GOATS FOR CALIFORNIA BRUSHLAND

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FRONT COVER PHOTO

Note how standing brush has been defoliated in this view of Spanish and Angora and Spanish-and-Angora-cross goats in San Diego County.

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The Brush Problem

Out of a total land area of about 100 million acres, California has 10 million acres of land almost completely covered with brush, plus several million more acres of brush mixed with oak woodland (Coppock, 1973). As time goes on, the state will increasingly need these brush areas for animal production, for game and other wildlife use, and for public recreation. Under present management principles, however, the virtually impenetrable heavy-brush portions of this acreage are almost a total loss for wildlife, recreational or economic use. They also constitute an extreme fire danger to grasslands, forest areas, and nearby crops and homes. Their brush root-systems also take up huge amounts of ground water, which is then transpired through the leaves, causing reductions in streams, springs and soil moisture. The history of much of this brushland area involves periodic and devastating fires, which are subdued only after much effort and expense. Afterward, the burned lands quickly grow over again with heavy stands of brush.

Goats For Brush Control

Brush-removal methods involving heavy machinery, chemical methods, or fire, are expensive and require great care. Properly managed grazing goats can be a valuable addition or replacement for other brush-control methods, often reducing costs and perhaps producing some monetary return while control is being obtained. In Texas, goats have long been used to help reduce heavy brush stands and open up the range for production of range grasses and forbs. Fertilization and range reseeding with desirable forage plants can then result in improved productive range, and domestic animals and game can feed through and around any remaining light brush cover. The lighter stands of brush provide much feed for goats occupying the range, so it is common in some areas to keep some brush rather than to eradicate it completely. In Texas, sheep, goats and cattle often occupy large tracts of fenced range together, and this gives more complete and even utilization of range and greater total production of animals.

The same process of brush reduction has been used in California but on a smaller scale, principally in Amador, Placer, El Dorado, Calaveras, and Santa Barbara counties, and to a lesser extent in other counties along the lower western slope of the Sierras. Angora goats once occupied more extensive areas of the state in Mendocino and Humboldt counties and portions of Tehama, Glenn, Butte and Colusa counties.

Kinds of goats available

There are probably fewer than 10,000 head of range goats in California. Most of these are Angoras, which are used for meat and production of mohair. One other breed, the Spanish goat, is occasionally found here and is sometimes crossed with Angoras to the detriment of the mohair. Such crosses produce hairy or kempy fleeces and shed their hair easily, which results in a light, commercially defective clip of mohair.

All goats including the milking breeds relish many species of brush, and thus to some extent can be used to open up small areas by reducing brush cover.

The role of goats in brush reduction

To remove or greatly reduce large stands of brush, the stands can be burned, or crushed and opened by bulldozing, chaining, or other mechanical means. If mechanical removal is used, the resulting brush piles should be

burned during wet weather or left to deteriorate gradually. If burning is done for removal, the stands should be surrounded by a bulldozed fire trail and the brush cover within then burned by trained crews (Emrick and Adams, 1977). After clearing, the area should be fenced into 20- to 80-acre pastures before animals are put in for grazing. Brush removal will be slower on larger pastures, although they can be useful and will cost less per acre to fence.

Fences should be of woven wire (32 inches high, 6- x 12-inch mesh) with two barbed wires above and one below. An alternative is a 39-inch-high woven wire fence with 6- x 12-inch mesh and one strand of barbed wire above and one below. Whatever type is used, a minimum total height of 48 inches is recommended particularly for Spanish goats. Existing 32-inch-high fences can be made higher by adding extra barbed wire.

At least two types of high-voltage, high-amperage electric fencing with a rapidly oscillating current are available; these are made in New Zealand and Australia but are available in the U.S. They are more economical to construct, and may also help protect against predators. However, these fences have not (as of spring, 1978) been widely tried under California conditions.

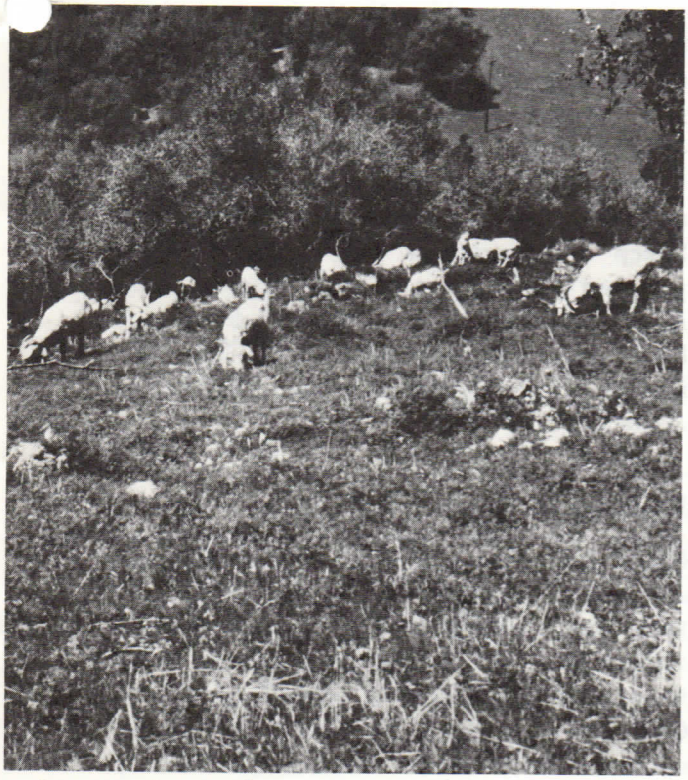
When green shoots from brush stumps and roots are 6 to 12 inches high, three wethers (castrated bucks) or two nannies per acre should be grazed on the pasture; normally, they will gradually reduce new growth to ground level. If two pastures are available, twice this number of goats per acre can be placed in one pasture, and as soon as the sprouts are grazed down the animals can be transferred to the second pasture. This is a relatively heavy stocking rate, so the goats should be given whatever supplements are necessary for their health and condition. Supplementation can be concentrates, hay, pellets or more pasture.

Brush removal or reduction by goats is based on keeping regrowth down to the degree desired. The stocking rate noted above should gradually reduce brush cover. Goats tend to graze each brush plant once or twice per day, and maintain constant grazing pressure.

In Amador County the recommended stocking rate is two mature goats per acre the first year, one mature goat the second year, and one mature goat per two acres thereafter. This last rate will keep brush controlled while providing for its continuation as a feed resource. The stocking rate will vary with the area according to brush species, soil, rainfall, and elevation, as well as completeness of brush cover. See your Farm Advisor for local recommendations on stocking rate.

This experimental plot has had the brush cover bulldozed into a pile and later burned. Angora goats are grazing off the new sprouts.

Brush has been removed, and after heavy grazing the trees are left with much open ground for grass production.



Angoras grazing grass, forbs and new sprouts after brush removal.

Typical grass, brush, tree combination resulting from opening up brushy range to allow for continued use of all species of forage.

The brush reduction process

In brush reduction or removal by goats, the effects on stumps and root systems must be to deny them foliage for the manufacture of food reserves. Any stored reserves (plant starches and sugars) are used up by new growth which is periodically grazed off so that the root system eventually starves and dies.

