoat.com](http://www.cybergoat.com)

### Goat Connection

[www.goatconnection.com](http://www.goatconnection.com)

### Langston University – E. (Kika) de la Garza American Institute for Goat Research

[www2.luresext.edu/goats/index.htm](http://www2.luresext.edu/goats/index.htm)

### Oklahoma State University

[www.ansi.okstate.edu/LIBRARY/Goats.html](http://www.ansi.okstate.edu/LIBRARY/Goats.html)

### Fort Valley State University

**Georgia Goat Center Publications**—[www.ag.fsvu.edu/html/publications/GoatCenter/Publications.htm](http://www.ag.fsvu.edu/html/publications/GoatCenter/Publications.htm)

**Dairy Goat** – [www.aginfo.fvsu.edu/publicat/](http://www.aginfo.fvsu.edu/publicat/)

[commoditysheets/fvsu005.htm](http://commoditysheets/fvsu005.htm)

**Meat Goat** – [www.aginfo.fvsu.edu/publicat/commoditysheets/fvsu006.htm](http://www.aginfo.fvsu.edu/publicat/commoditysheets/fvsu006.htm)

### North Carolina State University – Extension Animal Husbandry (see Meat Goat)

[www.cals.ncsu.edu/an\\_sci/extension/animal/eahmain.html](http://www.cals.ncsu.edu/an_sci/extension/animal/eahmain.html)

### Florida A & M Goat Program

[www.famu.edu/acad/colleges/cesta/goat\\_program.html](http://www.famu.edu/acad/colleges/cesta/goat_program.html)

### The University of Maryland's National Goat Handbook

[www.inform.umd.edu/EdRes/Topic/AgrEnv/ndd/goat](http://www.inform.umd.edu/EdRes/Topic/AgrEnv/ndd/goat)

### University of California-Davis

[www.animalscience.ucdavis.edu/facilities/goat.htm](http://www.animalscience.ucdavis.edu/facilities/goat.htm)

### University of California Cooperative Extension

[www.vetmed.ucdavis.edu/vetext/INF-GO\\_CarePrax2000.pdf](http://www.vetmed.ucdavis.edu/vetext/INF-GO_CarePrax2000.pdf)

### Empire State Meat Goat Producers Association

[www.esmgpa.org/index.cfm](http://www.esmgpa.org/index.cfm)

### Association of Small Ruminant Practitioners

<http://aasrp.org>

### Livestock for Landscapes

[www.livestockforlandscapes.com](http://www.livestockforlandscapes.com)

### BEHAVE—Behavioral Education for Human Animal Vegetation and Ecosystem Management

[www.behave.net](http://www.behave.net)

*Offers managers tools and resources to harness the power of behavior to induce beneficial outcomes on the land.*

### National Scrapie Education Initiative

[www.animalagriculture.org/scrapie](http://www.animalagriculture.org/scrapie)

### FAMACHA information

[www.vet.utk.edu/departments/LACS/pdf/FAMACHA.pdf](http://www.vet.utk.edu/departments/LACS/pdf/FAMACHA.pdf)

## CD-ROMs

### Multi-Species Grazing and Leafy Spurge

TEAM Leafy Spurge. 2002.  
USDA-ARS Northern Plains  
Agriculture Research Laboratory  
1500 North Central Avenue  
Sidney, MT 59270  
406-433-2020

[www.team.ars.usda.gov](http://www.team.ars.usda.gov)

*This CD provides a variety of useful information about using grazing as an effective, affordable, and sustainable leafy spurge management tool. It contains economic reports, posters, photos, a PowerPoint presentation, an extensive bibliography, and more. A great resource.*

### GOATS! For Firesafe Homes in Wildland Areas

Kathy Voth  
6850 West County Road 24  
Loveland, CO 80538  
[www.livestockforlandscapes.com](http://www.livestockforlandscapes.com)

*This CD/handbook is designed to provide fire managers, communities, and livestock owners information on using goats to reduce fire danger. It includes expected results, and the "hows" of managing animals, choosing treatment sites, developing contracts for services, estimating costs, and starting projects. This is a great CD with some excellent videos.*

## ATTRA Publications

The following publications are available free from ATTRA. Copies can be requested by calling 800-346-9140 or downloaded at our Web site, <[www.attra.ncat.org](http://www.attra.ncat.org)>.

