



# Dairy Goat Manual

**A report for the Rural Industries Research  
and Development Corporation**

by Arthur Stubbs and Gaille Abud

April 2002

RIRDC Publication No 02/025  
RIRDC Project No PTP-11A

# DAIRY GOAT MANUAL



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ISBN 0 642 58424 9  
ISSN 1440-6845

*Dairy Goat Manual*  
*Publication No. 02/025*  
*Project No. PTP-11A*

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# Foreword

This Manual of “Dairy Goat Notes” was compiled as part of the RIRDC Project PTP-11A, “Improving Productivity and Specialty Cheese Production in the Australian Dairy Goat Industry – Phase 2”. The Notes were compiled by the project researchers, Gaille Abud and Arthur Stubbs.

Information contained in this Manual is provided as general advice only. For application to specific situations, professional advice should be sought.

RIRDC and its research agents have taken all reasonable steps to ensure that the information in these publications is accurate at the time of publication. Readers should ensure that they make appropriate enquiries to determine whether new information is available on the particular subject matter.

This manual, an addition to RIRDC’s diverse range of over 800 research publications, forms part of our New Animal Products R&D program, which aims to accelerate the development of viable new animal industries.

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**Peter Core**  
**Managing Director**

# Acknowledgments

Some of these Notes are based on information provided by Dairy Food Safety Victoria (DFSV), modified as necessary for goats. Several key areas are reproduced in their entirety.

References and acknowledgments are given on individual Notes.

The authors would like to thank DFSV, the Victorian Department of Natural Resources & Environment, the Tasmanian Department of Primary Industry, Water & Environment, and other specialist personnel as listed in individual Dairy Goat Notes, for their individual advice and assistance in the preparation of the Notes.

Further important information on milk production is available from DFSV and/or your appropriate State body that deals with dairy food safety. Local Departments of Agriculture may also have information on aspects of dairy goat farming. Dairy Branches in particular have relevant and up to date information developed for dairy cows that is often applicable to goats.

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# 1.1 Industry and Markets

## Industry development

Dairy goats have been present for a long time, largely as a cottage industry on the fringes of cities, supplying fresh milk to a local market, and well outside the mainstream farming sector. Usually the farmer has been responsible for the whole enterprise; farming, packaging, marketing and distribution. Sometimes a small distributor has been involved, often someone with their own milk to place. Other products have usually been added to improve viability of the operation (goat yoghurt or other food items). Some early attempts at manufacturing (powdering) in Victoria failed for a variety of reasons, including very high production costs, loss of a health subsidy and quality assurance problems.

The growth of demand for specialty cheeses in Australia provided an opportunity for development on a scale that is ideal for an emerging industry. The focus moved from small farms often on city fringes, to larger scale farms on more suitable land. Farms were able to establish and develop in partnership with expanding factories, local markets continued to grow and development was relatively smooth.

Inadequate and very seasonal milk supply was the main limiting factor until 1999 when oversupply became an issue. Several options were explored, firstly the possibility of developing the export market for cheese, and secondly the manufacture of other products. Both of these options remain open. However supply has now decreased with some producers leaving the industry due to peak season milk being oversupplied. There will possibly still be a winter shortfall. Some farms have demonstrated various ways that this can be overcome.

Victoria and Tasmania are the main manufacturing States. Victorian cheesemakers processed 1,145,000 litres of milk in 2000-2001, and Tasmania 348,000 litres. It is difficult to get information on 'commercial' production in other States but the total excluding Victoria and Tasmania is probably about 1,100,000.

Industry organisation and information are very basic, and opportunities will open up as these progress. The Australian Specialist Cheesemakers' Association (ASCA) includes goat amongst other specialty cheeses, and the Australian Goat Milk Association (AGMA) was formed in 2000 to represent the whole of the industry.

Several R&D projects have been funded by RIRDC and DNRE.

Worldwide, dairy goats as an agricultural alternative in developed countries have followed a similar pattern to Australia, reflecting a global interest in product. Traditional countries such as France, which has long been the world leader in dairy goat production, have encouraged new large scale systems and an enterprising product development and export push.

Dairy goat farmers need to understand how the whole industry works; of all agricultural enterprises, farmers' understanding cannot stop at the farm gate.

## Farms

Successful goat dairy farms are operating on systems developed for cow dairying. Several of these are focus farms for a RIRDC project. Dairying models are generally useful and little adaptation has been necessary in areas such as grazing management, despite many common myths to the contrary.

Housed systems are widely used overseas for stock. They appear to offer more control including over seasonal conditions such as drought. However they are inflexible and costs in setting up and running, are high. Bought-in feed costs climb during shortages. Whilst they offer advantages with regard to some health problems, eg parasites, they carry their own health risks.

Mixed systems are common in Australia, ie some grazing and some housing. This appears to not offer the best of both worlds, with problems associated with each system being seen, and the main advantages of each being negated. For example, pasture quality cannot be maintained so dependence on hand feeding increases, and parasites can become intractable.

Prices paid for milk range from 65c/litre to \$1/litre, and this has been stable for some years. Sometimes a seasonal incentive is paid and sometimes price is based on solids. Farmers usually deliver their own milk and a delivery fee is either built in to the price or paid separately. A consideration for farmers who may be more familiar with the dairy cow industry, is that on occasion surpluses do occur for a variety of reasons, and product may have to be dumped. Small factories may experience cash flow problems and payment for milk has been delayed on occasion.

The possibility of developing an on-farm cheese factory should be regarded with caution. There are some successful, high profile instances with high product recognition, but the workload is enormous, usually with those involved learning everything as they go. Small enterprises may not be able to afford the labour units that they need for their diverse undertakings. Marketing is a difficult area and the field is very competitive.

Potential outlets for milk should be explored by intending farmers, and the size of this market quantified as far as possible. Manufacturers who express interest in taking milk may not have any idea of the amount that may be supplied, especially those outside Victoria/Tasmania.

Location of farms should be in productive dairy type country as close as possible to outlets.

It is likely that estimates of a viable herd size will go up, but at present 250 appears reasonable. Production per head is usually over estimated. Information from Australia and overseas, using various management systems, indicates around 500 litres/head/year average, with a wide variation between individual goats. Production gains need to be made by both genetic improvement and management, but size in numbers is as likely to remain significant as it is in mainstream dairying, and for the same reasons.

Regulation varies between States, with either the dairy authority or the health department licencing farms.

## **Markets**

### **Fresh milk**

Markets for fresh milk are difficult to service due to small quantities required and a wide distribution area, compounded by problems of QA and shelf life. Pasteurisation has been strongly resisted by some suppliers despite its potential advantages in these areas, citing consumer demand for unpasteurised product. States such as Victoria and Tasmania do not allow the sale of unpasteurised milk. Milk QA is supervised by dairy authorities or health departments. It is likely that demand has lessened due to other products such as soy drinks being readily available. Health food stores are seen as a natural market.

Interest is high amongst some sectors of the recently deregulated dairy cow industry. A large dairy company in Queensland is currently supplying pasteurised goats milk locally and interstate, using its established distribution networks, and reports very encouraging growth.

The size of the potential market is difficult to determine but an assessment in 1989 (Susan Young, Dept of Agriculture & Rural Affairs, Vic, Agdex 417/840) quoted USA figures of 6-9 litres/week per 1000 population, and expressed doubts as to whether this level could be reached in the medium term in Victoria. Estimates of market size in NSW 1984 were for 1.2m litres/year (Paul Greenwood, Dept of Agriculture, Agfacts Agdex 471/01). Estimates of actual sales suggest 1000 litres/week for 122,500 population is the highest achieved in Australia (northern Tasmania in the 80's) (pers.comm. L Mance).

Liquid milk in UHT form produced in NZ has been marketed here and local production has been proposed for export. Many enquiries are received from Asia for this and other products and RIRDC/DNRE Victoria have a current project looking at this potential. Flavour issues are perceived to be a limiting factor.

### **Goat cheese**

As mentioned above, this has been the growth area. Australia-wide production in 1999 was valued at \$3.2m (ASCA). Recent market surveys (RIRDC) predict continued growth but this has not been quantified, and last spring oversupply was not absorbed by the current markets.

Main outlets are restaurants, delicatessens and increasingly supermarkets, which offer an enormously expanded market. Goat cheese is available much more widely than a few years ago, and this has occurred in the absence of specific paid advertising. Goat cheese has benefited from the interest in specialty cheeses, including promotional activities such as ASCA's annual Specialty Cheese Show, but mostly from the food press. It is used widely in cooking and especially in easily prepared foods such as salads. There is interest within the industry in the Australian Dairy Corporation's role being expanded to include goat and sheep products.

