



Small Ruminant Production 101

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Adapted from slides provided by Dr. Dahlia O'Brien, Virginia State University, Small Ruminant Specialist, Virginia Cooperative extension

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Today's Topics

- Introduction to small ruminants
- Breeds
- Reproduction
- Pastures and feeding
- Herd health
- Facilities – housing and supplies
- Predators
- Marketing
- Budgets



Introduction – Sheep vs. Goats

➤ Sheep

- Grazer – close to the ground
- Grow faster
- Strong flocking instinct
- Established enterprise
- More #s and diversity

➤ Goats

- Browser
- Grow slow
- Curious and independent
- New industry
- Less #s and diversity

Similar management practices, diseases, ethnic demand and constraints to production

US Goat and Sheep Production

- Meat (most popular; \approx 80%)
- Income derived from the sale of live animals for meat/sale of meat
- Milk
- Income derived from the sale of milk, cheese and/or other dairy products
- Fiber
- Wool, mohair, cashmere
- Brush control

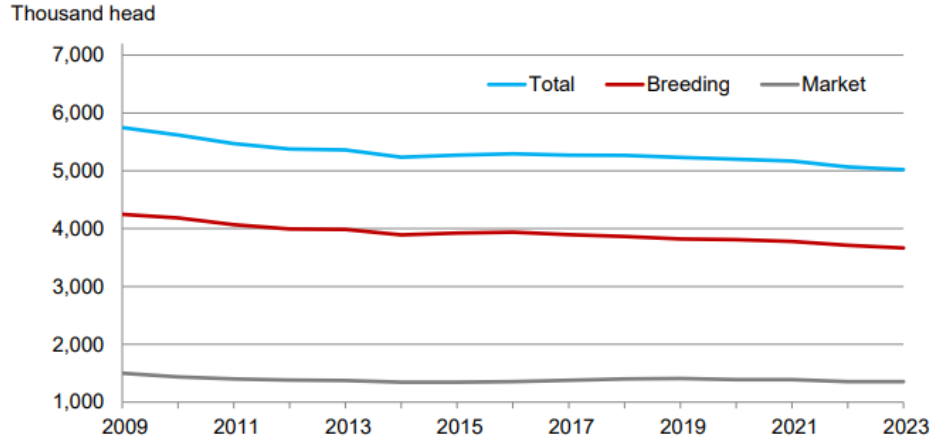


5.02 million head

Top states

1. Texas (700,000)
2. California (575,000)
3. Colorado (430,000)
4. Wyoming (330,000)
5. Utah (270,000)

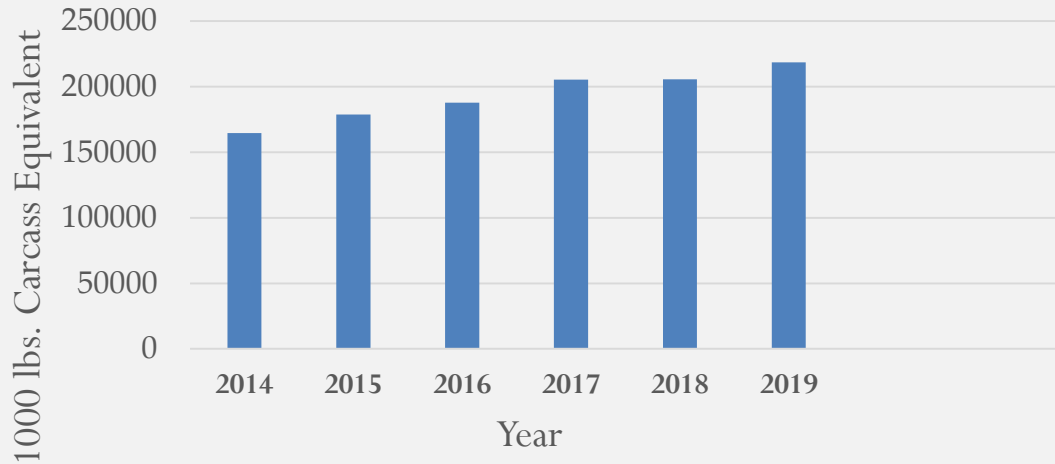
All Sheep and Lambs Inventory – United States: January 1



In Virginia, sheep #s were 73,000 head in January 2022

National Agricultural Statistics Services; <https://downloads.usda.library.cornell.edu/usda-esmis/files/000000018/pv63h240d/9880wt403/shep0122.pdf>

