

BEST MANAGEMENT PRACTICES FOR DAIRY GOAT FARMERS

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Basic Considerations of Establishing a Goat Dairy in Wisconsin

INTRODUCTION

The goat dairy industry in Wisconsin is a niche market. Currently, there are 165 licensed goat dairies in the state. According to manufacturers of goat milk products, sales are increasing by 10 to 15 percent annually. Despite the rapid growth of the industry, operating a profitable goat dairy requires careful planning and management.

The main purpose of this “Best Practices Guide” is to provide some insight into the dairy goat industry. This guide contains basic knowledge to help those who are considering a dairy goat operation make a sound decision as to whether or not this would be a viable business for them. Success in the industry is not guaranteed.

The focus of this guide is to provide the basic information necessary for the development and management of a goat dairy.

A goat dairy farmer in this “Best Practices Guide” is defined as a farm milking at least 50 does and selling their milk to a milk plant. There are a few exceptions but most plants require a farm to be milking at least 50 does before they will consider picking up their milk due to the cost of transportation. A farmstead dairy is one in which the farm processes their own milk and sells their own product.

Before deciding to start a commercial dairy goat operation, it is critical to ask yourself several questions:

- The first question that one will need to answer is “Why do I want to become a dairy goat farmer?”

If the answer is “I love dairy goats and it would be a cool way to make a living,” make sure you’re not getting ahead of yourself. You may want to start with just a few goats, milking them for your own use, and looking at other possibilities for working with goats

- If the answer is “I like goats and I feel that I have the ability to manage a dairy herd and make a reasonable income.” Then you may want to do your homework and decide if a goat dairy is for you. This needs to be viewed as a business venture.

Did you know?

- *Wisconsin has more dairy goats than any other state in the country*
- *Wisconsin has 5,000 premises registered with goats*
- *Wisconsin has 165 licensed goat dairies*

Following are key factors that you will need to research for your situation and decide how your business will respond.

Remember if you cannot get your operation to work on paper, you will not get it to work in actuality. Do not be in a hurry to start a dairy, take the necessary time to plan. It is much more economical to set up properly the first time than to remodel and spend money twice.

Unless the potential new farm is on an existing milk route or is close to a plant, the new farm may not have a market for their milk.

Basic Considerations of Establishing a Goat Dairy in Wisconsin

FINDING A MARKET

Before you invest any money in facilities or animals, make sure that you have a market for your milk. Most goat milk in Wisconsin is sold to a cheese plant. Other options for selling your milk include making your own farmstead cheese and selling fluid milk.

Selling to a Cheese Plant

Though goat cheese sales are increasing, cheese plants source most of the additional milk needed for the increased production from farms they already buy from, rather than adding a new farm to their milk route. If the dairy plant is short on milk after they have given their current producers an opportunity to expand, they may then consider adding a new farm. However, processors will not purchase new milk if they do not have a market for it.

A plant will only agree to purchase milk if they have a need for it. If you build your facilities, build your herd, put milk into your tank and then call the dairy plant to pick up the milk, the plant will most likely say no. Remember milk will only be purchased if they have a market for it. This practice insures a steady market with a stable price for those currently producing milk.

Due to the currently low rate at which plants are taking on additional farms, many new farms have found that an easier way to enter the market is to purchase an existing dairy goat herd from someone going out of

It is critical that new operations seek out a secure market for their milk before investing in any equipment, facilities, or animals.

business. The contract to ship to a particular processing plant is generally transferred with the sale of the herd.

A Plant will only agree to purchase milk if they have a need for it.

A plant may consider putting a farm on if they fit into an existing route and

have purchased the herd of an existing plant patron. Remember to contact the plant before purchasing the herd to be sure they will purchase the milk. In this scenario the seller may be asking for thousands of dollars for the “Milking Rights.” This fee is not required by the plant; it is strictly the seller’s fee. If this is the only opportunity to sell to a plant, you may choose to pay the fee in order to establish a market for yourself

Also keep in mind that when a plant has a need for more milk they will look at where the potential new farm is located. Unless the potential new farm is on an existing milk route or is close to a plant, the new farm may not have a market.

Transporting of the milk to the plant is a major cost. Currently, the plants purchasing goat milk are located in central, southwestern, and northwestern Wisconsin or just over the border into Illinois. If the potential new farm is located in northern or northeastern Wisconsin the opportunity to be picked up by one of the plants is much lower.

84% of Wisconsin goat dairies sell their milk to cheese plants.

Opportunities to sell milk to a cheese plant are primarily in the southwestern part of the state. Cheese companies buying goat milk from Wisconsin farms include Mont Chevre-Betin in Belmont, WI,

Basic Considerations of Establishing a Goat Dairy in Wisconsin

Woolwich Dairy in Lancaster, WI, Southwest Wisconsin Dairy Goat Producers Co-op in Mt. Sterling, WI, Kolb Lena Cheese Co. in Lena, IL, and Bass Lake Cheese in Somerset, WI. These plants also purchase milk from Illinois, Iowa, and Minnesota. The Quality Dairy Goat Producers Co-operative of Wisconsin markets their milk mainly to Carr Valley Cheese in Mauston and La Valle, Wisconsin and sells spot loads to other plants as the need arises. There are other plants in the state which will purchase loads of milk on occasion to make specialty cheeses.

the plant pays the rest. With a third plant trucking is paid for by the plant for farms in a 50 mile radius with a variable fee paid by farm, beyond that. With the fourth plant trucking is paid for by the plant if you are in a 100 mile radius of the plant and anything over 100 miles the farm pays by the mile. A fifth plant assesses a hundredweight charge that is the same for all producers, plus a stop charge based on the distance from the plant. In this system producers pay all of the hauling charges. Milk is usually picked up every 3rd or 4th day.

Each plant handles their transportation a bit differently. With one plant the farm pays a \$30.00 stop charge each time the truck comes and the plant

Sample Transportation Costs for Milk Hauling

PLANT	AMOUNT PAID BY THE FARM	AMOUNT PAID BY THE PLANT
Plant A	\$30.00 stop charge	Plant pays the rest of the transportation costs
Plant B	\$20.00 stop charge	Plant pays the rest of the transportation costs
Plant C	By the mile after 50 miles per 100 lbs. of milk	Plant pays the transportation costs of the first 50 miles.
Plant D	By the mile after 100 miles per 100 lbs. of milk	Plant pays the transportation costs of the first 100 miles.
Plant E	100# weight charge same for all farms, plus stop charge based on the distance from the plant	Patron pays all of the transportation costs. The plant does not pay any.

pays the rest. With another plant the farm pays a \$20.00 stop charge each time the truck comes and

Basic Considerations of Establishing a Goat Dairy in Wisconsin

Farmstead Production

If you are unable to find a market for your milk, you can look into the possibility of a farmstead cheese operation. With this plan review all aspects of it carefully and keep in mind there are only 24 hours in a day.

In a farmstead cheese operation the goats will need to be managed and milked, a decision will need to be made as to what product to produce. If cheese is the product to be made a cheese maker's license will need to be obtained by attending classes and doing an apprenticeship, about a 2 year process.

Once everything is done the product produced will need to be marketed and sold. Before one dollar is invested into the operation, be sure there is a reliable market.

There are currently five farmstead cheese operations in Wisconsin. Though many producers are enticed by the idea of seeing their milk through all of the stages from goat to finished product, selling fluid milk and having a farmstead cheese making operation are entirely different in terms of work. In a farmstead cheese operation, 60 – 70% of the time is spent making and marketing cheese. Therefore, herd size and management is much different than on a large farm selling bulk milk.

INVESTING IN FACILITIES AND A HERD

Wisconsin is an excellent state for goat dairies to prosper due to the existing infrastructure from the cow dairies. Much of the equipment out grown by the cow dairies can be readily adapted to a goat

dairy. However, it is important to be sure that you are buying equipment and facilities that will really meet your needs. If you are just starting, consider renting or leasing land and a barn. By delaying high initial capital investment, you may be able to invest in a higher quality herd and establish a stronger business. Once you have a well established, successful business, you can consider buying land or upgrading facilities.

In some areas of the state the average life of a goat dairy is less than three years.

Basically, two thirds of the individuals that start goat dairying in these areas will be out in three years. There are a number of reasons for this quick exit. They include a lack of understanding of the industry, limited resources, and failure to plan. In some cases they were unable to find a good source of information prior to starting their business. Another factor that enters the picture is the first year they purchased a herd of goats in milk with little or no young stock. They are making money. The second year some of the does did not breed back and they have baby goats to care for and pay the feed bill for. By the third year there are more kids to care for, along with last year's young stock to be bred, some of the does needed to be culled thus less milk and more cost.

Wisconsin is an excellent state for goat dairies to prosper due to the existing infrastructure from the cow dairies.

To enhance the probability of success a dairy goat producer should have a mentor, a reliable, proven source of information, have completed a business plan, have thoroughly researched the industry, and carry a low debt load.

Basic Considerations of Establishing a Goat Dairy in Wisconsin

PLANNING FOR SUCCESS

Develop a Business Plan

A business plan for your dairy goat operation is a key to the success of the business. Carefully consider the proposed cash flow and long term profitability of your business before starting. Not only are a business plan and financial projections essential to make a sound, well-informed business decision, but your financial institution will require these documents before lending you any start-up money. Fortunately, there are many organizations that can help you develop these documents. If you are not familiar with developing a business plan or would like to have someone review the plan, contact the agricultural extension agent or the farm trainer from the local technical college. As you learn more about the goat dairy industry, continue to revisit and revise your business plan and financial projections.

Do your Homework

Before investing in a goat dairy, do your homework. Visit at least ten different existing goat dairies. Find out how they do things. Make a list of things that will work well for you and things that will not. Learn from them. Find out what others would like to do differently if they could and other suggestions they have. Develop a list of questions that can be asked at each farm that is visited. Before visiting a dairy, call ahead and make an appointment. Do not just stop in. This gives the producer a chance to set some time aside to devote to the visit. Keep in mind you are one of many that are trying to take time away from the farmer's day. Limit the time of your visit and listen to what you are being told.

Find a Mentor

Build a relationship with someone who is willing to answer your questions?

One of the major challenges facing anyone interested in starting in the dairy goat industry is a lack of readily available proven information. It can be hard to find good information and in some cases even to find any information that fits your individual situation. Some of the information that applies to cows also applies to goats, but not always. A valuable way to learn about the industry as you are starting out is to build a relationship with a mentor. Is there someone that you can build a relationship with who would be willing to answer your questions? A new person in the dairy cow industry has a number of knowledgeable resource people available to them within their own township and county. The goat dairyman does not have this same opportunity.

TIME, LABOR, & MANAGEMENT

The market is there for the milk, a business plan has been developed, and the homework is completed. Now is the time to evaluate the time,

Time, labor and management are key factors in the success of the operation. These are key factors that are often overlooked.

labor, and management available for your business.

Time

Time is a major factor in the success of the

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operation. Remember there are seven days in a week and the animals need to be milked two times a day. It is not unusual to put in 12 to 14 hour days. During the kidding season, more hours per day are usually needed. It is also hard to leave the operation. Give some thought as how you will handle seldom being able to be gone for a night or a vacation.

Labor

Labor is a major factor in the success of the operation. A dairy goat operation is a very labor intensive operation. If you are looking at other family members as the major source of labor, be sure they are as committed to this enterprise as you are. This is a key factor and often overlooked. On average, 200 to 300 milk does is about all one couple can handle without hiring outside help. The exact number depends on the efficiency of your set-up. A balance needs to be found between labor investments and equipment investments.

Depending on what your income expectations are, you may chose to have part-time or full-time employment off of the farm.

When looking at labor keep in mind chore time, along with management issues such as disbudding, tattooing, vaccinations, hoof trimming, barn cleaning, maintenance issues, raising crops, marketing and selling your milk, and managing the farm finances.

Management

Management is a key factor in the success of the goat dairy business. If management skills are lacking, develop a plan to develop these skills.

There are many management areas that require knowledge including: animal selection, genetics, milking procedure, milk equipment, animal care, animal housing, feeds and feeding, financial, record keeping, and others.

“Research has indicated that management and environment may account for as much as 80% of the differences in milk production, while actual genetic influences are only 20%.” (Proving your Buck by Jane Wierschem.)

BUILDING YOUR TEAM

Find a Veterinarian

As you build your operation, you should also be building a relationship with a veterinarian. Talk with local veterinarians and find one that is knowledgeable about goats or is at least willing to learn. Even if the veterinarian doesn't know much about goats, if they are willing to contact other veterinarians and work with you, you will be off to a good start. Develop a working relationship with the veterinarian and develop a herd health plan. Preventing illness is a lot cheaper than curing it!

The feeding program is the largest farm expenditure and the health and productivity of your herd depend on it.

Find a Feed Nutritionist

In addition to a veterinarian, you will also need a feed nutritionist. Who will supply the feed and balance the rations? The feeding program is the largest farm expenditure and the health and productivity of your herd depend on it. Does it make economic sense to purchase all of the feed? Is pasture an option to work into the feeding

Basic Considerations of Establishing a Goat Dairy in Wisconsin

program? The labor used to raise crops may be better utilized in another aspect of the operation. If you have a number of acres, you may be able to produce crops that can be sold as an additional source of income. In some cases feed may be purchased for less than it can be produced for. Better quality may be purchased than what can be produced. A critical factor is to decide where your time is best utilized.

Is the feed nutritionist willing to work with the farm as a business entity? Are they willing to balance the ration for a dairy goat producing milk, not just a mini cow? Dairy goats have different requirements than dairy cows. The NRC has recently released revised standards for goats. Rations should be developed for the milking does, kids, young stock, bucks, and dry does.

Find a Dairy Supply Dealer

Identify a dairy supply dealer that will provide equipment, supplies, and maintenance to your dairy equipment. The initial design and installation of the milking equipment will affect the farm's ability to produce quality milk. The equipment will be used every day for the life of the dairy therefore it must be convenient and dependable. Properly functioning equipment is the key to producing quality milk and to maintaining healthy udders.

INSPECTION AND

LICENSING

The milk house and parlor plan will need state approval before it is built or remodeled. Contact the dairy inspector in your area to give input into the set up of the milking facility. They will be the one inspecting it and giving final approval. They may even have some ideas to save money.

Develop a good working relationship with them early on.

The dairy farm will need to pass an inspection before any milk is shipped, ensuring that everything meets state requirements. The dairy plant will need to apply for a milking license for the farm and the water must be tested. (State statues ATCP 60 and 80 list most of the farm requirements.)

The procedure for obtaining a dairy license is that the dairy plant field man must inspect and approve the farm before the state inspector is notified that the farm is ready to be inspected for issuing a license. If the farm does not meet all the required items, and the state inspector has to return for another time, there is a re-inspection fee.

RECORD KEEPING AND DHI TESTING

Developing a system to keep accurate herd records is a critical factor for success. DHI (Dairy Herd Improvement) records give you a number of management tools. By reviewing the amount of milk, butterfat, and protein an animal produces, a decision can be made as to which animal is not meeting production goals. This is a benefit as it supplies numerical details, not just the visual.

By reviewing the amount of milk, butterfat, and protein an animal produces one can best decide which animal is not meeting production goals.

Contact a DHI representative and decide which plan best fits your needs.

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Identifying and withholding the milk from a small number of goats may assure that the farm meets the required Somatic Cell Count (SCC) regulations. Any farm selling their milk is required to monitor their SCC. This is often done by the plant when they pick up your milk. If the SCC is at 1 million, you will receive a warning letter from the state. If the SCC is 1.5 million or greater, the farm has 14 days to achieve a passing test or the milk cannot be picked up.

Using DHI records, you can trace which animals are bred, their breeding date, and to what buck. Online records are available through DHI. Individual farm reports can be developed showing who to breed, who to pregnancy check, who needs to be dried off etc. Good records are necessary for improving milk production within the herd.

You will also need to keep records on the history of your animals and the business and financial matters of the farm.

- Keep a record of any animal that has been treated and with what product.
- Develop a system for keeping financial records other than the shoebox. There are a number of inexpensive programs for a home computer.
- Remember sound management decisions are made with good records. Profit margins are slim. One poor management decision may mean no profit this year and perhaps even the next couple of years.

OTHER SOURCES OF

Develop a system for keeping financial records other than the shoebox.

INCOME

In planning your business, look at all angles of the business for sources of income. Milk is the obvious source and will range from 80 – 95% of the total income. There are a number of other income streams, though, that may not be obvious at first glance, but may provide an important secondary income. Be sure to consider the following aspects of your farm when you are writing your business plan.

- **BUCK KIDS.** In any one year about 50% of the kids will be bucks. If the space and labor are available they may be raised to market weight and sold. Know what the buyer wants. The market for goats varies by the time of year and the objectives of the buyer. If the space or labor is not available they will need to be sold. Locate someone who will purchase them within a week of birth. Know the buyer's requirements. The market is highest for milk fed meat kids during the Christmas and Easter seasons. The kids need to have a good fat covering to make this market. Market weight is between 20 – 40 lbs. Direct farm sales is a possibility also.
- **SALE OF CULL DOES.** The cull goats may be sold through a sale barn. Check area requirements. Direct farm sales are also a possibility if the farm develops the market.
- **SALE OF BREEDING STOCK.** Accurate records will need to be kept for the sale of breeding stock. Animals will be marketed on their qualities.
- **SALE OF COMPOST.** If all of the

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manure is not used on cropland, look into composting it and developing a direct sales market.

- **UNIQUE FARM PRODUCTS.** Research other opportunities that may be available in the area or within the time, labor, and management plan of the farm as
 - Goat milk soap and skin care products
 - Goat milk products made for the farm
 - Farm tours
 - Other ideas unique to your farm

ASSESS BUSINESS

FEASIBILITY

The final step in the process of planning for a goat dairy is to decide if this business enterprise fits your situation. After all of the research has been completed; make a pro-list listing the attributes of goat dairying and then make a con list of goat dairying with the downfalls.

Goat dairy farming is one way to make a profit from dairy goats. If the final analysis shows that goat dairying would not be a viable business, explore other options such as raising meat kids, raising young stock for other goat dairies, raising meat goats, raising breeding stock, or milking a few does and selling the products made from their milk.

Basic Considerations of Establishing a Goat Dairy in Wisconsin

GOAT DAIRY START-UP CHECKLIST

Use the following checklist as a guide in gathering the necessary information as to whether or not a goat dairy would be a viable business venture.

- Goat milk market
 - Agreed upon price
 - Transportation price agreed on
 - Potential target pick up date
- Business Plan Developed
- Farms Visited
- 1. 6.
- 2. 7.
- 3. 8.
- 4. 9.
- 5. 10.
- Time Available
- Labor Available
- Management key issues
- Mentor Identified
- Veterinarian
- Feed Consultant
- Dairy Supply Resource
- DHI Testing
- Record Keeping System
- Other Sources of Income
- Final Evaluation

Managing Milking Does

DAIRY GOAT BREEDS

One of the first decisions you will make in managing your dairy is which breed(s) will comprise your herd. There are seven full sized major breeds of dairy goats recognized in the United States. The different breeds vary in their overall size, milk volume, and fat and protein percentages in their milk. If you are purchasing an existing milking herd, the breed is already determined, though additional animals can always be bought or bred into the herd. If the herd is a new one you may be able to select the breed of your choice.

If you are maintaining pure lines, it is advisable to limit the number of breeds in the milking herd.

Overview of Breeds

The **French Alpine**, also known as the Alpine dairy goat, is a medium to large size animal with erect ears and numerous color variations. They are very hardy, maintaining good health with excellent production. They are very adaptable and their kids tend to be very aggressive eaters.



The Lamanche has either gopher or elf ears.

The **Lamanche** is the only breed that originated in the United States (California). They come in many

Step one in managing your milking herd is to select a breed or breeds that best fit your production goals or understanding the breed or breeds that comprise your herd.

different colors with either a gopher ear, maximum length of one inch, or the elf ear with a maximum length of two inches. They are also a very hardy breed with good milk production that is high in butterfat.

The **Nubian** has pendulous ears that extend at least one inch beyond the muzzle. They come in a variety of colors. Although they produce less milk than other breeds, their milk is high in butterfat and



The Nubian has pendulous ears.

protein. They tend to be more vocal than all of the other breeds.

The **Oberhasli** is a Swiss dairy goat with erect ears. It is chamoisee in color. (Chamoisee is a bay ranging from a light to deep red bay.) They have two black stripes down their face, a black dorsal stripe, black from knees down and a black underbelly. The breed averages for milk production have increased substantially in the past few years.

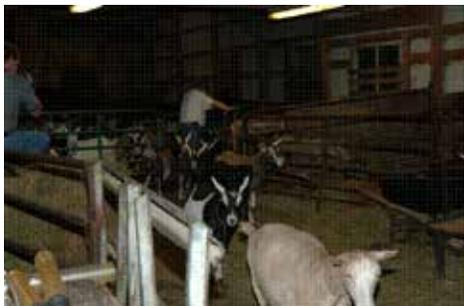
The **Saanen** dairy goat is one of the largest framed of the breeds. Saanens produce well, averaging about the same as Alpines but tend to have lower fat and protein levels. They tolerate cold weather well. The Saanen breed originates from Switzerland, has erect ears and is completely white or light cream in color.

Managing Milking Does

Key Factors In Breed Identification

Breed	Ears	Color
Alpine	Erect	Varies
Lamancha	Gopher or elf	Varies
Nubian	Pendulous	Varies
Oberhasli	Erect	Chamoisee with black trim
Saanen	Erect	White or cream
Sable	Erect	Any color other than pure white
Toggenburg	Erect	Light fawn to dark chocolate with white trim

Sable Saanens are a newly recognized breed who have Saanen ancestry but come in a variety of colors, usually white with black or brown. They have similar production traits to white Saanens.



A dairy goat herd is often made up of more than one breed.

The **Toggenburg** dairy goat originates from the Toggenburg Valley of Switzerland and is the oldest breed. It is of medium size, hardy, and milk production is competitive with the Saanens and Alpines. Toggenburgs are known for a long, steady lactation and generally have a closer protein to fat ratio. Toggenburgs have erect ears. Their solid color varies from light fawn to dark chocolate. Their distinct white markings are as

follows: white ears with dark spot in middle; two white stripes down the face from above each eye to the muzzle; hind legs white from hocks to hooves; forelegs white from knees downward with a dark vertical stripe below the knee acceptable; a white triangle on each side of the tail; white spot may be present at root of wattles or in that area if no wattles are present.

Dairy goat herds often are comprised of two or three breeds to maximize on the strength of the breeds. If you are maintaining pure lines it is advisable to limit number of breeds.

In deciding which breeds to include in your herd, consider who will be buying your milk and how they set their price. Each dairy plant that purchases milk pays a bit differently. Thus, this may influence your breed selection. Some plants put more emphasis on volume and some emphasize components in their pay schedule.

Managing Milking Does

MILKING DOE FACTS

A basic knowledge about the doe is essential to good herd management. A milking doe has two teats with a single orifice each. If the doe has more than two teats or a double orifice she could develop into a problem animal. Some does with these defects will milk out with machines with little trouble but others create problems, slow the milking process, and should be culled.

Does should be milked on twelve hour intervals. The udder is constantly producing milk and only stops when it is completely full. Therefore, the objective is to never let the udder get so full that it stops producing milk. There maybe some benefit in milking does three times a day in the first 45 – 90 days of their lactation but labor is usually a limiting factor.

A mature dairy goat can be expected to produce one gallon of milk per day, which is about 8.6 lbs. Lactations can be 300 or more days but some family lines do not hold production as long. The average annual dairy herd production is about 5.0 lbs. per day. A dairy goat's gestation period is five months. The doe will ideally milk for five months, be bred back, be dried off after milking for ten months, and then have a two month dry period.

Special points of interest:

- There are seven full sized breeds of dairy goats.
- Dairy goats eat 4 – 6% of their body weight in dry matter.
- Dairy goats will drink at a ratio of 4:1 weight of water to dry matter intake at 60 degrees F.