### General

#### **Sustainable Goat Production: Meat Goats**

*Offers information specific to meat goat production and should be read after Goats: Sustainable Production Overview. It discusses topics that include selection, breeds, marketing, feeding, and profitability. It also includes sample budgets, case studies of farms in Montana and Missouri, and many further resources.*

#### **Dairy Goats: Sustainable Production**

*This publication is intended for those interested in starting a commercial goat dairy. It discusses the five major considerations to be addressed in planning for dairy goat production: labor, sales and marketing, processing, regulations, and budgeting and economics. It includes production information specific to dairy goats, including choosing breeds and selecting stock.*

#### **Small Ruminant Sustainability Checklist**

*This checklist is designed to stimulate critical thinking when evaluating a farm that produces sheep or goats. The sustainability of a farm depends on many factors involving farm management, use of resources, and quality of life. The questions in the checklist are intended to stimulate awareness rather than to rate management practices. Use this guide to define areas in your farm management that might be improved, as well as to identify areas of strength.*

## Health

#### **Integrated Parasite Management for Livestock**

*With parasites developing resistance to all dewormers, and more farmers producing livestock by "natural" methods, there is interest in looking for alternative ways to manage parasite problems. This publication outlines a systems approach to assess and manage the soil, forages, and animals to decrease internal parasites and their effects.*

#### **Predator Control for Sustainable & Organic Livestock Production**

*This publication focuses primarily on the control of coyotes and dogs, which are the main causes of livestock lost to predation. It discusses management practices, physical barriers, the use of guard animals, and other predator control measures.*

## Forages

#### **Assessing the Pasture Soil Resource**

*This publication explains how to take a soil sample and an easy way to assess soil biological activity and water infiltration. Assessment sheet included.*

#### **Matching Livestock and Forage Resources**

*This publication examines how to manage pas-*

tures and grazing animals to make more profitable use of the farm's resources.

### **Meeting the Nutritional Needs of Ruminants on Pasture**

*Impact of grazing management on nutrition, supplemental feeding on high quality pasture, feed profiling, feed budgeting, and matching livestock and forage resources for efficient pasture use are all covered.*

### **Multispecies Grazing**

*This is a brief overview of why multispecies grazing is beneficial, and includes considerations for multispecies management.*

### **Introduction to Paddock Design**

*This presents the basics of paddock design and considerations in fencing and water technology. Many enclosures.*

### **Rotational Grazing**

*This publication examines how to manage pastures and grazing animals to make more profitable use of the farm's resources.*

### **Sustainable Pasture Management**

*This includes managing fertility and pests, grazing systems, conserved forages, maintaining productivity, and additional resources.*

## Marketing

### **Alternative Meat Marketing**

*This is a comprehensive introduction to producer marketing of meat products. It discusses pitfalls, producing and packaging for quality and consistency, direct marketing options, value-added products, food safety and labeling, and niche markets. Contains a list of resources.*

### **Direct Marketing**

*This publication on direct marketing alternatives – with emphasis on niche and specialty markets and value-added crops – features many farm case studies, as well as information on enterprise budgets and promotion/publicity. A new section discusses implications of Internet marketing and e-commerce for agriculture.*

### **Evaluating a Rural Enterprise**

*This publication is for people who already live in*

*rural areas and want to add new enterprises to their operations. Its sections guide the reader in evaluating resources, assessing finances, gathering information, and marketing. It also discusses choosing an "alternative" enterprise and offers further resources.*

### **Holistic Management**

*This is an introduction to holistic management. Holistic management is a decision-making framework that assists farmers and others in establishing long-term goals, creating a detailed financial plan, developing a biological plan for the landscape, and implementing a monitoring program to assess progress toward the goals. Holistic Management helps managers to ask the right questions and guides them in setting priorities.*