Management measures used by goat ranchers to control rate and amount of brush reduction—in addition to well being of the goats—are (a) stocking rate and (b) rate of supplementation. High stocking rate and little or no supplementation forces goats to graze even the less palatable species and parts of plants. Thus with severe overgrazing much brush may be eradicated within 2 to 3 years. Because breeding animals' needs are more critical than are those of relatively mature wethers, the latter—known to the trade as "older stockers"—are best suited to use where heavy stocking is required. These animals also tend to be hardier than nannies and where allowed to grow out well will be larger, heavier and less subject to predators. A further advantage is that the operator does not have the task of kidding out the flock.

These stocker yearlings are at an ideal age to start on a brush removal program. The corral fence is 39-inch woven wire with one barbed wire above.

The rancher can keep stockers, for one or two seasons, and then sell them for slaughter as "muttons" or for brush removal to another rancher at the end of the best feed season (late spring or early summer); he can then buy a new younger flock of stockers as replacements. He may also wish to keep stocker wethers for six or seven seasons, particularly if they are Angoras and producing mohair. The rancher cannot expect to get as much income as usual from mohair or weight-gains of goats if they are primarily being used at heavy stocking rates to remove brush and to increase capital value and productivity of range.

Breeding flocks of grade or purebred goats are better suited where the rancher wishes to stock more lightly (perhaps $^1/_2$ to 1 head per acre) and open up brush stands by killing back part of it gradually and removing the low growth (understory). The aim here is to let in more light, remove much of the cover, and allow growth of grass and forbs—this growth is consumed with the brush, and the brush is used as a regular feed source (sustained-yield system). At lighter stocking rates, grazing pressure is not as critical because pastures should contain some unused forage. If forage is short, however, breeding animals must be well fed by the rancher. Sheep and cattle, or either, may later be pastured with the goats. These animals utilize more grass and legumes or other forbs, and less brush in grazing, than do goats. The goats in such an arrangement are primarily used to control brush.

Brush species grazed

Goats will graze almost all species of brush and trees, but the time of year influences their choice of species. Only limited detailed studies have been made in California as to these grazing preferences. The University of California and the U.S. Forest Service cooperated in a study in Amador County (Anonymous, 1976) on the effectiveness of Angora goats in control of brush. The report

states results were encouraging on control of interior live oak, whiteleaf ceanothus, and Toyon.

The same report (Anonymous, 1976) notes the browse preference of 350 Angoras browsing on grass-type conversions and mature brush in the Los Padres National Forest. The report stated, in part, that:

> The goats' characteristic of continually moving as they browse has caused some very positive impacts. The goats have brushed back some trails and roads. In flats where the brush stands 10 to 15 feet the goats have very noticeably opened up the understory, essentially leaving a park-like appearance.

The investigators also said: "We have not seen any plant that the goats will not take at least sometime in the year. However, they do have their preference".

The following are species consumed in the study, with notations on preference and season when grazed:

Scrub oak (*Quercus dumosa*)
Coast live oak (*Quercus agrifolia*)
Chamise (*Adenostoma fasciculatum*)
– particularly in late spring and early summer months when making full leader growth.
Manzanita (*Arctostaphylos* spp.)
– not too heavily grazed in late summer months.
California buckwheat (*Eriogonum fasciculatum*)
California sagebrush (*Artemisia californica*)
Big sagebrush (*Artemisia tridentata*)

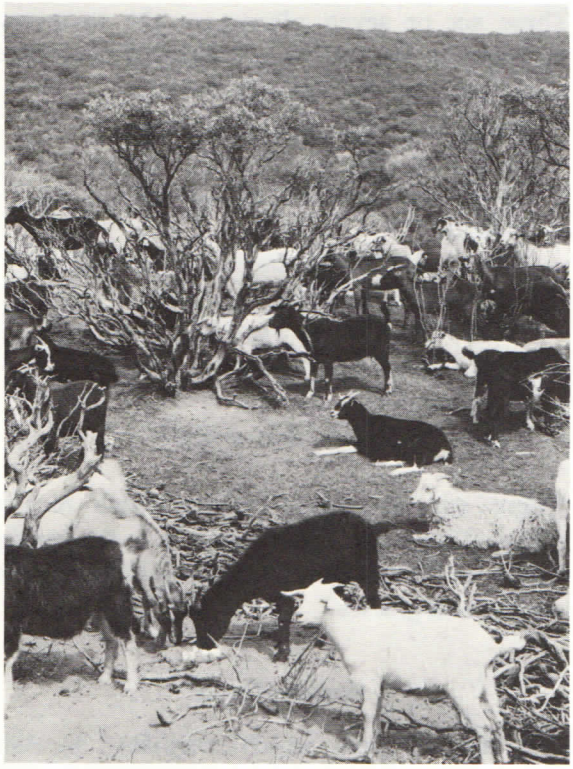
These six or seven plants are the mainstay throughout the year. The following plants are moderately grazed through the year:

Wedgeleaf ceanothus (*Ceanothus cuneatus*)
Greenbark ceanothus (*Ceanothus spinosus*)
Yerba Santa (*Eriodictyon crassifolium*)
– more in winter.
Sugar sumac (*Rhus ovata*)
Juniper (minimal) (*Juniperus californicus*)
Yucca (minimal) (*Yucca* spp.)

There are also some plants which receive seasonal preference, particularly in the spring. These include annual and biennial wildflowers and annual grasses.

Angora Goats

The Angora goat, which originated in Asia Minor, was first imported into the United States in 1849. It produces fleeces of the beautiful, long, lustrous fiber known as mohair. The Angora goat population of the world is concentrated in Turkey, South Africa and Texas, with each of these areas having about one-third of the total population. The Angora goat population in this country has varied from 4.18 million head in 1965 to a low of 1.18 million in 1974. Texas leads the states (over 95 percent) in the production of mohair, followed in order by Arizona, New Mexico, Missouri, California, Oregon and Utah (USDA Crop Reporting Board). In California, Angora goats are raised in 22 counties, from Orange County in the south to Trinity County in the north; the largest concentrations are in Amador and Calaveras counties.



Manzanita, showing high browse line.

Mountain mahogany, an excellent browse plant for cattle and sheep as well as goats.

Scrub oak after browsing.

Desert Ceanothus. Virtually every small leaf on branches within reach has been browsed.

The mohair market

Mohair is used in the manufacture of suits, robes, sweaters, drapes and in many new blends combining wool and synthetic fibers. Because of its luster and smoothness and its ability to absorb dyes, mohair is ideal for fine upholstery coverings. However, the mohair market fluctuates more than the wool market and is much more sensitive to the whims of the fashion designers—in 1972-73, for example, prices went from $0.26 a pound to $1.50 a pound. In the United States, average weight of the mohair fleece is 6.5 pounds per year, which amount is obtained in two shearings, spring and fall; in California the average is 6 pounds. The better purebred and the more highly selected and well-managed commercial (grade) flocks may produce an average annual fleece weight of 12 pounds or more. The fleece prices plus incentive payments have ranged from $0.72.9 a pound in 1963 to $2.90 a pound in 1976 (USDA Crop Reporting Board).

In assessing goats for mohair production, they are examined for fleece length, fiber diameter, density, and uniformity in the shoulder, side, leg (britch), and belly.