BASIC TERMS IN DAIRY GOAT HUSBANDRY

Doe	Female goat of any age
Buck	Male goat of any age
Kid	Baby goat
Yearling	A goat that is about one year
Wether	Castrated male goat
Lactation	Period of time in which the doe produces milk
Heat	Period of time in which the doe's egg is released and she's ready to accept the buck
Gestation	Period of time in which the fetus is carried
Kidding	Act of doe giving birth to a kid
Cabritto	Meat from a goat under one year of age
Chevron	Meat from a goat over one year of age



A male goat is called a buck.

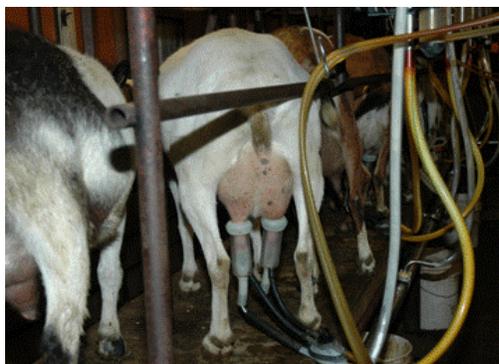
Managing Milking Does

THE FRESH DOE

The body condition of the doe is very important. If she is too thin when she kids, the kids will be small, have low vitality and the doe will have low milk yield. If the doe is carrying too much fat she may have kidding difficulty, develop ketosis and have a low milk yield.

The transition from a dry doe to a fresh doe is a very stressful time for the doe.

The first milk of a newly fresh doe is called colostrum. It is a thick yellow milk that is high in antibodies for the newborn kids. The second milking will still have evidence of colostrum. The first two milkings are to be withheld from the tank; most dairies withhold the third as well. If the doe was dry treated her milk should be tested for antibiotics before it is put into the tank.



Monitor the milking of the fresh doe daily.

The doe's milk production will peak around day 100. A high producing doe will not be able to take in enough feed to meet the demand of milk production. She thus meets this additional need by using the reserves in her body.

The transition from a dry doe to a fresh doe is a very stressful time for the doe. It will take two or



Vaginal drainage for the first days after kidding is normal.

three days for the doe to come into milk. Watch the doe very carefully during these first few days. If she is running a temperature she may have a uterine infection. Vaginal drainage for a few days is normal but drainage for over a week indicates a problem. If she goes off of feed, she is also experiencing health problems. Early detection is the key to getting her back on track.

FEEDS AND FEEDING

Due to their critical role in the health and production of the doe, as well as their significant cost, managing your feeds and rations should be central to your operation. Over the course of her life, feed will be the main cost of this doe. A correctly balanced ration is the key to maximizing milk production and the health of your milking doe.



Forage may be made into round bales and stored in a line outside.

Managing Milking Does

There are a number of decisions that will need to be made regarding the feeding program. These include:

- 1.) Is it more economical for the farm to produce its own forages and other crops or to purchase the needed feeds?
- 2.) What type of forages best fit your farm's situation?
- 3.) Which feeding program fits your farm's situation? You may consider TMR (Total Mixed Ration), individual grain feeding, group feeding, topdressing (feeding of concentrate), and/or grazing.
- 4.) What are your farm's milk production and component goals?

It is very important to find a feed nutritionist or feed consultant to help in balancing the diet to meet the nutrient requirements of the does. The mill where the farm purchases their ration ingredients usually has a feed consultant or nutritionist available to consult with you. This individual can help develop a balanced ration for your does. They can also help trouble shoot problems.

There are many factors that enter into balancing a ration. The doe's feed requirements change throughout her lactation. Yearling milkers have different requirements than aged does. High producing does have different feed requirements than does that have lower milk production. There are a few minor differences based on the breed of goat that is being fed. Working with the feed consultant or nutritionist, the farm manager can

A correctly balanced ration is the key to maximizing milk production and the health of your milking doe.

put the herd into at least two different groups and possibly three to best meet the needs of the does.

Does do not like a lot of fine particles in their feeds. They will usually not eat this portion of the feed and they can easily sort out a feed. They will eat what they like best and leave the rest. To ensure that the doe gets what she needs, she has to eat all of her feed including the fines.



Goats cannot sort their feed when it is pelleted.

Thus, if at all possible, feed a pelleted feed rather than a texturized feed. (Texturized feed is a whole grain mixed with oil or molasses to bind the fines.)

There are several other resources available to you and your feed company. For balancing rations, you can use the "Goat Nutrient Requirement Calculator" at the Langston University website:

www.luresext.edu/goats/research/nutritionmodule1.htm.

The Langston University nutrition model will require you to enter basic information about your doe and your feed such as: body weight, body weight gain desired, milk production, and fat and protein % of milk. The feed company should provide the nutrient levels in the grain and a forage sample can be analyzed. It also looks at calcium and phosphorus for minerals.

Managing Milking Does

The Small Ruminant Nutrition System is a new resource that is based on the animal state and the analysis of the feed. It can be downloaded for free at:

<http://nutritionmodels.tamu.edu/srns.htm>.

This tool combines information from the US and Europe and provides the most comprehensive information. However, the required feed analysis input information is very detailed and a nutritionist is more prepared to enter feed data than a farmer.

Another available resource is the

National Research Council's (NRC) Nutrient Requirements of Small Ruminants, 2007. Its cost is \$130.00 and can be ordered at www.nap.edu or 1-888-624-8422. Be aware that there is a separate Errata printed to replace the goat requirements table.

When balancing a ration for goats remember that they are not mini cows. They eat 4-6% of their body weight in dry matter and they are very selective eaters.

INTAKE AND FEEDING BEHAVIOR OF GOATS

The following is taken from "Balancing Diets For Lactating Goats" Antenello Cannas, Dipartimento di Scienze Zootccniche – University of Sassari, Sardinia, Italy.



Large square bales must be stored inside.

Intake and Feeding Behavior of Goats

- Lower digestive capacity than cattle
- High level of intake
- Mouth width and mobility, high selection of diet
- Necessity of reducing particle size of feeds more than cattle
- Higher fiber particle breakdown
- Higher concentrate particle breakdown
- Ability to cope with antinutritional factors
- Big salivary glands
- Presence in the saliva of compounds able to limit the negative action of tannins and toxins.
- Goats have higher levels of intake than cows (4-6% of body weight vs. 3 – 4%)
- Goats digest fiber less than cows
- They are helped by fine chopping of the forages more than cows.
- Goats digest starch better than cows
- Goats select much more than cows
- Problem of sampling the pasture or the diet for analysis
- With TMR chop finely the forage
- Traditional feeding let them select the forage
- Goats can face tannin rich diets



Goats on pasture will eat from the top down.

Managing Milking Does

EATING AND INTAKE CHARACTERISTICS

The following information is taken from "Starting a Commercial Goat Dairy" by Carol Delaney, Small Ruminant Dairy Specialist, University of Vermont.

Eating Characteristics

- Goats are intermediate feeders and cows are grazers.
- Goats select and feed with lips while cows use their tongue to grab forage
- Goats commonly eat 50:50 diets on farms while this could upset cow's rumen.
- On pasture, goats will eat from the top down, including seed heads, while cows and sheep will graze close to the ground.

Intake Characteristics

- Goats need 1.5 times energy as a cow for maintenance per pound of flesh but can eat up to twice as much as a cow. Goats can eat 3.5 to over 5% of body weight in dry matter. Cows are closer to 3%.
- Goats will eat less feed when pressed on set stocked or continuous pastures and still try to select best feed. Cows and sheep will try to maintain quality and quantity and can handle higher fiber diets.

Goats need 1.5 times the energy as a cow does for maintenance per pound of flesh but can eat up to twice as much as a cow.

GRAZING KEY POINTS

The following information is taken from Starting a Commercial Goat Dairy by Carol Delaney Small Ruminant Dairy Specialist Vermont.

- 14.4 acres / 100 goats – .14 acre / goat just grazing
- Optimum grain fed on quality pasture is 1.75 lbs. for 6.4 – 8 lbs.milk per day average
- Grazing / hayland : 1/4 acre per goat
- Will feed 1/2 the hay if you graze vs confinement.

FEED TESTS

A forage analysis can help you ensure that your herd is eating a balanced ration. As the forage changes, forage samples should be tested and the ration should be adjusted accordingly. The % protein of the grain ration will be based on the forage.

The best nutritional indicators are:

- Milk yield and quality
- Body condition score
- Milk Urea Nitrogen (MUN)
- Feces

MUN

Information taken from Small Ruminant Dairy Newsletter, Carol Delaney, Small Ruminant Dairy Specialist Vermont.



Milk

Urea

MUN is an indicator of excess protein in the diet.

Managing Milking Does

Nitrogen or MUN, is an indicator of excess protein or nitrogen in the diet. You can measure this with a bulk tank sample sent to a DHI testing lab. If the animals are getting too much protein, they must use energy to dispose of it. For example, if a doe eats 100 grams (0.2 lbs) of excess crude protein in a day, she will sacrifice the energy that could have made 130 – 140 grams (0.3 lbs.) of milk. Your MUN levels should fall within the following range:

- Too low: 12 – 15 mg/dl MUN
- Too high: above 25 mg/dl MUN

As a rule of thumb, if the manure is dark and runny, then the MUN is high.



Ag Source provides testing for the Milk Urea Nitrogen (MUN) levels in your milk. Check with your local technician for details on this testing service.

ANIMAL COMFORT

Animal comfort is a must for maximum production. The goal is to minimize stress on the milking doe. The more often the doe is lying down chewing her cud the more milk she will produce.

There are a number of environmental factors to evaluate. Does should not be overcrowded.



Goats need to be able to get outside to improve their overall comfort.

Overcrowding increases stress and reduces milk production. They need 20 – 30 sq. ft. per animal; less inside space is necessary if they have a place to

Animal comfort is a must for maximum production.

go outside and more is needed if they do not.

If does are fed a limited amount of feed then all does must be able to get at the feeder. Plan about 12 –13 inches per animal. If the feeder is kept full at all times then you will need 10 – 11 inches of feeder space per animal.

The design of the feeder is important. It should be designed so does can not get into the feeder and so they do not put their feet into the feeder. If they do they may contaminate the feed either spreading disease or other does may refuse to eat the feed. The feeder should also be designed so the doe can not waste feed.

Does need a constant supply of clean, fresh water. The emphasis here is on clean. If you will not drink the water, they will not. The more they drink, the more milk they will produce. An automatic waterer works well. Manually filling a

Managing Milking Does

water supply is labor intensive and on a busy day forgotten or delayed. Have a regular cleaning schedule for the waterer.

Goats prefer warmer water and will decrease water intake below 41 degrees F water temperature.



The automatic waterer keeps a supply of fresh water in front of the doe at all times. Be sure to clean waterers often.

At 60 degrees F ambient temperature, goats will drink at a ratio of 4:1 weight of water to dry matter intake. For example, a doe with a dry matter intake of 5 pounds will drink 20 pounds of water.

The bedding should be relatively clean and dry. Kneel on the bedding—if your knee gets wet it needs to be cleaned out. Wet bedding is an excellent source of bacteria. When the doe lays down and the teat end comes in contact with wet bedding conditions are perfect for udder infections.

Ventilation is critical to animal health and comfort. Do not under estimate how important this factor is to the overall health of the animal and even to the farmer. Proper ventilation can lead to high production levels and decreased sickness. Improper ventilation can lead to higher vet bills and lower milk production. With proper

ventilation you will not be able to smell the ammonia. To check the ammonia level, kneel down, placing your nose at the level of a goat to see if you can smell any ammonia.



Proper ventilation is a critical factor in animal health.

PRODUCING HIGH QUALITY MILK

The key to producing quality milk is properly cleaned milking equipment, following the proper milking procedure, and milking does with healthy udders.



Quality milk starts with clean milking equipment and healthy udders.

Begin by understanding the requirements for the production of quality goat milk. The standards for raw goats' milk are as follows:

- Bacteria Count
 - Grade A 100,000 cfu/ml
 - Grade B 300,000 cfu/ml

Managing Milking Does

Grade A is milk sold for the purpose of bottling for fluid milk sales. Grade B is milk sold for the purpose of making cheese. On the report that comes back from the lab, the bacteria count will be noted as PC (Plate Count). The number shown will need to be multiplied by 1000. Thus if the PC is 10, the actual is 10,000 cfu/ml.

- Somatic Cell Count
 - Grade A: < 1,000,000
 - Grade B: < 1,500,000

Quality Milk

- Properly cleaned milking equipment.
- Proper milking procedure.
- Healthy udders.

This number is listed as SCC and needs to be multiplied by 1,000. Thus if the SCC is 550 on the report form, it is really 550,000.

- No antibiotics

The milk hauler will take a sample of milk from the bulk tank. When the load gets to the plant it is tested for antibiotics. If the load turns up “hot” all milk samples are tested. The farm that had the antibiotics in their milk pays for the complete truck load of milk. You are required to have insurance to cover this type of incident. All plants will require proof of this insurance before you ship.

- No added water.
- No off flavors or smells.
- Temperature within two hours
 - Grade A < 45 degrees F
 - Grade B < 50 degrees F



The temperature of the milk in the tank is displayed on this panel.

Proper Milking Procedures

The production of high quality milk depends on learning and routinely following the proper milking procedures. The following steps are critical to reduce bacteria on the milk skin, reduce bacteria and SCC, and to detect early stages of mastitis.

The milker should wear milker's gloves. The milker's skin is a porous surface harboring many bacteria. The milker's glove is a non-porous surface that does not harbor bacteria and can easily be cleaned.

Step 1. Pre-dip. Use a commercially prepared high quality dip 0.5% iodine or other approved product. The teat should be debris free. The pre-dip should cover the teat about 3/4 of the way up the teat. The dip needs to remain on the teat for 30 seconds. Research shows that effective predipping reduced bacterial counts in milk by 5 to 6 fold and reduced the risk of isolation of listeria by 4 times. (Hanssen et al. 2001.)



Health issues can be identified with the use of a strip cup.

Managing Milking Does



The pre-dip helps reduce bacteria counts in the milk.

Step 2. Forestripping. Use a strip cup to milk into. This technique is the only method to detect mild clinical mastitis. Early detection of mastitis is important to successfully treat it. The highest bacteria and somatic cell counts are in the teat cistern. Thus, forestripping into a strip cup can reduce bacteria, somatic cell count and identify early stages of mastitis.

Steps in Proper Milking
1. Pre-dip
2. Forestrip
3. Dry teat adequately
4. Attach milking machine
5. Post-dip

Step 3. Adequate drying. Drying of the teats is the most important step in pre-milking hygiene as moisture is a growth requirement for bacteria. Herds that dried teats had a SCC 44,000 cell/ml lower than herds that did not (Moxley et. al., 1978.) Single use paper towels or cloth towels maybe used



Dry the teats with a single use towel.

to dry. The towel must be dry. Do not dry several animals with the same towel.

Step 4. Attach the milker. After the initial stimulus for milk – let down, it takes a period of about 20 – 60 seconds for the response of oxytocin, which influence will last about 5 – 6 minutes. Thus do not stimulate more does than you are ready to attach a machine to within a 2 – 3 minute span. Machines should fit the doe properly and should not slip. **DO NOT OVER MILK.**

Over milking may cause teat end or udder damage.

The production of high quality milk depends on routinely following the proper milking procedure.

Step 5. POST DIP. Use a quality commercially prepared product that is compatible with the pre-dip. The purpose of the post dip is to reduce the bacteria found in the milk film on the teat skin. This is also a fundamental aspect of the control of contagious mastitis.



Post dip helps to reduce the bacteria found on the teat skin.

Managing Milking Does

SOMATIC CELL COUNT

An integral part of producing quality milk is understanding and using the somatic cell count in managing your milking does.

Somatic Cell Count Standards

Goat milk quality standards are based on cow milk Somatic Cell Count standards. Until research provides a better system the goat industry will be required to follow the cow milk standards.

SCC of goats milk can not be directly compared to cows milk. Somatic cells from uninfected cows ranged from 25,000 to 50,000 cells/ml. Somatic cells from uninfected goats ranged from 50,000 to 400,000 cells/ml. The Pyrocinn Y-methyl green stain test

gives good somatic cell counts. Fossomatic results are usually higher and not as useful.



The CMT helps to identify milk with a high SCC.

Somatic cells are an important part of the immune system. They increase in response to infection. The largest influence of SCC is mastitis.

Animals in late lactations have a higher somatic cell count. Thus if the complete herd is in the same stage of lactation, the SCC will run higher for the herd in later lactation. By milking year round and having animals at different stages of lactation, the SCC herd average will be more consistent.

There will be an increase in the number of SCC on the day of estrus for the doe. (Mcdougall et. Al. 2002 JDS 85-378.)

The largest influence of SCC is mastitis.

The SCC of a goat or a herd can be monitored through Dairy Herd Improvement (DHI) records. By testing each month the SCC for an animal will be run. Results of this test will be reported back to the farm. You may receive a separate list of individuals with the highest SCC. Usually the top 20 are listed. Depending on the results the herd SCC may dramatically drop by withholding the milk of only a few animals with the highest somatic cell counts.

Testing and Treating Mastitis

A California Mastitis Test (CMT) should be done on any of the high SCC does. CMT may be purchased from a dairy supply business. By following the directions you will be able to determine if the animal has abnormal milk (mastitis) and should be treated.

It is a good idea to have a bulk tank culture test run before you have problems. This test will identify which bacteria are common to the farm. Your veterinarian will be able to get you the necessary materials so that you can have the

Early detection of mastitis is the key to effective treatment.

bulk tank culture test run. Work with your veterinarian to develop a protocol as to how the farm will handle a case of mastitis. The bulk tank culture test will help the veterinarian decide which mastitis treatment products will work best.

Managing Milking Does

Early detection of mastitis is the key. If the animal goes undetected you will notice milk yield decreasing until eventually the doe has little or no milk on a given half. Depending on the bacteria causing the problem the doe may become extremely ill and die.

If a doe is treated with a drug for which the milk must be withheld, develop a protocol so that everyone who milks knows that this doe was treated. One possibility is to use red leg bands. Put one securely on each hind leg. Does have been known to remove them. Then keep records of the does that you treat and with what product. Develop a system in which the record book is handy so that this information is readily recorded.

Purchase a devol snap test if your milk processor will not test a sample from your treated doe. Even if you withhold milk all of the required milkings you may find a doe that is still carrying some residuals. Only when a sample reads negative can it be put in the tank.

Information regarding milking procedure and SCC was taken from the presentation "Producing High Quality Goat Milk" Pamela Ruegg, DVM, MPVM UW – Madison.

DHI RECORDS

To manage your herd effectively, you'll need to develop a record keeping system that tracks the information you need and is user – friendly. Good sound economic decisions are based on good records.

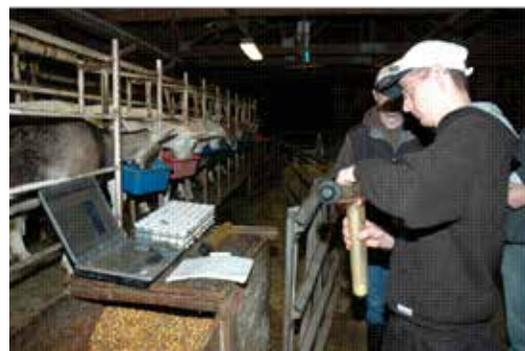
DHI (Dairy Herd Improvement) records have many options available to the farm manager. DHI

will provide information on the pounds of milk produced for the milking, the current lactation or previous lactations. Other basic information includes pounds of butterfat, pounds of protein, and the somatic cell count. If the milk goes directly from the goat to the bulk tank via the pipeline, the farm manager does not have a good idea of the amount of milk the doe produces. The size of the udder can be deceptive.

DHI also has an on-line program with many options. For example, the test sheet indicates the number of days the doe has been milking, the buck the doe is bred to, and the breeding date. The DHI online records allow for tracking birth date, sire, dam, health records, and much more.

Since most of the plants pay on butterfat and protein, knowing which does and doe lines have high components will help make sound culling and breeding decisions.

Good, sound economic decisions are based on good records.



DHI records have many options available to the farm manager.

Managing Milking Does

ULTRA SOUNDING THE DOE

About 30 days after does have been bred they can be ultra sounded to determine whether or not they're bred. The veterinarian charges by the hour for this service. You can keep track of when specific animals are ready for a pregnancy check with the user-defined reports feature of DHI.

Using an ultra-sound, the veterinarian will be able to identify how old the fetus is, whether or not the doe is bred or open, if the doe has any pregnancy difficulties, and how many fetuses she is carrying. Upon completion of the ultra sounding all data is entered into the DHI system. The dairy herd manager can treat the does which have a problem breeding back. If does have been pen bred, an estimated kidding date can be determined.

THE DRY DOE

You will also need to develop a protocol for drying off the milking doe. Another user defined report that can be generated from the DHI records is the dry-off list. A milking doe should have an eight week dry period. If the dry period is too short the quantity of milk produced in the next lactation will be reduced.

If the doe is not bred she should not be dried off even if her milk production has decreased substantially. If you dry off a doe that is not bred, she will be out of production for at least six months. If you do not dry off the doe when she should be dried off, she will not produce as much milk in her next lactation. Some heavy production does can produce a large amount of milk right up to kidding. Thus the volume of production isn't an indicating factor necessarily of whether or not they should be dried off.

Do not routinely treat all does for parasites as this will lose the efficacy of the worming medication used on the farm.

Managing Dry Does

To dry off a doe, milk her every other milking for 3 to 4 days. Then stop milking her. You may want to treat the doe with a dry treatment. The purpose of the dry treatment is to clear up any existing infections and to prevent new ones.

Work with your veterinarian to decide which type of dry treatment best fits your situation. A shot of BOSE may be given at this time. Again, work with your veterinarian to determine the dosage and whether or not it is a sound management practice for your herd.

At 14 to 21 days before she kids a doe's ration should be changed to a steam up ration.

At three weeks prior to kidding each doe should be vaccinated with tetanus and enterotoxemia C & D bacterin injections to build immunity for the fetus. As you are drying off your doe it is a good time to take fecal samples and evaluate them for parasites. Only does carrying heavy infestations of parasites should be treated. Do not routinely treat all does for parasites as this will reduce the efficacy of the worming medication used on the farm. Move does from the milking herd into the dry herd in groups. It is less stressful on the does.

Feeding the Dry Doe

The dry doe's feed requirements are different from a milking doe's. She is no longer producing milk but the fetus(es) are growing rapidly in her womb.

Managing Milking Does

During this eight week dry period the amount of grain will be reduced. Forage should be free choice with an ample clean fresh water supply.

At 14 to 21 days before she kids a doe should be switched to a steam up ration. The purpose is to transition her from the dry ration to the milker ration. If the dry doe goes directly from the dry ration to the milker ration she may go off of feed.

The transition ration will also help to prevent milk fever. Though a young doe can easily pull the extra calcium that she needs immediately out of her bones, the aged doe has more difficulty quickly extracting calcium from her bones.

The transition ration also helps to eliminate the stress of switching from one feed to the next. Having all feeds pelletized will prevent the does from picking up changes that would be in the texturized feeds. The feed nutritionist or consultant can develop feeding protocols for the farm.



Attention must be paid to the proper feeding of the dry doe.

COST OF PRODUCTION

Determining your costs of production is a critical step in the farm operation. Begin by determining what it costs the farm to produce 100 lbs. of milk.

The price that is given for milk is for 100 pounds. Thus if the price of goat's milk is \$27.00, you will receive \$27.00 for every 100 pounds you produce or \$.27 per pound.



The future productivity of a doe depends on her care as a fetus and newborn kid.

The method by which each plant determines the price paid for milk is a bit different. Spend some time with your plant's field representative until you fully understand their pricing system. This will be helpful when making management decisions.