### **Keys to Success in Value-Added Agriculture**

*This publication presents, largely in the words of 14 farmers, important lessons they learned in adding value to farm products and marketing directly to consumers.*

### **Marketing Strategies for Farmers and Ranchers (SAN publication)**

### **Adding Value to Farm Products: an Overview**

*This publication introduces the concept of value-added farm products, explains a few of the nuts and bolts for starting a food processing business, and provides resources for additional information.*

### **Value-added Dairy Options**

*This presents considerations for those who want to increase their profitability by bottling milk, making cheese or yogurt, or doing some other processing of their milk. This publication discusses regulations and organic milk certification and offers resources for further information. Call 800-346-9140 to request this publication, since enclosures are available only with the hard copy.*

## **Books**

The following books offer useful information on a wide variety of production and marketing issues. These titles may be available through your local library, or may be requested through inter-library loan. Most of these books will be worthwhile purchases for individuals new to

goat production. Previewing the books at a library is the best way to select the titles that will be most useful to you.

Used copies may be available through on-line services or through other booksellers. Many suppliers of sheep and goat equipment also offer books in their catalogs, and copies are available from the publishers as well.

### **Meat Goats: Their History, Management, and Diseases.**

Mitcham, Stephanie, and Allison Mitcham. 2000. Crane Creek Publications, Sumner, IA. 264 p.

*A well-written combination of the author's personal experiences raising goats, veterinary knowledge (Stephanie Mitcham is a DVM), and a compilation of information from other experts in the field. Includes information about handling systems (hard to find elsewhere).*

### **Small- Scale Livestock Farming: A Grass Based Approach for Health, Sustainability, and Profit.**

Ekarius, Carol. 1999. Storey Books, Pownal, VT. 217 p.

*Not specific to any species of livestock, this book contains farmer profiles and quite a bit of holistic planning and economic information. Very complete in treatment of rotational grazing.*

### **Storey's Guide to Raising Dairy Goats (revised and updated; originally titled Raising Milk Goats the Modern Way)**

Belanger, Jerry. 2001. Storey Books, Pownal, VT. 288 p.

*Very good general book for producers of dairy goats.*

### **Goats and Goatkeeping**

Thear, Katie. 1988. Merehurst Press, London. 176 p.

*Very interesting book for goat producers, geared for the small farm. Covers milk, meat, and fiber. Practical and concise, very similar to The New Goat Handbook, but with added detail.*

### **The New Goat Handbook**

Jaudas, Ulrich. 1989. Barrons Educational Series, Inc., Hauppauge, NY. 93 p.

*A colorful book with many photographs and line drawings. Very interesting and informative.*

### **Goat Husbandry**

Mackenzie, David. 1967. Faber and Faber Ltd., London. 368 p.

*An older book, it can be found in libraries and from sellers of used books. British terminology. Very good reading. A classic.*

### **Angora Goats the Northern Way**

Drummond, Susan Black. 1988. 2nd edition. Stony Lonesome Farm, Freeport, Michigan. 203 p.

*Order from: Stony Lonesome Farm  
1451 Sisson Rd.  
Freeport, MI 49325*

### **Raising Goats for Milk and Meat**

Sinn, Rosalee. 1995. Raising Goats for Milk and Meat: A Heifer Project International Training Course. Heifer Project International, Little Rock, AR. 140 p.

*Written for persons with limited resources, this is a very practical book. Available through Caprine Supply (among other sources).*

### **The Meat Goats of Caston Creek**

Tomlinson, Sylvia. 1999. Redbud Publishing Co., Victoria, TX. 181 p.

*Personal experiences of the author.*

### **Your Goats: A Kid's Guide to Raising and Showing**

Damerow, Gail. 1993. Storey Books, Pownal, VT. 172 p.

*Gail Damerow writes very good books; this one is easy to understand and very informative. Not just for kids.*

### **Natural Goat Care**

Coleby, Pat. 2001. Acres U.S.A, Austin TX. 371 p.