Affluent to middle income areas are the main home of chevre, or French style goat cheese, with fetta style increasing in popularity. Fetta is available in some ethnic areas (Greek and Balkans) where chevre is not common. Fetta is most commonly made from cows milk but there is a common perception that it is goats milk. This is a problem, as cow cheeses are much cheaper and there is considerable price sensitivity.

Competition from imports continues. It may not have impacted on local growth very much but has the potential to put pressure on prices. Local product costs more to make than the retail price of some imports, even with a low A\$. Scale is one reason for this, but there are also industry supports in Europe. The local industry needs to take full advantage of its strengths.

In the past, local cheese quality and consistency have been described as poor, but these do not seem to be major problems now. Customer expectations appear to be met. Australian cheeses were well received at an international conference in France in 2000, and some imports are felt to be inferior to local product.

## **Other products**

Goat milk powder in bulk or tablet form is attractive and there are regular enquiries from Asia. The NZ industry has developed with a very strong export orientation and its principle product is powder. Unlike cows milk powder, goats milk powder is a high return product at this time, selling here for around \$10,000/tonne, and powder based products such as infant formula offer even better returns. Considerable effort has gone into development and promotion of these lines. There is some competition possible from Europe.

The major problem in embarking on powder production is in securing supply of the quantity of milk, on a regular basis, to profitably operate powder plants and to meet export market demands.

## **Further information**

Information and expertise in larger scale economic production is not readily available. Courses designed for dairyfarming are an excellent starting point. Some goat farmers are very productively involved in Target 10 (Vic) or similar groups. An accredited goat course (fibre, meat and milk) is available at some tertiary institutions. Farm consultants especially with dairying expertise can be valuable. Goats do have some particular needs and information needs to be evaluated, but less so than is often thought. The Australian Goat Milk Association, RMB 2830 Settlement Rd, Childers, 3824. The Dairy Goat Society of Australia (Vic Branch) Herd Improvement & Producers' Association, 395 Flat Rock Rd, Hurstbridge, 3099.

## **References**

RIRDC: Milk Production from Pasture, Murrindindi 1996  
Dairy Farm Surveys 1996-1999  
Market Surveys 1998/9, 2000  
Report on IGC, France 2000  
Market Survey, Susan Young, Dept of Agriculture & Rural Affairs, Vic, Agdex 417/840  
Paul Greenwood, Dept of Agriculture, Agfacts Agdex 471/01

# 1.2 Farm Location & Layout

## Location

Farms should locate near markets and in productive dairy type country, capable of supplying quality year-round feed. A forward-looking dairying area is ideal as services and facilities are likely to be of assistance to dairy goat farmers: dairy supplies, vet experience, consultants, contractors, education/extension, technology. The influence of local attitudes and advice is considerable.

A farm considered marginal for cow dairying may be suitable, but the reasons for marginality should be carefully considered. A steep block is difficult to work, regardless of species, although a small bodied animal may be physically able to graze the terrain without damaging it. A small acreage is unlikely to be viable. Returns per ha need to be considered, and the size of a viable herd, presently at least 250, is likely to increase. It has been suggested that a boutique operation, eg incorporating cheesemaking, alters these assumptions; however observation of developing businesses suggests otherwise.

## Milk Delivery

The farmer is likely to have to transport his/her own milk, and distance is important in terms of time and cost. It may be possible to have an arrangement with several farms and factories involved, rotating deliveries to offset costs. If the market is there, larger quantities of milk would offer more opportunities for other products and markets as well as for lower transport costs.

## Markets

Most farms currently supply cheese factories. You should reach a firm understanding with your prospective outlet/s before proceeding. This is not easy, and misjudgments can be made on both sides. Seek information as widely as possible both within the general industry and in the local area.

## Layout

A whole farm plan should be developed. TAFE and other education or extension services may offer courses or advice, and a consultant may be used. Basic dairy farm considerations apply. For most purposes, 5-6 goats can be considered equivalent to 1 cow.



Attention should be paid to:

- *Ease of operation* - including pasture management, access of stock, machinery and people to all required areas, adequate drainage and water supply. Small paddocks, suitable fencing and wellformed tracks are important for these reasons.
- *Herd health* - for example, location of kid raising facilities away from effluent (Johnes disease and others).
- *Priorities* - most farms will not be able to implement all the aims at once. Those with the greatest economic impact will usually have to be addressed first.
- *Future development* - most operators have found their initial assumptions need revising upwards, even without basic industry parameters changing. Flexibility in setup is important.

Acknowledgement: Victorian Dairy Industry Authority - The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).



# 1.3 Fencing

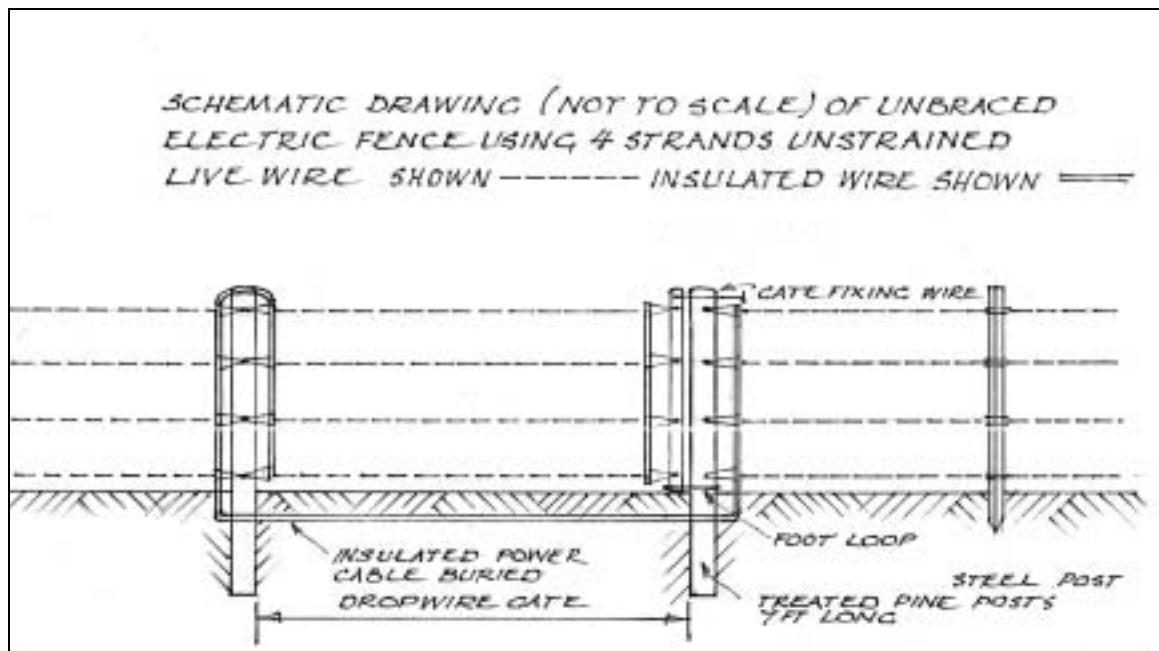
Fencing for dairy goats is not basically different from current standard farm fencing. It does however need to be well made and maintained.

As with any livestock, goats should be kept within good fencing from the start. Once a habit of getting out is learnt, it may be hard to break.

Goats are small bodied and relatively agile. They may climb on fences, or squeeze through gaps, but are less likely jump over. Fences need to be safe as well as a restraint, or injury and loss may occur.

Plain wire fences are not recommended as they are a poor barrier unless kept tightly strained, and maintenance requirements are high. Ringlock or hingejoint is usual for boundary fences and sometimes for main internal fences. These may have a hot wire offset, ~30cm above the ground. This is recommended especially for kids which may get through sheep ringlock.

Electric fencing is generally ideal, being cheap and easy to install and a very effective barrier. Electric break fencing for managed grazing uses removable posts and 1,2 or 3 hot wires. Follow the manufacturer's recommendations for installation and use.



Permanent fencing is not recommended along laneways, which may need to be graded or drained. Electric fencing is easily removed and replaced in such a situation.

Bucks, especially in the breeding season, may require a substantial paddock fence, or be kept in a secure yard. As is usual with stockyards, a yard fence higher than the standard paddock fence may be needed.

Gates should be hung with small gaps only when closed.

Yard fences are often made of mesh panels/sheep panels.

Detailed information on fencing is available from Departments of Agriculture and fencing stockists.