Some plants have a two-tiered pricing system. A higher price is paid for winter milk than for summer milk. Each plant may vary a bit on what they consider summer months and winter months.



To determine your profit you must know your cost of producing 100# of milk.

Managing Milking Does *Managing Feed Costs*

To manage feed costs effectively, grain should be fed to the does based on output, age, and condition. The chart below uses the daily weight of milk fat and milk protein to set grain amounts. The system is 7 times the daily fat and protein output from the DHIA reports.

Most does are within .2 – .4 # fat and .1 – .3 # protein. This puts grain fed at 2 – 5# per day.

The chart assumes that each doe will be at three different grain levels during a 10 month lactation. The top two lines are helpful in planning as about 90% of a doe's output will probably be shipped in the lactation. The cost on the bottom line is the feed cost based on the # actually shipped. This number would be more or less if the herd ships a higher or lower % of the DHIA number. Grain levels can also be set at 1# of grain per 3# of milk.

Grain Amount Based on Fat/ Protein Weight

Production Fat and Protein=6.3	1300	1500	1700	1900	2100	2300
Pounds shipped	1235	1425	1615	1800	2000	2200
Grain Use	800	800	950	1000	1050	1200
Grain Value	\$89	\$89	\$106	\$112	\$118	\$134
Hay Use Daily Peak	4	4.5	4.5	5	5	5.5
Annual hay value	\$84	\$90	\$90	\$96	\$96	\$102
Feed cost annually	\$173	\$179	\$196	\$208	\$214	\$236
Feed cost / cwt milk sold	\$14.00	\$12.56	\$12.14	\$11.56	\$10.70	\$10.73

Managing Milking Does *Developing a Cash Flow Statement*

A cash flow statement should be developed for the farm operation. Other expenses besides feed should be taken into account. A farm trainer from

a technical college or the county agent will be helpful in developing this statement. Include the following information in this statement.

Cash Flow Statment

Income	Expenses
Milk sales	Feed (If you grow your own , use the cost of purchased feed)
Kids	Bedding
Cull does	Transportation of milk
Other Income	Veterinarian
	Breeding
	Milking supplies
	Machinery
	Machinery repair
	Hired Labor
	License Fees
	Office Supplies
	Miscellaneous
	Fixed Costs
	Electricity
	Taxes
	Loan payments
	Insurance
	Maintenance
	Depreciation
Income Total=	Expenses Total (Expenses + Fixed Costs)=

Income minus Expenses minus Fixed costs equals return to labor and management

Managing Milking Does DOE MANAGEMENT CHECKLIST

1. Breed(s) of choice are:
2. Basic doe information reviewed.
3. Fresh Doe Basics.
4. Feed nutritionist balance ration
5. Forage samples
6. Animal Comfort
7. Quality Milk Production
8. Proper Milking Procedure
9. SCC information
10. Record Keeping System
11. Ultra Sound
12. Dry Off.
13. Feeding the dry Doe.
14. Cost of Doe / Profit

Breeding and Kidding

Compiled by Clara Hedrich and Dan Considine, Consultant

BREEDING PROTOCOL

To maximize production, you first need to develop a breeding protocol for the farm. A good breeding protocol will help you manage your herd to keep them healthy and productive.

A breeding protocol identifies when a doe will be bred based on number of days in milk and pounds of milk being produced. It includes criteria for culling does and selecting a buck. DHI records provide easy access to the majority of the information needed for developing the breeding protocol.

Give some thought to the maximum number of does that you will breed in a given month. Remember five months after breeding, the does will be kidding and the farm's labor, facilities and management will need to care for the number of kids born. If the goal is to milk year around, planning must be done for year-round breeding otherwise the farm may have little or no milk during the months of January and February.

BREEDING SYSTEMS

When planning for breeding on your farm, you will need to decide what breeding system you will use. There are four primary systems to consider. They include hand mating, pen breeding, Artificial Insemination (AI), and out of season breeding.



Hand mating

Hand mating is selecting the buck for the doe and mating them. With this system, the exact breeding date can be recorded, a mating can be planned, and it is obvious whether the buck actually bred the doe. This system is more labor intensive than pen breeding and relies on the manager to identify the doe in heat and complete the mating.

Pen breeding

In pen breeding the buck is placed in a pen of does. Pen breeding is less labor intensive than hand breeding. The buck will identify the does in heat and breed them. If two or three does are in heat on the same day, the buck may single out one and not breed the others. The farm manager may be able to record some breeding dates. Ultra sounding the does will give due dates of pregnant does and identify open does.

If you are using a yearling buck, there should be no more than 10 – 25 does in the pen. A mature buck can be placed with 15 – 40 does per pen. In pen breeding, two different breeds of bucks maybe put in the same pen. This technique assures that at least one buck will breed and hopefully both.

Breeding and Kidding

However, if there are breeding problems with a buck, they may not be identified until several months later. Using, for example, a Nubian and an Alpine buck in the same pen will allow the identification of the sire of the kids. When crossed with another breed, the Nubian will produce airplane ears.



Artificial Insemination

Artificial Insemination (AI) offers the opportunity for superior genetics to be used on the farm that may not be readily available in a live buck. The farm manager will need to develop the skill of AI because there are not technicians in the area available to breed the does as in the cow industry.

AI is a learned skill and is labor intensive. Two factors are key to the success of AI. One is proper technique and the second is placing the semen in the does at the correct time. Unless the farm manager has this skill prior to starting the goat dairy, it is recommended to plan for the use of AI in the breeding program after a few years down the road. Use AI when your schedule allows a gradually increasing number of does to be inseminated as success and experience allow.

Out of season breeding

Out of season breeding will need to be used to increase winter milk production. Does are seasonal breeders and come into heat when the day length is decreasing. They will generally start cycling in late August through the end of January. Keep in mind that a few does may naturally cycle as early as the end of July and a few may cycle as late as February. Does can be brought into heat out of their normal season either by exposing them to artificial light or through the use of hormones.



Artificial lighting

To cause a doe to cycle out of her normal season, artificial light is used to simulate the length of summer days. To cause does to cycle in April or May, give does 20 hours of light starting January 1 for a minimum of 8 weeks. Borrow a light meter from your electric company and check the light intensity in the pen at the doe's eye level. The light intensity should be at least 70 lumens. If the light intensity is too low, the number of does that will cycle out of season will be minimal. If the light intensity is excellent 60% or more of the does will cycle out of season. Also, check for dark areas in the pen.

After 8 weeks, turn the lights off. Make sure that the does are exposed only to natural daylight. At night the building must be dark; even a yard light shining in will affect results. The does will cycle

Breeding and Kidding

4 - 6 weeks after the lights have been turned off. This system is easiest used with a separate building. The pen breeding system should be used so as not to miss any does in heat as out of season heats are generally not as obvious and are of shortened duration.

The bucks that will be used for out of season breeding must be put under lights also. If the buck is not put under lights at the same time the does are, they most likely will not be prepared to breed when the does are in heat.

Hormones

Does may also be brought into heat by the use of hormones. Currently the use of Cydr's and PG 600 to heat synchronize does has not been approved by the FDA to be used in the United States. The FDA is in the process of approving these hormones for heat synchronization in does in the United States.

By using out of season breeding and having does kidding year round, does within the herd will be at different stages of their lactations. In addition to providing you with year round milk production, this will be a factor in helping to maintain a lower somatic cell count (SCC) for the herd. Since does tend to have a higher SCC at the end of their lactation, breeding year round will tend to give you a lower herd SCC at any one point in time.

BREEDING YOUNGSTOCK

Yearling does may be bred in the first year at about 7 to 10 months of age, depending on the breed. The does should be of good size and body condition. They should weigh at least 70 to 80

pounds. Body weight relative to breed is more important than age and can influence lifetime performance. Does should not be too fat or too thin as this may cause breeding problems.

It may be advantageous to breed does at 10 to 12 months of age if they will need to compete with adult does when they enter the milking herds. The disadvantage of waiting to breed at 12 months is the additional cost of raising the doe with no return.

The doe kid may be able to conceive at three months of age but should not be allowed to do so, as her growth may be permanently stunted. To prevent this, buck kids should be separated from doe kids at an early age.

The Doe's Heat Cycle

An understanding of the signs of estrus and close observation is the best way to determine when a doe is in heat.

Signs of heat (estrus) include:

- Swelling and redness of the vulva
- Head butting
- Mucus discharge (may become white toward the end of estrus)
- Tail twitching
- Increased bleating (vocalization)
- Frequent urination

Breeding and Kidding

Standing or riding are not seen as heat signs in goats as often as cows. The presence of a buck in or at a neighboring pen stimulates does to express signs more obviously.

Decide when to observe the does for signs of heat. Observation around feeding and milking times is undesirable, because the does are not necessarily concentrating on estrus then. Find additional times during the day to observe them.

If the herd is not separated and a buck is allowed to run with the milking herd, the does that kidded out of season in the fall may cycle later in the same season and be bred back. Take precautionary measures to prevent this. The doe should not kid twice in the same year as it is too stressful on her system and her milk production will be reduced.

The introduction of a buck can have the effect of natural synchronization of estrus in does. This phenomenon distinguishes goats from cattle and appears to be due to keener senses of perception and a more nervous nature. The natural synchronization of estrus can have the advantages and disadvantages of synchronized kidding. However, when a buck is placed in a pen with too many does, you may overuse a male in too short a service period.

The buck effect works best during in-season breeding. It is a natural way to heat synchronize a large number of does. To use it effectively, the bucks must be penned out of the sight and smell of the does. When the buck is introduced to the does, the sudden sight and smell of the buck will trigger the heat cycle in a number of does.

Estrus (heat) lasts from 12 to 48 hours, averaging 36 hours. Ovulation occurs 24 to 36 hours after onset of heat. Goats should be bred naturally once 24 hours after onset of heat or, if conservation of the buck is not a consideration, every 12 hours until the receptive period is over.

If artificial insemination is being used, it is recommended that you breed twice. Does' heat cycles are 21 days in length. However, considerable variation between individual does exists without any abnormality. The recurrence of estrus cycles should be fairly consistent in an individual animal. A doe with an unusual cycle length of 35 to 40 days should be suspected of embryo loss and should be placed under careful observation. Second estrus breeding usually produces more kids.

A buck must be prepared for the breeding season with good nutrition, parasite control, foot trimming etc. A pre-breeding genital exam should be carried out with examination of the testicles for any abnormalities. The testicle should be plump, firm and symmetrical. If any abnormalities or problems are suspected, a semen evaluation should be carried out. Many systemic debilitating diseases including arthritis, foot rot, and scrotal infections can affect fertility of bucks.

Resource: Extension Goat Handbook Reproductive Management. E.L. Bliss, University of Florida, Gainesville; EA Oltenacu, Cornell University Ithaca, NY and R.S. Ott, University of Illinois, Urbana.

Breeding and Kidding

THE PREGNANT DOE

Pregnancy diagnosis should be done to ensure pregnancy has occurred and if not, the situation corrected before the end of the season. Gestation in goats is 150 days.

The use of ultrasound to determine whether or not the doe is pregnant is an effective method. Ultra sounding can also identify other breeding problems. For instance, if a breeding date was not recorded at breeding time, an approximate date can be determined by ultrasound so the doe may be properly dried off.

However, goat owners should keep in mind that an animal detected as pregnant may later lose the fetus. Goats may be more susceptible to abortion than cows particularly during periods of poor nutrition.



There are only a few reproductive diseases that are a problem in goats. Brucellosis caused by *B. melitensis* is not found in the United States although it is a problem in other parts of the world. Goats are resistant to *Brucella abortus*, the brucellosis of cows, thus it is not a problem. Enzootic abortion, a chlamydial infection causes abortions.



Characteristically, 80 percent of abortions occur in first and second freshners and 3 to 4 weeks before normal kidding. Natural immunity develops and vaccination programs are effective in problem areas. Whenever an abortion occurs consult your veterinarian.

THE DRY DOE

The pregnant doe should have a 45 – 60 day dry period prior to kidding. They should be improving in condition for the last month before kidding. During the last three weeks, a steam-up ration should be fed so does can easily transition to the milking doe ration. Nutrition must be carefully managed to provide the necessary nutrients so that metabolic disorders such as ketosis and milk fever do not occur.

Work with your veterinarian to determine a vaccination schedule for your herd. Generally, does should be vaccinated with CDT and other vaccines as needed three weeks prior to kidding. Work with your veterinarian and feed nutritionist to determine if a selenium shot (BOSE) is a necessary management practice for your herd. If so, administer the selenium shot as directed by your veterinarian.

Breeding and Kidding

During the one month prior to kidding the parasites within the doe are most active. The FAMACHA System is a tool that can help you to quickly identify does that need to be treated for worms. Do not automatically treat all does as a number of does will not need to be wormed. Treating all does is expensive and helps the parasites build up immunity to the wormer.

Another method of determining the parasite load of a doe is to take a fecal sample from the doe and send it to a lab. Work with your veterinarian to determine the best wormer to use for your does and the correct dosage. The dosage rate listed on the label of a wormer for sheep and cattle should generally be increased by 1 ½ times to 2 times when used for a goat. A goat's metabolism is faster than a cow or sheep's so a goat dosed at the rate listed for cattle or sheep will be under dosed. Knowing the weight of the doe is critical to determine the correct dosage. A weight tape works well for this.

THE KIDDING DOE (PARTURITION)



Your attendance at kidding can be life saving. The fetus acquires the capacity for extra uterine life only shortly before term, and may die in utero if parturition is unduly delayed.

As kidding time approaches, the udder rapidly enlarges, the pelvic ligaments relax around the tail head, and the vulva becomes greatly enlarged. Eight to 12 hours before birth, the cervix begins to dilate and the cervical mucus plug will be in evidence, as a sticky substance. The first stage of kidding lasts 1 to 6 hours. It is very important to ensure that the doe kids in a clean space.

You will also note that the doe has moved away from the other does, will stand up and lay down more often, and at times seems to be making sounds to her belly. If progress stops, a vaginal exam with a clean, well lubricated exam sleeve is in order.

Normally the fetus enters the birth canal and the doe starts an abdominal press. The chorioallantoci sac is ruptured and the unbroken amniotic sac (water bag) is then forced through the vulva. Delivery of the kids usually occurs in a short time once the water bag can be viewed. Kids may be presented either with their front feet forward or in posterior presentation where their rear feet are presented first. The doe may rest between each kid for a short period of time. Most does are best left alone during parturition.

If labor is prolonged for more than one hour with no progress, a vaginal exam is again needed. With multiple births, more than one fetus may be lodged in the pelvis. Careful sorting is necessary before delivery is possible. The goat's uterus is very fragile and prolonged manipulation may result in uterine rupture. "Ring womb" occurs when,

Breeding and Kidding

with prolonged labor, the cervix begins to contract, making delivery impossible. Call your veterinarian when major problems arise.

After parturition, the doe should begin to lick the kids and she may eat part of the fetal membranes. There is no evidence for benefit or harm from ingestion of the fetal membranes. Normal kids will start trying to stand up immediately and should be on their feet and nursing within a short period of time.

For the purpose of disease prevention, kids should not be allowed to nurse directly. Kids should be removed from their dams and fed heat treated colostrum and then pasteurized milk. Milk the doe out as soon as possible after kidding. The first milk is colostrum and should be heat treated and fed back to the kids. The second milking will still include some colostrum. It is not until at least the third milking that the milk can be placed into the tank; some does may need a few more milkings before their milk is clear of colostrum.

Retention of the fetal membranes, a condition not uncommon in cows, seldom occurs in goats. A retained placenta should be treated conservatively with the exposed portions clipped off. The placenta is discharged naturally in 3 – 5 days if not normally expelled within 6 hours after kidding. Systemic antibiotics are indicated only if the doe shows signs of illness or it takes more than one day for the placenta to be passed.

Thorough disinfection of pens after each delivery is important for successful reproductive management. The fresh does will normally discharge a deep red, mucus-like material called

lochia for 7 to 14 days postpartum. Large amounts of bright red blood, foul smelling exudate, or pus are all abnormal. If abnormal discharge appears, consult your veterinarian.

The doe will come into milk production in the next two to three days after kidding. She should be monitored closely after kidding to catch any early signs of health problems as a uterine infection or milk fever.

Managing Milking Does

BREEDING AND KIDDING CHECKLIST

Use the following checklist to develop your breeding and kidding protocol.

1. BREEDING PROTOCOL

- Number of days in milk at which a doe should be bred
- Number of pounds of milk a doe is producing at which she should be bred
- Criteria for culling a doe
- Criteria for buck selection

2. BREEDING SYSTEMS

- Hand mating
- Pen breeding
- AI
- Out of season breeding
- The buck effect

3. WHAT'S MY PLAN FOR BREEDING YEARLINGS?

4. WHAT'S MY PLAN FOR OBSERVING DOES IN HEAT?

5. DETERMINE IF THE DOE IS PREGNANT BEFORE SHE IS DRIED OFF.

6. CARE OF THE DRY DOE (LAST MONTH OF PREGNANCY)

- Give CDT vaccination
- BOSE if recommended by your veterinarian
- Use of FAMACHA to evaluate for parasites or send a fecal sample to the lab
- Start stem up ration three weeks before kidding

7. DEVELOPMENT OF THE FARM PROTOCOL FOR DEALING WITH THE DOE THAT IS READY TO KID

Raising Kids

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INTRODUCTION

Kid management from birth to breeding is an essential component of the dairy goat enterprise. With the possible exception of the nutritional management of the doe herd, the kid management program has the greatest effect on the long-term productivity of the dairy goat herd. The dairy goat kid at birth represents a genetic resource necessary to replenish the herd gene pool, which has a changing composition due to death, culling and sales for breeding stock.

While the genetic character of the kid is determined at the time of conception, survival to lactation and an adequate body size are necessary to realize inherent genetic potential for lactation. One of the advantages of the dairy goat is the opportunity for rapid genetic progress due to early sexual maturity (breeding is possible at 7 months), short gestation interval (150 days) and multiple offspring per parturition (2.0 or more for mature does).

Kid mortality has a direct effect on genetic progress by its effect on selection pressure, that is, the number of kids, which are available to be retained as replacements. Maintaining low mortality from birth to weaning, while producing a 90 - 110 lb. doe (depending on breed) at kidding should be the primary objective of the kid management program.

As practiced on most dairy goat farms, the kid raising enterprise is highly labor intensive. In order to reduce the characteristic high labor input per unit of milk produced on dairy goat farms,

attention should be given to systems of kid management, which reduce labor while keeping mortality low.

A farm protocol for the selection of kid does that will become replacements for the dairy goat herd should be developed. To advance the herd production and component levels, only doelings from the above average does should be kept. The DHI records will supply this information.

PRE-PARTURITION

The kid management program should actually begin prior to parturition with attention to the nutritional needs of the gestation doe in late-lactation and during the dry period. With a gestation period of 150 days, most of the development of the dairy goat fetus occurs when the nutritional intake of the doe is at the lowest—late lactation and during the dry period.

The tendency is to regard the late-lactation and dry doe as a nonproductive part of the milk-producing system. On the contrary, however, a well balanced diet for the dry doe is essential to producing healthy kids. Depending upon the forage source and size of the doe during the dry period, from one to two pounds of a 14 to 19 percent concentrate ration should be fed daily.

Pregnant does should receive plenty of exercise. An overly fat doe should be avoided, but the high producing doe needs to recover body weight lost during the previous lactation. Clean, cool water and free choice trace-mineralized salt should be available.

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Vaccination boosters for *Clostridium perfringens* C and D and tetanus toxoid should be given not less than 3 weeks prior to kidding. Vitamin E / selenium (BOSE) injections are given during the dry period to prevent white muscle disease in the kids, especially in areas where soils are selenium deficient. Work with your veterinarian and feed consultant to decide if giving BOSE injections are right for your dairy herd. Does should be evaluated at about three weeks prior to kidding to determine whether or not they should be wormed. The Famacha method is an easy way to do this. Remember that not all does will need to be wormed.

The goal for average kid weight at birth should be 6 to 11 pounds. Underweight, weak kids do not do well and require extra care and labor.

PARTURITION

The doe should kid in a clean environment; either a well-rotated pasture or stall bedded with straw or other absorbent material. Prior to birth the kid has been existing in a germ-free environment and parturition represents exposure to common disease organisms to which the mature animal has developed resistance, but are new to the kid.

Watch kidding does carefully

The location of the kidding stall or pasture should be near a well-traveled area in order that the doe will be frequently observed for kidding difficulties. Few adult does require assistance at the time of kidding though problems are always a possibility. First-freshening does should be closely watched,

especially if bred to bucks known to sire large kids.

Clear airways and dip navel cord

At the birth of a kid the first thing to check is whether or not the airways are clear. Clean off any excess mucus. The next two steps are critical to the future health and survival of the newborn kid. The second step in the care of the new born kid is to dip the navel cord in a solution of 7% tincture of iodine to prevent entry of disease causing organisms through the navel cord and directly into the body of the kid. The navel cord is a direct route to the stomach. If necessary, a long navel cord can be cut to 3 to 4 inches in length. A bleeding cord should be tied with surgical suture material. If no surgical material is available, dental floss may be used in its place. Dipping of the cord in iodine not only prevents entry of organisms but promotes rapid drying and the eventual breaking away of the cord from the navel. If the navel cord is not dipped in tincture of iodine, the kid may develop navel ill. Death may follow, though penicillin can save some infected kids.

Feeding Colostrum

The third critical step is the feeding of colostrum milk as soon after birth as possible. The colostrum, or first milk, contains antibodies, which the doe doesn't pass to the fetal kid in utero. Consumption of colostrum must occur as early as possible and prior to 18 hours after birth as there is a rapid reduction in the permeability of the intestinal wall of the newborn to the antibodies. These large gut openings close up within 24 hours to protect the kid from foreign infection.

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In other words the intestinal wall of the new born readily absorbs these necessary antibodies and its ability to do so rapidly decreases until it can only absorb a low level of antibodies. Thus the newborn needs to receive this antibody rich colostrum as soon after birth as possible. The longer the delay for them to drink the colostrum the fewer antibodies their system will absorb and the less chance they have of fighting off infections. If a newborn does not receive colostrum, their chances of surviving beyond two weeks is minimal. Colostrum can provide the newborn with immunity protection and immune support for weeks to come (3-8 weeks depending on the disease).

(Note: if you get your colostrum from other farms, the antibodies won't be for the same strains of diseases on your farm.)



A colostrum meter is used to test the level of antibodies in the colostrum. Before colostrum is pasteurized it should be tested.

The colostrum not only provides antibodies; it also provides nutrition and serves as a laxative. The first bowel movement is meconium (like a sticky black tar). The meconium is the leftover material from when the kid was in the amniotic sac.

The colostrum should be bottle-fed to the newborn to insure adequate consumption. The doe should be milked as soon as possible after parturition. Use a colostrum meter to test the level of antibodies in the colostrum. If the colostrum has a low level of antibodies it should not be used. Feed 1 ounce of colostrum per pound of body weight three times during the first 24 hours. An 8 pound kid should get 8 ounces every 8 hours. *(Mary Smith, DVM "Managing Kidding & Lambing", 2005 Cornell Sheep & Goat symposium.)*



There are three readings on the meter in which the colostrum may fall. If the meter is green the colostrum once pastuerized may be fed to the kid. If the meter is red there are not enough antibodies in the colostrum and it should not be fed to the kid. Colostrum in the yellow reading is marginal.

Before the colostrum is fed to the kid it must be heat-treated. To heat treat colostrum put it in a double boiler type pasteurizer. The colostrum must be heated to 135 degrees F to 145 degrees F and held at that temperature for one hour. If you heat the colostrum to a higher temperature it will turn the consistency of yogurt or pudding.

If the kid is refusing to drink, after 2 attempts 3 – 4 hours apart, stomach tube the kid, give them no more than 4 oz. at a time through this method. Remember if a kid does not receive colostrum its

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chances of survival are severely reduced.