Goat meat (chevon)

The meat of Angora crossbred, and of Spanish as well as milk-goat kids, is in great demand during Easter, especially among Americans of Slavonian descent in California. There is also a large market among Mexican-Americans, Filipino-Americans, and Greek-Americans. Mexican-Americans prefer the kid carcass (called "cabrito" or little goat); it is prepared in various ways, but is particularly favored for barbecuing. Thus a large potential market exists in southern California and Baja California. In 1972, prices of market kids ranged from $18.00 to $25.00 per head. Yearlings or older goats are often smoked to make a product called "Kastradina". Meat from aged goats is sometimes processed or used in table-ready meats such as salami. Chevon is a very lean meat with an excellent flavor.

Stocker operations: Angoras

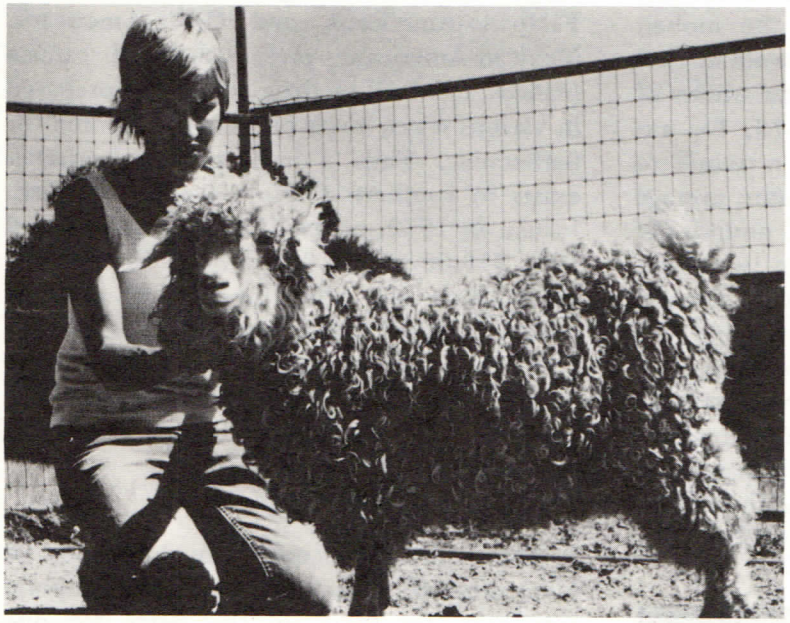
Stocker operators commonly buy kids or older wethers from other commercial operators and run them on the range for one season. They are then sheared and sold as mutton goats for slaughter. Thus, income depends on increase in weight and the mohair sold. Stocker kids are less hardy and are more susceptible to predation than are older animals. In the trade, stocker kids purchased commonly weigh 30 to 40 pounds. Yearlings or 2-year-old stockers should weigh 60 to 80 pounds. When fed for one or two seasons they can be sold as light or heavy "muttons", weighing 85 to 150 pounds, if in reasonable to good condition. Wether goats can be kept for six or seven seasons if desired.

Purebred breeders

Angoras are occasionally raised as purebreds—these are animals selected for superiority in length, uniformity, and weight of mohair fleeces, as well as superiority in body characteristics. A breeder of purebreds may exhibit animals and fleeces at fairs or other livestock shows to promote his flock. Such a breeder may sell billies to commercial (grade) Angora

producers or he may sell billies and nannies to other purebred breeders. A few slightly less desirable purebred females are sometimes sold to commercial producers.

Purebred breeders also produce and sell a clip of mohair in spring and another in autumn. Superior Angoras have fleeces that grow about 1 inch per month, and these are shorn twice yearly to avoid seed defect in the fleece, to increase the goat's comfort, and to avoid shedding.



An excellent type of purebred doe kid for breeding.

An outstanding purebred billy in use as a flock sire.

Commercial Production Of Angoras

The commercial producer of Angoras sells his annual kid crop for slaughter, or as stockers if castrate males (wethers), or as breeders if females. He also sells mohair from the twice-yearly clip.

Breeding the flock

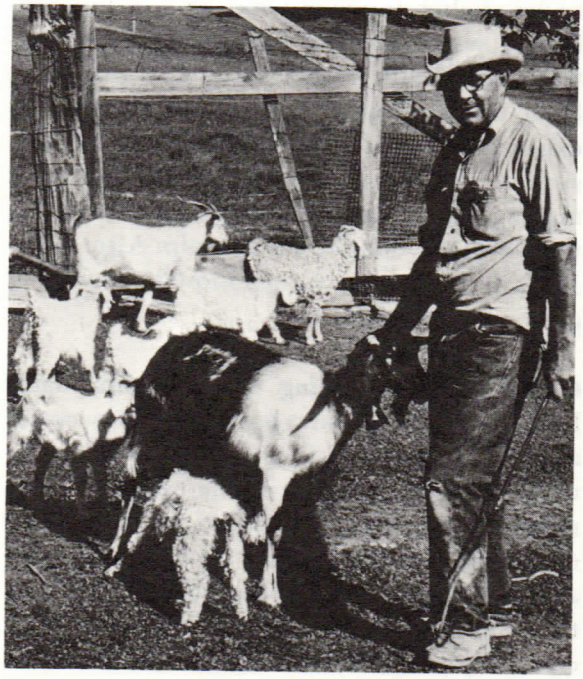
Nannies (does) and billies (bucks) are seasonal breeders, and mating commonly takes place in July or August. From 2 to 4 billies are used per 100 nannies. Gestation varies from 139 to 156 days but averages about 149 days, so most births can be expected through December and January. Nannies usually start to come into heat about 8 days after the billies are introduced, as the presence of the male has a pronounced effect on the females. The sight, odor, action and sound of the billy all affect the reproductive behavior of the nanny.

The billy has an extremely strong odor, which is more pronounced during the breeding season. The billy is noted for his unclean habits (including masturbation, and urination on his head, neck and chin whiskers) so his infamous odor is not surprising. He has very strong scent glands located in the skin on the back of the head between and behind his horns, and these produce the odor which is very attractive to nannies approaching or already in heat. Goat breeders commonly rub a rag over the scent gland area to produce the so-called "buck rag" which is used to test nannies for heat on ranches where there are no billies. Billies are occasionally de-scented by surgical removal of these glands. In view of the role of the billy in initiating and synchronizing, estrus such removal may be undesirable in a grade flock.

Good yearling does should weigh about 70 pounds at breeding, with older does weighing up to 85 or more. Billies should weight 125 to 175 pounds, depending on age and condition.

Kidding

With goats, the birth process is known as kidding. Three different management methods are employed in this process: open-range kidding, kidding at the stake, and kidding in corrals. When the nanny has her young, she needs to be closely associated with it for some time in order to become acquainted with its odor and, later, its individual cry and appearance. If the mother is frightened away from the kid soon after birth, or if the kid becomes lost, the mother will usually not claim her young even if it is returned to her, and mismothering with starvation of the kid will result. Accordingly, kidding requires that the rancher or his employees sort out mothers with their proper young (while creating as little disturbance as possible). Well-fed goat mothers care for their new young more carefully and completely, and show more desire to claim them. Many ranchers find it a good practice to brand the nanny and her young with the same number for identification purposes.



Orphaned Angora kids nursing on a milk goat doe. Only by constant attention and care can a maximum percentage of abandoned or orphaned kids be saved.