# 1.4 Breed Selection

## Breeds

The specific characteristic of a dairy breed of animal is length of lactation. Breeds of goat used for fibre or meat production, may produce adequate daily quantities and quality of milk, but are likely to have lactations short of the 300+ days that are expected of dairy animals. It is recommended that goats of dairy type be obtained.

Dairy breeds tend to be taller (80+cm) and less solidly built than fibre and meat types. They should be strong and vigorous.

### Swiss breeds

Saanen (white), Toggenburg (brown with white ‘Swiss’ markings: facial and ear stripes, white around tail and lower legs) and British Alpine (black with white Swiss markings) are the Swiss breeds available in Australia. Saanens are the most common type, white being genetically dominant. They are considered to be placid and good producers. However as with all livestock, there is as much variation within a breed as between breeds.

Saanen



Toggenburg



British Alpine



Anglo Nubian



### Anglo Nubian

Based on Indian and North African breeds. They have distinctive long pendulous ears and roman noses and are usually considered a dual purpose breed suitable for arid conditions. They tend to have shorter lactations and lower milk volume than Swiss breeds.

### Crossbreds and mixed breed stock

Crossbreds between the Swiss breeds and also Swiss-Anglo Nubian are common. Many of these are phenotypically (in appearance) of one breed or another. Purebred stock is not common and may not perform as well as mixed breeds.

## **Production levels**

As much information as possible should be obtained about the production achieved by a herd or individual before purchase. However buyers should be aware that up to half of production is due to environmental factors. Animals will tend to produce at the level of the herd they are in.

When considering stock, especially purchase of bucks or does to breed bucks from, buy only from the top say 2% of the herd in question. Actual production levels will tell less about the genetic value of the animal, than its ranking in the herd. For example, a doe that produces 1000 litres/year in a herd which has an average production of 500, is a better doe than if the herd average is 1500 litres/year.

## **Costs**

As there are no genetically proven stock in Australia, be wary about paying very high prices for individuals. However generally speaking, prices are not extremely high for stock when the immediate returns are taken into account. A doe that produces 500 litres at 60c/litre will gross \$300 in a lactation.

## **Settling in**

Purchased stock will not perform to capacity for some time, usually the next lactation. Younger animals probably have a better chance of settling in. This is particularly true if environmental differences are large.

## **Obtaining a herd**

It is unusual to be able to purchase a complete milking herd of any size. In practice, the most satisfactory way of obtaining a milking herd has been to purchase a drop of kids from one or more farms, and raise these. It is possible, if they are well grown, to kid them at 12 months of age. Some losses should be expected and 10% is not uncommon, especially as the farmer is learning as he/she goes. Accidents and injuries appear to be higher amongst goats than cattle.

## **Selection criteria**

Most payment is currently on litres of milk. This is likely to change to payment for milk solids. This should be taken into account when purchasing stock. Be aware that kg of milk solids are more important than % fat or protein, although some cheesemakers specify a certain % level.

## **Disease**

Disease status of animals purchased should be obtained. Vendor Declaration statements are recommended. These may do as little as state that disease status is unknown, but may offer protection to the buyer if the status proves different to that declared.

Parasites and drench history and possible drench resistance, mastitis, footrot and scald, caprine arthritis encephalitis ('big knees'), caseous lymphadenitis ('cheesy gland') and Johnes Disease are common problems. JD has serious implications in some States, and may lead to culling of the herd. Vaccination status should be obtained.

## 1.5 Annual Farm Check List

CATEGORY	TASK	TIMING
Pastures	Soil Test Fertilise with Phosphorus (P), etc. Apply Nitrogen (N) Close paddocks for Silage/Hay Check for Weeds Check for Insect damage Oversow if required	Spring Late Summer &/or Spring From Autumn as needed Early Spring Autumn & Spring Autumn & Spring Autumn
Animal Health	Vaccinations (Pulpy Kidney, Tetanus, Cheesy Gland) Worm Tests (Faecal Egg Counts) Drenching Drench Tests (Faecal Egg Counts) Foot Trimming Udder Checks (Oedema, Mastitis) Weighing Condition Scoring Foot Baths Disease Checks	Late Summer & Late Winter  Autumn, Winter, Spring & Summer As required after worm tests As required after drenching Usually twice a year Pre-kidding ) Three times during lactation & pre- ) kidding According to seasonal conditions Ongoing & according to veterinary advice
Dairy Shed	Check Machines Replace Rubbers QA Check	Annually (Winter) Annually (Winter) Develop a program, eg, daily, weekly, monthly, annually
Kid Rearing	Disbudding Weighing (to check growth) Vaccination (Entero & Tetanus) Weaning	3-7 days after birth Weekly ideally 5 weeks & 9 weeks after birth At about 8 weeks or 16kg
Milk Production	Yield Monitoring Protein & Fat Test Quality Tests (Food Safety) Herd Testing (Milk, Protein, Fat, BMCC)	Daily ideally, or per delivery Per delivery Per delivery At least 3-4 times annually
Mating	Determine annual kidding pattern Acquire bucks or arrange for AI Induce oestrus if required Synchronise oestrus if required Run bucks with herd, hand mate or use AI Pregnancy Testing	A year in advance 6 months ahead of mating 6 months ahead of kidding pattern 6 months ahead of kidding pattern 5 months ahead of kidding pattern  As required

<b>Feeding</b>	Calculate Feed Requirements (Quantity & Quality) for all stock Estimate Pasture Production Prepare Feed Budget	Annually, 6 months in advance  Annually, and then Monthly Annually, and revise Quarterly
<b>Records</b>	Production Feeding Health Mating & Kidding Paddocks Financial	) Daily, Weekly, Monthly, Annually ) as required by Notebook, Wall ) Chart, Planner, Computer ) ) )

Record keeping examples:

## Annual Planner

<i>Season</i>	<i>Task</i>
<i>Autumn</i>	Feed Budget, Worm Test, Herd Test Mating Weeds & Insects, Nitrogen, Oversowing -----
<i>Winter</i>	Feed Budget, Worm Test, Herd Test Milking Machine checks Vaccinations, Udder checks, Foot trimming -----
<i>Spring</i>	Feed Budget, Worm Test, Herd Test Soil Test, Fertiliser, Silage/Hay paddocks, Weeds & Insects Vaccinate kids, Review kidding pattern -----
<i>Summer</i>	Feed Budget, Worm Test, Herd Test Vaccinations, Foot trimming -----

## Production & Feeding Wall Chart

Date	Does milked	Daily litres	Paddock & area grazed (ha)	Est. Pasture DM intake (kg)	Hay/Silage fed (kg)	Bail Feed (g/doe)
15/09/01	180	540	12 - 0.25	450		500
16/09/01	185	530	"	460		500
17/09/01	185	560	"	460		500
18/09/01	190	580	9 - 0.30	480		500
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## 2.1 Milking Premises Requirements

The first requirement for industry growth and development is high quality of milk supplied by farmers. Good product can't be made from inferior ingredients. In a small industry producing specialty goods, the importance of this can't be over-emphasized. Additionally, smaller volumes and less frequent milk delivery in the goats milk sector are a risk factor that must be factored in. Consumers are becoming more sensitive to health issues, including bacteriological and residues. Flavour is an important issue with goats milk and products.

There are differences between States' requirements for milking premises but the basic aim is the same – good facilities are necessary for production of high quality milk.

Farm safety issues are important. Apart from risk of personal injury from badly designed or maintained premises, insurance and compensation issues may apply.

### Siting

Discuss siting with your regulatory office (see contact list on page 7) and other local environmental, planning and health authorities as appropriate. Premises should be easily accessible to stock, operators and any vehicles that may now or in the future require access, in all weathers. Free drainage from building, yards and tracks should be possible, and effluent disposal such as settling ponds should be conveniently located.

### Access

You may need tanker access in the future, if not at present, and this could be a large vehicle. Some tankers can carry milk in separate smaller compartments and it is conceivable that goats milk could be collected in such a vehicle. It's best to allow for something like this now as it may be expensive at a later stage.

The shed should be as close to the road as possible so the tanker access track can be short. Tankers may have difficulty with hills. Clear vision is necessary for the driver. Overhanging branches and other obstructions should be removed. Power lines must be well away from possible contact and clearly indicated. Allow good access to the milk vat and a suitable turnaround.

Keep stock off access tracks. The track should be soundly formed and drained. Consult a construction expert, eg a municipal engineer, for advice.

### Services

Consider the availability of power and water when selecting the shed site.

### Surroundings

These should be clean and free of pests, and of anything that might attract pests. The area should be free from offensive odours, eg from piggeries, manure heaps.