Before the milk is removed from the pasteurizer take the temperature of the milk to assure it has reached the correct temperature.

Colostrum is heat treated to kill any harmful bacteria. Two major diseases may be passed from the doe to the kid through the colostrum. These two diseases are Caprine Arthritis Encephalitis (CAE) and Johne's. Any excess colostrum can be frozen and used in the event that a doe has poor quality colostrum or very little.

After heat treating colostrum pour it into plastic bottles. Any extra bottles should be put in the freezer. When a bottle is needed it can be placed in hot water to thaw out and be warmed. The same style of nipple that is on the lamb bar should be used. The objective is to get kids drinking on the lamb bar within two or three days.

The plastic beverage bottle may be reused for a number of feedings. Be sure to wash bottles and nipples thoroughly after each feeding. Preventing

the spread of a disease is much easier than curing



Milk should be stirred occasionally when it is being pasteurized to maximize the killing of harmful bacteria. Heat milk to 161 degrees F and hold it there for 15 seconds.

it.

Steps four and five can be completed while the colostrum is either being heat treated or a frozen bottle is thawing. Line the bottom of a large plastic tote tub with shredded paper. Place kids in



A plastic tote tub works well for new born kids. The tub is easy to clean and sanitize.

the tub. Once the kids are completely dry change their bedding. Depending on your resources either use the shredded paper or shavings. These plastic tubs are easy to clean and sanitize.

Use a neck band that you can write on to ID each kid as to birth date and dam. Record the kidding

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in your record keeping system. (ID kid neckbands can be purchased through a goat supplier such as “Caprine Supply or Hoegggers”).

BIRTH TO WEANING

Raising kids is labor intensive. The use of an automatic feeder or a lamb bar does save labor but some key points must be followed. Under natural suckling kids consume small amounts of milk at very frequent intervals. Ideally, artificial rearing should mimic natural suckling but the constraint of available labor precludes frequent feeding. Nevertheless, kids should be fed up to four times daily for the first two to four days and twice daily thereafter.

Feeding Kids

There are a few key points to remember when feeding kids. Small, frequent feedings increase digestibility and decrease digestive disturbances. Consumption of large quantities of milk may lead to bloat due to entry of milk into the reticulo-rumen or rapid passage of milk through the abomasum and small intestine resulting in diarrhea. A kid will drink less if the temperature of the milk is cool (40 degrees F). Thus if your goal is to limit the amount of milk being consumed at any one time feed it at a low temperature.

Once the kid is suckling from a bottle they should be transferred to a lamb bar or an automatic feeder. If feeding a large number of kids on a regular basis an automatic feeder may be an economical choice for your farm. Milk replacer is automatically mixed on an as needed basis. Thus the kid can eat whenever it wants to. The manager needs to keep a close watch to be sure all kids are drinking.



Measure out the exact amount of milk and / or milk replacer when using a lamb bar so kids are not overfed. The lamb bar does save time when feeding kids.

Another labor saving system of feeding kids is using the lamb bar. There are ten nipples on a lamb bar. Therefore only 8 to 10 kids should be placed in each pen. When filling the lamb bar add only enough milk to feed the kids in the pen. Pour a maximum of 16 oz. of milk / milk replacer per kid into the lamb bar pail. If you have 8 kids in the pen the maximum amount of milk / milk replacer is $8 \times 16 \text{ oz.} = 128 \text{ oz.}$ or 4 quarts. Do not overfeed the kids by pouring extra milk / milk replacer into the lamb bar pail.

During the first week you will find most kids will not drink a full 16 oz. Ten to twelve ounces is more accurate. The best way to tell if a baby goat is properly fed or has drunk enough is by feeling their stomach. If it is hard to the touch they have too much. It should feel full but not hard. If you are not sure, underfeeding a bit is better than overfeeding. Remember if the kid is overfed, they run the risk of bloat. If it is a bit underfed, they do not. But underfeeding continually will also result in kids with slower growth rates.

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Since some kids drink faster than others, the problem arises where the fast drinkers get too much and the slow drinkers do not get enough. If this is a problem separate containers like soda bottles may be placed inside of the lamb bar pail and then each tube is placed in a bottle. Thus, the kid only gets a set amount.

Feeding Milk or Milk Replacer

Step six in raising kids is to determine the most economical feeding system for the kids. By penciling it out, it may be less expensive to feed a kid goat milk replacer than goat milk. A limitation to the use of milk replacer is the tendency by manufacturers to substitute whey for skim milk as a protein source. Whey is high in lactose which causes bloat and scours in young kids.

Work with your veterinarian and feed nutritionist to find the best milk replacer to meet your needs. A calf milk replacer has been formulated to meet the needs of a calf which consumes considerably more than a kid. Although a kid and lamb will consume about the same amounts, the lamb milk replacer has been formulated for the lamb which has a few different nutritional needs than does the kid.

The farm manager will need to decide how a milk replacer best fits into their feeding plan. Milk replacers should be 16 – 24% fat and 20 – 28% protein with milk-based proteins. (Small Ruminant Dairy Newsletter, *Winter 2007 Carol Delaney University of Vermont.*)

One system is to feed pastuerized goat's milk for

the first week or two then transition to about 50% milk and 50% milk replacer and then after four weeks or so to solely milk replacer.

DO NOT OVERFEED.

Other options include feeding pastuerized goat's milk until weaned, feed pastuerized goat's milk the first couple of days and transition to a milk replacer, feed pastuerized goat's milk the first week or two then mix a certain percentage of milk replacer with the goat's milk until weaned. The temperature at which the milk and or milk replacer will be fed at needs to be decided. Kids will drink more if the milk or milk replacer is warm 103 degrees F (and slower and or less if the milk and or milk replacer is cooler than that.)

When feeding a milk replacer it is very important to follow the exact directions of the manufacture, including the correct temperature of the water used for mixing it. If the milk replacer is not mixed at the correct temperature, the resulting product will not be properly digested by the kid's digestive tract.

You may chose to feed cow's milk to the kids. Find out if the dairy cow herd is Johnes free. Johnes may be passed from the cow's milk to the goat. Pasteurize the milk if in doubt. Also, beware that kids are more likely to scour on cow's milk.

To pasteurize goat's milk, heat it to 162 degrees F. Research on Johnes has shown that stirring the milk on occasion does help to insure that the toughest bacteria is killed. Before taking the milk out of the pasteurizer, always check the

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temperature of the milk. If just one time the milk is not properly pasteurized, the organisms that cause CAE or Johne's have now been fed to the kids.

Weaning

Kids can be weaned as early as six weeks and ideally not more than eight weeks old.

Determination of weaning is based on the amount of grain and water the kids are consuming. The most important consideration when deciding when to wean a dairy goat kid is whether or not the average daily consumption of concentrate and forage is adequate for growth and development to continue in the absence of milk. Fixed weaning ages are less desirable than weight goals such as 2.0 to 2.5 times birth weight.

Dry feed consumption is important in developing body capacity. At ¼ pound of grain per day kids will wean well. Kids eating only hay but no grain will not wean well. By increasing body capacity, feed intake and digestion increase. Research has shown that at two months of age a weaned kid has a reticulo-ruminal capacity five times as large as suckling kids of the same age.

Place a small amount of grain in a feeder for the kids within two weeks of age. When the kids are eating grain well, introduce a hand full of hay. The rumen is not fully developed and operating until two months of age. Work with your nutritionist to develop the best feeding program for your kids. Coccidiosis is naturally in the environment and thus your kids will have some. Hopefully, it will be at a low level and will not result in a problem. You may have medication placed in the feed to

prevent coccidiosis. If feeding a calf starter the amount in the starter is formulated to treat calves and not kids.

Housing

Kid housing will be further discussed in the unit "Facilities and Equipment". A few key points to remember when designing pens for kids:

- Do not overcrowd kids.
- Keep the pens dry and draft free.
- Design the pens so the ammonia from the urine does not become trapped within the pen.

Proper ventilation will prevent respiratory problems. Keeping pens clean and dry will help to eliminate other health issues. An excellent nutritional program will not make up for unsanitary, poorly ventilated, drafty environments.



Kids should be disbudded between 3 and 14 days of age, while the horn bud is visible.

Disbudding

Kids should be disbudded between 3 and 14 days of age, while the horn bud is visible. Use an electric disbudder. If the farm manager does not

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know how to disbud, work with your veterinarian or another dairy goat farmer to develop this skill. Disbudding kids at this age is a lot less stressful than dehorning them later. Kids are disbudded to prevent injury to other goats and to those who work with the goats. Horned goats are more likely to get caught in fences and feeders.



Clean the ear with alcohol, rub on the ink, tattoo the ear, roll on more ink, and then work the ink into the tattoo with a toothbrush.

Kid Identification

If the goal of the farm is to keep replacements from above average does and sell the extra does a protocol needs to be developed as to how these kids will be identified. Permanent identification



The electric dehorner is used to dis bud kids.

also allows the tracking of animals for health purposes and genetics.

Tattooing the kids within two weeks of age will allow for permanent identification. A management decision that will need to be made is whether or not to register the animals. If animals are registered, the farm tattoo is placed in the right ear and the animal tattoo in the left ear. The farm tattoo that is on file with a goat registry may be used for animal identification instead of the scrapie ear tag.

When an animal is sent to market, a scrapie ear tag will need to be placed in the ear or tail (if a Lamancha). If under six months and going to slaughter, they do not need a scrapie ear tag. If they are over 6 months, they need a tag.

Vaccinations

At three weeks of age, kids should be vaccinated for Clostridium perfringens CD and also tetanus. A booster should then be given two weeks later. Consulting with your veterinarian will determine if you need to vaccinate for anything else that may be a problem in your herd.

Buck Kids

A major management decision that will need to be made is “How to manage buck kids?” Explore your options and make the best management decision for your operation. Buck kids to be slaughtered under two months of age do not need to be castrated. If meat goats are to be kept until an older age, castrating can be done at two to four weeks of age.

Some options to consider include:

Selling buck kids at birth to another farm to

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- raise.
- Allowing the buck kids to run with the does and then sell them when they reach 20 to 40 pounds. Remember that kids easily get into feeders and can become a nuisance when the goal is to have your dairy goat herd eat non-contaminated feed.
- Raise the kids yourself. This may be an option if you have the labor and space available.

Before you make a final decision on buck kids explore the available markets in your area. Which option is the most economical?

WEANING TO BREEDING

The objective of raising the dairy goat kid should be to produce a lactating animal with an adequate body size as inexpensively as possible and in the shortest possible time. For the heavier breeds (Saanens, Alpines, Nubians), the goal should be a 110 pound doe freshening at 12 months of age. The lighter breeds (LaMancha, Toggenburg, Oberhasli) should reach 90 pounds in a similar timeframe.

If a doe is weaned at 8 weeks, weighing 20 lbs and is to kid at 12 months at 110 lbs, then she must gain 90 lbs in 10 months or approximately 1/3 lb daily. Therefore, the nutritional program must aim for a growth rate of approximately 150 gm daily with consideration for both the nutritional requirements of the growing doe and the growing fetus over the 5-month gestation period. If does are freshening at 15 to 20 months, then the proper size is more easily attained with less grain feeding.

Forage must constitute the core of an economical

diet for growing dairy goat kids with mixed concentrates or simple grains fed to provide the nutrients that are not provided by the forage consumed. Forage quality is, therefore, very important but because the dairy goat is a browsing animal, it is quite difficult to estimate. Leaves and young stems chosen by browsing animals have crude protein and digestible energy values higher than the average for the whole plant. The kid grazing on improved pasture, browsing in woodlots or consuming alfalfa hay is able to select plant parts which have a higher nutritional value than laboratory analyses of the forage samples might show. In order to formulate a program of supplementation on a forage-based diet, given the ability of the dairy goat to selectively browse one must estimate what the kid is actually consuming rather than what is available.

Fresh water and exercise are also important in the post weaning period. Attention must be given to control of internal parasites, especially coccidiosis. Treatment of kids with a coccidiostat, either liquid or solid, should begin at 3 weeks of age and continue at proper intervals through the post-weaning period.

Hooves should be trimmed frequently to assure proper development of the hoof. If the farm manager has no experience trimming hooves consult your veterinarian or your mentor dairy goat farmer for assistance.

Raising Kids

SUMMARY

There are a variety of management techniques available for raising healthy replacement dairy goat does and bucks. Selection should be based upon efficient use of available resources and development of a healthy doe of adequate bodyweight ready to produce an economical level of milk at 12 months of age. Particular attention needs to be paid to the system of feeding pre-weaning due to high labor requirement for raising young kids.

Stress and disease-causing organisms often interact to produce high kid mortality. Cleanliness, proper nutrition and a good herd health program are the best ways to prevent such losses.

Resources used "Extension Goat Handbook – Management – Birth to Breeding" by J.A. Yazman, Winrock International Livestock Res. Train. Ctr. Morrilton, Arizona and L. Turillo, Cornell University Ithaca, NY.

Raising Kids

COST OF RAISING A KID FROM BIRTH TO WEANING

Use the following guideline to help determine the cost of raising a replacement doe on your farm. Fixed costs as electricity, mortgage payment, the cost of producing your own feed are not included and those specific costs for your farm should be included when determining the final cost of raising a doe or buck on your farm.

0 TO 2 MONTHS	
\$	Milk Fed.
\$	Milk Replacer Fed
\$	Bedding
\$	Grain
\$	Hay
\$	Medication
\$	Coccidiostat
\$	Labor Time spent feeding / caring for kids.
\$	Disbudding
\$	Tattooing
\$	Vaccinations
\$	Misc.
\$	Subtotal 0-2 months
2 TO 6 MONTHS	
\$	Grain Mix
\$	Hay
\$	Labor (Hoof Trimming etc.)
\$	Medication
\$	Worming
\$	Subtotal 2-6 months

6 TO 11 MONTHS	
\$	Grain Mix
\$	Hay
\$	Labor (Hoof Trimming etc.)
\$	Wormer
\$	Medication
\$	Breeding fee
\$	Pregnancy check
\$	Subtotal 6-11 months
11 TO 12 MONTHS	
\$	Grain Pre-Fresh
\$	Hay
\$	Wormer
\$	Medication
\$	Labor (Hoof Trimming etc.)
\$	Vaccinations
\$	Subtotal 11-12 months
\$	Subtotal 0-2 months
\$	Subtotal 2-6 months
\$	Subtotal 6-11 months
\$	Subtotal 11-12 months
\$	Total cost of raising kids 0-12 months

KID RAISING COSTS BASED ON 2008 PRICES

MILK REPLACER \$70.00 FOR 50#

8 weeks on all goat milk 120# @ \$30.00 cwt \$36.00
 milk replacer -or- ¾ goat milk and ¼ \$34.00

-or- all replacer 133# @ \$20.00 cwt \$27.00

Starter at ¼ - ½ #/ day 45 days @ 17 cents \$ 3.00

Starter hay to 60 days \$ 1.00

Total at weaning
\$40.00 \$38.00 \$31.00

Raising Kids

14% grain ration 1 – 1 ½ # / day 420 days @ 9 cents \$60.00

Hay 2# 245 days @ 6 cents \$21.00

Hay 3# 210 days @ 4.5 cents \$27.00

milking **Total weaning to**
\$108.00

Labor cost estimated 2 hours per kid to weaning \$16.00

Labor cost 2 – 17 months estimated 6 hours per doe \$48.00
(Includes feeding, vaccinating, worming & feet trimming)

If 0% up to milking loss using goat milk & replacer **\$210.00**

If up to weaning loss is 10% and 80% after **\$216.00**

If up to weaning loss is 15% and 80% after **\$220.00**

Raising Kids

CHECKLIST FOR RAISING KIDS FROM BIRTH TO WEANING

Goal #1: Maintaining low mortality from birth to weaning while producing a 100 pound doe at kidding.

Goal #2: Development of kid management system that reduces labor input but keeps mortality low.

- 1. Development of farm protocol for the selection of kid does that will become replacements.
- 2. Develop a management plan for the feeding and care of the dry doe.
- 3. Dry doe vaccinated with CDT three weeks prior to kidding.
- 4. Famacha method used for evaluation of worm load three weeks prior to kidding and wormed if necessary.
- 5. Pre – fresh diet fed to dry does.
- 6. Check with the veterinarian regarding any additional vaccination that may be specific to your herd.
- 7. Kidding area established for does.
- 8. Procedure developed for the care of new born kids.
 - airways cleared
 - navel dipped in 7% iodine
 - feed colostrum to kid ASAP
 - Test colostrum for quality
 - Pastuerize colostrum (130 degrees F for 1 hour)
- Freeze extra colostrum
- stomach tube if necessary
- place kid in tote tub
- use a neck band to ID the kid
- 9. Decision to use the lamb bar or an automatic feeder.
- 10. Development of a feeding system specific for your farm
 - use of just milk
 - use of a combination of milk and milk replacer
 - start on milk and quickly transfer to milk replacer
 - temperature at which the milk product should be fed.
- 11. If the decision is to use milk replacer, the selection of one that will fit one's needs. (Work with feed nutritionist and veterinarian).
- 12. Development of the protocol for the weaning of kids.
- 13. Introduction of grain to kids at two weeks of age and when eating grain well introduce hay.
- 14. Establishment of a healthy environment in which to raise kids.
- 15. Disbud kids.
- 16. Permanent ID of kids.
- 17. Development of a vaccination program.
 - CDT at three weeks and five weeks of age.

Raising Kids

- _____ Any others specific to your farm.
- _____ 18. Plan for dealing with buck kids.
- _____ 19. Develop nutritional plan for kid from weaning to breeding.
- _____ 20. Protocol for breeding does.

General Herd Health

Compiled and Written by Clara Hedrich, Reviewed by Dr. Chris Duemler

INTRODUCTION

Quality management practices that prevent diseases and health issues are more successful and more economical than the treatment of the disease or health condition. Prevention is easier than the cure.

The first step in developing a quality herd health program is to work with your veterinarian to develop a herd health plan. Putting together a plan for the year will help to keep the herd on schedule for the necessary management practices. Sanitation and timely management practices such as disbudding, dehorning, worming when necessary, and vaccinating on a set schedule will help prevent illnesses and other health issues.



The key to an effective record keeping system is to develop a system that is handy and easy to use.

The second step in developing a quality herd health program is to develop a record keeping system to keep track of health records. An accurate record of any drugs administered will be useful for future reference. An idea is to keep a daily planner in the milk house. As a management practice is performed all pertinent information is recorded. The record keeping system needs to be handy and easy to use in order for it to be used on a regular basis.

DISEASE MANAGEMENT

(Compiled from information from "Disease Management" Extension Goat Handbook C.S.F. Williams, Michigan State U., East Lansing)

It is important to recognize that the principles and problems associated with raising goat kids are no different from those of raising other farm animals. The beginner who is raising only a few animals in a place where kids have never been housed will experience fewer and simpler problems than the person who has been raising large numbers of kids in the same building for many years.

It follows that the system of management used in the early years of raising goats may not give the same results three or four years later, when the kid numbers have increased, and the pens have been in constant use. Pens should be cleaned, sanitized and left vacant for as long as possible between each batch of newborn kids.

Raising kids outside in small portable pens or hutches has been useful in preventing kid losses due to diarrhea, pneumonia, and some other diseases that have become a problem in long established goat herds.

PREPARATIONS PRIOR TO BREEDING

Cull problem goats before breeding. Does with chronic pneumonia and mastitis, disabling arthritis, and poor body condition will not have kids with the best chance of living. These does will serve as a focus of infection for the rest of the herd and the next generation. Cull does who have a history of

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producing kids with problems. Cull poor producers and those with personality traits that make them a nuisance in the herd.



Check with your veterinarian to see if using a selenium-vitamin E supplementation also known as BOSE is an advisable management practice for your herd.

Devote more time to your higher quality and best producing goats. The return on investment of time and money will be greater and efforts more satisfying than being burdened with work on a large number of lesser quality goats.

Keep only as many does as can be fed and cared for properly. Undernourished goats in late pregnancy are likely to develop pregnancy toxemia, and may deliver kids with poor livability. Over-nourished goats have a tendency to do the same thing.

Score body condition on all pens and all goats regularly. Put your hands on your goats, including bucks, to determine if there is too much or too little fat over the ribs. Do not be fooled by thinking fluffy goats are doing well; they may be fluffed up because of weight loss and low blood sugar. Feed goats to desired body condition.

Check with a veterinarian regarding the iodine and selenium status of soils in the area. Goats in iodine deficient areas should have access to loose iodized salt at all times. If not, the kids will be born with goiters, may be born dead or die shortly after birth. In selenium deficient areas, it may be advisable to supplement the goats with selenium, in one or more of the following ways: a.) Use a trace mineral salt or a mineral mix fortified with selenium; b.) Inject the pregnant does with vitamin E plus selenium preparations; c.) Selenium can be incorporated into grain mixes, d.) Inject the young kids with vitamin E plus selenium preparations.

If the necessary supplements are not provided, the kids may die of acute muscle damage in the heart, suffer from muscular weakness, may be especially susceptible to pneumonia, or have difficulty sucking and may inhale milk. Selenium-vitamin E supplementation may prevent losses from various forms of white muscle disease in selenium deficient areas of the US. Selenium poisoning may occur in areas of the country where soil selenium levels are high, so it is important to discuss with your veterinarian the need for selenium supplementation. Extra selenium may be vital, a waste of money, or toxic; depending on the soil in your area of the country.

PREPARATIONS PRIOR TO KIDDING

Plan ahead and buy supplies like vaccine, nipples, iodine, etc. Clean the maternity and kid pens and leave them vacant for as long as practical. If at all possible, try to have another set of maternity pens and kid pens for the second half of the kidding season. This will help to break the buildup of infection in the pens. Kids born late in the season

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will usually give more trouble than those born early in the season. This may be due to disease build-up or that the owner is getting a bit tired, careless, or too busy.

Provide adequate lighting for the goat barn. A 40-watt light bulb covered with flyspecks offers little help in detecting early signs of ill health.

Put kid pens in a draft-free, dry area. Remember, with 10 kids in a pen, each receiving 2 pints of milk, there will be about 2 ½ gallons of urine excreted per day. Kids must stay dry. It's impossible to accomplish this when the bedding is wet.

Heat lamps use a lot of energy, and do not contribute to the health of kids. Hair dryers are better than heat lamps for fluffing and drying the newborns and making sure the hair on the ears is absolutely dry. This is important to prevent frostbite. Healthy, well-fed kids in a draft-free environment do not need heat lamps.

Kid pens should have three solid sides with the fourth side gated and open to the floor. This provides adequate air movement and yet prevents drafts. A design similar to a calf hutch, with an outside pen, is appropriate. Slotted floors with spaces not exceeding 3/8 inch wide may be used for hot weather pens for kids. Avoid construction methods that permit heads or legs to be caught in openings, thus causing broken legs or strangulation. Avoid building any goat structures out of green treated wood or preservative treated wood, as goats will chew wood when they are bored. The green chemicals will kill goats when

ingested. Also, avoid lead-based painted surfaces because these may be toxic or irritating.

Decide, with the help of a veterinarian, what the health program will be for the kids. Devise a recordkeeping system to make sure the program and plan is followed and record which kids received which treatment and what needs to be done.

There are various infectious goat diseases, which may be controlled or reduced by removing kids from their dams at birth, and raising them in facilities, separate from mature animals in the herd.

KID CARE AT PARTURITION

A kid born during a normal parturition seldom needs human help to survive. Kids born during dystocias, or difficult birth, may need help. The most important thing is to clear the mucus out of the mouth and start the kid breathing. Poke a straw up the nose to provoke sneezing. Pinch hard on the skin between the toes or on the ears or the tail. This will usually make a kid scream and in order to scream, it must breathe in first. A kid that is not breathing well will not inflate its lungs properly and will be a candidate for pneumonia.

The umbilical cord should be dipped in a 7% tincture of iodine. This will control infections such as bacterial arthritis (joint-ill) and septicemia, caused by bacteria entering via the cord. The cord can be pinched off to 2 inches in length. Avoid cutting with sharp instruments as bleeding can occur.