Lamb imports



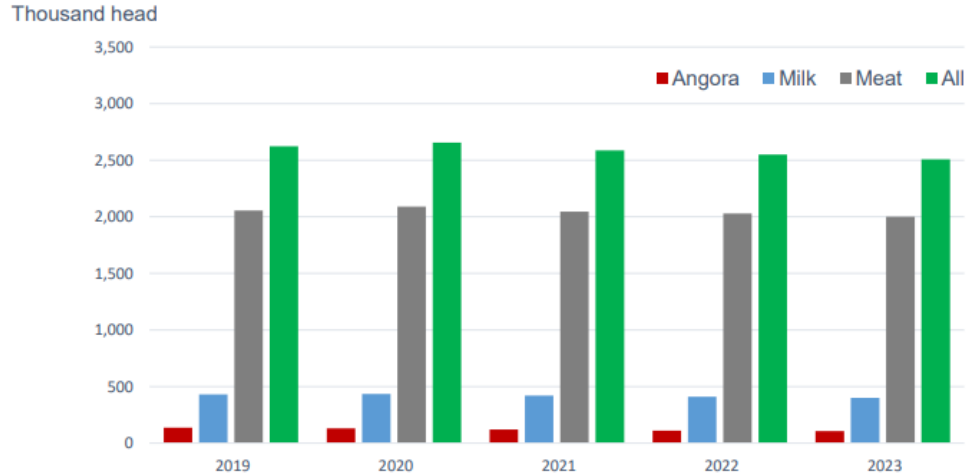
75% coming from Australia

2.51 million head

Top states

1. Texas (725,000)
2. Tennessee (85,000)
3. California (80,000)
4. Oklahoma (78,000)
5. Missouri (76,000)

All Goats and Kids Inventory by Class – United States: January 1

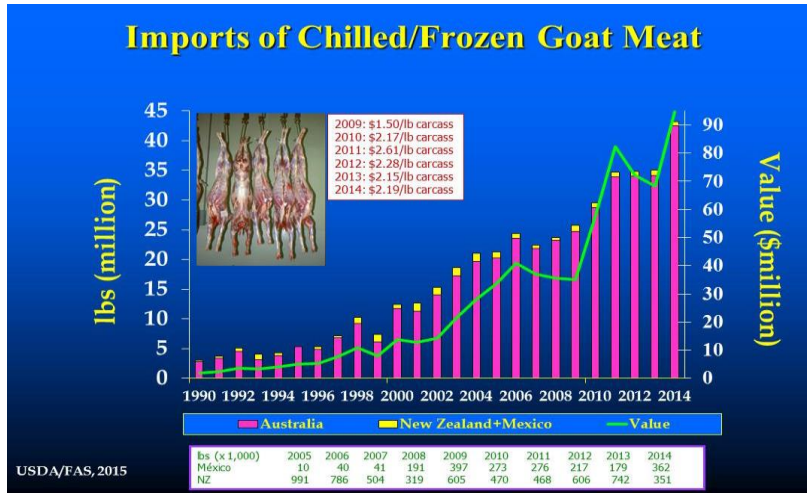


In Virginia, goat #s were 39,000 in January 2022

National Agricultural Statistics Services; <https://downloads.usda.library.cornell.edu/usda-esmis/files/000000018/pv63h240d/9880wt403/shep0122.pdf>

Goat imports

Ethnic groups have a preference for goat meat, milk and cheese products



USDA/FAS, 2015

Goat and Sheep Terminology

| | Intact males | Castrated (neutered male) | Adult female | Offspring up to a year |
|-------|--------------|---------------------------|--------------|---------------------------|
| Sheep | Ram | Wether | Ewe | Lamb (ewe lamb, ram lamb) |
| Goat | Buck | Wether | Doe | Kid (doe kid, buck kid) |

Terminology

- Doeling or buckling = young goat offspring
- For both species, if they are around a year old, we use the term yearling (i.e. a yearling doe)
- A mother is called the dam
- The father is called the sire
- The process of giving birth is lambing or kidding.
- **WARNING** – intact males can be dangerous!

Pros of raising sheep and goats

- Can effectively utilize low quality roughage
- Brush Management
- Less acreage and investment
- Small, easy to handle with nice disposition
- Reproductive efficiency (gestation length of 5 months)
- Strong niche demand for products
- Suitable for home slaughter



Cons of raising sheep and goats

- No mainstream demand for products
- Requires labor (especially goats)
- Challenges
 - Lack of knowledge
 - Fencing
 - Predators
 - Parasites