Open-range kidding. Some Angora producers in Texas feed their flocks well but allow them to kid out on the range with no special attention except for measures taken against predators. This results in strong selection for maternal care. Such kidding could also be practical elsewhere, provided weather and feed conditions during kidding are favorable and where predators are controlled. However, care must be taken to minimize disturbance of the kidding flock, as disturbances promote movement of animals and lead to mismothering of newborn kids.

Kidding at the stake. This very old system involves bringing the flock close in to a kidding area where there are many small sheds similar to calf shelters, dog houses, or A-frames like turkey coops. A stong wooden stake is driven into the ground in front of each shelter, and a rope about 3 feet long and $^1/_4$ inch in diameter is tied around one of the front ankles of the kid soon after birth. The rope has a swivel between foot and stake in order to avoid becoming twisted. Thus, the kid can move about to nurse, and can get under shelter to avoid wind, rain or hot sun. During warm dry weather, kids may be tied 6 feet apart with a tightly-stretched wire lying flush to the ground, but they should not be exposed to hot sun. Nannies under this system are turned out to feed after their first nursing of the day, but return in the evening to allow the young to nurse again. After 12 to 14 days the kids are turned loose to travel and graze with the mother.

Corral or barn kidding with a jump board. Here, the nannies are brought into a corral and are allowed to kid and nurse their young under close supervision of the rancher. When nannies are ready to return to the range, bars or boards are placed across the corral gateway at about 18 inches above ground—this keeps the younger kids in the corral but the nannies can easily jump back and forth. When kids are able to jump the obstacle they are allowed to do so and travel with their mothers. In northern California (and in colder areas) sheds and barns with pens, and perhaps electric lights and heat lamps are used in kidding operations. Newborn kids are highly susceptible to chilling, so even in milder climates some shelter is needed. When an intensive close-care system is followed, jump boards are not used until the young are 2 to 3 days old; up to that time the mothers are kept constantly with the kids. Some operators use a cutting chute to separate kids from their mothers, but this has to be done carefully to avoid injury to kids. Other operators hold the kids back with stick or sheep hook, allowing only nannies to leave the corral.

Using a sheep hook to keep kids in the corral so that nannies can go out to graze. Kids quickly learn to stay back when they see the hook.

Twinning

More young born and reared mean greater income from the flock. Angoras are not particularly noted for twinning, but in some flocks twinning ability has been emphasized in selection and flock management. Accordingly, flocks will vary from 80 to 150 percent or more in number of kids born (calculated as a percentage of nannies kidding). Factors favoring twin production and survival include excellent management and a generally higher plane of nutrition for the flock. Extra supplementation, either from particularly good pasture, hay, or $^1/_4$ to $^1/_3$ pound of grain daily, is given during the last 2 weeks before breeding. This is called "flushing" and encourages early breeding, firm conception and superovulation to produce twins. Other management measures include using breeding stock from breeding lines selected for twinning, or using nanny and billy twins out of twin stock. Extra care, shelter, and supplementation will insure that twins have a better chance to survive and grow properly.

These does were kidded on the range but receive extra supplement to help support their twins.

Castration

Young male kids should be castrated either by knife, burdizzo, or elastrator rings. Some ranchers prefer not to do this at the usual 3 to 4 weeks of age but when kids are older and larger, perhaps at yearling age. A new method of castration, which originated in Russia, is called the "Baiburtcjan" method. This involves making a small incision in the lower half of the testicle and, after cutting inside in a circular fashion to macerate the contents, squeezing out the soft inner tissue. There appears to be less shock to the animal than with normal castration, and part of the tissue which produces testosterone is retained. Following this treatment in California experiments, goats grew larger and faster than did normal castrates or intact males—they grew bigger, had larger horns, produced more mohair, and appeared better able to resist predators (due to size and horns). In these California trials, goats castrated by the Russian method have not exhibited libido, although varying degrees of libido have been shown by sheep and cattle so castrated.

Weaning, stocking rates

Young are usually weaned from the mother at 4 to 6 months of age or when the range becomes dry and the nanny's milk production drops. Weaned kids should weigh 25 to 50 pounds.

Angora breeding flocks are usually stocked on range at the rate $^1/_2$ to 1 animal per acre. However, this can vary highly, depending on climate, soil, brush cover, and amount of brush reduction desired.

Supplementation

Alfalfa hay is an excellent supplement and can be used as a source of energy or protein. It can be fed in baled form, or as pellets or cubes. Other good hays are oat and vetch, or clover hay. Grains such as barley, wheat, milo, field corn or oats are an excellent source of energy and may be hand-fed at the rate of $^1/_4$

to $^1/_3$ pound per head per day or higher during critical periods, such as just prior to breeding, 2 weeks prior to kidding, when kids are very young, or when feed is short. Oats usually cost more than other grains and commonly have less feed value per pound because of weight of hull present.

It may be necessary or desirable to feed grain 2 weeks prior to kidding in order to increase mothering instinct in nannies, and fat reserves in nannies and unborn kids. Where range feed is poor, or if the flock is registered purebred, it may pay to feed grain 6 weeks prior to kidding. Fat reserves in the nanny will increase her milk supply as well as kid size at birth. In newborn kids, fat reserves are a form of stored energy which can be used by the body as a source of heat.

Field corn, like range pellets, can be fed directly on the ground in rocky hard areas or on thick grass sod; avoid muddy or soiled ground or roadways for such feeding. If feeding in troughs or mangers, allow at least 1 foot of manger space per nanny and see that weaker animals also get a chance to eat. It is desirable but may not be practical to separate sizes, ages, and sexes during feeding to minimize the butting problem; providing more feeding space and larger quarters also tends to minimize this. Numerous types of commercial range pellets are available for sheep or goats; they are convenient to handle, can be fed on the ground, and can be purchased in any desired grain-roughage proportion. However, pellets are usually considerably more expensive than are their roughage and grain components.

In late summer and fall when most range forage is dry, shattered, and perhaps leached by early rains, range animals still need protein for growth and repair—energy is usually available from cellulose and fiber digestion of forage. In spring, after the first green grass appears, the need is primarily for energy. In late winter when grass has much moisture, animals have difficulty consuming enough forage to maintain condition. Nannies kept on a low plane of nutrition during gestation tend to miscarry, or lose the pregnancy through fetal absorption. Animals miscarrying one year tend to repeat this in subsequent years even if feed conditions are better; thus it is advisable to cull nannies not producing kids.

Salt and minerals

Salt and minerals are extremely important to goats partly because of their high consumption of fiber, cellulose, and brush. Browsing seems to increase salt needs appreciably, so for that reason (and as a general safety measure), range salt plus mineral blocks or mixes fed in salt troughs should always be available. Salt-hungry animals may overconsume salt in the half-ground form, so provide salt in limited amounts in such situations. Animals consuming too much can be given large amounts of fresh water to flush the salt out.

Shearing

Angoras are usually shorn in spring and in fall. If this is not done, some animals may shed part or all of their fleece as the long unshorn fleece is a heavy load for them to carry throughout winter. Goats are either shorn "Texas style" by tying their legs after shearing the brisket and belly, or without tying the legs. Some shearers like to work on a low table to avoid bending over. The old method involved shearing the animal while it was on its side or back in a shallow trough. Shearing quarters must be kept free of straw and dirt.