- Be sure the kid gets colostrum early.

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METABOLIC AND NUTRITIONAL DISEASES

(Compiled from Metabolic and Nutritional Diseases by D.R. Nelson U. of Illinois, Urbana Extension Goat Handbook)

Pregnancy Toxemia

Also known as pregnancy disease, ketosis, or twin lamb disease. Pregnancy toxemia is a metabolic disease of goats and sheep in late pregnancy. Factors important in the development of the disease are

- 1.) Presence of two or more fetuses
- 2.) Undernourishment during late pregnancy when the fetuses have the most rapid growth
- 3.) Addition of stress such as severe weather, sudden changes in feed, other disease or transportation upon the previous factors.

The disease usually appears in the last 30 days of pregnancy and is more common after the first pregnancy. The doe shows signs of ketonemia, ketonuria, acidosis, and central nervous system involvement. The mortality rate is high in affected animals.

Cause

As pregnancy progresses, an increasing demand is made on the available blood glucose supply of the doe because of fetal development. The principal source of energy to the fetus is glucose and utilization by the fetus occurs to the detriment of the mother. Glucose requirements during late pregnancy are increased 70-80% over the nonpregnant state since 80% of fetal growth occurs during the last 40 days of pregnancy.

Blood sugar levels decrease as pregnancy progresses (hypoglycemia) from a normal 350-450 mg per 100 ml blood to 20-25 mg per 100 ml blood in late pregnancy. Pregnancy toxemia may develop when levels decrease to about 18 mg per 100 ml blood. The severity of hypoglycemia will be directly affected by undernourishment of the mother or by increased requirements of the fetus(es).

As the glucose supply diminishes from increasing fetal demands and decreased glucose production due to undernourishment, energy requirements are furnished by other metabolic pathways, i.e. from free fatty acids and amino acids. Breakdown of the free fatty acids results in increased production of ketones, acetoacetate, and B-hydroxybutyrate. As hypoglycemia becomes more severe, the ketone level in the blood increases (ketonemia) and ketosis occurs.

As ketosis increases, the bicarbonate level in the blood decreases and acidosis may result. When the bicarbonate level declines sufficiently, the animal will become comatose. During the later stages of pregnancy toxemia, water consumption decreases, urine output is decreased, and kidney function is impaired. The blood sugar level may increase severely (hyperglycemia) during the late stages of the disease as a result of the response of the adrenal glands to stress.

Circumstances that cause severe hypoglycemia will usually result in pregnancy toxemia. Undernourishment of the doe may not meet the demands for glucose production. The level of

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nutrition should be increasing as pregnancy progresses so that the doe will be able to provide fetal requirements. The doe should be gaining weight during pregnancy.

As previously mentioned, multiple fetuses greatly increase the glucose requirements. A gradual onset of undernourishment, as would be seen if the feed intake was not increased during pregnancy, may be tolerated by the doe and toxemia may not develop.

However, if the animal is starved for several days, pregnancy toxemia may develop readily. Sudden changes in weather, infections or transport may result in periods of inappetence and may trigger pregnancy toxemia. Excessively fat animals may develop periods of poor appetite under stressful situations.

Clinical Signs

Clinical signs are those observed with involvement of the central nervous system. Initially, the animal tends to separate from others. There is mild depression. Evidence of blindness develops, the animal runs into objects, shows little or no reaction when approached, and wanders aimlessly. Dullness and depression become progressively severe. There is reluctance to move. Eventually, they go down in sternal or lateral recumbency and show little or no response to the environment. The does become comatose and eventually die.

Occasionally, animals may show a short period of intermittent spasms of hypersensitivity. There may be quivering, twitching of the ears, muzzle or eyelids, or spasms of certain muscles. Incoordination may be evident. Recumbent

animals may have convulsive paddling movements.

Chewing, teeth grinding, or vigorous licking movements may be seen. Mild scouring may be present. A snuffling respiration due to excessive nasal secretion may be common. Drooling of saliva is also seen.

Temperature and pulse are within normal limits. Respiration is usually normal until the later stages when it may become labored. The appetite is poor or absent. Ketones may be detected in the urine.

Post Mortem Findings

The liver is enlarged and has a pale yellow to orange coloration. The adrenal glands may be enlarged. The uterus contains two or more fetuses.

Treatment

Oral administration of glycerol or propylene glycol or intravenous administration of glucose may be effective in the early stages of the disease. Insulin may be used with these treatments for better utilization of glucose. During the late stages of the disease, glucose administration may be ineffective or detrimental because the blood glucose levels may be very high.

During the later stages of the disease, acidosis, and dehydration may be important factors. Intravenous administration of large volumes of electrolyte solutions with sodium bicarbonate may be important. Corticosteroids may not be effective in the later stages unless given at dosages utilized to combat endotoxic shock.

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Cesarean section or other methods of terminating pregnancy may be effective in some cases.

Prevention

An adequate nutritional level throughout the pregnancy will prevent pregnancy toxemia. Protein and energy levels during the last 30-40 days of pregnancy should meet the doe's maintenance requirements as well as the growth requirements of the fetuses. Allowing the animal to become excessively fat should be avoided.

Management during late pregnancy should be directed at avoiding appetite problems in the animals. Avoid sudden feed changes, diminish stresses of severe weather, delay or avoid transportation, and prevent concurrent disease problems.

Parturient Hypocalcemia

Also known as milk fever. Parturient hypocalcemia is a metabolic disease in does following kidding characterized by poor milk production, poor appetite, lethargy, and low blood calcium levels. A hyperirritability characterized by tetany may occasionally occur.

Cause

Following kidding, most does may have a lowered calcium level in the blood (hypocalcemia). This is partially due to the drain on available calcium by the production of colostrum. (Colostrum contains twice as much calcium as milk). Calcium is supplied from two sources:

1.) dietary

2.) mobilization of calcium from the bone.

Normally, calcium requirements following kidding are provided primarily from the diet since mobilization of calcium from the bone does not provide significant amounts until about 10 days after parturition. A loss of gastrointestinal function for any reason, before or at parturition, may cause a severe drop in the blood calcium level. Signs of hypocalcemia may develop. Since older animals have more digestive upsets at parturition, they have more problems with hypocalcemia.

A high level of calcium in the ration during gestation places almost complete reliance on the dietary source of calcium. If the prepartum diet is low in calcium, calcium mobilization from the bone is instituted to meet the calcium needs. If a gastrointestinal dysfunction occurs at parturition, the effects are not severe since part of the calcium requirements is supplied by mobilization from the bone.

Clinical Signs

Usually high producing older does are affected shortly after kidding. The does show lethargy, poor appetite, and poor milk production. Occasionally, hypocalcemia tetany may be observed. The doe is hyperirritable and may show muscle twitching of the lips, eyelids, and ears. Trembling or twitching of other muscles of the body may also occur. Convulsions may develop.

Blood calcium levels may be 5 – 7 mg per 100 ml blood. The response to calcium therapy may be diagnostic.

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Treatment

Administration of calcium preparations, intravenously or subcutaneously, will provide dramatic relief of clinical signs. Lethargic does may begin eating and become more active and alert within 12 hours. Tetany usually subsides in 30 – 60 minutes after treatment.

Calculosis

Also known as urinary calculi urolithiasis, kidney/bladder stones, or waterbelly. Calculosis is a metabolic disease of male ruminants characterized by formation of concretions within the urinary tract with obstruction to the outflow of urine. This often results in rupture of the bladder or the urethra.

Cause

The disease occurs in animals on a high concentrate diet with a mineral imbalance resulting in excessive phosphorus intake. A high phosphorus level develops in the blood and in the urine. Magnesium and ammonium phosphate precipitate to form a concretion or calculus. The size may vary from sand-like particles to as much as 5-10 mm.

In the female ruminants, the calculi are passed easily through the short, expandable urethra. In the male ruminant, the urethra is long and does not expand easily. The calculus must pass around three curves in the urethra. In sheep and goats, the urethral process is a short (2-3 cm) extension of the urethra beyond the tip of the penis. The diameter of the urethral process is slightly smaller than the remaining urethra. Calculi have a

tendency to lodge at the lower curve of the penis or at the urethral process.

Once calculi have lodged, the wall of the urethra is damaged. Urine flow is obstructed and pressure may build up in the bladder until the bladder ruptures. If severe damage occurs to the wall of the urethra, it may rupture and urine may flow into surrounding tissues.

Urinary calculi problems are seen most frequently during the winter in periods of very cold weather when water consumption may be reduced.

Clinical Signs

Signs do not develop until there is partial or complete obstruction of the urethra. Uneasiness, frequent attempts to urinate and straining are seen early. Crystal deposits may collect on the preputial hairs. The animals may refuse food, isolate from the group and kick at the abdomen. If the bladder ruptures, the abdomen may enlarge. If the urethra ruptures, the lower abdominal wall may become thickened from urine infiltration. If the bladder or urethra rupture, the animals may show temporary improvement. However, as time progresses, the animal becomes depressed and death eventually results.

Treatment

Once clinical signs develop, damage to the urethra may be severe and while the animal's life may be saved, its reproductive capabilities may be lost. Since the calculi may frequently lodge in the urethral process, this may be easily removed and may eliminate the obstruction. Removal of the

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urethral process has no effect on the reproductive abilities of the buck.

Prevention

The calcium-phosphorus ratio should be 1.5 – 2:1. Often in breeding males, it is advisable to decrease the grain and increase the roughage. Adequate clean water should be available. Prevent freezing of the drinking water in the winter. If calculosis is a herd problem, feed ammonium chloride 0.5 – 1% or gradually increase the salt in the diet to 5-10%.

Coccidiosis

(Information compiled from Coccidiosis by M.C. Smith Cornell U., Ithaca, NY Extension Goat Handbook).

Coccidiosis is a contagious disease of goats, especially young kids. The disease is caused by one or more of approximately 12 different species of protozoa, called Eimeria, which parasitize and destroy cells lining the intestinal tract of the goat.

An infected goat sheds thousands of microscopic coccidial oocysts in its feces every day. When first passed, the oocysts are harmless to another goat. However, under favorable conditions of warmth and moisture, each oocyst matures (sporulates) in 1 to 3 days to form 8 infective sporozoites. If a young kid swallows the sporulated oocyst, the sporozoites are released and rapidly penetrate the intestinal cells.

From here on, the life cycle gets very complicated. The coccidia pass through several periods of multiplication during which large schizonts are

formed. The intestinal cell of the goat is destroyed and thousands of small forms called merozoites break out and invade other intestinal cells. Eventually sexual stages are reached and new oocysts are produced. The entire life cycle from oocyst to new oocyst takes 2-3 weeks.

If a young kid is suddenly exposed to many sporulated oocysts, it may become severely ill 1 – 2 weeks later. It will be off feed, listless, and weak. It may show abdominal pain by crying or getting up again as soon as it lies down. At first, the kid might have a fever, but later the body temperature is normal or even below normal. Diarrhea begins pastey, then becomes watery. The kid may dehydrate rapidly. The diarrhea is only rarely bloody. Neither is straining common. Signs often show 2-3 weeks after the kids are weaned, because the lactic acid produced by the digestion of milk helps to inhibit coccidia in the nursing kid.

Young kids may be killed quickly by a severe attack of coccidiosis. Others – those initially stronger or less heavily infected – will develop a chronic disease characterized by intermittent diarrhea and poor growth. Tails and hocks are dirty. The kid with chronic coccidiosis cannot digest its feed properly because the intestines have been severely damaged. As a consequence, such a kid will be a potbellied poor-doer for months afterwards. Frequently, such a stunted kid will be too small to breed its first winter.

Even though coccidiosis is typically a disease of the young growing kid, most adults are mildly infected and continuously shed oocysts which serve to infect young kids. Occasionally an adult goat shows temporary diarrhea when stressed or

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exposed to a new species of coccidia. This is especially common after the doe has been boarded on another farm for breeding.

Diagnosis of coccidiosis can be based on clinical signs or microscopic fecal exams. Coccidiosis is so common that it should be suspected whenever kids older than about 2 weeks of age are scouring. Sudden dietary changes can also cause diarrhea, but these make the kid more susceptible to coccidiosis. Thus diarrhea that begins with the consumption of too much milk, grain, or lush grass may drag on for days because of coccidiosis.

Older kids and adults with diarrhea may have worms rather than coccidiosis, or they may have both problems together. Oocysts can be identified if the feces are mixed with a concentrated sugar solution. The oocysts float to the top, along with larger worm eggs. They are collected and examined with a microscope. Oocysts may be shed in the feces as early as 10 days after a kid is infected, but often the first attack of diarrhea occurs before oocysts are available to be identified. In these cases, the trained technician can do a direct fecal smear to look for smaller merozoites, which do not float, in the sugar solution.

If a kid dies of coccidiosis, post-mortem examination will quickly give the diagnosis. The small intestine will have many irregular raised white areas, often about 1/8 to 1/4 inch in diameter. A smear taken from these white spots will show many coccidial forms if examined under a microscope.

Whether or not a goat gets sick with coccidiosis

depends on several factors. One is the number of oocysts swallowed at one time. Small exposures, frequently repeated, lead to immunity. Large exposures destroy all the intestinal cells at one time and kill the kid. The age of the goat is also important. This is partly because the older animal has usually had time to develop some immunity. Also, very young kids are more fragile creatures. Good nutrition (including vitamin E-selenium supplementation in selenium deficient areas) helps the goat to defend itself against coccidiosis.

Immunity to coccidiosis is rarely complete. This means that the healthy adult goat continues to pass many oocysts in her fecal pellets. However, most of her intestinal cells are safe from invading coccidia. As each of the 12 or so coccidia species is completely independent from the others, with no cross immunity, a goat that is happily living with one type of coccidia may develop diarrhea when exposed to a different type.

Prevention of coccidiosis is very important in larger herds if young kids are to thrive. Once diarrhea has developed, most of the damage to the intestine that leads to stunting has already occurred. Sick kids are treated to save their lives and to limit contamination of the pens, but the owner has already lost control of this contagious disease. Several key facts will help to design a prevention program. The first is that the adult goats are the original source of infection for young kids, because they shed oocysts constantly. All old bedding and manure should be removed from the kidding pens before the new kids are born. Sporulated oocysts are commonly present on the skin of the udder; thus the kid may become infected at the same time as it takes its first drink of colostrum. The doe's udder should be washed

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and dried before the kid nurses or else the kid should be removed from its dam at once and bottle-fed the colostrum.

It is best to raise kids completely separate from the adults until they are ready to breed. Even when rushed from the doe to a clean barn, kids still manage to pick up a few coccidia. As multiplication is rapid, a few can become many very quickly unless good sanitation is stressed. Fecal contamination of feed and water must be prevented. This means that feeders and waterers should be outside the pen whenever possible, and arranged so that fecal pellets can't fall in. Grain should be put in keyhole creep feeders rather than the open troughs that kids love to play and sleep in. Hay racks also must be covered to keep kids out.

Because oocysts have to sporulate to become infective, exposure can be reduced by cleaning the pens daily. Slotted floors are helpful. However, daily cleaning entails a vast amount of work and gives disappointing results, if used alone. Ordinary disinfectants don't destroy oocysts. Even 5% formalin won't work. Instead, it is important to concentrate on keeping the pens very dry, as moisture is necessary for sporulation. Leaking waterers should be fixed at once. Otherwise, the wet ground or floor around the water source is a perfect environment for oocyst sporulation.

Small grassy "exercise lots" are also very dangerous and should not be used. It is very important to avoid overcrowding; spreading the kids out decreases the number of oocysts on any given square inch of pen floor or pasture. If many kids are present on the same farm, they should be

grouped by age. Putting a 2 week old innocent kid into a pen with kids 2 months old, where coccidial numbers and immunity have been building up for some time, invites disaster for the newcomer.

Oocysts are killed by very cold temperatures (far below zero) or by hot dry conditions above 104 degrees F.

Thus, at the end of the kidding season, pens and feeders should be moved out into the hot sunshine for natural sterilization.



Corid is one of the medicines that may be used to treat Coccidiosis in young kids. Follow the directions of your veterinarian and the label when treating kids.

Treatment

A variety of drugs may be given orally to treat the kid sick with coccidiosis. These include sulfa drugs such as sulfaguanidine and sulfamethazine, tetracyclines (aureomycin or terramycin), and amprolium (Corid R). Each of these has associated dangers if overdosed. Sulfas can cause kidney damage in the kid that is dehydrated. Tetracyclines will interfere with rumen function in older kids and adults. Very high levels of amprolium may lead to a fatal nervous disease, called polioencephalomalacia, because of a thiamin deficiency. Usually treatment is continued for about 5 days. Labels and veterinary instructions should be followed. If the diagnosis is not certain, and the kid may have bacterial enteritis or pneumonia rather than coccidiosis, sulfamethazine, or tetracycline is usually given instead of amprolium.

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All of these drugs are coccidiostats, which means that they slow down rather than kill the coccidia. Thus, if a kid is very heavily infected when treatment is begun, medication may not help that kid much. The drugs will greatly reduce the contamination of the environment, and thereby give other kids time to develop immunity. After kids have become immune to the disease they still continue to shed oocysts. Fecal exams may reveal thousands of coccidia per gram of feces. Medicating these older kids or adults will temporarily reduce the passage of oocysts but will not improve growth rate. Within 2 or 3 weeks after medications is stopped, coccidial levels will return to pretreatment values. Thus, except for protection of younger kids, it is a waste of time and money to treat older apparently healthy animals that don't show diarrhea. It is far better to separate the young kids from these older carriers.

Medication of apparently healthy animals is necessary for kids on large farms with previous problems with coccidiosis. The aim is to prevent damage to the intestines rather than waiting for diarrhea to occur. For instance, it may help to treat the kids with anticoccidial drugs on a daily basis for a week or more before stressing them by weaning or moving onto pasture. Consult your veterinarian for the best treatment practice for your farm.

In summary, although most goats carry coccidia and will have positive fecal exams, normally only the young kids become sick with coccidiosis. Deaths and stunted kids result. Raising kids separately from adults, keeping pens clean and dry, preventing fecal contamination of water or feed,

and, in some herds, continuous preventive medication are necessary to prevent the disease. It is neither possible nor desirable to completely eradicate coccidia from the adult goats. A low-level infection with the parasite serves to keep these goats immune to the disease.

DIARRHEAL DISEASES

(Resource used Diarrheal Diseases J.L. Ayers Los Olivos, CA. Extension Goat Handbook).

The most severe diarrheal diseases are colibacillosis and salmonellosis. The primary source of infection is feces of infected animals and transmission is by ingestion. The propensity of young kids to nurse objects especially just after being bottle fed and their innate curiosity, often satisfied by mouth, makes them easy prey for infection.

All objects, which can be contaminated by feces, are potential transmitting agents including bedding, pails, nipples, clothing, tools, feed, water, and the skin of the udder and perineum of the mother. The organisms are often ingested within minutes after birth.

Clinical Signs of Salmonellosis

The peracute case is found dead without previous signs and is most frequent in the newly born. The acute form has been reported in 2 – 4 week old kids with a high morbidity and mortality and in adults over 1 year old. First there is a profuse, watery, (the fecal consistency may be more like paste or putty with *S. dublin*) yellow diarrhea; this is rapidly followed by depression, rapid dehydration, and weakness. Some die in 8 – 12

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hours, most in 24 – 48 hours and a few live for a week. The temperature may reach 106 – 108 degrees F but often returns to normal or subnormal near death.

Clinical Signs of Colibacillosis (E. coli)

The septicemic form usually occurs in the first 4 days of life and when there has been no absorption of colostral antibodies. The animal is depressed, weak, anorectic (won't eat), the temperature is elevated early but drops below normal when the animal becomes weak and goes down. Diarrhea is not common. Death usually occurs in 2 days. Animals surviving for a week may show signs of the organism localizing in the joints, brain, eyes, or lungs.

The signs of the enterotoxogenic form are mostly those of shock; severe weakness to coma, subnormal temperature, cold clammy skin, and pale mucous membranes inside the mouth, wetness around the mouth, collapse of the superficial veins, slow and irregular heart beat, milk convulsive movements, and periodic cessation of breathing. Diarrhea may not develop although the abdomen may be slightly distended and fluid sounds may be heard from the intestines. Death is usual in 2 – 6 hours after signs begin.

The enteric form in which signs of toxemia do not predominate is characterized by profuse watery to pasty, pale yellow to white foul-smelling diarrhea which is occasionally streaked with blood. The appetite is variable. Abdominal distension and fluid sounds may also be present. Some may recover after a few days. A few become progressively worse, losing their appetite

completely and become clinically dehydrated.

Prevention and Treatment

Work with your veterinarian to identify the disease and then work out a plan of prevention and treatment in your herd.

MASTITIS

(Information from Mastitis S.B. Guss Pennsylvania State U. University Park Extension Goat Handbook)

Aspects of Dairy Goat Mastitis

Mastitis may be defined as inflammation of the mammary gland caused by specific disease producing microorganisms. Mastitis in dairy goats, like mastitis in dairy cows, is a disease of considerable economic importance. As in dairy cows, infection is usually spread from infected to non-infected susceptible animals during the milking process.

Some aspects of dairy goat mastitis closely resemble mastitis in dairy cows. Others resemble the disease in sheep. Subclinical mastitis may be defined as mammary gland infection as revealed by laboratory examination of milk samples. Clinical mastitis is characterized by signs of inflammation: swelling, pain, fever temperature, and abnormal milk secretion. Clinical cases may be acute, where animals clearly show all the characteristic signs of inflammation and chronic, where the infection remains in a more or less quiescent state with recurrent milk to severe attacks.

The most common organism involved in dairy goat mammary disease is Staphylococcus

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epidermitis, which is commonly found on the skin of human hands and the udder skin of goats. This organism produces progressive chronic mastitis very similar to *Streptococcus agalactiae* infection in dairy cows. Recurrent attacks where the udder is feverish and painful; the quantity of milk secreted is curtailed and the somatic cell count is greatly elevated depending upon the frequency and severity of attacks.

Staphylococcus aureus is also an important organism involved in dairy goat mastitis. It is found in both non-clinical and acute mastitis cases. Acute or peracute attacks are quite similar to blue bag, the common form recognized in sheep.

Clinical acute cases result when infected udders are injured and they are characterized by severe inflammation which may rapidly become gangrenous, with fever, intoxication and gross changes in milk secretion. The milk secretion of clinical mastitis flare-up in a gland or the whole udder may become yellow, thick and greatly reduced in quantity.

In peracute cases, gangrene quickly develops, often within a few hours and the affected animal may die unless the entire gangrenous gland is surgically removed.

Streptococcus agalactiae infection is often reported as a cause of dairy goat mastitis. It and other streptococci are not nearly as prevalent or economically important as they are in dairy cows.

Corynebacterium pyogenes mastitis in dairy goats

is characterized by the presence of firm round abscesses in the milk producing tissue. The disease is usually progressive. Advanced cases of the disease reveal multiple abscess formations with nearly complete destruction of milk secreting tissue.

Diagnosis

Subclinical mastitis in goats may be identified as it is in dairy cattle- by laboratory culture and examination of carefully collected milk samples. However, the common pathogen in goats is usually not considered pathogenic in cows. Laboratories which commonly culture cow milk for mastitis may report goat milk samples infected with *Staphylococcus epidermitis* as negative. That organism is not coagulase positive or hemolytic on blood agar plate culture.

Staphylococcus aureus is readily identified by laboratory culture of milk samples.

Corynebacterium pyogenes may not be detected by laboratory examination if udder lesions are few and well isolated by abscess formation.

The California Mastitis Test (CMT) and Somatic Cell Counts (SCC) of milk are useful monitoring tools to detect the presence of mastitis in the mammary glands of dairy goats. The California Mastitis Test is a simple, rapid means for detecting mammary gland infection and irritation. A higher CMT is normal for goats than for cows.