*Order from: Acres U.S.A.  
Austin, TX 78709  
800-355-5313*

*Fascinating book; Australian author pays*

*much attention to nutrition and maintaining health organically.*

### **Goat Medicine**

Smith, Mary, and David M. Sherman. 1994. Lippincott Williams & Wilkins, Baltimore, MD. 620 p.

*This book is recommended as a useful gift for a veterinarian. Very scientific, some of the terminology will only be understood by a veterinarian. Chapter 1 (Fundamentals of Goat Practice) is very helpful to producers as well as veterinarians. Chapter 20 (Herd Health Management and Preventive Medicine) is also very useful to producers.*

### **Sheep and Goat Medicine**

Pugh, D.G. 2002. W.B. Saunders Company, Philadelphia, PA. 468 p.

*A great gift for a veterinarian. A wealth of information for producers and for veterinarians. Knowledge of veterinary terminology will be helpful in using this book .*

### **Goat Health Handbook: A Field Guide for Producers with Limited Veterinary Service**

Theford, T.R. 1983. Printed in collaboration with Agricultural Experimental Station, University of Arkansas. 123 p.

*Available from:*

*International Winrock Publication Sales  
P.O. Box 9363  
Arlington, VA 22209-0363*

### **Building a Sustainable Business: A Guide to Developing a Business Plan for Farms and Rural Business**

DiGiacomo, Gigi, Robert King, and Dale Nordquist. 2003. Minnesota Institute for Sustainable Agriculture, Saint Paul, MN, and the Sustainable Agriculture Network, Beltsville, MD. Available for \$14.00 + \$3.95 S/H by calling 802-656-0484 or 800-909-6472. Publication can also be viewed at <[www.misa.umn.edu/publications/bizplan.html](http://www.misa.umn.edu/publications/bizplan.html)>.

*Business planning is an important part of owning and managing a farm. A business plan helps farmers demonstrate that they have fully researched their proposed enterprise, that they know how to produce their product, how to sell what they produce, and how to manage financial risk. This comprehensive workbook will guide farmers*

*through every step of the process in creating a business plan. Includes many examples from existing farms. This workbook is a bargain.*

### **...May Safely Graze: Protecting Livestock Against Predators**

Fytche, Eugene. 1998. Published by the author. 103 p. To order, write to Eugene Fytche, R.R. #1, Almonte, Ontario. K0A 1A0.

*This book explores how to identify and quantify the predator problem, and includes information on many methods to control the problem, including guard animals, fencing, and management.*

### **Fences for Pasture & Garden**

Damerow, Gail. 1992. Storey Communications, Inc., Pownal, VT. 160p.

### **Sheep Housing and Equipment Handbook**

Hirning, Harvey J., Tim C. Faller, Karl J. Hoppe, Dan J. Nudell, and Gary E. Ricketts. 1994. MidWest Plan Service, Ames, IA. 90 p.

*This book is useful for goats, as well. Can be ordered by visiting <[www.cerc.colostate.edu/titles/MWPS3.html](http://www.cerc.colostate.edu/titles/MWPS3.html)>.*

## **Magazines**

### **The Stockman Grass Farmer**

P.O. Box 2300  
Ridgeland, MS 39158  
800-748-9808  
[www.stockmangrassfarmer.com/sgf/](http://www.stockmangrassfarmer.com/sgf/)  
\$32 per year (12 issues).

### **Countryside & Small Stock Journal**

W11564 Hwy 64  
Withee, WI 54489  
800-551-5691  
[www.countrysidemag.com](http://www.countrysidemag.com)  
\$18 per year (12 issues).

### **The Goat Magazine**

2268 CR 285  
Gillett, TX 78116  
830-789-4268  
830-789-0006 FAX  
[editor@goatmagazine.com](mailto:editor@goatmagazine.com)  
[www.goatmagazine.com](http://www.goatmagazine.com)  
\$24.00 per year (6 issues). \$5.00 for a sample issue.

### **Goat Rancher**

Terry Hankins, editor and publisher  
731 Sandy Branch Road  
Sarah, MS 38665  
888-562-9529  
www.goatrancher.com  
\$25.00 per year (12 issues).