Meat nutrition comparative table based on 3 oz serving

Table 1. Meat Nutrition Comparative Chart

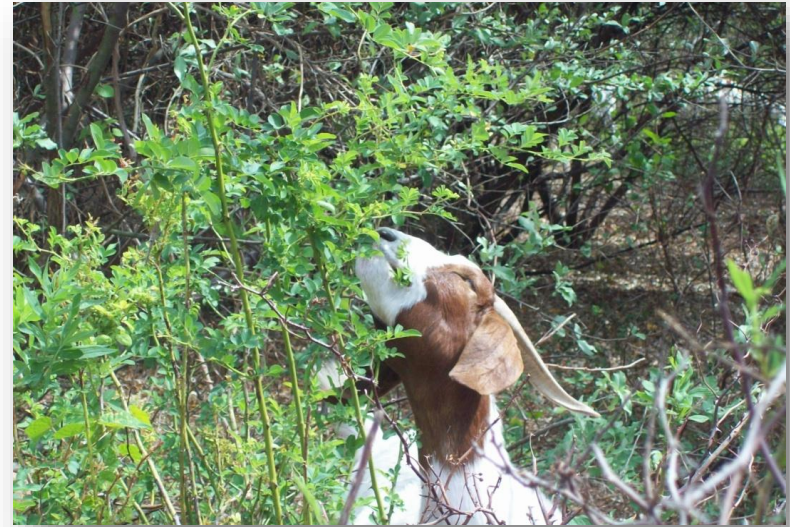
| Nutrient | Goat | Rabbit | Chicken | Beef | Pork | Lamb |
|-------------------|------|--------|---------|------|------|------|
| Calories | 122 | 167 | 162 | 179 | 180 | 175 |
| Fat (g) | 2.6 | 6.8 | 6.3 | 7.9 | 8.2 | 8.1 |
| Saturated Fat (g) | 0.8 | 2.0 | 1.7 | 3 | 2.9 | 2.9 |
| Protein (g) | 23 | 25 | 25 | 25 | 25 | 24 |
| Cholesterol (mg) | 64 | 70 | 76 | 73 | 73 | 78 |

USDA Nutrient Database for Standard Reference Release, 2001

Why do you want to raise sheep and/or goats?

- Additional income
- Weed/brush control
- Want to produce meat, milk or fiber for self/family
- 4H projects
- Agri-tourism
- Fun

Reason why will then determine what breed to start out with



Sheep breeds

- American Sheep Industry Association web site:
<http://www.sheepusa.org/>
 and
<http://www.sheepandgoat.com/breeds.html>

| Fine | Medium (meat) | Long | Minor* |
|--|---|---|---|
| American Cormo Booroola Merino Debouillet Delaine-Merino Rambouillet | Border Cheviot Dorset (Polled or Horn) Hampshire Montadale | Border Leicester Coopworth Cotswold Lincoln Perendale Romney Wensleydale | Black Welsh Mountain Bluefaced Leicester California Variegated Mutant Clun Forest Gulf Coast Native Icelandic |
| Medium (dual purpose) | North Country Cheviot Oxford Shropshire Southdown Suffolk Texel Tunis | Hair | Jacob Karakul Navajo-Churro Scottish Blackface Shetland Wiltshire Horn |
| Columbia Corriedale East Friesian Finnsheep Panama Polypay Targhee | | American Blackbelly Barbados Blackbelly California Red Dorper Katahdin Romanov Royal White St. Croix | |

Source: Directory of Breeds, American Sheep Industry Association

Adapted from Susan Schoenian, www.sheepandgoat.com

www.agriculture.vsu.edu

Hair Sheep Breeds

- Shed coat seasonally
- No shearing required
- Parasite resistance
- Heat tolerance
- Low maintenance
- Easy care
- Leaner, milder meat
- Good mothering ability



Goat Breeds

- Meat
 - Boer, Spanish/scrub, Kiko, Savannah
- Dairy
 - Nubian, Alpine, Saanen etc.
- Fiber
 - Angora, cashmere

Dairy goat breeds - <https://americangoatfederation.org/breeds-of-goats-2/dairy-goats/>
Meat goat breeds - <https://americangoatfederation.org/breeds-of-goats-2/meat-goats-2/>
Breeds of sheep - <https://www.sheep101.info/sheepbreedsa-z.html>



Fencing and Facilities

- Fencing is required on sheep and goat farms
- Perimeter/boundary (example, high tensile electric, woven wire, mesh wire)
- Woven wire fencing - goat's horns may become entangled
- A five- or six-strand high-tensile fence with electrified first, third, and top wires is effective



Fencing and Facilities

- Watering systems
- Clean, fresh water should be provided at all times
- Shelter to protect from harsh weather conditions




Space requirements

| | Open shed (sq. ft.) | Confinement dirt floor | Dirt lot | Confinement slatted floors |
|---------------------|------------------------|---------------------------|----------|-------------------------------|
| Bred females | 8 | 12-16 | 20 | 8-10 |
| Female and young | 12 | 16-20 | 25 | 10-12 |
| Male | 8 | 20-30 | 20 | 14-20 |
| Feeder lamb/kid | 6 | 8-10 | 15-20 | 4-6 |