Somatic Cell Counts are a more accurate measure of udder health. Healthy dairy goat herds can be expected to produce milk with a somatic cell count under 500,000. The presence of mastitis infection

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in dairy goat herds is reflected in bulk tank milk samples with a somatic cell count exceeding 1,000,000 cells per milliliter. Goats in heat may also have a SSC of 1,000,000 cells per milliliter or more. The milk will appear normal and will have no signs of any type of mastitis. In a day or so the SSC for the goat will return to its normal SSC.

Prevention and Treatment

Tender loving care may be the most important basic requirement for mastitis prevention and treatment. Dairy goats are very sensitive, intelligent animals. When the person milking the goat likes the animals and handles them gently, quietly and patiently, goats willingly and eagerly participate in the milking procedure. With ideal milking management, goats show abundant evidence of affection for the person doing the milking job, letting their milk down for maximum ease and speed of milking.

Milking machine equipment, if properly cleaned and used, will milk goats rapidly without injury when used by trained operators who like the animals. Machine milking requires good milking preparation – clean dry teats and teat cup inflations. Rough handling, irregular-milking times, over-milking, or inadequate preparation for milking all take their toll in stress and injury. These directly affect mastitis resistance and susceptibility. Dry bedding is necessary for mastitis prevention.

Mastitis in dairy goats, like mastitis in dairy cows, is rarely an important disease in herds where animals are thoroughly prepared for milking by massaging and washing udders. The use of a bactericidal solution to cleanse the udder and teats

also stimulates good milk letdown. Dry the udder and teats with an individual paper towel before milking begins. To minimize infection of the udder from the milker's hands, milker's gloves should be worn.

Milking machine teat cups should not be attached to the goat until udder and teats are thoroughly washed and massaged, cleaned and dried. Machine milking which is hurtful or excessive beyond normal letdown contributes to teat end injury and the spread of mastitis from goat to goat in the milking procedure.

Teat Dipping

This procedure has been found useful for preventing spread of mastitis from infected to susceptible glands in dairy goat herds. It helps to close teat ends after milking and minimize the bacteria that may enter the teat end right after milking.

Dry Treatment

Dry cow mastitis treatment udder infusion formulations are recommended for goats which have had evidence of mastitis infection before drying off and they may be at least as effective in preventing mastitis attack during the dry period. A single dry cow quarter udder infusion dose is recommended for each udder half in the goat. Develop a dry treatment protocol with your veterinarian for your farm.

Systemic Treatment

In severe acute attacks of mastitis, systemic administration antibiotics by intravenous or other parenteral means is indicated. Frequent udder

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massage with gentle hand milking may be helpful to relieve pressure in the affected gland to aid recovery. Strict attention should be paid to milk withholding instructions on the label of the product used. When mastitis cases are treated by a veterinarian, be sure that you follow milk-withholding instructions given.

Summary

Mastitis in dairy goats is usually the result of



Antibiotic udder treatments available are excellent for treatment of infected mammary glands, but success with their use is determined by the level of milking management and sanitation used in milking the herd.

defective milking management which gives the organisms responsible the opportunity to produce and spread disease.

Adequate sanitary preparation for milking which results in clean dry udders, clean milking equipment, use of milker's gloves, and dry bedding are fundamental requirements for mastitis prevention. Regular use of the California Mastitis test and/or Somatic Cell Counts can successfully monitor the progress of mastitis control and the health status of udders in the herd.

Antibiotic udder treatments available are excellent for treatment of infected mammary glands, but success with their use is determined by the level of milking management and sanitation used in milking the herd. Of course, milk from treated does must be withheld from human consumption according to label instructions; nor can meat of treated goats go to butcher before usually 30 days.

STOMACH WORMS

(Information taken from Stomach Worms R. E. Bradley U. of Florida, Gainesville Extension Goat Handbook)

Some of the most important internal parasites of goats are "stomach" worms. Because of husbandry practices, diagnosis and treatment-control of these parasites should be approached on the basis of the entire herd, not as individual animals alone.

In a goat herd, young animals under 6 months of age are by far the most susceptible to parasitic infection. This group of kids is highly susceptible since they have had very little exposure to parasites and thereby have very little resistance or immunity.

The second most susceptible animals in the goat herd are the yearlings and 2-year olds. The growing animals, with their rapidly expanding blood volumes are susceptible to blood loss due to the actions of certain species of the stomach worms. This age group also is the most likely to suggest malnutrition, which will make them more susceptible to parasitic disease. It is a proven fact that animals receiving an adequate, balanced ration are less susceptible to parasite infection.

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The older members of a herd will generally be resistant to parasitism due to prior exposure to the various parasites. However, they will harbor subclinical numbers of the common parasites and thereby serve as reservoirs of infection for the younger, susceptible members of the herd.

All of the parasitic organisms that are capable of producing disease in goats follow a definite life cycle pattern. In general, the actual infection of the goat is by mouth, but there are some necessary developmental stages that occur in the environment, such as in the pasture soil or in the bedding of a stall or barn.

The use of anthelmintic drugs as a part of controlling stomach worm infections in goats is an important and essential part of the total herd health program. The exact drug to use is determined by the cost per dose and ease of administration with most species of domesticated animals. Anthelmintics should be used only as an aid to the series of management techniques. It is proven fact that when anthelmintic drugs are substituted for good management in stomach worm control in a goat herd, poor results are always the end result.

Less common and therefore less important internal parasites of goats are liver flukes (*Fasciola hepatica*), lungworms (*Dictyocaulus* sp.) and whipworms (*Trichuris* sp.) Fortunately, the management practices recommended for controlling stomach worms are effective for controlling these less common parasites.

In conclusion, stomach worms are considered one

of the most pathogenic gastrointestinal parasites of goats. They are best controlled by strict management procedures which include drug treatment, but which mainly depends on the prevention of fecal contamination of feed and water.



With the use of the FAMACHA Card the farm manager can quickly evaluate does. Based on the color of the mucus membrane of the eye a decision can be made as to whether or not the doe needs to be wormed.

Key points to remember when worming goats

Parasites in goats in the southern United States are resistant to many of the drugs available for their control. In order for dairy goat farmers in Wisconsin not to face the same problem the following key points must be followed.

Follow the concept of “Smart Drenching” and FAMACHA. Smart Drenching is an approach whereby we use the current state of knowledge regarding host physiology, anthelmintics pharmacokinetics, parasite biology, dynamics of the genetic selection process for resistance, and the resistance status of worms on the farm to develop strategies that maximize the effectiveness of treatments while also decreasing selection for drug resistance. Specific strategies exist that can and should be used to maximize the effectiveness of treatments and to prevent the development of anthelmintic resistance. Some of these are directly related to the concept of Smart Drenching, while others relate to general management practices.

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FAMACHA, was developed in South Africa for classifying animals into categories based upon level of anemia. Since anemia is the primary pathologic effect from infection with *H. contortus*, this system can be an effective tool for identifying those animals that require treatment (but only for *H. contortus*).

To use FAMACHA, the color of ocular mucus membranes are observed and compared to a laminated card which has colored illustrations of eyes from sheep at different levels of anemia. The scale goes from 1 (mucous membranes are red) to 5 (mucous membranes are white); all animals are examined at regular intervals and only animals scored as being anemic are treated.

FAMACHA is distributed under the auspices of the South African Veterinary Association who have requested that Southern Consortium for Small Ruminant Parasite Control (SCSRPC) serve as the sole US distributors. The charts are now available for sale. **All inquires should be directed to:** famacha@vet.uga.edu. In addition, SCSRPC has a web site that is a source of information on FAMACHA, Smart Drenching and novel approaches to nematode parasite control in small ruminants. The URL for the web site is: www.scsrpc.org

(Following is an excerpt from “ Updates on Novel Approaches to Small Ruminant Parasite Control” by Seyedmehdi Mobini, DVM, MS, Diplomat, ACT Professor/Research & Extension Veterinarian Georgia Small Ruminant Research Extension Center Fort Valley State University Fort Valley, GA 32030 –4313. For future explanation or information please contact DR. Mobini

directly.)

- Work with your veterinarian to develop a parasite protocol so parasite drugs remain effective on your farm
- In summary: Treat only goats that have a high level of parasites, when they need to be treated. Test your goats either using fecal samples or FAMACHA. DO NOT treat all of your goats on a regular basis.
- Most drugs for parasites when given to goats need 1 ½ times to 2 times the sheep dosage.
- Use a goat weight tape to determine the correct weight of the goat to give the correct dosage.
- Pour ons intended for cattle are not effective on goats, as the hides of the animals are different.
- Cull your most susceptible goats, as some are more susceptible to parasites than others.
- Test the goats after treatment to determine the efficacy of the drug on your farm.

TOTAL HERD HEALTH PLAN

The goal of a herd health program is to improve the herd’s productivity. This goal is achieved through nutrition management, disease control, reproductive management, parasite control and environmental management. Each herd is unique and the plan must be tailored to fit the situation. Records are important in assessing progress and helping to determine the next step.

Work with your veterinarian to develop an annual calendar for your goat dairy. This calendar should list the approximate times and ages when certain

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activities should be performed to maximize profits per productive unit.

Items to consider for the annual calendar include:

Dry Doe

1. Dry off protocol.
2. Worming protocol.
3. Vaccination protocol.

Kidding

1. Clean kidding area.
2. Examine doe's udder for mastitis.
3. Colostrum to kid.
4. Dip navels with iodine.
5. Protocol for fresh doe.

Kid 1 to 3 weeks of age.

1. Dehorning.
2. Castration.
3. Vaccinations. (CD and T, CL etc.)
4. Tattooing.

Deworming.

1. Protocol for kids. (Coccidia and others).
2. Protocol for adult does. (Worm only those that need it, after testing either fecal or FAMACHA).

Vaccination Programs.

1. Protocol for vaccinations for animals.

Mastitis Program

1. Examine udder two times daily.
2. Use recommended pre dip and post dip.
3. Dry treat protocol.
4. Check milking system on a regular basis.

Foot Care

1. Keep pasture areas dry.
2. Trim hooves three to four times annually.

External Parasites

1. Protocol for ringworm.
2. Protocol for lice and mites.

Other health problems specific to the farm.

1. Johne's testing program.
2. CAE testing program.
3. CL protocol.
4. Others.

Facilities and Equipment

Compiled by Clara Hedrich and Dan Considine, Consultant

DAIRY GOAT HOUSING

Dairy goats do not need fancy housing. Many older buildings can be adapted to cut costs. Those intending to remodel a building for housing goats or planning to build a new one should first visit several goat dairies. Ask the owner operators about the strengths and weaknesses of their housing systems. Contact the local county agent farm trainer and your mentor for their ideas. They will also be able to help with insulation and ventilation needs. Do as much work upfront as possible to ensure that you develop the best plan for your facility.

In earlier chapters of this Best Practices Guide the discussion has been about how to manage the dairy goat to maximize your profits. Your facilities will play an important role in the efficiency and ease of your overall operation as well as your daily work. The first thing you will need to decide when planning your building needs is the goal for the number of animals in your dairy goat operation. How many milkers, dries, yearlings, bucks, and kids will need to be housed?



Stock panels work well for fencing goats. The key is to use the correct wire size for the age of the animal that you are working with.

Decide on your herd size

To maximize your efficiency when dealing with your animals you will want to handle them in groups. Will a pen of milkers be 50 does, 75 does or 100 does? A pen of kids 10 kids, 20 kids? A pen of yearlings 50 does, 75 does? How will the bucks be housed? The bucks can be placed in individual pens or put together in groups. Young bucks should not be penned with mature bucks. Mature bucks may injure young bucks.

When planning pen size, you will need 7.5 sq. ft/goat if the goat is under 60 lbs. and 11.5 sq. ft/goat if the goat is over 60 lbs. An adult goat or springer will need 15 to 20 sq. ft/goat. The exact number of sq. ft/goat depends on the size of the animal and the pregnancy status. An ideal setting would include an exercise area or paddock for each group.

Making pens

If you want to keep pen sizes flexible you can use 7 bar pipe cattle gates. The only drawback is a few goats will figure out how to turn sideways and crawl out between the pipes. Stock panels also work well. Get the correct wire size for the age of animal that you are working with. A drawback with using stock panels is with smaller horned goats they may get caught in the fence.

GROUPING ANIMALS

To maximize bio-security, each group should be in a separate building. Thus, there should be a milker barn, a yearling barn, a kid barn, and a buck barn. When deciding penning in each of the barns, group animals of the same age and size together.

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In some cases a kid may grow slower than others, thus move them in with kids of the same size, rather than kept with its age group. Kids should not be housed in the same building as the milkers. Milkers may be penned in several different ways.

1. They may be penned by milk production.
2. Yearling milkers are penned separately from mature does.
3. In the event that all ages of does are penned together, yearlings will need to kid around 16 to 20 months of age so they can compete with mature does.

When pen mates are changed, the animals will reestablish their social order. This adds stress to the animals and can reduce milk production. Minimize pen changes and always add animals in groups.

What facilities does your breeding program require?

Consider the facilities requirements of your breeding program in designing your barn. Are you planning on year round milk? Do you plan to use lights for bringing your does into heat for out of season breeding? For does to be brought into heat out of season, you will need a barn in which you can use the long day lighting for three months out of the year. If you plan to pen breed, how many different breeds will you have? Are you going to cross breed or keep breeds pure? Are you going to hand mate your does? Your breeding program goals will help you to determine your housing needs.

WORKING IN THE BARN

Cleaning

The fourth item to take into consideration is ease of cleaning. All pens should be able to be cleaned using a skid steer or tractor with a bucket. Any hand shoveling should be minimized. Ceiling height should allow for this equipment to be able to maneuver safely. Having to work around corners, waterers, and/or poles in pens will lengthen the time it takes to clean the pens.

Animal Flow

When designing your pen layout for the milkers, review the flow of your animals with an eye toward an efficient animal flow. Animal flow is most efficient if animals do not have to back track. Goats will go up steps into your milking area, but will prefer to go down a ramp. However, your layout is more efficient if the animals come directly in to the milking area without going up stairs. In this scenario, the person milking will be in a pit. Goats prefer a lighted area over a dark area. All gates should have snap hooks or other goat proof latches, as goats are able to unlatch many other types.

Plan your Feeding System

What you are feeding will help determine how to efficiently arrange your barn. Are you feeding grain in the milking area? How much? Set it up so that your grain supply is readily available. Minimize the waste of feed by the milkers. Feeders should be large enough so that they can not nuzzle the grain out on to the floor. They also like to fill their mouth and chew dropping grain. Position feeders to reduce grain waste.

If you are feeding round bales, a wire panel bent in a circle limits the amount of hay they can waste.

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These can be set in their pen area so that all does have easy access to the hay. Commercial round bale feeders with 6 to 7 inch spacing work well also. But avoid cattle round bale feeders as goats can climb in and get caught and killed.

If you are feeding dry hay, baleage, TMR (Total Mixed Ration), or grain, it is ideal to have the feeder set up outside of the pen, so that they can reach their heads through and not get their feet in the feed or pull extra feed back into the pens. Goats like to eat with their heads up, their feet on something and are climbers. Thus if the feeders are in the pens with the goats you may find that they will readily climb into the feeders and contaminate their feed. Feeders should be covered or designed so that goats can not climb into them. Feeder space should be 1.0 - 1.5 ft. per adult goat. The size of your adult goats and stage of pregnancy will be a factor in determining your exact feeder space. A good feeder design is to have a raised feeder with a curb that goats can put their front feet on and then reach through to eat.

Automate your feeding system as much as possible. Calculate the cost of the automation versus the amount of time and labor saved. If the skid steer or tractor bucket is used for feeding make sure they are thoroughly cleaned, especially after cleaning out the barn.

All ages of dairy goats need a constant supply of clean fresh drinking water. An automatic heated waterer saves labor and insures that water is available at all times. Keep waterers clean and position them so that feet and feces droppings do not end up in the water. Locating waterers so that they are outside of the pen and above the rump of

the goat can minimize this problem.

ELECTRICAL NEEDS

If the wiring system in your buildings needs to be updated, check with your power supply company. They sometimes have programs available that will help share the cost of updating.

Take an inventory of your electrical needs. The use of long day lighting will help to maximize milk production especially during the winter months, but will require electrical lighting. What about your milk pump, water pump, and bulk tank chiller? The power company may also have time of use programs in place that will help to save the cost of electricity.

A generator may be an investment that should be considered. In case of a power outage, plans need to be in place as to how water will be pumped, goats milked, and the milk cooled.



Evaluate your power needs. If your electrical systems need updating, check with your power supply company as they may have some cost sharing programs available that may fit your needs.

Facilities and Equipment

VENTILATION

Including good ventilation in your goat facilities design will be critical to your herd's health.

Ventilation is a continuous process to remove moisture and other contaminants given off from the breath of animals from inside the building, provide fresh air for the animals, remove odors and gases from animals waste, provide a satisfactory minimal temperature in winter, and maintain a summer temperature inside the barn that is cooler than outside.

The optimal temperature for a dairy goat is 50 degrees F to 64 degrees F. The minimum temperature is 43 degrees F and the maximum temperature is 81 degrees F. When the temperatures are outside of these ranges the goat must begin to use additional energy for cooling or warming. The optimal humidity range is 60% to 80%.

A system is required to bring fresh air into the building, distribute it evenly, and remove it. This system is completely different for the two types of housing environments, "cold" and "warm".

In "cold" housing, natural convection forces move the air, and properly located adjustable inlets provide distribution and volume control. In "warm" housing, a mechanical ventilation system, either exhaust or pressure, is used. Exhaust systems are more popular. Air distribution is provided by properly located inlets and exhaust via two or more mechanical fans, at least one running continuously.

Cold housing

This is becoming more popular because of increasing energy costs and simplicity in providing a healthy environment. The cold unit is mainly a "shell" to keep rain and snow off the animals and to protect them from wind.

Sufficient air movement must be provided to prevent fogging and excessive condensation beneath the roof. Satisfactory ventilation can be provided through a continuous open ridge (minimum 4-inch width with no screen over the opening) together with suitable wall openings. A 1-inch thickness of rigid insulation is recommended under the roof to reduce condensation in winter and heat gain in summer.

Inlets in the wall of the building need to be at least two sizes: large openings for summer use and much smaller ones to allow air movement in winter. Summer air inlets are often 3X6 ft or 4X9 ft doors that may be adjusted during changing weather. Winter air inlets are commonly under overhangs and may be equipped with hinged doors that can be closed during snowstorms. Curtains may be used in a natural ventilation system.

Warm housing

Warm housing involves a mechanical ventilation system in which winter temperatures are maintained at 40 degrees F or above. To control temperature and moisture, the following items must be provided:

- Insulation in the walls and ceiling (insulation R Values in the walls of at least 14, ceilings should have an R-value of 23 or more)
- At least 2 exhaust fans (1 running continuously and 1 thermostatically controlled)
- Adjustable air inlets

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- Limited door and window openings
- Supplemental heat when needed

Rules for Locating Exhaust Fans

- In barns where animals are maintained all year on a manure pack, space the fans uniformly in the south or west wall to provide for best airflow across the barn in summer.
- Locate all fans at least 10 ft away from doors or other openings.
- Locate the thermostats controlling the high capacity fans near the center of the building and at a height of 5 to 6 ft. Do not place the thermostats on an outside wall.
- In winter, attempt to maintain the temperature at 40 to 45 degrees F. Remember, the higher the inside temperature, the more difficult it is to control moisture during cold weather.
- Do not locate fans near pens of kids or yearlings in an attempt to draw heat to this area from areas where older animals are kept. Aerosol contaminants from the older animals may cause younger ones to have more disease problems.
- Wet corners often can be dried up by admitting fresh air.
- Install all fans near the ceiling.

Ventilation values

Winter	30 cu. m. / hr. / goat
Summer	120 cu. m. / hr./ goat
Air speed	(Adult) 0.5 m / sec. (Kids)0.2 m / sec.
Air Intake	2 times the surface area of the exhaust

Birds

Birds can be a problem in buildings. They will get into feed supplies and waterers. They tend to leave their droppings in feed and water. This contamination can cause health problems. Some thought should go into how to handle unwanted birds in animal housing.

STORAGE

Deciding how you will store your feed and bedding is also important in determining your facilities needs. Round bales can be stored outside although some waste will still occur. Line wrapped baleage or individual wrapped bales of baleage will be stored outside. Bales of dry hay and bedding should be stored inside for best results.

Determine the amount that you will have on hand at your maximum feed inventory and that will indicate the amount of space you will need for



Determine the amount that you will have on hand at your maximum feed inventory and that will indicate the amount of space you will need for feed and bedding storage. Line wrapped baleage or individual wrapped bales of baleage will be stored outside.

Facilities and Equipment

feed and bedding storage. Grain rations may be delivered in bag or bulk. Feed bins are necessary for bulk delivery. Bulk feed is cheaper than bagged feed.

EQUIPMENT NEEDS

Your equipment needs will be largely determined by your facilities design and the specific needs of your operation. A few primary pieces of machinery that you may want to consider include a skid steer, or tractor with a bucket and a manure spreader. A skid steer or tractor with a bucket is handy for feeding and cleaning needs. A tractor and manure spreader will allow you to spread the manure on the field. You will need to work with your county agent or farm trainer to decide what other equipment should be purchased or if it makes more sense for you to hire custom work to be done. The number of acres that you own will help to determine your equipment needs.

Other minor pieces of equipment that will be useful are:

- A leaf blower for cleaning the milking area
- A wheelbarrow or larger wheel wagon for doing chores
- Basic hand tools like a shovel and a pitchfork
- A power washer for cleaning
- A space heater in the winter for supplemental heat in the milk house to keep pipes from freezing
- A hand held hair dryer works great for unthawing frozen water pipes in the winter



A space heater may be used during the winter in the milkhouse to keep pipes from freezing.

MILKING AREA

Equipment and facility needs of the milking area and the milk house will be described in more detail in “Best Practices Guide #7 Milking Systems and Routines.”

A milking parlor is an area, which is separate from where the animals are housed. This area has a floor drain. The milking machines may be washed in place or taken in to the milk house to be washed and the pump jar is located in this area.

A milking area is one in which the goats are milked, machines are taken into the milk house to be washed and the pump jar is located in the milk house. The milking area does not have a drain in the floor and may not be separated with a wall from where the animals are housed. The pipeline may be a low line or high line.

The milking equipment dealer that will install the milking equipment will need to submit a plan for your milk house and milking parlor/area to the

Facilities and Equipment

state for their approval.

Contact your field inspector for any ideas they may have for the set up of your milking facility before you start the actual building or remodeling of this area. The field inspector will need to give their final approval before you start shipping milk.

Involving the field inspector from the start may save you time and money. When all is completed you will need to apply for a license with the Wisconsin Department of Agriculture to be able to ship milk.

INVESTMENT IMPACT ON COST PER CWT

Buildings, Equipment, Parlor, Feed Bins, and Feeders

- \$50,000.00 is a realistic investment for parlor, milk house and equipment
- \$40,000.00 to \$50,000.00 for housing and feeders for a 200 head milking herd
- Cost per head is higher on smaller herds

Investment Impact on Cost per CWT

Number of Milkers	100 milkers	200 milkers	400 milkers
Amount Invested	\$65,000	\$100,000	\$125,000
Cost per milker	\$650 / milker	\$500 / milker	\$312 / milker
20 year depreciation	\$32.50 / milker	\$25.00 / milker	\$15.60 / milker
8% interest	\$52.00 / milker	\$40.00 / milker	\$25.00 / milker
Total	\$84.50 / milker	\$65.00 / milker	\$40.60 / milker
Cost / cwt.	\$5.60 / cwt.	\$4.30 / cwt.	\$2.70 / cwt.

Note: The above one hundred weight price (Cost/cwt.) is based on a goat producing 1500 pounds of milk annually.