Mohair fleeces are merely rolled up flesh side out, and not tied with twine as is wool. If practical, mohair fleeces should be separated into uniform grades after shearing each animal. Uniformity of grade is the key to success in preparing mohair for the market, and can be achieved by separating the flock before shearing into various classes: kids, yearlings, young nannies, old nannies, muttons and billies (coarse-haired goats). Each class is then

Sorting different grades and types of mohair from a single fleece. Fleeces correctly rolled and kept clean are better prepared for market and command a higher price.

sheared by itself and the mohair packed accordingly. Approved classes of mohair are as follows.

Classes of Mohair

Shearing season	Class
Spring	Average adult (coarse hair) Fine adult (main clip) Young goat (4th shearing) Kid (2nd shearing)
Fall	Average adult (coarse hair) Fine adult (main clip) Yearling (3rd shearing) Kid (1st shearing)
	Off-types:
Spring and Fall	12 months (includes capes where left from last shearing) Short adult (under 3½ inches) Stain (heavy stain) Burry (heavy burr content) Crossbred Colored hair

Bags in which mohair is to be packed should be identified neatly and legibly.

Those not familiar with mohair should visit warehouses where it is handled and familiarize themselves with the above classes (other breeders can also offer information).

Other good practices include:

- Controlling lice.
- Supervising shearing.
- Shearing 2 weeks after rain or after spraying.
- Using 5-foot-long bags and packing them firmly from bottom to top.
- Sewing tops of bags with stitches no further apart than 3 to 4 inches.

The clip is damaged by:

- Shearing damp goats (this causes death loss in goats and staining of fleeces).
- Rolling bags around in dirty pens. This soils bags and mohair.
- Mixing crossbred or colored hair with good hair.

It is difficult for an Angora producer to get a good price for a small clip unless he joins a wool and mohair pool or arranges to ship his clip to Texas. Small producers might do well to confer with other Angora producers and try and market together in order to minimize shipping costs and perhaps get a better selling price by marketing a greater volume.

Angoras are particularly susceptible to chilling and will freeze or get pneumonia if the animal is exposed to wet, cold weather when freshly shorn. Therefore shorn animals should have some source of shelter, such as a straw-bedded shed or barn with sufficient room to shelter the flock. If shelter is available and the flock is fed inside, the animals will seek the shelter in particularly cold periods and at night. However, too-small shelters are worse than none at all because the flock may try to crowd into them and smothering will result.

Marketing kids

If replacements are to be saved from the kid crop, choose them by body size and conformation. Kids can often be marketed on the ranch, or by consignment through local slaughter houses. Local restaurants may be good customers if they can be assured of a supply of kids. To insure desirable weight and condition for marketing, kids may need supplemental grain in pasture or feedlot. The best market may be around Easter, as many people like young goat meat at that time; however, Easter Day varies, so this is a difficult market to plan for.

Advertisements in local papers will attract buyers, as will visits to labor camps or announcements in Spanish language newspapers. Many people find word of mouth spread by initial buyers to be a good method. Goats of all ages are freely traded at country auctions so these may be a source as well as sales outlet for goats. If the producer is a beginner planning to buy stockers for brush reduction and then resale for slaughter, he should contact outlets for slaughter animals in advance to assure their readiness to handle the goats. Local Farm Advisors' offices can give advice on this.

An excellent lot of Angora nanny kids for retention as flock replacements or for sale as breeders.

These young kids show the strong bodies and growth resulting from feeding supplements.

Spanish Goats

Spanish Hair goats, Mexican goat, Spanish Meat goat, and Spanish goat are synonymous names—along with some more expletive in nature!—occasionally used for an animal whose ancestors were brought from Spain by early explorers. Remnants of those brought in are now found in many areas of the Western Hemisphere including islands in the Pacific and Atlantic oceans and the mainland of South and Central America. Today, Mexico has a sizeable population of these goats and there are possibly a half-million in Texas, where they are used for meat on ranches, hunted as trophies (in the case of the billies), or sold mostly to the roast kid or barbecue trade as "cabrito". In California, there are a few on brushy rangelands in southern California, and a few in the Sierra foothills. The Channel Islands off Santa Barbara have long had a population of feral goats thought to have been left by early Spanish explorers who brought them along on their ships as a source of meat (it is thought that the animals were put ashore with the expectation that they would furnish meat for later expeditions). In the past, San Clemente and Santa Catalina Islands have been severely overgrazed by Spanish goats; the goats have been hunted by sportsmen, and sometimes subjected to expensive but minimally effective eradication measures like water-trapping, driving into fence traps with dogs, horses, jeeps, and (more recently) helicopters. Extensive shooting programs have also been mounted against them, but all control attempts fail to keep populations from increasing again once the eradication measures are stopped. As a result of this pressure, however, the island goats are much wilder and more difficult to domesticate than are those on the large Texas ranches.

The Spanish goat in Texas

Relatively little has been published on production of the Spanish goat, although Groff (1973) gives some useful information. In Texas, Spanish goats have been largely left to survive on their own with little or no supplementation, no particular effort to kid out the flocks carefully with extra feed, care or shelter, and rarely with any attempt to im-

prove stocks by selective breeding. On many ranches the animals are hunted periodically, both for the rancher's home-meat supply and for sport by those willing to pay a fee. The result has been close adaptation of the animal to the range, selection and adaptation to wildness, and ability to reproduce and survive on the range with little care.

The first Meat Goat Conference was held at the San Angelo Texas A&M Research and Extension Center in 1975. In a report on this in September of that year the West Texas Livestock Weekly noted that "The Spanish goat has long been the stepchild of the Texas livestock industry. But he is gradually buying his way into full family membership because of a growing market for fat kids". A further comment was given which is indicative of the tenacity of Spanish goats to persist: "Once introduced onto a place, Spanish goats are usually permanent. Somebody Tuesday said they have one similarity to bitterweed: if they ever make seed, they are there to stay".

This large flock of Spanish goats demonstrates the variety of form and color characteristic of these animals. (Photo courtesy of Dr. Maurice Shelton, Texas A&M University, San Angelo.)

An outstanding Spanish billy showing exceptional muscling, body thickness and bone size.

Spanish and Angora and Spanish-and-Angora-cross goats resting.

Breed description

The Spanish goat is a relatively tall long-bodied animal, highly variable in color, body thickness and bone size (some billies are outstanding in size, bone structure, and body thickness). Males and females commonly have horns, often of trophy size and shape on the males. Colors vary from solid black, brown or white to fawn and brown with black points and a black stripe down the back (Groff, 1973). There are many combinations of spotting: black and white, brown and white, black and brown, and blue-gray. The senior author of the present publication has observed black goats with brown points, and Spanish and Angora crosses with beautiful light fleeces colored light reddish-brown, mulberry or pale blue. Color in goat hair is highly inheritable and some Texas breeders have produced flocks of uniform colors.

There has been some crossing of Spanish goats with various breeds of milk goats, but most ranchers believe that crossing with high milk-producing strains leads to udder troubles in range goats. Crosses of Spanish goats with Angora tend to reduce body scale.

Weight

Range nannies can weigh up to 100 pounds, although most weigh less (down to 80) and a few weigh more. Breeding males can weigh as much as 200 pounds, especially if old and possessing some dairy-goat blood. Commonly, mature Spanish billies weigh from 150 to 175 pounds. Spanish goats are rarely fed to reach maximum weights.