### Buildings, Yards and Facilities

The design and construction of the shed, yards, milk storage facilities and access tracks are important for ease of management and minimising the time taken for milking and cleaning up.

Points to consider are:

- simple construction
- flexible design to allow for future changes/expansion

- good doe flow
- doe comfort
- operator comfort
- safety
- design of premises to enable milking to be completed in no longer than 1 ½ hours

Consult your local advisory officer for information and advice on shed design and construction. You should visit as many operating sheds as possible to see how they work, and how they could fit your requirements. It's important to see the system in operation.

Cow systems can be adapted easily for goats. *However, remember that a small animal can fit through or under a small space, and may attempt to do so especially whilst becoming used to a system.*

## **Milk Room or Dustproof Compartment**

- Allow enough space above a large vat for lid opening and dipstick clearance, and enough space between vat and walls for cleaning and servicing.
- Ensure adequate lighting so the vat can be easily inspected.
- Install protective covers on lights to prevent broken glass from getting in the vat.
- Seal the junction of each wall with both the floor and the ceiling.
- Install a water seal at the entry into the pipe for the drainage from the milk room to the milking area pit.
- Fit each door with a self-closing device.
- If windows are able to be opened, fit fly screens. Interior sills should not be present.
- Provide flyscreened ventilators in the walls and ceiling to disperse steam and allow the room to dry quickly.
- Provide an access door and clear passage for easy connection of milk transfer/tanker hose to the outlet of the vat.
- Construct a concrete apron with good drainage and provide a clean manure free area adjacent to the milk room for the milk transport vehicle.
- Ensure that drainage from the vat outlet does not flow under the vat.
- Provide adequate lighting outside the milk room for the safe collection of milk at night.
- Make sure there are good facilities, eg hot water easily accessible, and a well-drained apron, for cleaning the milk transport tank.
- Construct a concrete path to all entries to the milk room, including between milk room and milking area.
- Do not keep anything that is not used directly in the area, in the milk room. This includes antibiotic contaminated milk and colostrum.
- It is best to restrict the number of vats in the milk room for ease of milk collection and maintenance of good hygiene.

## **Milking Shed**

- Should be well-ventilated, well-drained and well-lit.
- Finish the internal surfaces of walls with a smooth impervious surface to at least 1500mm above floor level.
- Finish floors with a nonslip free-draining surface sealed at the junction of the floor and walls.
- Internal walls, ceilings and roof under-surfaces should be constructed to exclude birds, rodents and insects, and to prevent buildup of dirt.
- Note that good surfaces and drainage, if not achieved satisfactorily in the first place, can be difficult to achieve later.

(See also Dairy Goat Note 'Milking Shed Design')

## **Air Space and Engine Room**

- Walls and floor should be waterproof and free draining.
- Fit machinery guards and other safety measures as required. Remember that farm machinery has a very poor safety record, and apart from personal injury, compensation issues apply.

## **Feed Bins and Storage**

Feeders, troughs and feed bins in the milking shed should be:

- constructed of steel, galvanised iron, PVC or other impervious material
- kept clean and sound
- situated so that feed and dust from them cannot contaminate milk.

Do not keep brewers' grains, silage or other wet feeds within 45 metres of a milking shed unless in a flyproof impervious shed or bin that is:

- adequately drained directly to the holding yard effluent disposal system
- finished in a way that prevents breeding of insects and the possibility of the contamination or tainting of milk.

## **Holding Yards**

- The yard should be of a sufficient size to hold the maximum number of goats to be milked. A maximum of 3 does per square meter is suggested.
- Yards are often the same width as the shed, or funnelled in to the shed, for better stock flow.
- Yard surfaces should be impervious to moisture, have a nonslip surface and adequate falls for drainage. A fall of between 1:30 or 1:50 allows for easy cleaning. The fall should be arranged so that the cleaner areas wash towards the dirtier areas, usually nearer the milking area. Twin falls may be used.
- Kerb the perimeters of yards and access ways to 150mm height to control effluent.
- Yard fences and gates should be constructed of steel, galvanised iron or equivalent material.
- The yard should be cleaned after each milking and maintained in good repair.
- Many goat dairies have covered yards.
- Drafting, loading or holding facilities may be incorporated into yards.

## **Effluent Disposal**

- Manure deposits should not be allowed to accumulate within 45 meters of the milk room.
- An effluent disposal system should comply with local environmental requirements. Farmers should contain dairy waste on their own properties and ponds should not be situated within 100 meters of any water source or water supply.
- Ponds are classed as fixtures and should be sited to comply with the requirements of local municipal regulations, which set minimum distances from road boundaries.
- Effluent ponds should not be sited within 45 meters of the milk room and should be kept as far away as possible from dwellings.
- Ponds should be of sufficient capacity to hold 3 months' effluent and should be fenced to prevent access by children and animals.



## Drainage Systems

All drains from the milking shed, milk room and holding yards should:

- be impervious, free draining, uniformly graded with a fall away from the milk room and milking shed so that all drainage discharges:
  - to a sump (to then be pumped or further discharged by properly constructed gravitational drains)
  - to a point at least 45 meters from the milk room and
- in the case of enclosed drains, have an internal diameter of not less than 150 mm.

All sumps used in the drainage system should be:

- equipped with a straining device or stone trap
- constructed to facilitate easy cleaning
- of such capacity to handle the maximum flow of effluent
- equipped with a gravity or mechanical effluent disposal system, and
- equipped with a stormwater by-pass so as not to fill ponds with stormwater.

Where a milk room is drained to a sub surface enclosed drain, the drain should be provided with a sanitary water seal (eg 'P' trap) immediately adjacent to the drainage outlet in the milk room or a self closing flap at the drain outlet.

All sumps and drains should be maintained in a clean and sanitary condition and in good repair.

## Toilet

Any toilet that is part of a milking shed should be:

- connected to a sewerage or septic system that conforms with the requirements of the local health authority
- vented to the open air
- not open directly into the milk room or milking shed
- inclusive of facilities for hand washing

A toilet cannot be connected to the yard effluent system under any circumstances.

## Water Supply

An adequate supply of good quality (fit to drink) water is important for:

- washing udders and teats
- cleaning milking machines and bulk milk tanks, and
- use in hot water systems.

The quality of water is reduced by its bacterial content and its 'hardness'.

The water bacteria which cause the worst problems are those that come from droppings, rotting vegetation and other decaying organic matter. The use of such water for washing teats or rinsing milking machines can lead to an increase in the bacterial content of the milk.

High levels of calcium or mineral salts in water cause 'hardness'. Hard water reduces the effectiveness of detergents, increases scale and milkstone buildup (which harbour bacteria), and can drastically reduce the life of a hot water service.

Rainwater in covered tanks where roof gutters are regularly cleaned, and water from a permanent stream are generally satisfactory for dairy use.

Water from an underground bore should be analysed for its suitability, and water from farm dams avoided because of surface contamination and runoff.

When choosing a source of water, or having a water analysis done, or treating water of inferior quality, assistance can be obtained from water supply authorities and local advisory officers.

## Hot Water Supply

Hot water should be at least 90 degrees C. for post milking sterilisation.

The size of the unit needed will depend on the number of sets of cups, and the pipeline and receiver capacities; the amount needed for washing the milk vat and the transport tank; and whether hot water is needed for other purposes, eg., mixing kid feeds and washing this equipment.

Hot water allowance of 10L/set of cups per day is recommended, plus other requirements.

Does	Sets of Cups	Volume
100	16	450 litres
150	22	600 litres
200	over 30	reverse flow (30L/unit/min)

Heater size will also depend on whether it uses off peak electricity. Supplementary solar heating is an option.

If water is to be drawn from the heater directly into the machines by vacuum or by pumping, a specially designed heater is required to avoid collapse of the unit during hot water drawoff.

For safety reasons, special attention should be paid to all pipe connections where large volumes of hot water or detergent are drawn rapidly through the system.

## Safety at the Milking Shed

Farmers should assess the risks at their milking sheds to ensure that a high standard of safety is maintained. Their responsibility is for the safety of family, employees, and the public.

### Buildings and Equipment

If building or altering the dairy, consider the following safety features:

- Nonslip floors, and safety grooving of slippery floors
- Provision of a room with a dry floor area that is safe for leaving children
- Adequate lighting in milk room, passages, outside sheds etc.
- External switches near loading door for night loading of milk.

If you have a tall vat with a top mounted manhole, be careful when climbing onto the vat. There should be an internal ladder.

### Chemicals

Use extreme care storing and using.