Facilities and Equipment

FACILITIES AND EQUIPMENT CHECKLIST

- ___ 1. Goal set for the number of animals you will need to plan your facilities for.
 - ___ Milking does
 - ___ Maximum number of dry does at peak dry period of herd
 - ___ Yearling does
 - ___ Kids
 - ___ Bucks

- ___ 2. Decision on use of buildings as how to house animals to maximize the biosecurity of each group and make the best use of facilities.

- ___ 3. Plans for the herd breeding program.
 - ___ Lightning needs for out of season breeding
 - ___ Lightning needs for increased milk production
 - ___ Hand mating does
 - ___ Pen breeding does

- ___ 4. Plan facilities for ease of cleaning.

- ___ 5. Design facilities for ease and efficiency of animal flow.

- ___ 6. Plan your feeding system. What your feeding program is will dictate your feeding system facility needs.

- ___ 7. Your power needs and plans for maintaining basic activities while the power is out.

- ___ 8. Plan the ventilation system for your buildings.

- ___ 9. Plan for feed and bedding storage.

- ___ 10. Identification of your equipment needs.

- ___ 11. Protocol for handling unwanted birds in buildings.

Facilities and Equipment

____ 12. Plan for the milking area and milk house needs.

RESOURCES USED

Chris Duemler, DVM

Housing R.D. Appleman, U. of Minnesota, St. Paul

Goat Extension Handbook

George F.W. Haenlein Univ. of Delaware

Donald L. Ace Pennsylvania State University

Milking Systems and Routines

Compiled and Written by Clara Hedrich with Daniel Considine, Consultant

The production of high quality milk depends upon clean, healthy goats properly fed and cared for and milked in a clean, efficient manner. The milk house is the final on-farm site of quality control in the milk production process.

The goal with any milking system is to produce a clean, wholesome product and to prevent injury and/or infection of the udder.

MILK HOUSE CONSTRUCTION AND FACILITIES

Whether the plan is to retrofit a cow milk house or build a new one, first select the dairy supply equipment company that will do the actual work. The project may be completed by using used equipment from cow dairies.

An excellent resource to use in the planning phase is the dairy inspector for your area. The dairy inspector will need to give final approval on the finished milk house facility and milking system before any milk can be legally shipped. Involving the dairy inspector from the beginning may save you time and money.

The dairy equipment company will need to draw up a plan for your milk handling system, milking parlor area, submit it to the state for approval, and upon approval they will be able to start work on the project.

The United States Department of Health,

Education, and Welfare publishes a handbook titled, "Grade A Pasteurized Milk Ordinance" which covers all aspects of milk production. The same rules apply to milk production from both dairy goats and dairy cows. Consultation with a dairy inspector will identify those essential building, milk handling, and equipment handling needs that must be part of a milk production program. If desired, a copy of the Milk Ordinance may be obtained by writing to Superintendent of Documents, Washington, DC 20402. There is a charge for the publication. In Wisconsin ATCP – 60 is the document covering all production regulations. Ag – 60 was last revised December 2002 and can be obtained from DATCP.

The milk house should be used for no other purpose than milk house operations and should have no direct opening into any barn, stable, or room used to house animals. The exception is that, if there is a direct opening, it must have a tight-fitting, self-closing, solid door.

The size of the milk house is dependent on the size of the operation and amount of equipment. Installed equipment should be readily accessible to the operator. A dairy inspector can guide the herd owner to appropriate measurements. Generally, aisles should be at least 30 inches wide with extra work space, if necessary, to permit disassembly, inspection and servicing of equipment. The floor must be smooth and made of impervious material, usually concrete, and graded to drain sites. Drains should not be located under bulk tanks or under the outlet of a bulk tank. Walls and ceilings must be constructed of smooth material, well-painted, maintained and in good repair. A good epoxy

Milking Systems and Routines

painted concrete block wall or glazed tile wall surface plus some of the plastic coated ceiling materials are good surfaces to resist water penetration and to clean easily.

Natural and artificial lights must be sufficient to offer a minimum of 30-foot candles of illumination. A combination of light source is most desirable to provide for night lighting. Windows also offer a source of ventilation. If possible, locate the windows so as to provide cross ventilation. Screens on windows and doors are essential to protect against flies and other insects. External doors must be self-closing.

Ventilation by mechanical means is desirable and sometimes necessary. Constantly wet conditions may sponsor mold and algae growth on floors and walls and encourage bacterial odors to develop. Ventilation assists in drying the surfaces and moving fresh air through a milk house to keep musty or foul air to a minimum. Milk houses may have permanently closed windows, such as glass block and mechanical ventilation in such instances becomes critical. Fan size capable of moving 15 to 20 cubic feet of air per minute may be adequate.

Masonry construction offers little protection from cold and will benefit from insulation, especially in prolonged cold spells to prevent freezing of water on floors and walls. With the vast amount of water needed and the necessity of pipes, sinks, and drains in the milkhouse, it becomes economical to consider insulating the ceiling, walls, and floor to protect the facility from freezing.

Equipment

Milk should be handled only in materials that are non-toxic and readily cleanable. These materials are glass, stainless steel, certain approved plastics, and rubber or rubber-like materials designed for milk handling. Do not use materials such as aluminum or copper-bearing metals for handling milk. Containers having tinned surfaces must be free of dents, pits, open seams and any evidence of rust spots. Such areas harbor bacteria and may lead to such defects as oxidized flavors.

The wash and rinse sink should have two compartments with each compartment big enough to hold the largest piece of equipment to be washed. Sanitizing of hand milking or bucket milking equipment or strainers can be done in the sink just prior to milking. Storage racks for utensils must be available and permit air movement and rapid, thorough drying of all equipment following washing and rinsing. Bacteria growth on surfaces is reduced greatly if the surface is dry.

Pipeline cleaning and sanitation should be done strictly as recommended by the manufacture and installer. No steps should be skipped and hoses must drain to prevent any hoses from holding water.

A separate sink should be available for washing hands of the milkers.

Cool Milk Quickly

Milk should be cooled quickly and held to under 40 degrees F. The most satisfactory equipment for

Milking Systems and Routines

cooling is the stainless steel farm bulk tank. The tank should be sized to hold the farm's maximum volume of milk that will need to be stored plus one more milking. (Depending on the plant and the time of year, the milk may be picked up every 3rd day or 4th day in the summer and every 5th day in the winter.

The bulk tank must be able to hold the temperature below 50 degrees F during milking and cool the blend milk to 45 degrees F or below in one hour.

Work with your dairy equipment supplier to select a bulk tank that will best fit your needs. The lowest volume of milk must also be taken into consideration. There must be at least enough milk to cover ½ of the paddle after one milking to correctly cool your milk.



A separate sink should be available for washing hands of the milkers. The two sinks used for washing and sanitizing equipment may not be used for this purpose.

Water Source

This must be from a supply properly located and protected and be of adequate quantity and of a safe and sanitary quality. The water supply is

periodically tested to make sure it remains uncontaminated. By law, wells must be tested every two years.

Sanitation

Good brushes, proper water temperature, and the right cleaning materials reduce the effort and increase effectiveness in cleaning and sanitizing milk equipment. Bacteria need three conditions for support of growth – soil (food), moisture, and proper temperature. Proper cleaning and sanitizing followed by rapid drying removes these



The control panel for the bulk tank has a constant temperature reading of the temperature of the milk in the bulk tank and runs the automatic wash system for the bulk tank.

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Adequate supplies of hot and cold water are essential. If the water is soft it makes the cleaning job easy. Most water supplies are hard, necessitating installation of a water softener or the use of cleaners manufactured especially for use in hard water.

Many cleaners are made for use in soft water and when used in hard water produce whitish residues

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when the equipment dries. This is called waterstone and milk solids cling to it making cleaning progressively more difficult. Equipment that is difficult to clean frequently is poorly cleaned and high bacteria counts usually result.

A protein film may appear if the cleaning solution is too weak or the wash temperature too low. It first appears as a bluish discoloration on equipment surfaces.

In manual cleaning, a sanitizer as well as a cleaner is needed. Some cleaners, such as quarternary detergent sanitizers and iodine detergent sanitizers, have a sanitizer built in. This does not mean that the final cleaning step of sanitizing before use of equipment can be omitted.

There are two types of cleaners. Alkaline cleaners are preferred because of their ability to remove milk-protein soil and butterfat particles from the equipment. Acid cleaners function by softening water and usually include wetting agents, which emulsify and remove fatty deposits if the water temperature is correct.

In any case, follow instructions printed on containers of cleaners and sanitizers. For manual washing the following general procedure may be used with many cleaners:

1. Rinse equipment thoroughly with water 100 degrees F to 120 degrees F immediately following milking. Water too hot sets the milk film; water too cool does not remove the fat.
2. Prepare a wash solution with water at 120 degrees F to 130 degrees F. Use a cleaner compatible with the water supply. Use a

thermometer and be sure water temperature doesn't drop below 100 degrees F.

3. Disassemble and soak all parts and equipment in wash solution for a few minutes.
4. Wash thoroughly using a good brush.
5. Rinse with clear, clean water. Use an acidified rinse if the water is hard (1oz acid cleaner to 6 gallons of water).
6. Place all equipment on racks to insure rapid drying.
7. Sanitize all equipment just before milking with a chlorine, iodophor or quarternary ammonium sanitizer. Drain but do not rinse sanitizing solution from equipment.
8. For pipeline and Cleaned-In-Place (CIP) systems the following general procedure may be used with those specific cleaners.
9. Pipeline and CIP cleaners are for use with circulating cleaning systems. These cleaners are chlorinated alkaline with low foaming characteristics. These wash solutions have a



The milking units are brought into the milk house and placed on this automatic washing system. The system washes the units as well as the pipeline automatically. The detergent and acid cleaner are placed in the plastic jars according to manufactures recommendations. Just before milking the system sanitizes the units and pipeline.

Milking Systems and Routines

10. pH of about 11.0 so they must be used with some degree of caution.

Make sure that there is plenty of hot water available for use in cleaning. Cleaning compounds are ineffective in cool water. Manual cleaners are used at about 110 – 120 degrees F while CIP cleaners are best used at a range of 140 – 160 degrees F. The solution should be a minimum of 120 degrees F when the wash cycle is completed.

There are no shortcuts to producing and protecting quality milk. Regulations and recommendations are aimed at getting the job done within practical and achievable building, milk handling, and management routines.

BASIC PRINCIPLES OF MACHINE MILKING SYSTEMS

Vacuum

The milking unit removes milk from the teat of the animal by the application of partial vacuum. Vacuum is measured in inches of mercury. The recommended range of vacuum level on the milking system is between 10.0 and 14.0 inches of mercury. The primary effect of the different vacuum levels is milking rate. As vacuum level increases, milking rate increases.

The vacuum used for a low line milking system is lower than the vacuum used for a high line milking system. Teat end vacuum should be 10 – 13 inches of mercury depending on the inflation.

Generally, teat end vacuum will be one inch less than the gauge vacuum on a highline system but very close to gauge vacuum on a low line system.

The Milking Unit

The pulsator causes the inflation to switch from the milking phase to the rest phase. As the pulsator operates, it causes the chamber between the shell and the inflation to alternate regularly from vacuum to atmospheric pressure.

During the milking phase, the space between the inflation and shell becomes a vacuum. Equal pressure inside and outside of the inflation causes it to open and the milk to flow, as the milk in the udder is at atmospheric pressure.

During the rest phase, air at normal pressure enters between the shell and inflation. Due to the vacuum in the stem the inflation collapses around the teat. The pressure of the collapsed inflation on the teat reduces congestion of blood and body fluids in the teat skin and tissues.

The rate at which the inflation is closed and opened, called the pulsation rate, varies from 60 to 100 pulsations per minute depending upon the manufacturer. The manufacturer's recommendations for a particular pulsator should be followed.

Pulsator Ratio

The pulsator ratio is the length of time the inflation is in milking position compared to the time it is in rest position. It is expressed as a

Milking Systems and Routines

simple ratio or as percentage of time open to time closed. The ratio should range between 50:50, 60:40 or 70:30 milk to rest ratio. The ratio should be verified by your equipment dealer to be sure that pulsators and inflations are functioning properly.

Milking Machine Selection

When selecting a type of milking machine, watch to see that the milk is quickly removed from the teat end. The reason for this is so that milk can not be forced back into the teat end. A small air vent in either the inflation or the claw will help move milk away. An air bleed is necessary on most types of pipeline units.

Inflations or Teat Cup Liners

Many types of teat-cup shell and inflation combinations are available. Teat size governs the choice of inflation size. In general, large teated animals can utilize larger inflations without discomfort, while the smaller teats are best milked with smaller inflations. Shorter stemmed inflations improve milk-out rates in goats.

Inflations can be made of rubber or silicone. Silicone is more expensive, easier on the teat ends and lasts longer than rubber. There is some difference in response time between milk and rest phase so that should be considered when selecting inflations. Be sure to change inflations according to the recommended number of milkings.

The Vacuum Pump

The most important consideration with regard to

the vacuum pump is that it possess adequate capacity (cubic ft./min.) at the operational vacuum level. Manufacturers can provide CFM ratings for various vacuum pumps or the CFM delivery can be determined by the use of a flow rate meter.



When selecting a milking machine, watch to see that the milk is quickly removed from the teat end. Shorter stemmed inflations improve milk-out rates in goats. Silicone inflations are more expensive, easier on the teat ends and lasts longer than rubber.

The size of pump needed for milking machine operation depends upon a number of factors. Among these are:

- Number of units.
- Size and length of pulsating lines.
- Type of pulsator.
- Type of system (bucket or pipeline).
- Requirements of other vacuum-operated equipment.

Make sure that your system has adequate CFM capacity. Check with your manufacturer for the vacuum pump ratings. The vacuum level should drop no more than ½ inch when all units are working and one is dropped (open). Try for 10 CFM per milking unit.

Milking Systems and Routines

The vacuum pump and the power unit should be installed as close as possible and practical to the center of the milking area. Such locations as a feed room or near a haymow chute should be avoided. The exhaust from the pump should be piped to the outside of the building through a pipe whose diameter is at least as great as that of the pump's discharge port.

Since oil is present in most exhausts, the exhaust should be directed downward and away from the side of the building, which prevents rainwater from entering the pump, and also prevents accumulation of oil and dirt on the side of the building.

The pump should be serviced as directed in the service manual. Maintaining the oil level in the pump or supply cup and checking the belt for proper alignment and tension are the two most important maintenance procedures, and should be done every two weeks. Recommended annual or semi-annual service checks will vary with the pump and the manufacturer's specifications.

Vacuum Regulators

Vacuum regulators admit air into the milking system to prevent the vacuum level from going too high. The regulator must have capacity equal to or greater than the vacuum pump capacity. A regulator which is too small may result in excessively high vacuum.

In the bucket milking system, the regulator should be placed between the pump and the first stall cock opening. In the pipeline system, the regulator(s) is usually located between the vacuum

pump and the milk receiver. A good location is beyond the vacuum reserve tank and near the milk reservoir but away from an elbow.

An area should be selected where the air being admitted into the regulator will be relatively clean. Some regulators may malfunction if not properly installed. Make sure that those types that rely on sliding valves are installed in a perfectly vertical position.

The regulator should be checked at least twice a month. Accumulation of dirt in the valve is one of the primary causes of malfunction. The valve seat and moving parts should be cleaned regularly. Most regulators are designed to not require oil for lubrication, since oil tends to collect dust and dirt. The manufacturer's recommendation for maintenance and service should be followed closely.

Regulator performance is affected by basic design. Servodiaphragm regulators are the most effective; while weighted level types are the least desirable.

Pipe Sizes

The milking units are operated by a piping system which must be large enough to permit the units to function properly. Restricted vacuum and milk line sizes may result in machine malfunction and lead to teat and mammary gland injury.

The pulsator pipe carries air from the pulsator to the vacuum pump. In the case of bucket milkers,

Milking Systems and Routines

the pipe is the only source of vacuum to the goat. In the pipeline milker, the sanitary milk pipe is the source of milking vacuum.

The following pipe sizes are suggested for the vacuum line for bucket milkers. The same size is recommended for the pulsator pipe of pipeline milkers.

<i>Number of Units</i>	<i>Size of Pipe</i>
Up to 5	1 ¼" pulsator pipe
5 to 7	1 ½" pulsator pipe
OR	1 ¼" looped (double) line
8 to 12	2" pulsator pipe
OR	1 ½" looped (double) line

*Looped systems are best, as the vacuum level is more stable at all outlets.

Sanitary or Milk Pipeline

Sanitary milk lines are made of stainless steel or glass. Glass affords visibility, while stainless steel is not as susceptible to breakage. Stainless steel can be welded in place under farm conditions.

The milk pipe must be installed on a continuous slope of 1 to 1 ½ inches per 10 feet of length. The maximum height of the pipe from the platform where the animals stand should be 5 feet.

Adequate slope, without low spots, facilitates complete drainage of cleaning and sanitizing solutions. Ceiling mounts that are subject to

movement because of variable loads on the floors above should be avoided. The line should slope toward the milk receiver so that milk can flow by gravity from the milk-inlet ports to the receiver without flooding.

Risers in milk lines must be avoided, since they cause the line to flood, contribute to the development of rancidity, and cause vacuum fluctuations. In new construction, it may prove desirable to slope the stable or parlor floors toward the milk room in order to keep milk lines as low as possible.

Install low lines where possible. The hoses to the milking units should not exceed six (6) feet in length. Adequate pipeline slope and size are essential to prevent flooding of the system. Flooding causes erratic vacuum changes in the system, which may result in increased udder irritation and a possible increase in the incidence of new infections.

Sanitary Milk Pipe Size (inches)

<i>Pipe Size</i>	<i>Maximum Number of Units per slope</i>
1 ½	4
2	8

These sizes apply to conditions where the animal is milked directly into the milk pipeline. Pipes for weigh jar systems operated primarily as milk transfer and wash lines must be of adequate size for washing.

Milking Systems and Routines

Number of Units

The number of units you should have varies widely, depending upon the type of system, the nature of the goats (fast or slow milking), and the operator. Generally, an operator can handle 4 to 6 units.

Milking Platform

The milking platform and area must be made of a non-porous surface. Wood may not be used to make the milking platform. Concrete, steel, or hard plastic is recommended.

Milking Practices

Good milking practices are essential to keep goats healthy and to achieve good labor efficiency.

During milking, there are two critical periods when udder damage is most likely to occur: at the beginning and the end. To prevent udder damage, make sure the animal is properly stimulated for “let-down” prior to attaching the machine. The stimulation should be accomplished in the same manner at each milking. The interval between stimulation and machine application should be short and constant. Ideally, the stimulation to machine-on time should be about one minute. The “let-down” hormone effect lasts about 7 minutes. It is important that the goat is milked out rapidly and the machine removed as soon as the goat is milked out.

Preparation of Udder

Pre-dip the teat. Use a strip cup to detect flaky or clotted milk. The strip cup also aids in stimulation because of the manipulation of the teat and udder.

Then dry with a single use towel.

Machine Application

Good milking management will aid in reducing udder irritation. Do not operate more milking units than can be handled effectively. Adjust the unit properly so that the goat milks out quickly. Proper adjustment also aids in minimizing “fall-offs.”

Unit Removal

Machine strip only as long as necessary to remove the milk that is readily available. Remove the unit gently, taking care to avoid injury to the animal. Shut off the vacuum, and then push down on the top of the inflation with the thumb or finger to release vacuum in the teat cups. The unit should then come off readily.

Teat Dipping

Teat dipping has been shown to give effective control of the common forms of mastitis. Immediately after milking dip each teat in a disinfectant solution which is specifically formulated for this purpose. Follow directions on



Upon the completion of milking a post-dip should be used to prevent bacteria from entering open teat ends.

Milking Systems and Routines

the label.

CAUTION: Do not use udder or equipment sanitizers as a teat dip unless they are specifically listed on the label for this purpose. Observe the teats regularly to make sure they are not chapped or irritated.



The proper milking procedure is important in producing high quality milk. The udder needs to be stimulated prior to milking to allow the "let down" hormone to take effect. The milker should wear gloves as the gloves have a non-porous surface which does not harbor any bacteria as skin may.

CHECKS AND MAINTENANCE

A regular thorough checking and maintenance schedule is essential to keep equipment in top working condition. The manufacturer of your equipment has specified many items. Follow those instructions carefully.

Several items apply to all systems. The most important are as follows:

Daily

- Check vacuum level.
- Make sure pulsators are operating properly.
- Check rubber parts for breaks, tears, and cleanliness.
- Check vacuum pump oil supply and belt tension.
- Install clean filters for each milking.
- Make sure air inlets to claw assemblies are open.
- Check bulk tank temperature.

Weekly

- Check and clean vacuum regulator.
- Inspect inflations.
- Check couplings and stall cocks for leaks and electrical connections.
- Check vacuum filter for cleanliness.

Monthly

- Clean regulator filters.
- Check and adjust vacuum pumps belt tension.
- Inspect all lines, gaskets, and fittings for leaks
- Check pulsators (airline connections and filter)
- Check condition of vacuum pump oil.
- Check CIP (clean-in-place) system for proper cycling and water temperature.

Annually

Milking Systems and Routines

- Contact your milking equipment dealer to schedule a routine check of your milking system.
- Have the cooling system checked and cleaned.

Troubleshooting Milk Quality Issues

Developed by Jordan Le Roux, Vermont Butter and Cheese Company and Daniel Scruton, Vermont Agency of Agriculture

Raw Bacteria Count (RBC) (Standard Plate Count)

Problem

Sample shows higher than standard RBC.

Solutions

Milking System

- Clean and sanitize bulk tank including lids, gaskets, agitator, and bridge, measuring stick, etc. after every pick-up.
- Sanitize the milking equipment before milking and thoroughly wash them immediately after.
- Clean and sanitize units if they fall on the floor and become contaminated.
- Make sure that wash cycle works properly. Pre-rinse start temperature should be between 110 degrees F and 120 degrees F. Washing cycle should remain above 120 degrees F and last 8 – 10 minutes (pH 11-13, chlorine concentration about 100 to 200 PPM). Acid rinse should be performed at a pH of about 3.0.
- Milking system should have thorough examination every year and at 1200 hours made by the equipment dealer.

Milking Method

- The goal is to milk clean, dry and sanitized teats.
- Clip goat's udders if needed.
- See *Milking Practices* section.

Filtering the Milk

- The goal is to produce clean not cleaned milk.
- Make sure filter is present before milking.
- Change single-use filter after every milking.
- If dirt is apparent on the filter, then goats were not cleaned and/or units fell off excessively.

Milking Parlor

- Keep clean and well ventilated.
- Remove the manure from the group.
- Milking parlor should be cleaned after every milking, floor, trough, and pit.

Bulk Tank

- Cool the milk to below 40 degrees F within 30 minutes after the completion of milking.
- The milk should never rise above 50 degrees F during the second and subsequent milkings.
- Make sure the thermometer is working properly; use a calibrated thermometer to check the accuracy of the gauge.
- Make sure that the bulk size tank is big enough to hold 4 days worth of milk during peak production period.
- Make sure that the cooling tank contains enough

Milking Systems and Routines

milk after the first milking to allow the agitator to function effectively, typically halfway up the paddle.

- Check if the agitator operates normally until the milk is cooled to between 34 degrees F and 40 degrees F.

Barn Area

- Keep goats dry, clean, and comfortable.
- Keep barn dry, clean, and well ventilated.
- Bedded pack should be maintained daily, add bedding as needed. Remove excess manure, high traffic areas should be scraped daily, (waterers, feed alleys, holding area.).

Laboratory Pasteurized (LP)

Problem

Sample shows higher than standard LP. If RBC is also high check items under RBC first.

Solutions

Milking system

- Check milking system for air leaks around gaskets, fittings, etc.
- Check sliding milk valves for build-up around cover.
- Check the cleanliness of elbow pipes by using a flashlight (no residues, no smell of milk).