Fencing and Facilities

- Grain
 - Hand feeding
 - Self feeding
- Hay
 - Square bales or loose hay
 - Large round bales
- Combination hay/grain
- Mineral
 - Loose
 - Block
- Build your own feeders
 - <https://www.premier1supplies.com/c/equipment/build-your-own-feeders-double-or-single-sided>







Keep animals out of feed
and don't feed on ground



Feeders

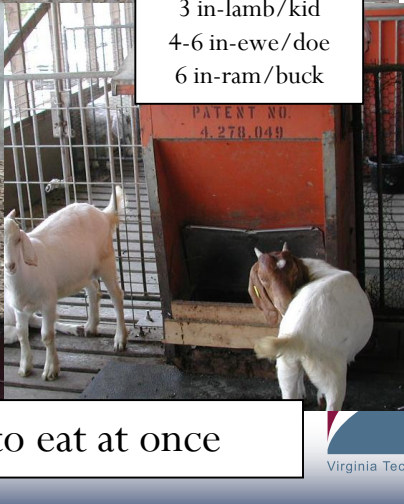




16-20 in-ewe /doe
12 in-rams/buck
8-12 in-lamb/kid



Self feeders

3 in-lamb/kid
4-6 in-ewe/doe
6 in-ram/buck



Provide enough feeder space for all animals to eat at once

Fencing and Facilities

- For sorting, treating, vaccinating, deworming, hoof trimming, etc.
- Transportation to market (truck rack)
- Livestock scale



Fencing and Facilities

- Milking stand: \$150 - \$360
- Useful for milking and trimming by yourself
 - Trained to it easily
- Udderly EZ goat milker (\$191)
- Milkers (4 goats at a time (\$1,899))

<https://www.vdacs.virginia.gov/pdf/dairyguide.pdf>

Illegal to buy and sell raw milk in VA



www.mittysupply.com



www.valleyvet.com

Reproduction

- **Pure-breeding**

- Showing or selling breeding stock
- Preserve a rare or heritage breed



- **Crossbreeding**

- Hybrid vigor – crossbred offspring are superior to their purebred parents
- Use complementary breeds – all breeds have specific strengths and weaknesses



Reproduction

- Important considerations in a breeding program:
 - Planned breeding programs
 - Do not run buck with does all year
 - Castrate all ram lambs and buck kids unless kept separate
 - Focus breeding to take advantage of markets

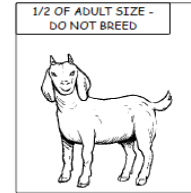
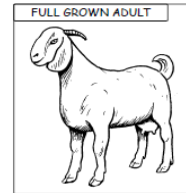


Reproduction

| | |
|----------------------|----------------------------------|
| Age at puberty | 5 – 8 months |
| Age at breeding | 8 – 12 months |
| Estrous cycle length | 21 days (18-22); 17 days (sheep) |
| Duration of estrus | 12 – 36 hrs. |
| Ovulation | 12 – 36 hrs. after estrus onset |
| Length of pregnancy | 5 months (146 – 155 days) |
| Breeding season | August - February |
| Anestrous period | March - July |

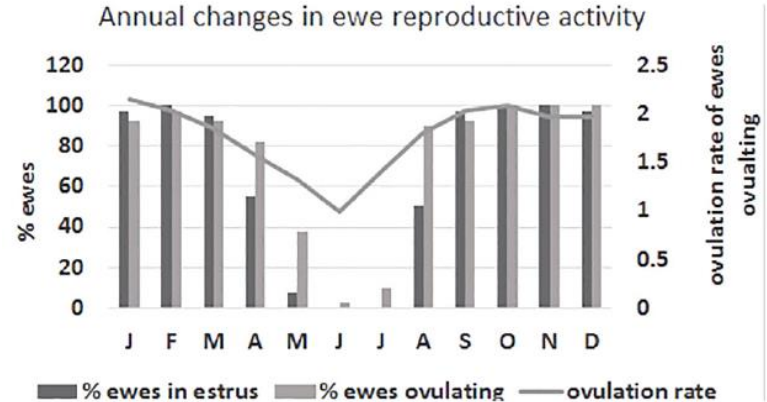
1 buck/ram can handle 30 females during breeding season

- Turn buck in with females five months before you want kids/lambs
- Usual breeding season is August - January
- Select replacement doe kids from top performing does
- Breed replacement does at 3/4 mature weight or as yearlings



Reproduction

- Estrous cycle is affected by the changing length of daylight
- Sheep and some species of goats are considered short day breeders (late summer and fall months)
- Pineal gland secretes melatonin (produced in the dark)
- Increased levels of melatonin (resulting from longer nights in the fall) stimulates the doe's reproductive cycle