- Follow the recommendations on the container and store in a safe dry place.
- *Lockable storage cupboard for chemicals.*
- Take care when mixing chemicals; they can react and cause problems such as serious burns.
- Unskilled operators and children should never handle dairy detergents
- Any product that may contaminate milk should never be stored in the milk room or milking shed.
- Chemicals that are no longer required must be disposed of appropriately. Contact your local council for information.

### Drugs especially Antibiotics

Use extreme care storing and using.

- Follow the recommendations on the container and store in a cool dry place.
- Do not use antibiotics without veterinary advice.

- Drugs that are no longer required should be disposed of appropriately. Ask your local council.
- Do not use when out of 'use by' date.
- Note the withholding period and discard milk from all quarters.
- Mark all goats under treatment. Record her name/number, drugs used, and date that the milk can be used again.
- Give the full dose and for the recommended period of time.
- Take care when handling. Gloves are ideal. Wash hands after using antibiotics.

With regard to these points, note that:

- repeated exposure to antibiotics (especially at a low level) can lead to the development of resistant strains of bacteria, resulting in that antibiotic no longer being effective in treating your livestock or your family.
- sensitivities such as contact dermatitis, and allergic reactions such as asthma, can also be a health risk.
- other drugs, eg, prostaglandins can cause serious reactions in humans.

### **Effluent Ponds and Sumps:**

Fence effluent ponds and securely cover sumps to prevent access by children or animals.

### **Electrical**

State authorities have a wiring code that must be observed at all times.

- Always employ an electrical contractor to carry out alterations, repairs or additions to electrical installations
- See that all wiring and equipment is well maintained
- Do not overload wiring installations.
- Install an overload safety switch.
- Advise the local supply authority if additional equipment is being installed
- Use weatherproof outlets and fittings in areas exposed to wind, rain or other moisture
- Ensure that all earthing connections and covers over live conductors and terminals are firmly secured and in good repair.
- Instal isolating switches.

### **Hot Water**

Ensure that hot water taps are turned off firmly and are out of reach of children.

Do not carry hot water in plastic buckets.

For safety reasons, special attention should be paid to all pipe connections where large volumes of hot water or detergent are drawn rapidly through the system.

### **Leptospirosis**

This disease is a problem in cow dairies. It can occur in goats but the extent is unknown. Urine splashing, which is a common mode of infection in cow dairies, is less common with goats. Precautions suggested for cow dairies are:

- Vaccination of cows (not available for goats).
- Always wear sound footwear
- Handle aborted foetuses with rubber gloves
- Reduce exposure of face, arms and body to urine splashing
- After contact with animals, wash hands thoroughly with soap and water.

## Operating Equipment

Protect moving parts such as pulleys, belts, shafts and augers.

Milking machines and in-place cleaning systems should comply with the recommendations for safety standards set out in Australian Standard AS 2844.2 'Milking Machine installations – Construction and performance'.

These recommendations include

- Keeping noise level as low as possible
- Protecting equipment
- Preventing a fire hazard developing from oil buildup
- Installing electrical equipment to comply with legal wiring codes
- Effective water protection of electrical equipment
- Isolating switches where applicable

## Milk Transport

Remove all obstruction to the driver's vision

Ensure the safety of children in the presence of transport vehicles

## Storage of Dangerous Substances used at the Milking Shed

Store drugs, medicines, sanitisers, detergents, chemicals and sprays in a secure dry cupboard or room that is not accessible to children or unauthorised persons.

Acknowledgement: Victorian Dairy Industry Authority - The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).

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## 2.2 Milking Shed Design

Milking is one of the largest labour inputs on the farm. Common factors that affect time spent in the milking shed:

- Tracks:
  - too narrow
  - sharp turns
  - poor surfaces
- Holding yard design
  - narrow yard entry
  - nonfunctional backing gate
  - slippery yard surfaces
- Shed entry
  - steep steps, ramps
  - lighting
  - blind corners
- Shed exit design
  - poor lighting
  - too narrow, or any obstructions
  - poor design of exit gates
- Operator efficiency or insufficient number of milking units
  - lacking routine
  - poor cup removal technique
  - waiting for goats
  - exit gates not controlled from a number of points in the pit
- Plant design and condition
  - plant flooding
  - small diameter milk line
  - lack of adequate fall in milkline
  - faulty pulsation
  - poor cluster design
  - low vacuum (pump capacity)
  - faulty vacuum regulation
  - manual feeding system
- Design of cleaning system
  - inefficient cleaning system
  - slow draw-off water heaters
  - inefficient yard washdown equipment
  - poor surface drainage

Some objectives to consider in planning a new dairy shed include:

- what is the future of the farm?
- how many labour units is the shed being designed for?
- how long should be spent milking and cleaning?
- what size shed should be built? Number of units? Rotary or herringbone?
- management of dairy waste?
- safety
- environmental, local government regulations and/or requirements

It is important to obtain advice from builders, dairy advisers, machine technicians, local authorities, and other farmers, and to observe sheds actually operating.

## Dairy Shed Types and Features

A herringbone design is common, double-up or swingover, with does milked from behind. There should be enough units to keep the operator busy (usually 12-24 units with 1-2 labour units). It is recommended that extra space be allowed for possible future increases in herd size. Foot bath facilities at exits are important.

A double-up system, ie., a set of cups for each goat position available, milks out the herd quicker than a swingover which shares sets of cups. Highline or lowline systems are available, however lowline systems are considered better for udder health as less 'lift' is required to move the milk.

Either a sunken pit or a raised platform, or a combination of these, may be suitable. If converting an existing shed a platform may be easier to install, especially if drainage is likely to be a problem. The convenience of the operator not having to climb in and out of the pit may be balanced against the slowing effect on goat movement of ramps used with platforms. Cost of installation in a new shed may be higher for a platform depending on the relative costs of formwork for a pit, and steel fabrication for a platform.

Goats are spaced at 300-320 mm at 90 degrees angle to the pit, ie 16 to 4.8 metres. Usual dimensions are 1200mm front to back of platform; rear to bails 900mm. If a right angle exit is used the distance should be about 550mm. A walkway around the platform is useful for drenching etc.

It is desirable that the platform and milk line slope in the same direction, about 1:60. Steps or ramps may be used if goats need to walk up to the platform. These should be as gradual as possible. On-ramps should be about 300mm wide. If too wide, several goats may jam. Sheep mesh floor or industrial flooring can be used.

### Pit design

Points to consider regarding pit design include:

- the pit depth is critical to operator comfort. It may range from 800mm to 1metre depending on the operator's height. It is easier to adjust for a shorter than for a taller person.
- pit width is measured between the nib walls. It may be as little as 1200mm for one operator but more usually is 1500mm. It needs to be under 2000mm for a swingover or the weight of the cups on the udder will be too great and to-and-fro walking inconvenient. A doubleup pit may be wider.
- swingover width 1650mm to 1800 mm.
- doubleup width from 1800-2 metres.
- up to 300mm pit overhang to allow for equipment installation and protection.
- pit head should be at least 1800mm long with exit steps on both sides.

### Bail Structure

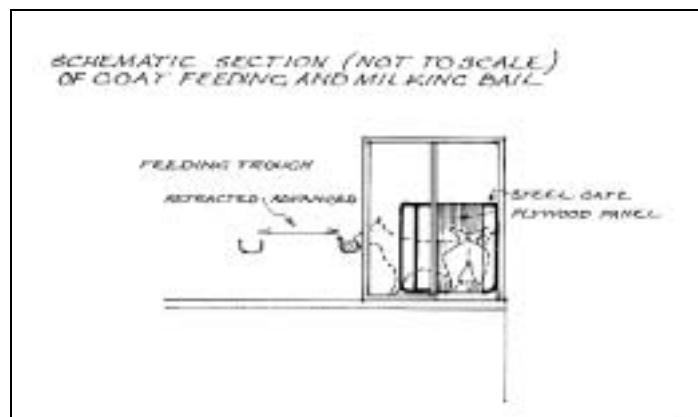
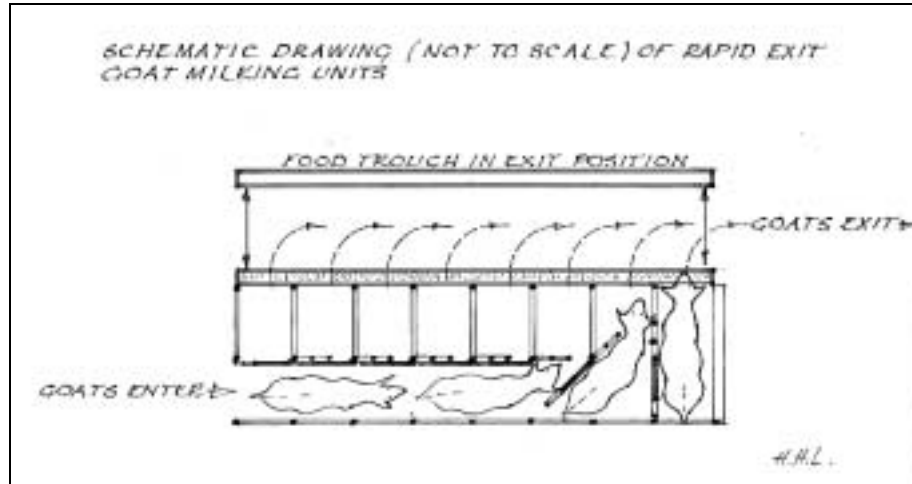
There is a diversity of restraining designs available. Cascade bails, cascade gates, rapid exit systems and several variations on head locking devices are used.