Estrus, and breeding schedules

A few Spanish nannies may breed at almost any season of the year, and in autumn some will breed even when lactating (Groff, 1973). One billy is adequate for 25 to 30 nannies but the small-flock owner should never breed to only one buck because of possible sterility. Gestation ranges from 147 to 152 days. To flush the nannies, they should be fed $^1/_4$ to $^1/_3$ pound of grain or range cubes daily, or moved to a fresh pasture about 2 weeks before breeding (Groff, 1973). Some ranchers leave billies with the nannies the year around, but Groff says that under this system doe kids may be bred before reaching adequate size.

For once-per-year kidding, Spanish does should be bred during August to October when most of them are in heat (Shelton, 1975). Where nannies are to be kidded on an open range having hard winters, it may be advisable to breed them later to avoid kid losses from exposure. In some areas, does can come into heat in any month except March and April, the only months in which researchers have found no goats in estrus.

Shelton (1977) says that Spanish goats will not produce two kid crops a year on a regular basis—three kid crops in 2 years is a realistic average, although some nannies do kid every 6 months.

A desirable twice-per-year breeding schedule might be to put billies in with nannies during May and June to kid in October and November; then again in November and December to kid in April and May. Replacement kids should ideally be from mothers kidding every 6 months; this applies to billies also.

Kidding

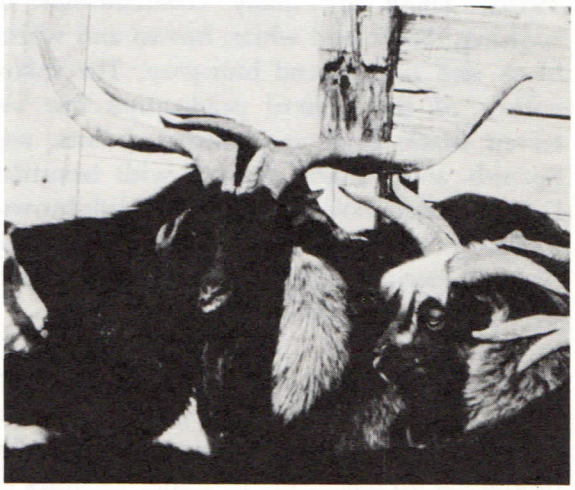
Groff (1973) says that no special attention is given to Spanish does at kidding—he claims that the best policy is to stay out of the pastures as much as possible during that time, but does recommend using pastures in which grazing has been deferred to produce more feed or pastures having small grain (which is excellent feed for milk production).

Breeders of Spanish goats in California may wish to consider one of the kidding methods recommended for Angora goats. Because of our higher rainfall and colder winter climate the breeder may wish to give his animals closer care and more careful management at that time.

Breed improvement

For a good within-the-flock selective breeding program, Groff recommends mating the best does to the best bucks, the second best does to the second best bucks, the poorest does to the poorest bucks. However, with many bucks to choose from, the so-called poorest bucks would be merely the third best among the top 10 percent, which by most standards would be very respectable animals.

In selecting nanny replacements for the flock, a maximum percentage of bucks and does should be chosen from mothers kidding twice per year, kidding early, and—where possible—noted for producing twins. This is because the number of kids produced per nanny is the single most important contributor to profit. From the kids produced by such mothers, choose those of large size, heavy bone and muscular build, and preferably those that have horns. (Horns in range animals are a deterrent to predation; big, well-shaped horns also add greatly to trophy appearance and there also may be an alternative market for sale of such animals to commercial or private hunting clubs.) Brown (1975), using his own selection system for over 7 years, has noted considerable improvement in his flocks. For example, some of his nanny kids reached sexual maturity at 4 or 5 months. In his program the billies are left in the flock year round; in 5 years the average kid crop for his Spanish goats was 140 percent and 60 percent for his Angoras. Most of the nannies kidded from December through March, though a few kidded at all times of the year.



Most mature Spanish billies show attractive trophy-type heads. Note horns on the billy in the center as well as the cape-like cover of lighter hair over his shoulders.

Kensing (1975) reported that average kid crop in Spanish goats is probably on the order of 150 percent in Texas, compared to a long-term 40 percent average in Angora goats.

Supplemental feeding

In addition to advising flushing of nannies prior to their breeding period, Groff (1973) recommends feeding each nanny $^1/_4$ to $^1/_2$ pound of cottonseed cake or $^1/_3$ to $^3/_4$ pound of yellow corn daily through winter or prolonged dry periods if quantity and quality of range feed are not adequate. Supplementary feeding also makes the animals easier to handle and usually will result in higher kid crops. Supplementary feeding is highly advisable for most range nannies prior to kidding—if nannies are thin, start feeding up to 6 weeks earlier; if nannies are in good shape but range feed is short, supplement 3 weeks prior to the start of kidding.

Groff says that self-feeding with salt as an inhibitor may be used as a supplement in large rough or brushy pastures even though goats do not eat salt-grain mixtures very readily. The salt proportion should be low (try 20 percent) and feeders should be located near water. Water intake can be critical if salt consumption is high.

Groff notes that in Texas a popular supplement mixture is 3 parts ground milo, 1 part cottonseed meal, and 1 part salt. California recommendations for salt-mix feeding are for 80 percent cottonseed meal and 20 percent salt in late summer and fall when ranges are short of protein. After green grass appears, but where it is short and high in water, the animals are usually low in energy, so a supplement of 80 percent ground barley and 20 percent salt should be fed. California goat ranchers commonly prefer to hand-feed supplements in order to keep flocks under closer observation and for ease of penning at night.

Weaning

Kids may be weaned at 4 to 5 months of age and will weigh 50 pounds live-weight or less. At that age and weight, buck kids are not usually castrated. Groff recommends that doe kids kept for replacements should be weaned in drylot and taught to eat supplemental feed, as it may be difficult to teach range-raised goats to eat supplements. This also tends to gentle the goats. Doe kids can be returned to the breeding flock at about 1 year of age and of desirable size (at least 70 pounds). Shelton (1975) has found that well-grown-out Spanish doe kids will breed at 6 to 7 months, although some will breed sooner. Breeding too young tends to stunt growth of young does.

Spanish and Angora and Spanish-and-Angora-cross goats travelling while grazing over a fuel-break study area in San Diego County. These goats typically graze over each portion of their feeding area twice daily.

Spanish and Angora and Spanish-and-Angora-cross goats feed closely in a preferred grazing area. The cleared area has been heavily grazed, while the brush stand is being gradually entered as the edge is opened up by grazing.

Spanish vs. Angora goats for brush control

Taylor (1975) compared Spanish and Angora goats at two levels of grazing intensities on two pastures at the Experiment Station in Sonora, Texas. One pasture had been heavily and continuously grazed by cattle, sheep and goats. The second pasture had not been grazed by livestock for approximately 29 years. The study was conducted on animals with fistulas in their esophagi equipped with tubes to divert forage eaten into a collecting bag at the will of the investigator.

In the heavily-grazed pasture, Spanish goats consumed significantly less grass and more browse than did Angoras, and their diet contained higher percentages of forbs and more digestible organic matter. This indicates that Spanish goats are more efficient grazers under poor range conditions than are Angoras.