### **The Goat Farmer**

An on-line magazine  
www.thegoatfarmer.com  
\$10 per year.

### **Meat Goat Monthly News**

Ranch Publishing  
P.O. Box 2678  
San Angelo, TX 76902  
www.ranchmagazine.com/mgn.html  
\$25.00 per year (12 issues).

### **Dairy Goat Journal**

W11564 Hwy 64  
Withee, WI 54498  
800-551-5691 (toll-free)  
www.dairygoatjournal.com  
\$21 per year and \$35 for two years.

### **United Caprine News**

P.O. Box 328  
Crowley, TX 76036  
817-297-3411  
www.unitedcaprinenews.com  
\$22.50 per year.

### **Langston University Quarterly Goat Newsletter**

Free quarterly newsletter  
To subscribe, visit <www2.luresext.edu/goats/library/subscription.htm>.

## **Contacts**

### **USDA Rural Business-Cooperative Development Service**

Stop 3250  
Washington, DC 20250-3250  
202-720-7558  
202-720-4641 FAX  
coopinfo@rurdev.usda.gov  
www.rurdev.usda.gov/rbs/coops/  
cswhat.htm

### **Langston University**

Agricultural Research & Extension  
P.O. Box 730  
Langston, OK 73050  
405-466-3836  
405-466-3138 FAX  
www.luresext.edu/goats/index.htm

### **New England Dairy/Meat Goat and Dairy Sheep Directory**

This directory was developed through the University of Vermont Center for Sustainable Agriculture's Small Ruminant Dairy Project and lists producers, service providers, and resources for farming with dairy goats, dairy sheep, and meat goats in Vermont, New Hampshire, Maine, Rhode Island, Connecticut and Massachusetts. Producers are listed alphabetically by state/town and indexed by breed; service providers are listed alphabetically and indexed by state/town. The directory also lists resources, including programs, associations, and periodicals. The Center suggests a \$5.00 donation per copy to cover copying, shipping, and handling. To order, or for more information, contact the Center at 802-656-5459 or e-mail <sustainable.agriculture@uvm.edu>. You can also mail your order to Center for Sustainable Agriculture, 63 Carrigan Drive, Burlington, VT 05405. Make checks payable to "UVM." No credit card orders.

## **Suppliers**

### **Caprine Supply**

P.O. Box Y  
3301 W. 83rd Street  
DeSoto, KS 66018  
913-585-1191  
800-646-7736 (toll-free)  
www.caprinesupply.com  
Offers Extension Goat Handbook for  
\$24.00 plus \$5.75 postage.

### **Hoegger Supply Company**

160 Providence Road  
Fayetteville, GA 30215  
800-221-4628 (toll-free)  
www.hoeggergoatsupply.com

**Sydell**  
46935 SD Hwy. 50  
Burbank, SD 57010-9605  
605-624-4538  
800-842-1369 (toll-free)  
www.sydell.com

**Hamby Dairy Supply**  
2402 SW Water Street  
Maysville, MO 64469-9102  
800-306-8937 (toll-free)  
www.hambydairysource.com

**Billy Goat Gruff**  
P.O. Box 10  
Dunnville, KY 42528  
www.billygoatgruff.net

**D-S Livestock Equipment**  
18059 National Pike  
Frostburg, MD 21532  
301-689-1966  
800-949-9997 (toll-free)  
www.dslivestock.biz

## Organizations

**American Dairy Goat Association**  
209 West Main Street  
P.O. Box 865  
Spindale, NC 28160  
828-286-3801  
www.adga.org



**International Boer Goat Association**  
P.O. Box 310  
Bonham, TX 75418  
877-402-4242 (toll-free)  
www.intlboergoat.org

**International Goat Association**  
www.iga-goatworld.org

**American Association of Small Ruminant Practitioners (AASRP)**  
1910 Lyda Avenue, Suite 200  
Bowling Green, KY 42104  
270-793-0781  
www.aasrp.org

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**GOATS: SUSTAINABLE PRODUCTION OVERVIEW  
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NCAT AGRICULTURE SPECIALISTS  
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