All bail and gate mechanisms should be operated from the pit.

Bails should have 100mm neck space when closed.

Bails usually have a division between them to stop does biting each other. A flange 100cm wide and the height of the bail is suitable.

A kick rail is not needed for kicking but a breech rail is used by many for animal safety.



## **Gates**

Backing gates may be used. Also, entrance and exit gates to the platform. Various gate designs such as sliding, swing, pendulum, and guillotine may be used.

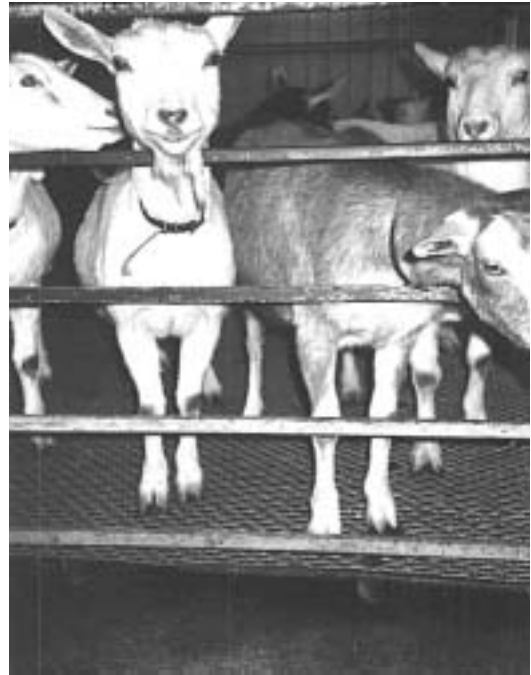
## **Rotary Dairies**

The number of goats at which these are economical is not clear but probably over 350. Note that design and function need to be closely investigated, as some operators have had problems with units that were in use originally for sheep. They should be viewed in operation.

## **Extra features**

Things that may be considered when planning a shed include:

- stall gates
- heating pit floor
  
- multiple hose connections
- drafting and AI facilities
- in floor drainage/submersible pumps
- colostrum lines
- large volume flood washing
- motion sensing lighting outside milk room
- toilet
- kitchen and shower facilities
- telephones/intercom
- computer facilities
- sheepmesh floor in holding yard to aid manure control and easy washdown.



Acknowledgments: Victorian Dairy Industry Authority - The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).



## 2.3 Milking Machines

Select milking machines and equipment for which availability of parts and service is assured. Advice can be obtained from a local AMMTA (Australian Milking Machine Technicians Association) technician, Milking Research Centre or local advisory officer. These people may not always have specific knowledge of goat milking, but understand the mechanics of milking, and have the knowledge and testing equipment to set your machine up correctly.

Selection, design and correct installation of machines is important so that:

- milking can be completed in about 1½ hours, irrespective of the number of goats being milked
- the machines are capable of being extended if doe numbers are increased.

Install machines so that pipelines and components can be easily dismantled for cleaning, inspection and servicing. Milking machines should be serviced on a routine basis at least annually to ensure satisfactory performance.

### Vacuum Pump

Choose a pump with enough capacity for future increase in milking plant size. It should be located for easy access for daily maintenance, be protected from moisture (including weather) and where it will not create a noise problem. Safety guards should be fitted. Pump exhausts should be directed so that discharges will not create a nuisance to other equipment (eg condenser unit) or to traffic areas.

The vacuum pump continuously draws air from the machine and expels it to the atmosphere which creates a vacuum in the machine. Air is admitted into the machine via pulsators, claw air admission holes, through the cups during cup changes and perhaps leaks. The pump needs to be capable of pumping sufficient air to maintain a stable vacuum in the machine at all times, so in addition to the normal air admission, reserve air is necessary to cater for such situations as cup falls. The reserve air enters the machine through the regulator. This is a valve mechanism that opens and closes as required to maintain a preset, stable vacuum in the machine.

Pump capacity tables are taken from the International Standards Organisation (ISO), and for goats (including allowance for reserve air) are as follows:

Number of Milking Units (Sets of Cups)	Required Pump Capacity
<10 units	150 + 80 L/min per unit
>10 units	950 + 45 L/min per unit

For example, 12 units would require pump capacity of 1040 L/min.

### Vacuum Levels

The following parameters are a guide, but from observations it appears desirable to keep vacuum levels as low as possible for goats:

- Highline: 42-44 kilopascals
- Lowline: 38-40 kilopascals

### Vacuum Regulator

This should be matched to the pump capacity, be leak free and capable of maintaining the desired vacuum level in the milking machine.

## Interceptor (Vacuum Tank)

The interceptor vessel (vacuum tank) should prevent moisture, milk residues, dirt and cleaning solutions being drawn into the vacuum pump, and provide adequate vacuum stability in the milk line. Interceptors should be provided with a self draining valve. The interceptor should be easy to inspect, clean and sanitise.

## Vacuum Gauge

Fit a vacuum gauge where it can be easily seen for checking that the pump and regulator are working properly. Check gauges for accuracy each time the machine is serviced.

## Sanitary Trap

A sanitary trap between the milk system and the air system should prevent cross contamination. Part or all of the trap should be transparent. It should be self draining and easy to clean.

## Milklines

Transport of milk from the claw may be via a highline or lowline system. Lowline is probably preferable because it can be operated at slightly lower vacuum levels, because no 'lift' is required and there are less friction losses because of shorter tubing. NB., pulsators that will work at lower vacuum levels need to be used.

Highline System



Milklines should be installed above the does' backs (but no higher than 1200mm above the platform) or below the level of platforms in a protected position. Entries should be welded expertly at the correct position and angle flush with the internal surface of the milkline to avoid milk flow turbulence. Bends for directional changes in milklines should be kept to a minimum and be capable of being dismantled easily for cleaning and inspection.

## Airlines

Airlines should:

- be of suitable material, eg, stainless steel, food grade plastic
- be securely mounted and designed so as not to restrict free air flow
- have adequate fall towards the interceptor
- have a drainage valve at the lowest point in any change of direction upward
- be fitted with suitable inlets and removable plugs or caps at the ends of airlines to facilitate cleaning.

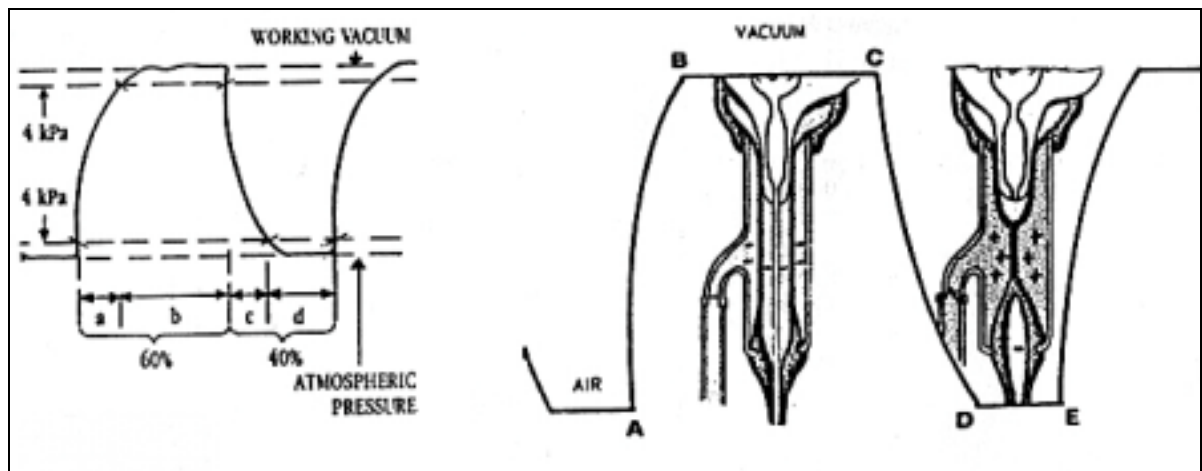
## Pulsation

Pulsation is the action of the teat cup liner opening and closing on the teat. A pulsator is the device that causes this to occur. Pulsators are really valves and they cause the liners to move by alternately connecting the chamber of the teat cup (the area between the liner and the shell) to vacuum and atmospheric pressure and back again, and so on. Pulsation action gives relief by allowing the liner to collapse and apply pressure to the teat end and causes the congestive fluids under the teat skin at the teat opening to be dispersed.