In the other pasture, Spanish goats also consumed less grass and more browse than did Angoras, but the difference was not significant. However, the Angoras consumed significantly more forbs (22.6 percent of their diet) than did the Spanish (13.9 percent). Digestible organic matter was higher for the Angora diet, but this can be explained by their higher percentage of highly digestible forbs.

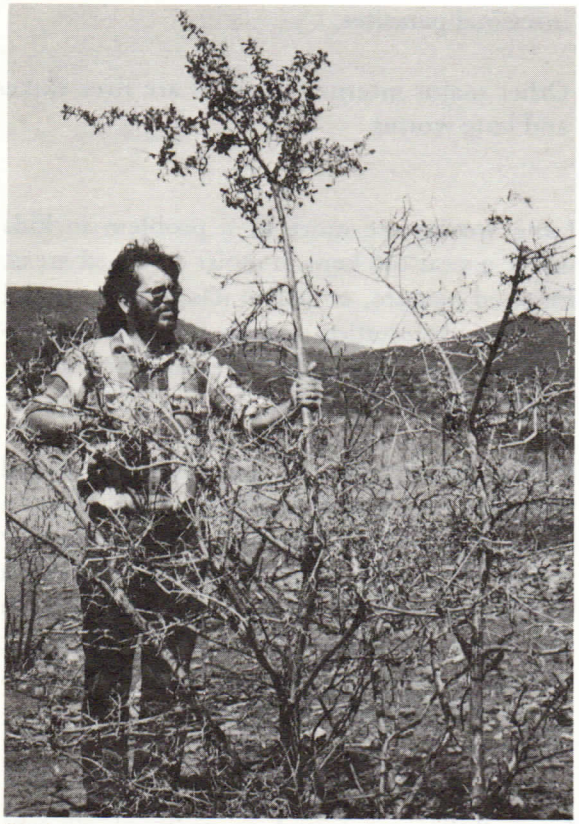
In the heavily-grazed pasture, brush was 78.5 percent of the Spanish goats' diet and grass was 19.4 percent; brush was 56.5 percent of the Angora's diet and grass 42.7 percent. In the ungrazed pastures, Spanish goats ate 61.9 percent brush, 23.8 percent grass and 13.9 percent forbs, while Angoras ate 48.4 percent browse, 29 percent grass and 22.6 percent forbs.

The study, which will cover a 5-year period, indicates that Spanish goats are more effective than Angoras for controlling brush, particularly under poor range conditions.

It is generally conceded that Spanish goats are more pugnacious and a bit more resistant to predation than are Angoras, although neither breed can withstand predation to any considerable degree. Spanish goats tend to be larger and taller than Angoras, and are believed to leave a higher "browse line"—up to 7 feet high—thus opening up the brush stand to a greater degree (Merrill and Taylor, 1976). They do not require shearing, and are seldom given extra care at kidding so that they are being naturally selected to take care of their young on the range without help from man.

The Spanish goat is rarely supplemented to any considerable degree, and in many parts of Texas subsists entirely off the land. This does

not mean, however, that they would not benefit from more attention and some supplementary feeding (with a resulting increase in production).



Spanish goats are reputed to browse up to 7 feet high. The man in this photo is 6 feet tall. Note the browse line on the scrub oak above him.

Which type of goat for California brushlands?

To the California producer who wishes to harvest brush, either for livestock feed on a sustained-yield basis or to reduce its growth, the question is: "Which is the best goat to stock, the Angora or the Spanish?"

The answer at this time appears to be that a properly-managed Angora flock will produce more income and do at least almost as complete a job of brush reduction as will the Spanish goat. However, if you plan to give a flock only rudimentary care, especially under harsh and dry conditions, the Spanish goat should be your choice. In either case—and especially if you are a beginner—start out with stockers and do not try to run breeding flocks until you gain more experience.

Parasites of Goats

External parasites

Goats commonly are hosts to lice, mites, ticks, and may also get nose warbles or bots. They also are subject to damage by blow flies and biting flies such as mosquitoes and gnats.

Goats grazing in brushland may suffer severe infestations of lice. Lice populations always tend to build up during colder months, but smaller populations of lice can be found on young kids as summer begins. Infestation can be severe enough to produce anemia and weakness. Young goats seem to be particularly susceptible to sucking and biting lice.

Biting and sucking lice cause acute irritation, promote rubbing and damage to the fleece, and cause severe weight loss in the flock in heavy infestations. Dipping or complete spraying of animals within 2 weeks after shearing will provide most effective parasite control. Goats are extremely susceptible to chilling, so do not dip or spray them during cold weather.

Treat the flock again 2 weeks later to destroy hatching lice not killed by the first treatment. Because infestation tends to persist, most producers plan to treat twice after each shearing. Recommendations on effective drugs are available from your Farm Advisor.

Internal parasites

Internal parasites of sheep and goats are of the same type and therefore can be shared or passed between them. Goats appear to be more susceptible to internal parasites than sheep are, so one must always look for damage done by these parasites during periods of stress or poor nutrition.

Stomach and intestinal parasites are basically of three types: coccidia, tapeworms, and roundworms.

Coccidia are microscopic parasites which can cause mucoid-to-bloody-tinged diarrhea. They are particularly harmful to younger kids and are readily transmitted in contaminated soil, feed, and water in small confined areas. They are less of a problem under open range conditions.

Goats seem particularly susceptible to outbreaks of coccidiosis; even older animals, weakened by other diseases such as Johne's disease, lice or malnutrition, may suffer from concurrent attacks of coccidiosis.

Tapeworms (*Monezia*) may commonly appear in the droppings of young goats, but they cause very little harm to the animal and therefore are not economically important.

Roundworms which live in the fourth stomach (abomasum), small bowel, cecum, and large bowel are of several genera and species (*Haemonchus, Trichostrongylus, Ostertagia, Cooperia,* etc.).

All roundworms are spread from water and feed contaminated by the feces of carrier animals, and all goats harbor some of these parasites. At certain times of the year (e.g., late spring and fall) large numbers of infective larvae may be present in pastures. Kids of 3 months or older, and mature animals under the stress of kidding, nursing of kids, or a state of poor nutrition, most commonly develop signs of roundworm parasitism.

Signs of roundworm parasitism generally include some degree of diarrhea, weight loss, lack of appetite, weakness and stiffness. The parasitism may accompany other diseases such as pneumonia, enterotoxemia, bluetongue, soremouth and polyarthritis, thus making diagnosis difficult.

Animals with heavy *Haemonchus* infection generally have swelling under the jaw (bottle jaw), paleness of eyes and oral membranes, stools that are normal or dark and diarrheic. *Haemonchus* consume large quantities of blood from the stomach and intestines, and thus produce signs of anemia, which are not usually common with other stomach and intestinal parasites.

Other major internal parasites are liver flukes and lung worms.

Lung worms are more of a problem in kids under a year old kept in moist confined areas, irrigated pasture, or native pastures of coastal counties. Infestation occurs from larval contamination of feed and water exposed to the feces of carrier animals.

Signs are those of pneumonia: labored breathing, nasal-oral discharge, fever, depression, and loss of appetite. Death generally results from a secondary bacterial pneumonia which follows lung worm migration through the lungs. Therefore, in selecting drugs for treatment of lung worm pneumonia one must treat both parasites and bacteria.