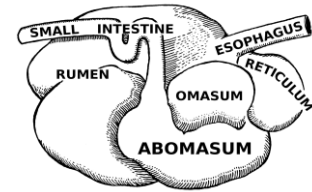
Nutrition

- All animals require six nutrient types: water, proteins, fats, carbohydrates, vitamins, and minerals
- Protein requirements increase during times of growth, pregnancy, or lactation (milk production)
- Protein needs are lowest for adults at maintenance



Nutrition

- Ruminants – 4 compartment digestive system
- The largest cost associated with small ruminant production is feed (60 - 70%)
- Goats prefer to browse (brush, leaves, small trees)
- Sheep prefer to eat broadleaf plants (forbs) and grasses
- Diverse forages allows sheep and goats to choose a diet that meets nutritional needs
- Whenever animals don't meet nutritional needs on pasture they should be supplemented
 - Hay, Grain, Feedstuff



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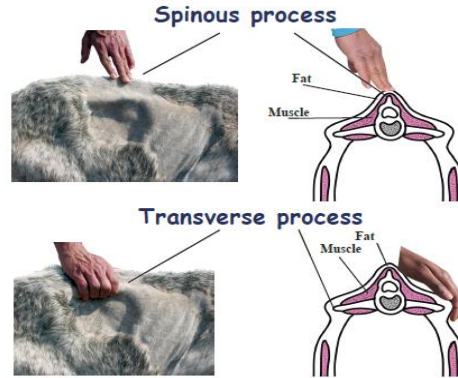
Nutrition

- Nutrient requirements will differ for herd maintenance, breeding, pregnancy, lactation and for growing lambs and kids
 - Follow the National Research Council's nutrient requirement and feed composition tables to balance rations for sheep and goats
 - Langston University Ration Balancer and Nutrient Requirement calculator
 - <http://www.luresext.edu/?q=content/nutrient-requirement-calculator-and-ration-balancer>

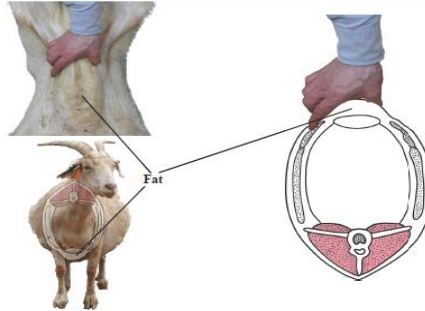


Nutrition

Lumbar region



Sternum



Fold on dotted line to make front/back BCS scorecard.



Body Condition Scoring of Goats

Body condition scoring (BCS) is a quick, easy method of describing how thin or fat goats are, using a numerical score from 1 to 5. A goat may be given a half score, such as 2.5, if it is between BCS 2 and BCS 3. Assigning a BCS cannot be done by looking at the goat, one must feel for muscle and fat cover. An appropriate BCS range for goats is from BCS 2 to BCS 4, as seen on the reverse side. Goats that are too thin (BCS 1) may have nutritional or health problems reducing productivity. Overly fat goats (BCS 5) have reduced fertility, increased birthing problems, and health problems.

BCS is commonly assessed in the loin area. Feel the amount of tissue covering the ends of the spinous and transverse processes of the vertebrae. Feel any loin muscle and fat filling the space between the backbone and horizontal bones. In very thin goats the bones can feel "sharp." As the animal gains condition, the thicker tissue covering makes the bone ends feel more rounded and smooth.

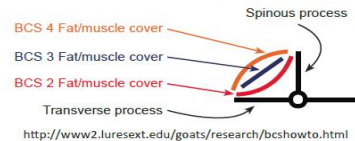
Recommendations

Does


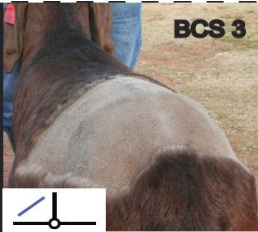




- BCS between 2.5 to 3.5 at breeding
- BCS of 3 to 3.5 prior to wintering and prior to kidding (Does may drop 0.5 or more in BCS during lactation, regaining condition after weaning with sufficient nutrition.)

Bucks

- BCS 3 to 3.5 prior to the breeding season



The Cooperative Extension Program at Langston University provides educational programs to individuals regardless of race, color, national origin, religion, sex, age disability or status as a veteran. Issued in furtherance of Agricultural Extension Work Act of September 29, 1977, in cooperation with the U.S. Department of Agriculture.