### Rate and ratio of pulsations

International standards specify pulsation to allow liners to be fully open for a minimum 30% (milking phase), and fully collapsed for at least 15% of the cycle with a limping phase (max) = 5%. To achieve these ISO pulsator specifications, a pulsator rate of approximately 90 cycles/minute is suggested at a 60:40 ratio. 60% is the liner opening, open and milking; 40% is the liner closing and closed on the teat. For safer pulsation it is suggested that the fully collapsed phase be a minimum of 20% of the cycle.

Diagram of Pulsation Action and Vacuum Phases



- a = increased vacuum phase
- b = maximum vacuum phase
- c = decreasing vacuum phase
- d = minimum vacuum phase

Milking Phase set at 60% (a + b)  
Rest Phase set at 40% (c + d)

It appears that goats are being successfully milked at considerably slower pulsations. Operators should be aware of any changes to the speed and sound of pulsators during milking as any change could indicate an operating problem. Pulsators should only be adjusted by technicians who have the correct test equipment. They should be cleaned and maintained regularly.

## Flow Rates

2 L/min milk flow rate from goats is approximately the same as cows. Because this is only coming from 2 teats, it seems obvious that claw tube bores should be as large as possible and ideally no restrictions through the claw. Because the entries into the milkline need to be closer together than for cows, it is probably better to have larger rather than smaller milklines with tangential entries. The present standard for cows is:

Outside Diameter (mm)	Slope of Milkline	
	10mm/meter	15mm/metre
38	6	8
51	12	16
61	18	24

## Milking Units and Claws

Claws should be:

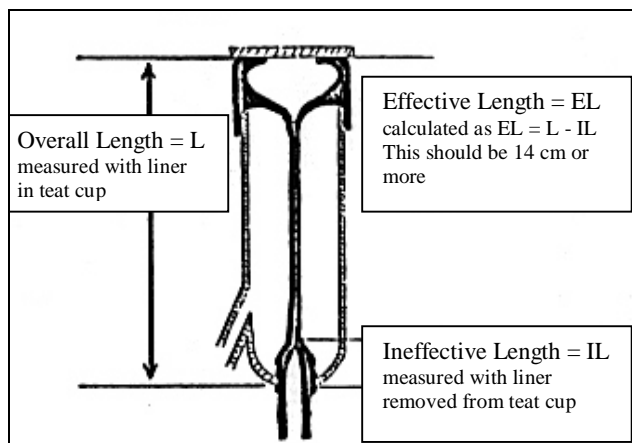
- fitted with large bore entries (min. 10mm) and outlets (min. 20mm)
- designed to prevent flooding
- stainless steel or food grade plastic
- of rugged construction
- able to be easily dismantled for inspection and cleaning

A cluster type bowl of min. 80ml capacity is recommended. The H claw with entries directly opposed may allow for cross contamination of milk between teats. Air admission holes are drilled in most claws and are necessary to maintain milk flow away from the cluster, release of vacuum at cup removal, and assist with the action of the liner. Air admission holes should be kept clear but not drilled out oversize.

Teat cup shells should be uniform in weight and length from cluster to cluster. If cow claws are modified for use in goats, welding must be of high quality with the internal surface flush to avoid milk flow turbulence. Costs of specifically designed goat cups, and in particular liners, may be much higher than cow equipment, and farmers may consider suitable cow cups and liners as an alternative. Observations would suggest that some cups designed for goat milking may not have sufficient length, which may result in teat damage (this applies to goats with longer teats). This damage is caused because of blood congesting around the ends of the teats and blood vessels rupturing.

## Teat Cup Liners (Inflations) and Rubberware

The teat cup liner is the only component of the milking machine to come into direct contact with the teat of the doe. The important thing here is that liners are long enough to completely collapse beneath the teats and that they are matched to the correct cups for correct tension. A light longer shell and matching liner may be a more practical design for goats. Heavy clusters may drag cups off. The mouthpiece of the liner must be comfortable for the goat and not restrict milk flow. Costs of specifically designed goat cups, and in particular liners, may be much higher than cow equipment, and farmers may consider suitable cow cups and liners as an alternative. The effective length of liners is shown in the following diagram.



There shouldn't be any need for stripping if equipment is suitable. To reduce possible problems from overmilking it is suggested that fewer units be handled by each operator towards the end of the season. Flow controlled cup removers will also help to prevent overmilking.

Liners and rubberware should be changed at least once per season or as soon as any faults are detected. Damaged liners and rubberware cannot be cleaned properly, and bacteria in cracks can reduce milk quality and increase the risk of total cell count failures and mastitis infections.

## Milk Receival Vessels

A range of equipment is in use for removing milk from the machine and transferring it to the vat.

A spit chamber releaser is suitable for small highline machines, but a receival vessel and milk pump will be required for large machines. The receival vessel should be made of high grade stainless steel, glass or foodgrade plastic, or a combination of these materials. It should be located where it can be easily dismantled for inspection and cleaning, and if located in the milking shed, where it will be clear of splashing. Large receival vessels should be fitted with can flushing devices.

## Milk Pumps

These should have sufficient capacity to cope with increases in milk production and may be of diaphragm or centrifugal impeller type.

- Diaphragm pump speed should not exceed 50 strokes/minute. The pump should be cleaned and drained after each milking and the diaphragm rubber replaced as soon as any fault is detected.
- Centrifugal pumps should be controlled by a probe switch which operates to activate the pump when the milk level in the receival vessel rises to a predetermined level and is fitted with a milk flow control device to assist cooling.

## Filters

A filter should be fitted to catch unavoidable sediment such as hair, dirt, dust or tissue from the milk, and is necessary when a plate cooler is fitted. Filters should be large enough to handle the pump pressure and volume of milk applied to them. Filters should be changed after each milking. If reusable nylon types are used, they should be cleaned and sanitised after each use. Fine pad type filters can be used in spit chamber release systems.

Where milk is to be pumped, suitably large sock type filters should be fitted:

- between the milk pump and the bulk tank, or
- between the milk pump and the plate cooler

## Coolers

Substantial cost savings can be achieved by precooling milk, and also the warmed water may be useful for udder washing where this is practiced. A flow control device can be fitted to the centrifugal pump to allow continuous running during milking to maximise cooling efficiency.

Where plate coolers are installed, an appropriately-sized filter should also be installed on the milk inlet side and it is recommended also to filter the water supply system.

Milk coolers should be cleaned regularly to:

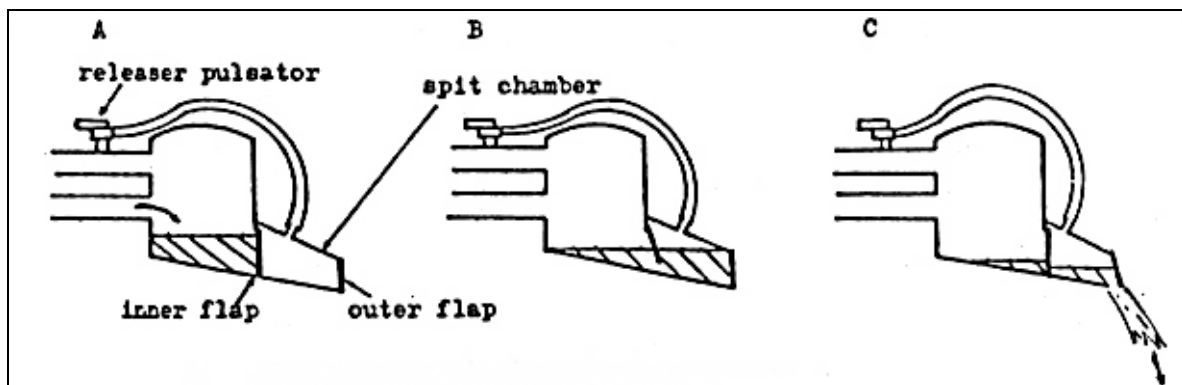
- maintain cooling efficiency
- maintain the quality of the milk
- reduce the operating costs of the bulk milk tank refrigeration.