Liver flukes are found in goats of all ages which have been exposed to wet meadows, irrigated pastures, or streams and ditches, in which live the intermediate host snails which carry the flukes. Dry brushland areas are generally free of liver flukes. Liver flukes are seldom numerous enough to cause death directly in goats, but the *Clostridium* organisms which accompany and are excited by liver-fluke invasion may cause death in the form of Redwater or Black's disease.

Adult goats and other animals tend to remain healthy despite carrying numbers of internal parasites. Resistance to most of these parasites increases in varying degrees as the goat matures. This means that animals 3 to 12 months old are generally the most susceptible to the parasites discussed. Older animals, though more resistant, do tend to succumb during periods of stress or starvation.

With help from a veterinarian, goat owners can determine the various types of internal parasites most likely to cause signs of illness in a given group of goats. Such methods as fecal analysis, autopsy, or internal examination of slaughtered animals are used.

A routine worming or parasite-treatment program should be followed. Preventive worming programs are always more rewarding than are treatments given after animals become severely ill.

Many new worming compounds are now or will soon be on the market. Most of these tend to be broad spectrum in nature, killing several species of parasites. Also available are new parasiticides that will affect some stages of all the parasites listed above. Because drugs and recommendations for their use vary, it is best to consult a veterinarian and also to follow label instructions for purpose and dosage. Alternate use of different parasiticides in a multiple-worming preventive program is usually recommended in order to reduce parasite resistance to a single drug.

Common Diseases

Damage and infection of mammary glands

A normal udder is necessary to raise healthy kids, particularly twins or triplets. Large dairy-type udders are not good in heavy brush because tearing and injury to the udder can occur. Internal infection (mastitis) is generally caused by staphylococci, and less frequently by streptococci or other organisms. A complete cure through treatment seldom occurs, and generally the udder dries up or produces less milk because of the chronic infection. Elimination of known mastitic does, or their isolation from the rest of the herd during kidding or nursing seasons, will help prevent the spread of the major mastitis bacteria.

Diseases common to young kids

Of the diseases caused by spore-forming organisms, tetanus and enterotoxemia are most common in younger kids. These organisms are always present to some extent where goats are grown.

Tetanus. The causative organisms gain entrance to wounds where they multiply and produce toxin that causes death. Stricken animals develop tetanic convulsions and nearly all die in a few days. The navel cord, and debudding of horns, castration, and puncture wounds all form potential growth areas for tetanus. Vaccination with tetanus toxoid or use of antitoxins, along with wound disinfection and cleanliness, help prevent this disease.

Treatment. Use of antibiotics and tetanus antitoxin along with cleansing of the local wound, if done early, may effect a cure in a few cases.

Enterotoxemia is caused by growth of the organism *Clostridium perfringens* in the small intestine of young goats. This growth is related to feed changes, and acute death results from the toxin produced by the organism. Sudden unexplained deaths of apparently healthy animals could be caused by enterotoxemia—an autopsy by a veterinarian may confirm the diagnosis. Toxoids, antitoxins, or oral antibiotics may be used to prevent this disease. Once the disease occurs in a herd, a rigid vaccination program for nursing kids or pregnant does (to protect the very young through colostral milk) should be maintained.

Soremouth (contagious ecthyma) is a virus disease that infects the eyes and mouth of susceptible animals and can occasionally be found on the teats of lactating does. It causes painful sores and scabs which can result in malnutrition. Soremouth frequently occurs in "goats feeding on brush" and all animals present in the herd should be vaccinated initially at the first sign of the disease. Thereafter young kids and replacement goats should be vaccinated yearly.

Paratuberculosis (Johne's disease, Wasting disease). This is a chronic bacterial infection spread from contamination of feed and watering areas by the feces of infected animals. Signs which usually do not appear until animals are at least 2 years old, begin with severe diarrhea and weight loss, generally initiated by the stress of kidding. Although infected animals improve when given excellent nutrition and their lactation terminated, this is an incurable chronic disease of a wasting nature and infected animals should be culled. (Johne's disease is frequently confused with internal parasitism or acute dietary upsets, so diagnosis should be confirmed by a veterinary laboratory.)

Infectious scours. This condition in young kids or newborn kids is generally associated with crowding, poor sanitation, and chilling and is generally caused by bacteria. Adequate colostral milk, clean surroundings, and judicious use of antibiotics are all basic to controlling this disease.

Pneumonia. Pneumonia epidemics in young kids as evidenced by rapid breathing, fevers, nasal discharge, and depression, are generally precipitated by crowding, poorly ventilated buildings, severe weather changes (hot or cold), and truck or train shipment. Viruses, bacteria, and mycoplasma organisms may all be present in the outbreak. Treatment consists of isolating sick animals, use of antibiotics and sulfas, and supportive treatment with fluids. In some cases, premedicating animals prior to the predisposing stress may prevent spread of this disease complex. Seek professional help.

White muscle disease is the result of a selenium deficiency and is frequently encountered in goats in our western states. Goats appear to be more susceptible to this mineral deficiency than are other animals. Sudden deaths, muscular paralysis, and weakness at birth are included in signs associated with white muscle disease. Injectable products containing selenium and vitamin E are available to prevent the condition, although affected goats do not always respond as well as do calves and lambs when injected. Feed additives of selenium are available for swine and poultry, but are not now available for other animals.

Foot rot caused by a specific bacterium is spread by contamination of yards and pens from the infected feet of carrier animals. It is most common under wet soil conditions, in irrigated pastures, and in crowded pen areas; in open brushland very little spread occurs. The causal organism survives in soil for at least 2 weeks. Trimming all feet, followed by foot baths in copper sulfate or formalin, is still the treatment of choice. During the trimming, all affected hoof tissue should be removed. Infected animals should be segregated from normal animals. Treatment and trimming of infected animals should be repeated, depending on severity. Animals having severely infected or malformed feet should be culled.

Boils caused by *Corynebacterium ovis* are of great concern to most goat owners, and probably no other bacterial disease is as persistent or results in as great an economic loss in affected goat herds. Localized abcesses should be opened with a knife or scalpel, the pus drained, and the inside area treated with tincture of iodine. Systemic antibiotics and sulfas may help in preventing spread of this disease internally.

Flies can spread these bacteria. In brushland there tends to be less animal-to-animal spread, although the increased incidence of lacerations from brush allows entrance of the organisms.

If a few animals are infected, it is best to cull them so that they do not act as carriers. No single preventive method is successful in stopping spread, but culling, segregation, treatment, sanitation and sometimes vaccination are helpful.

Joint conditions. Swelling of the knee (carpal) joint in goats is common because of the frequent irritation to which the joint is subject. This may result in non-painful swellings involving the bursas or joint capsules themselves. However, acute pain or lameness associated with joint swellings generally indicates an infection of some sort. Joint infection in younger kids may be due to navel infections resulting from birth in unclean surroundings.

Joint infections in yearlings or mature goats may be an extension of infection from elsewhere in the body. Mycoplasma arthritis may occur spontaneously or be a sequel to pneumonia or mycoplasma mastitis infection.

Acute joint conditions require use of antibiotics. The nature and extent of treatment will depend on the type of infection.

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REAR COVER PHOTO

An excellent flock of purebred Angora goats showing the dense long staple fleeces characteristic of a select flock. Humboldt County, California.