|  <p>BCS 2</p> |  <p>BCS 3</p> |  <p>BCS 4</p> |
|--|--|---|
|  <p>BCS 2 - Spinous process is felt as a ridge. A depression is felt between the spinous and transverse processes. Little muscle and fat can be felt. If bone ends are sharp and individual vertebrae felt, the BCS is 1.</p> |  <p>BCS 3 - Spinous process does not feel like a ridge, but smooth with small ripples indicating the bones. Area between spinous and transverse processes is filled with muscle and fat cover and felt as a straight or slightly bowed out slope.</p> |  <p>BCS 4 - Spinous process feels smooth but not buried in tissue. Individual bones are difficult to feel. Area between the spinous and transverse processes feels full and rounded. If bones are buried in tissue and not felt, the BCS is 5.</p> |

<http://www.langston.edu/body-condition-scoring-goats-0>

Health

- Important to have a working relationship with a veterinarian
- Keep good records of treatments and withdrawal periods



| | Sheep | Goats |
|--------------------|-------------------|-------------------|
| Rectal Temperature | 101.5° - 104°F | 102° to 104° |
| Respiration | 12-20 breaths/min | 15-30 breaths/min |
| Heart Rate | 70 – 80 beats/min | 70-90 beats/min |
| Rumination | 2/min | 1-2/min |
| FAMACHA© scores | ≥3 | ≥3 |

Health

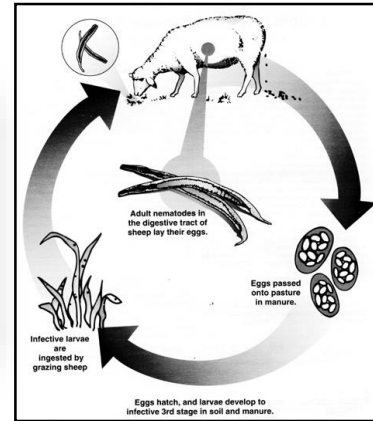
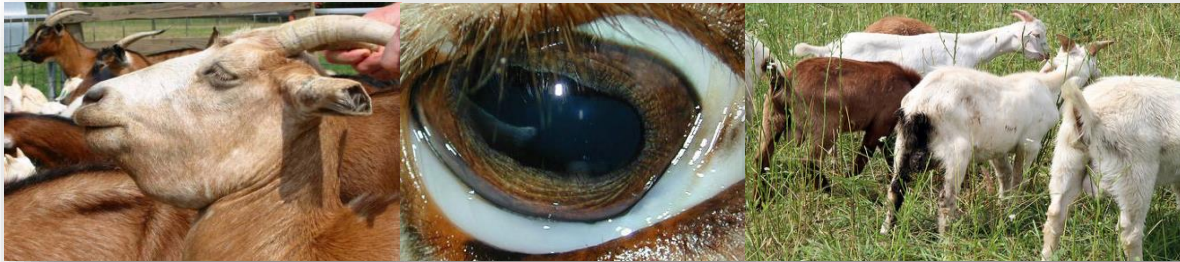
- Many vaccinations
- Most recommended is CD-T
 - Clostridium/over-eating disease
 - Tetanus



<http://www.sheep101.info/201/diseasesa-z.html>

Health

- Sheep and goats are the most susceptible livestock to internal parasites
- Signs include rough hair coat, thin/unthrifty, bottle jaw, anemia, diarrhea



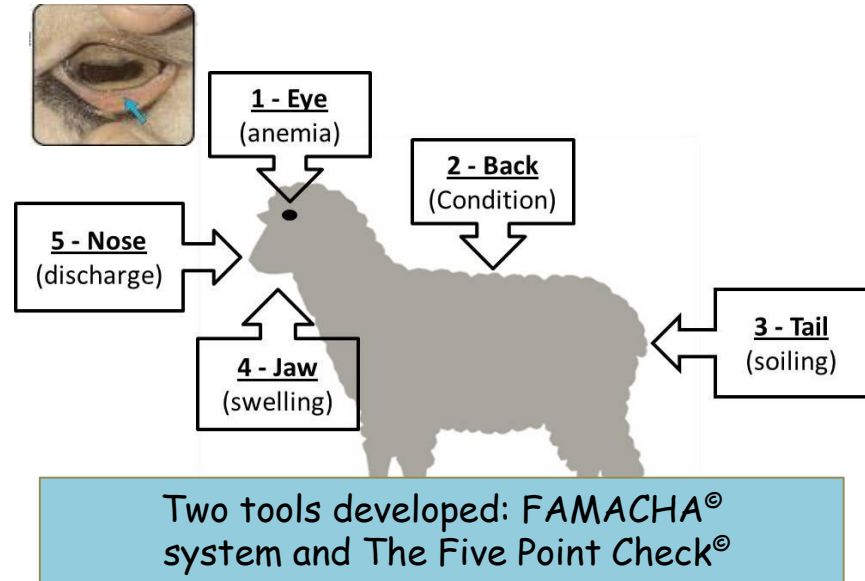
Health



- Controlling internal parasites/worms
- Chemical parasite control
 - Targeted selective treatment (FAMACHA and Five Point Check)
- Alternative parasite control strategies
 - Natural/herbal Dewormers
 - Diatomaceous Earth
 - Copper Oxide Wire Particle (COWP)
 - Plants containing *Sericea lespedeza*
 - *Duddingtonia flagrans*
 - Pasture Management
 - Host Immunity and Genetic Selection