Vacuum Pipelines and Hoses

- Clean the vacuum pipelines from the receiver to the sanitary trap and back to the distribution tank.
- Clean the vacuum hose between the bucket and pulsator.

Bulk Tank

- Check bridge or portion of bulk tank above the milk line.
- Take apart, and clean as needed, all removable parts, especially outlet valve gaskets, measuring stick, etc.
- If a bluish bio-film is noticeable, remove with a strong chlorinated cleaning solution.
- Be sure spray rinsing over the outside of the tank does not drip into the milk, milk should be wiped not rinsed if the milk is near an opening.
- Be sure any condensation dripping from overhead pipes cannot enter the tank.

Milking Method

- The goal is to milk clean, dry and sanitized teats.
- Clip goat's udders as needed.
- See *Milking Practices* section.

Antibiotics

Problem

Sample test is positive (antibiotics are present).

Milking Systems and Routines

Solutions

- Carefully identify goats that have been treated with antibiotics in order to discard the milk from these goats.
- Carefully read the label on the antibiotic container and follow the veterinarian's recommendations.
- Avoid exceeding the prescribed dosage; carefully read the prescribed withholding time.
- Goats treated with antibiotics should be segregated from the rest of the herd and milked last or with separate equipment; all milk from treated goats should be discarded until the goat's milk has been cleared with the appropriate test.
- Be sure drug test kits used are appropriate for the antibiotics administered.
- When sending a sample to the lab, be sure to identify both the animal and the drug used on the vial.

Somatic Cell Count (SCC)

Problem

The sample test results show a high number of somatic cells in the milk. Research has shown that during rut an uninfected goat may have a somatic cell count greater than 1,000,000 SCC/ml. That is why the regulatory standard for goats is higher than that allowed for cows, sheep, etc. It is important for a goatherd to have a SCC below 500,000 prior to rut if you expect to receive the milk quality bonus for SCC through rut. To ship milk all year, a strategy needs to be developed to deal with this problem. Consider out of season breeding so that only a portion of the herd is in rut at the same time. This solves problems if you sell

milk in a quota-based market as well as returns more money to you by increasing your quota from a more consistent production. To prevent mastitis from elevating your SCC, you need to address the items listed below.

Solutions for Prevention

Milking System

- Ensure that the milking equipment is operating properly at every milking.
- Have the system entirely inspected once a year or every 1200 hours of operation.

Milking Method

- Mastitis occurs when bacteria enters the udder. That is why milking hygiene is critical to maintain a low SCC, see section *Milking Practices*.

Hygiene

- Keep goats clean, dry, comfortable, and well nourished.
- Bedded pack should be maintained daily. Add bedding as needed. Remove excess manure.
- High traffic areas should be scraped daily. (waterers, feed alleys, holding area, etc.)

Herd Management

- Use DHIA.
- Use the CMT on any suspicious goat.
- Ask your local veterinarian to help and advise

Milking Systems and Routines

- you.
- Cull goats with chronic mastitis.
- Dry off animal in late lactation especially if CMT is positive.
- Milk mastitic goats at the end of the milking process.
- Use a clean sanitized milking unit on all fresh goats.

Preliminary Incubation (PI)

Problem

The sample test results show a high PI count. A high PI count usually is caused by dirty equipment or udders and an insufficient sanitizing of the milk contact surfaces. If RBC is also high check items under RBC first.

Solutions

Milking Systems

- Be sure all milk contact surfaces are sanitized prior to use.
- Ensure that the milking equipment is operating properly at every milking.
- Have the entire system inspected at least once a year or every 1200 hours of operation.
- Check milking system for air leaks around gaskets, fittings, etc...

Milking Method

- Proper teat disinfecting is crucial to maintain a low PI; the goal is to milk clean, dry, and

sanitized teats;

- Clip goat's udders as needed.
- See section on *Milking Practices*.

Bulk Tank

- Make sure that the cooling tank contains enough milk after the first milking to allow the agitator to function effectively; typically halfway up the paddle.
- Be sure spray rinsing over on the outside of the tank does not drip into the milk; milk should be wiped not rinsed if the milk is near an opening.
- Be sure any condensation dripping from over head pipes cannot enter the tank.

Cleaning of Milking System

- Have the water analyzed at least once a year in order to adjust the solutions.
- Pre-Rinse
 - Immediately after use, all equipment and utensils should be rinsed with lukewarm water (110 degrees F – 120 degrees F).
 - Water rinse should not be re-circulated but should be discharged to drain.
 - Do not use hot water (>125 degrees F) as it may cause milk bio-films or cold water as it may cause butterfat solidification.
 - Disassemble and clean all manual wash items.
- Washing
 - Prepare the appropriate cleaning solutions; follow directions strictly; always measure

Milking Systems and Routines

- amounts.
- Be aware of the wash solution temperature; temperature should be not less than 120 degrees F at the end of the cycle.
- Circulate cleaning solution for a minimum of 20 slugs, typically 8 to 10 minutes.
- pH should be between 11 and 13.
- Chlorine concentration should remain about 100 to 200 PPM.
- Acid Rinse
 - Water should be lukewarm.
 - Acid cleaner should be added to adjust the water pH to about 3.0. This is particularly important for hard water.
- Storage
 - All utensils and equipment should be stored in a manner that permits water to drain completely and let air dry.
- Sanitizing Procedure
 - Equipment should be sanitized prior to its next use to reduce the residual bacterial contamination of milk product to contact surfaces;
 - Sanitizers will not compensate for poor cleaning.

Milking Practices

- Wear milker's gloves.
- If teats are soiled, clean them with an appropriate udder wash, using individual towels.
- Coat each teat to the base of the udder with an effective teat disinfectant; leave on for at least 30

seconds.

- Remove the foremilk by hand stripping into a strip cup.
- Wipe the teats with an individual towel and do not forget the teat ends.
- Attach unit after completing teat preparation.
- Reposition units as needed to minimize squawking.
- When milk flow ceases, immediately shut off vacuum and remove unit.
- Coat teat with post milking disinfectant (teat dip).
- Between groups, remove manure that may have accumulated on the milking platform.
- Have adequate trash and towel receptacles to minimize clutter in the milking area.

RESOURCES FOR MILKING SYSTEMS AND ROUTINES

Milk house Construction, Equipment and Sanitation

D.L. Ace Pennsylvania State U. University Park

Machine Milking Systems

S.B. Spencer Pennsylvania State U. University Park

Trouble Shooting Milk Quality Issues

Jordan Le Roux

Vermont Butter & Cheese Company

Milking Systems and Routines

Daniel Scruton

Vermont Agency of Agriculture

Goat Extension Handbook

George F. W. Haenlein Univ. of Delaware

Donald L. Ace Pennsylvania State University

Identification and Genetics

Compiled and Written by Clara Hedrich with Daniel Considine, Consultant

IDENTIFICATION

There are several good reasons to permanently identify your goats. The permanent identification:

1. Allows the farm manager to keep track of who the goat is and to keep accurate records on ancestry, health, reproduction, and lactation.
2. Is required by ADGA (American Dairy Goat Association) in order to register your goat.
3. In the event the animal is lost or stolen, the animal can be readily identified
4. By being able to identify the animal, it is much easier to make genetic progress. Goats may be permanently identified by using a tattoo, tag, or a microchip. Tattoos are permanent if well done but take time and effort to read and may fade with age.



Supplies that are necessary for tattooing include the tattoo tongs with numbers and letters, tattoo ink, rubbing alcohol, towels and a toothbrush. A tattoo is a form of a permanent identification. Tattoos are placed in the ears of all of the breeds of goats except for the Lamancha breed. The tattoo is placed in the tail web of the Lamancha.

Goats are curious by nature; thus using non-permanent identification may be a challenge. Ear

tags may be chewed on, pulled out or worked out of the ear and eventually lost. Plastic number tags on a neck chain are readily chewed on and the number maybe unreadable or simply the may chain break and the number will be lost. Ear tags with microchips in them are becoming more common. Neck chains with matching numbered tattoo or ear tag may be a good system. This provides a good visible ID in the neck tag and also provides a corresponding permanent ID.

Permanent Identification of Dairy Goats

The first step in correctly identifying a kid goat is to place a neckband on the kid upon birth. On the neckband write the animal's birth date and doe number. Record this information along with the sire in your reproduction record-keeping system.

If tattoos are the primary ID, kids should be tattooed early at 1 to 4 weeks. Required tattoo supplies include a tattoo tongs with numbers and letters, tattoo ink (most prefer green ink) either paste or a roll on, a bottle of rubbing alcohol and a toothbrush.

The farm identification letters/numbers go in the right ear. To determine the right or left side of an animal, stand directly behind the animal facing the back end of the animal. Your right side will be the animal's right side; your left side will be the animal's left side.

The Unique Tattoo Sequence should be used in the right ear of all the goats. The sequence is assigned by ADGA when a membership is issued.

Identification and Genetics

A sequence preference can be requested on the membership application. If the requested sequence is already in use, another sequence will be assigned. A unique tattoo can be used by more than one membership if authorized in writing by the ADGA member that is assigned the sequence.

If the assigned unique tattoo is used and each goat has a different left ear tattoo, the goats are uniquely identified and meet the scrapie requirements for movement within or out of Wisconsin (if also registered). Scrapie tags are available from WDATCP and are required to sell goats over 6 months in Wisconsin if goats are not tattooed and registered.

The tattoo in the left ear is used to identify the specific animal. This tattoo starts out with a letter, which represents the year. The ADGA tattoo letters by year are 2007 – X, 2008 – Y, 2009 – Z, 2010 – A and 2011 – B. The second tattoo is a number. The first animal born that year has the number 1, the 2nd is 2, etc. Thus the 52nd animal born that is being tattooed in the year 2008 would receive the tattoo Y52 in her left ear.



Goats may lose neck chains and identification tags. A system should be in place to permanently identify the animal so that if a tag is lost the animal can still be positively identified.

To actually tattoo an animal, place the correct letters and or numbers in the tattoo tongs. Punch a piece of paper to be sure the tattoo is correct. Next clean the inside of the ear with rubbing alcohol. Rub this surface with the green ink; put the flat rubber surface against the back of the ear. Do not tattoo over a major vein in the ear. Tattoo the ear using the tattoo tongs to puncture the ear firmly. Roll on more ink, and scrub this ink into the tattoo marks with the toothbrush. The ink needs to be rubbed in for at least twenty seconds to get a long lasting tattoo.

This tattoo will permanently identify the animal for the rest of its life. Since the ears of the Lamancha breed are so short, they have their tattoos in their tail webs. To read tattoos in black or brown skinned ears, darken the area around the goat's head and ears and shine the beam of a flashlight through the back of the ear so it illuminates the skin around the tattoo. The tattoo is very easy to read if done properly.

When animals enter the milking herd, neck chains with a tag are put on for easy identification. Recording the tag number for each tattoo is necessary as goats will lose neck chains and tags. Using neck tags matching tattoo or ear tags works well.

Small sheep and goat tags (like Premier) applied close to the head can be applied at a few hours or days old and will usually stay in for the lifetime of the animal. These are small tags and are hard to read unless the doe is caught and held.

Identification and Genetics

In summary, permanent identification is necessary for accurate recording of reproductive, milk production, and health records for an animal. It is hard to maintain and make genetic improvements in your herd if no records are kept.

Microchip Identification

Microchips under the skin or embedded in ear tags are also used and can result in time savings during stock working. The chips can be lost with tags or migrate under the skin. Under skin microchips can be reported to ADGA for addition to the certificate of registered animals. They are more tamper proof than tags or tattoos and are gaining in popularity.

Breeding Goals

The first step to advancing your herd genetically is to develop your breeding goals and then stay with them. In a dairy goat-milking herd obviously you will be looking at milk production, butterfat, and protein components.

But, remember type is important also. The doe must have strong feet and legs with the correct set to the legs to allow her to move freely to and from the feed and water source as well as the milking area. She needs a strong mammary attachment that is high and wide. This will minimize udder trauma as she walks and as she lies down and gets up. A deep wide body will give her lungs, heart and rumen plenty of room for feed capacity, to help oxygenate and circulate the blood. A strong topline will set up the body to work well together. A slightly sloping rump will allow the doe to have kids without getting lodged in the birth canal.

A key point to remember: Milk puts the doe in the herd, but type will keep her in the herd.

GENETICS

The genetic potential of dairy goats to produce milk and fat can be improved each generation if does and bucks with the best genotypes in the current generation are selected as parents for the next generation.

Selection Response

Again, the first step in the selection process is to define the goals of the program; e.g. which traits are desired in selection. The appropriate records



More genetic progress can be made in a herd if the concentration of the efforts is on the selection of the buck.

need to be collected on the selection candidates and their relatives.

From these records, the breed values of the individuals are estimated and the goats ranked from best to worst. The breeder must now decide how many goats of each sex are needed, and selection is then simply keeping the top ranked animals. Fewer bucks are required to maintain the population than females; therefore the intensity of selection for males should be much greater. This

Identification and Genetics

points out that more progress can be made by concentrating efforts on buck selection.

Inheritance of Production and Type Traits

The inheritance of milk production and most body type traits is complex. Unlike some physical traits that are simply inherited (qualitative traits) and are controlled by a few genes (for example, coat color and the presence of horns), milk production and body type traits are under the control of many genes (quantitative traits), perhaps a thousand or more. Although the individual influence of each of these genes may be small, their collective influence can be great.

Production and type traits also are affected by environmental factors such as feeding, management, and health. In most cases their influence is greater than inheritance. However,



Coat color is a qualitative trait that is affected by only a few genes.

this does not mean that genetic selection is not effective for improving many of these traits.

Environmental influences, however, can mask

genetic differences when selecting between animals and the genetic constitution of an animal cannot be determined with certainty by physical observations or by test matings as is the case with some simply inherited qualitative traits. One cannot be sure if above or below average performance of an individual goat is due to genotype or environment.

Accordingly, parents may not “breed true” for production and type traits, and more likely will have wide variations in their offspring. Each kid receives only a sample half of each parent’s genes, which by chance can be above or below average. Furthermore, each kid can be subjected to different environmental conditions.

Environmental Corrections

Environmental influences can be controlled and corrected to permit more accurate identification of genetic difference between individual goats. Major environmental factors include level of herd management, year, age, season, parity of kidding, length of lactation, dry period, and previous lactation.

Genetic milk yield values are expressed as deviations from the herd average (including herd level adjustments) to remove the influence of herd management and to facilitate comparisons between does from different herds. Most differences between herds for average milk production are due to feeding, housing, diseases, etc. Estimates are that 10 to 20% of the differences in production between herds is due to genetics. The remainder 80 – 90% is due to environment.

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Season of kidding has a marked influence on milk production. Does kidding between December and March have, on the average, higher milk and fat yields than does kidding later in the year. The influence of season of kidding on percentage of fat is considerably less than on yields of fat and milk, but does kidding in April to July have slightly higher fat tests than does kidding earlier. If comparisons are made between does with records initiated during different seasons, they should be adjusted for season of kidding. Season adjustment factors in conjunction with correction for age of kidding have been published for each breed.

Age of kidding affects milk production strongly. Age and season of kidding jointly account for 30 to 40% of the total variation within a goat herd for milk and fat yields, which increase up to 5 years of age and then decline with advancing age. Effects of age on fat percentage are less pronounced. Lactation number, in addition to the effect of age, has a large influence on milk and fat yield in the dairy goat, which makes the dairy goat different from the dairy cow. The average difference in 305-day milk yields between first and second goat lactations is approximately 300 lbs.

Heritability

Heritability indicates the relative importance of heredity in the expression of a trait and measures the average percentage of variation between individuals that is due to heredity. For example; if a trait has a heritability of 30%, 30% of differences between individuals for a particular trait are attributable to genetics but the remaining 70% are due to environmental influences.

Heritability also gives an indication of the potential for phenotypic selection to improve a trait genetically. A high heritability suggests that individual selection will produce rapid genetic improvement, but a low heritability value indicates that progress from such selection will be slow and other means may need to be adopted to improve the trait.

The heritability of milk yield of goats is moderate and about 30%. Fat yield has a similar heritability. Heritability of fat percentage is higher about 50%, and heritabilities of other milk constituents such as protein and solids-not-fat are similar to that of fat percentage.

Repeatability

Performance of goats, either good or poor, tends to be repeated although not perfectly.

Repeatability represents the average correlation among records of the same animal and measures the tendency to be similar on successive records by the same animal. The repeatability of successive milk and fat yield records of the same doe is about 50%. Repeatability of fat percentage, and probably the other major milk components, is approximately 60%.

Improvement of Several Traits

Selection for one trait seldom leaves other traits of economic importance undisturbed. Many production and type traits are correlated genetically; i.e. they are influenced by some of the same genes.

Identification and Genetics

The primary purpose of the dairy goat is to produce high quality milk efficiently. Accordingly, milk production must be a major selection goal. The more traits that are selected in a breeding program, the less the progress that can be made for any single trait. Therefore, the breeder must restrict his selection emphasis for traits other than milk yield to only those that have economic importance and large heritabilities to respond effectively to selection. Traits which have created shorter life span should be identified for emphasis in the herd breeding program.

Making Genetic Progress

In order to make progress in your herd there are a few key concepts to keep in mind and follow.

The first concept is to set goals for your herd. Where do you want to go with your herd and how do you plan to reach those goals?

Second as you start your goat dairy, work hard at your management practices. Fine-tune them. Depending on what resource you read, how well an animal does in your herd is anywhere from 60 to 80% management and 40 to 20% genetics respectively. Management is a huge factor in how productive an animal is in your herd. The best genetics can not make up for poor management practices.

The third step is to identify the style of animal that does well in your herd. What does well in your herd under your management, in your facilities may not do well in another setting. Another type of animal that does extremely well in someone

else's setting may not do well in yours. As you identify animal types that do not do well in your herd, consider culling them.

Once you're comfortable with your management, you have your goals and you've identified the style of animal that works best for you the fourth step will be to select a buck or a group of bucks for your herd. Get as much information on the bucks as you can before you make your decision. Ask to see milk records on their dams. Look at the relatives of a potential sire to find genetics to change your herd for the traits that you select to emphasize.

The ADGA Linear Appraisal program data and the ADGA genetics website are helpful to identify potential sire families. Spending \$50.00 on a young buck kid may get you what you paid for a meat kid and not a sire. Remember, the buck puts in ½ of the genetics for your herd. If you have 100 does each doe will only contribute 1/100th of the genetics for the herd.

To make the most genetic progress, select bucks from the top 15% on the USDA Sire Summaries. Select bucks only with positive scores for PTA's, PTI's and or ETA's.

PTA (Predicted Transmitting Ability)—this comparison number is calculated from the animal, its progeny and its ancestry. A buck that is average for a trait will have a PTA at zero. A buck that has a plus for a trait indicates that this buck is better than the average for the breed. It is important to have a percentile ranking with this number as it

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gives a comparison where this buck is compared to other bucks within the breed.

PTA's are generated for Milk Yield, Fat Yield, Fat Percentage, Protein Yield, Protein Percentage, Dollar Value. These are expected difference from herdmates of average genetic merit per lactation. PTA for type is the expected difference from herdmates of average genetic merit in Final Score (ADGA LA system.)

PTI (Production Type Index) is a genetic index that combines production and type evaluations into one score. PTI's provide a comparison between bucks of a breed and are not expressed in pounds or points, as are PTA's. The Indexes are listed with a 2:1 production emphasis and a 2:1 type emphasis.



A Saanen crossed with any other breed will usually produce an animal with a white coat. A Nubian crossed with a breed that has erect ears will produce an animal with airplane ears. Ears that are too long to be considered erect but are too short for a Nubian. They are somewhere in the middle of these two ear types.

ETA (Estimated Transmitting Ability) – this comparison number is an estimated number for a young buck based on PTI numbers from his sire and dam. When a buck or doe has enough production and type data available, a PTI will be generated and the ETA will no longer be listed on ADGA pedigrees or performance reports for that animal. Twice each year new calculations are run by USDA and new PTA's and PTI's are generated. The latest calculation will have most value, as the most data is included.

MAKING SENSE OF GENETICS

Genetics as one begins can be very challenging and confusing or can be quite rewarding. Start out by learning the definitions to a few of the basic terms used, learn a few of the basic concepts and then use the resources available to do your sire selections and matings.

Two resources that are extremely valuable to the dairyman are:

1. A handbook written by Jane Wierschem entitled "Beyond the Basics". Topics covered include Bucks & Breeding, Genetics & Genetic Evaluations, Milk Production & DHI Testing, Type Evaluations and Linear Appraisal, The ADGA Sire Development Program, and more. You may order a copy by contacting Jane Wierschem PO Box 24 Minocqua, WI 54548.
2. The American Dairy Goat Association website also has valuable tools to help you select animals. Go to the website www.ADGA.org. On the menu to the left one can select ADGA

Identification and Genetics

Genetics, Superior Genetics, and Sire Development. Each area has many valuable tools to make selecting quality animals reliable.

For example under ADGA Genetics by selecting Pedigree, a search may be made for an individual animal, under Planning “Try Out” breedings electronically before really doing the mating. Planned Pedigree, Estimated Transmitting Ability (ETA) and Coefficient of inbreeding are “calculated based on choice of sire and dam. PTI /ETA – can search for top animal based on Production Type Index (PTI) and Estimated Transmitting Ability (ETA).

A search under Production gives Predicted Transmitting Ability (PTA) based on data modeled by the Animal Improvement Programs Laboratory (AIPL) of the USDA from years of DHI, production tests.

Use the ADGA genetics data and website to select sire lines that will be likely to change the traits you have identified while also improving or maintaining milk yield.

The genetic evaluations calculated by the AIPL – USDA would show what an animal might or may not be able to pass along genetically. These genetic evaluations are the sire and dam PTAs (Predicted Transmitting Abilities), PTI (production- type indexes and ETAs (Estimated Transmitting Abilities).

SUMMARY STEPS

- ____ 1. Permanent identification of animals.
- ____ 2. Goals set for the herd.
- ____ 3. Quality management practices.
- ____ 4. Identification of the style of animal that will do well in your herd.
- ____ 5. Protocol for selecting your buck.

RESOURCES USED

Adjustment Factors For Milk Records G. R. Wiggans ARS – USDA Beltsville, MD

Genetics of Milk and Type B.W. Kennedy Ontario Agr. College Guelph, Canada

Extension Goat Handbook

George F. W. Haenlein Univ. of Delaware

Donald L. Ace Pennsylvania State University

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Wiggans, G. R. ARS – USDA Beltsville, MD: "Adjustment Factors For Milk Records."

Williams, C.S.F., Michigan State U., East Lansing: "Disease Management" Extension Goat Handbook.

Yazman, J.A., Winrock International Livestock Residential Training Center, Morrilton, Arizona and Turillo, L., Cornell University, Ithaca, NY: "Management—Birth to Breeding," Extension Goat Handbook.

FURTHER INFORMATION

Wisconsin State statues ATCP 60 and 80 list most of the farm regulations and licensing requirements pertaining to dairies:

Dairy Farms: <http://www.legis.state.wi.us/rsb/code/atcp/atcp060.pdf>

Dairy Plants: <http://www.legis.state.wi.us/rsb/code/atcp/atcp080.pdf>

Goat Nutrient Requirement Calculator at the Langston University website:

www.luresext.edu/goats/research/nutritionmodule1.htm

The Small Ruminant Nutrition System is a new resource that is based on the animal state and the analysis of the feed. It can be downloaded free at:

<http://nutritionmodels.tamu.edu/srns/index.htm>

The National Research Council's (NRC) Nutrient Requirements of Small Ruminants, 2007.

The cost is \$130.00 and can be ordered at www.nap.edu or 1-888-624-8422.

For more information about Johne's, contact the Wisconsin Department of Agriculture, Trade and Consumer Protection's Division of Animal Health – Johne's Program at 608-269-0604 or 608-224-4872 or the website Johne's Information Center:

<http://www.vetmed.wisc.edu/pbs/johnes>