Health

- Controlling internal parasites
- Deworming only those animals that require treatment
 - It helps in identifying animals that are susceptible (or not) to worm infections
 - Helps to manage drug resistance and decrease deworming frequency
 - This technique slows down resistance by increasing “refugia” (number of worms left in refuge from the drug)



Health

- Foot – Rot
- One of the most economically devastating diseases of sheep
 - Caused by two types of bacteria: *Bacteroides nodosus* and *Fusobacterium necrophorum*
 - Emits foul odor
 - Highly contagious
 - Treatment consists of hoof trimming, foot bathing/soaking (5% copper sulfate, 10% zinc sulfate), vaccinating (footvax), antibiotics and culling
 - Foot scald – infection between hooves



Predators

Losses of Sheep and Lambs from Predators: Number of Head and Total Value, United States, 2009

| Predator | Number of Head | % of Total Predators | Total Value |
|-------------------|----------------|----------------------|----------------------|
| | <i>Number</i> | <i>Percent</i> | <i>1,000 Dollars</i> |
| Known Predators | 225,300 | 91.1 | 18,670 |
| Unknown Predators | 21,900 | 8.9 | 1,846 |
| US | 247,200 | 100.0 | 20,516 |

Losses of Sheep and Lambs from Non-Predators: Number of Head and Total Value, United States, 2009

| Non-Predator | Number of Head | % of Total Non-Predators | Total Value |
|--------------------------|----------------|--------------------------|----------------------|
| | <i>Number</i> | <i>Percent</i> | <i>1,000 Dollars</i> |
| Enterotoxemia | 17,400 | 4.5 | 1,310 |
| Parasites | 30,400 | 7.8 | 2,838 |
| Other Digestive Problems | 19,300 | 5.0 | 1,673 |
| Respiratory Problems | 36,500 | 9.4 | 2,944 |
| Metabolic Problems | 2,800 | 0.7 | 245 |
| Other Diseases | 13,800 | 3.6 | 1,429 |
| Weather Related | 83,300 | 21.5 | 6,838 |
| Lambing Problems | 52,900 | 13.7 | 4,934 |
| Old Age | 39,300 | 10.1 | 5,538 |
| On Their Back | 3,300 | 0.9 | 440 |
| Poisoning | 10,100 | 2.6 | 1,011 |
| Theft | 1,900 | 0.5 | 162 |
| Other Non-Predator | 22,200 | 5.7 | 1,955 |
| Unknown Non-Predator | 54,100 | 14.0 | 4,986 |
| US | 387,300 | 100.0 | 36,303 |

National Agricultural Statistics Services, 2000

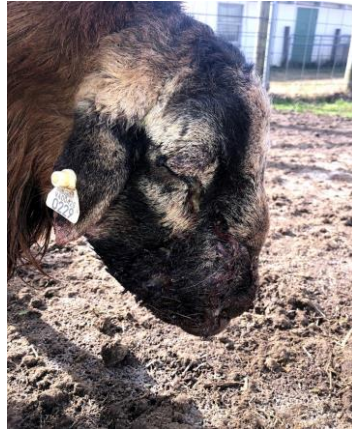
Losses of All Goats: Number by Predators, Diseases or Other Known Causes, Unknown Causes, and Total Value, 2009

| Item | Losses | | Total Value |
|---------------------------------|-------------|-------------|----------------------|
| | Goats | Kids | All Goat Losses |
| | <i>Head</i> | <i>Head</i> | <i>1,000 Dollars</i> |
| Predator | 60,000 | 120,000 | 18,720 |
| Diseases and Other Known Causes | 80,000 | 175,000 | 26,520 |
| Unknown Causes | 41,000 | 78,000 | 12,376 |
| Total | 181,000 | 373,000 | 57,616 |

¹ Goat value per head is based on a two-year straight average, using Texas data, of the value of all goats reported in the January 1 Sheep and Goat Survey from 2009 to 2010.

National Agricultural Statistics Services, 2010

Predators



Livestock guardians

- Guardian dogs
 - Great Pyreneese
 - Maremma
 - Akbash
 - Karackachan
 - Anatolian Shepherd
- Llamas
 - Female or neutered male
- Donkeys
 - Gelding or Jenny



Goat and Lamb Markets

- Significant profit can be realized with effective, smart marketing
- Producers can take advantage of the ethnic/religious demand for lamb and goat in marketing their animals
- The type (size, sex, and condition) desired at particular holidays varies

| Holiday | Religion | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|-----------|--------------|---------------|--------------|--------------|-----------|
| Eid ul-Adha, Festival of the Sacrifice | Muslim | Aug 22-25 | Aug 12-15 | Jul 31-Aug 3 | July 20-23 | July 9-10 |
| Muharramm/Hajra, Islamic New Year | Muslim | Sept 12 | Sept 1 | Aug 20 | Aug 10 | July 31 |
| Mawlid al-Nabi, Prophet's Birthday | Muslim | Nov 21 | Nov 10 | Oct 29 | Oct 18 | Oct 9 |
| Beginning of Ramadan (month of fasting) | Muslim | May 15 | May 6 | Apr 24 | Apr 13 | Apr 3 |
| Eid ul-Fitr, Festival of Fast Breaking | Muslim | June 15-16 | June 5-7 | May 24-26 | May 14-16 | May 2-3 |
| Pesch (Passover) | Jewish | Mar 31-Apr 7 | Apr 20-27 | Apr 9-15 | Mar 28-Apr 8 | Apr 16-23 |
| Rosh Hashanah | Jewish | Sept 10-11 | Sept 30-Oct 1 | Sept 19-20 | Sept 6-7 | Oct 26-27 |
| Chanukkah | Jewish | Dec 3-10 | Dec 23-30 | Dec 11-18 | Nov 29-Dec 6 | Dec 18-25 |
| Western (Roman) Easter | Christian | Apr 1 | Apr 21 | Apr 12 | Apr 4 | Apr 17 |
| Eastern Orthodox (Greek) Easter | Christian | Apr 8 | Apr 28 | Apr 19 | May 2 | Apr 24 |
| Christmas (Western) | Christian | Dec 25 | Dec 25 | Dec 25 | Dec 25 | Dec 25 |
| Epiphany, Feast of the Nativity | Christian | Jan 6 | Jan 6 | Jan 6 | Jan 6 | Jan 6 |
| Chinese New Year | Confucion | Feb 16 | Feb 5 | Feb 5 | Feb 12 | Jan 21 |

<https://www.sheepandgoat.com/ethniccalendar>

Goat and Lamb Markets

- Public livestock auctions
- Direct on-farm marketing
- Marketing to middlemen (dealer, brokers or meat packers)
- Direct to meat processor
- Marketing cooperatives
- Grazing services



Small Ruminant Budgets

- Beginning producers that prepare a business plan are 10 – 20 times more profitable than those that don't (anecdotal evidence, VCE)
- Do a business plan/enterprise budget (www.agplan.com)
- Offers a free business planning template, complete with examples, to guide you through the process
- Required to apply for loans and grants
- Allows you to accomplish
 - Mission statement
 - Goals and objectives (production, marketing and financial plan)
 - Business description (resources available)



Launched in 2007, AgPlan has been used to create 60,000+ business plans!

AgPlan makes it easy for you.

- Develop your own Business Plan
- Learn what you need to include in your Plan with Tips & Resources
- View Sample Business Plans for ideas
- Share your Plan — print, download and work with your own Reviewers

Small Ruminant Business planning

- Enterprise budget sheets available online
 - Total variable costs
 - Projected net return
 - <https://www.sheepandgoat.com/spreadsheets>
 - Evaluate different production scenarios prior to taking that risk yourself
 - Keep good records

| 2016 Sheep Enterprise Budget | | | | |
|---|----------|------------------|------------------|-------|
| BUDGET SUMMARY | | | | |
| Income | | Total | Per ewe | % |
| Market lambs | | \$ 28,969 | \$ 289.69 | 91.8% |
| Cull ewes and rams | | \$ 2,068 | \$ 20.68 | 6.6% |
| Wool | | \$ 505 | \$ 5.05 | 1.6% |
| Other income | | \$ - | \$ - | 0.0% |
| Total Income | | \$ 31,541 | \$ 315.41 | |
| Expenses | | Total | Per ewe | % |
| Feed costs | | \$ 13,367 | \$ 133.67 | 70% |
| Ewe feed cost | \$ 7,528 | | \$ 75.28 | 39% |
| Lamb feed cost | \$ 5,839 | | \$ 58.39 | 31% |
| Veterinary costs | | \$ 1,523 | \$ 15.23 | 8% |
| Other costs | | \$ 4,218 | \$ 42.18 | 22% |
| Total expenses | | \$ 19,108 | \$ 191.08 | |
| Profit | | \$ 12,433 | \$ 124.33 | |
| Expense Ratio: Expenses ÷ Income | | | 61% | |
| Total Investment | | \$ 71,200 | \$ 712.00 | |
| Years to Repay Investment | | | 5.73 | |
| Rate of Return on Investment (ROI) | | | 17% | |