The cooler should be dismantled, inspected and manually cleaned if necessary when milk quality problems occur or if the milk filter sock bursts during use. Care must be taken when reassembling to avoid damage to the rubber gaskets. Do not overtighten.

Milk must be cooled to less than 5 degrees C no longer than 3½ hours from the start of milking. Goats milk will require cooling rapidly to lower temperatures to reduce bacterial activity because of infrequent milk pickup/delivery.

## Releaser

This is a common method of releasing the milk from the system. The diagram gives an example of the operation of a typical spit chamber releaser.



- Spit chamber at atmospheric pressure. Inner flap closed.
- Spit chamber under vacuum. Inner flap opens.
- Spit chamber at atmospheric pressure. Outer flap opens, milk is released.

## Test Buckets

Test buckets and associated rubber ware should be kept clean and in good repair. Unclean and unsound test buckets can cause milk quality problems.

## Herd Testing Equipment

Herd testing equipment supplied for use on farm by a herd testing unit should be inspected for cleanliness whilst being fitted to the milking machine. The microbiological quality of the farm milk can be adversely affected by the use of unclean equipment. It should be clean before use and cleaned afterwards.

Acknowledgement: Victorian Dairy Industry Authority - The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).

Further information:

Countdown Downunder: Farm Guidelines

## 2.4 Milking Management

### Doe Identification

Accurate identification is needed for effective herd management, including breeding and health issues. It is especially important when does have been treated with drugs such as antibiotics that have a withholding period. Paint marking may assist in temporary identification for these purposes but cannot assist ongoing management.

The system used should be easy to read in the paddock, and in the shed or yards. Various systems are used, including ear tags, tags on neck collars, write-on neck collars, leg straps and electronic implants. Herd test organisations recommend tattoos or small brass ear tags as a backup for the above. Ear tags survive better if they do not hang down below the ear.

### Udder Preparation

Udder and teats should be clean and dry before teat cups are put on. Teats and udders that are visibly clean are best not washed. Dust may be brushed off. Use clean running water and ensure the whole washed area is dry before milking commences. Dirty water running back down, is likely to contaminate teats worse than they were before washing.

Clipping hair on udders can reduce dirt in the area. A mud free environment, in particular well formed laneways, will keep contamination to a minimum.

### Mastitis

Mastitis is an inflammation of the udder resulting from infection. Mastitis is described as 'clinical' when there are actual signs of infection such as lumps in the milk, discolouration or watery fluid, or when there is swelling, hardness or heat in the udder. 'Subclinical' mastitis has no outward signs.

Both can be caused by the same bacteria and can damage the udder, reduce milk production and affect the quality and quantity of dairy products. Mastitis can be spread during milking by the milker's hands and through milking machines.

Acknowledgement: Victorian Dairy Industry Authority - The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).

Further information:

Countdown Downunder: Farm Guidelines



## 2.5 Cleaning and Sanitising Equipment

### Milking Equipment

Equipment with milk contact surfaces should be cleaned after each milking. Components that are difficult to clean should be inspected daily to ensure that their surfaces are clean.

### Milking Machines (manual cleaning)

1. After each milking, scrub all residues from the exterior of the teatcups, claws, drop tubes and rubbers with a warm solution of alkaline detergent and water.
2. Turn off plate cooler water supply.
3. Cold water rinse; draw at least 10 litres of cold or warm water through each cluster into the machine
4. Remove and clean the milk filter. If a plate cooler is in use, replace the filter for the remainder of the cleaning process
5. Detergent wash (temperature of water and amount of detergent as recommended by the manufacturer on the label of the detergent container). Draw at least 5 litres through each set of cups. Raise each cluster clear of the liquid and lower it back into the liquid a number of times to obtain a turbulent action during this process.

It is generally recommended that:

- a) acid be used in the morning and alkaline at night, or
  - b) alternatively alkaline 12 times and acid twice per week.
6. Final rinse: draw at least 5 litres of water at a temperature of at least 90 degrees C through each cluster as a final rinse.
  7. After the final rinse, run the machines under vacuum for 2 minutes prior to shutdown to remove moisture from the vacuum pump and to leave it re-oiled.
  8. Withdraw all plugs and releaser flaps and open all drain points to permit air drying between milkings, and
  9. Dismantle and manually clean the releaser if required.

### Milking Machine (cleaning in-place)

Use a low to medium-foaming general purpose detergent suitable for circulation cleaning. Medium to high-foaming detergents may produce excessive foam during circulation cleaning. The basic cleaning-in-place procedures, variations of which may be required in specific instances, are:

1. Follow the steps set out in paragraphs 1, 2, 3 and 4 of Milking Machines (manual cleaning) procedure.
2. Remove and separately clean those items that cannot be effectively cleaned by circulation cleaning, or that restrict the velocity (flow) of the cleaning solution.
3. After the machines have been arranged for circulation cleaning, circulate with a cold rinse followed by a cleaning-in-place detergent at a temperature:
  - a) of 60-80 degrees C when an alkaline general purpose detergent is used, or
  - b) of 80-90 degrees C when an acid detergent is used.

NOTE: Filling the machine will reduce the effect of heat loss and minimise the load on the detergent solution.

4. Circulate the detergent cleaning solution for approx. 3 minutes, allowing the first 10 litres to run to waste. If the temperature of the solution at the outlet of the return line falls below 60 degrees C, circulation should be discontinued as redepositing of milk residues may occur. Maintain sufficient flow and turbulence in the pipeline (eg by using a surge valve) to ensure effective cleaning.

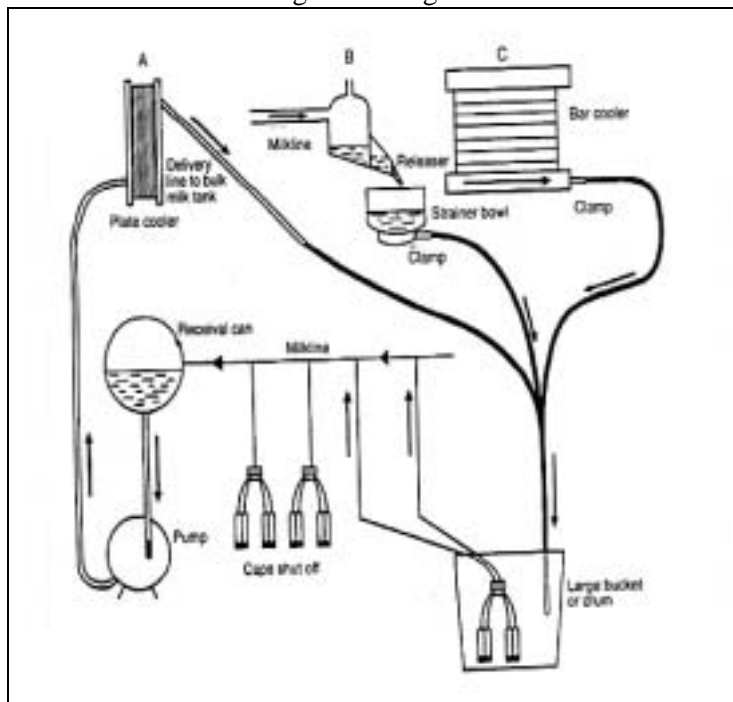
5. Discharge the detergent cleaning solution from the circuit, and
6. Draw hot water (at least 90 degrees C) from the intake through the machines to waste. Do not recycle this water.

## Milking Machines ('Bomb' cleaning)

Machines should remain in a clean condition if the twice daily routine cleaning system (manual or cleaning-in-place) is working effectively. If there is a breakdown in the effectiveness of the routine cleaning system the plant can be 'bomb' cleaned. However 'bomb' cleaning should never be adopted as a routine cleaning procedure. If it is found to be necessary, then the overall methods and procedures in use must be examined to determine the cause of the recurring problem.

Operators using insufficient water volumes, inadequate water flow rates, incorrect detergents and detergent use, coupled with blocked jettors and insufficient plant vacuum can cause the problems to persist. 'Bomb' cleaning can be seen as a solution to end all problems that, in reality, may be the result of poor general cleaning routines or faulty equipment. If high bacteria counts persist as a result of unclean machines, advice should be sought from local advisory officers.

'Bomb' cleaning of milking machines



Purpose of 'bomb' cleaning is to:

- remove build-up of milkstone deposits
- clean up of equipment at the start of a new season, and
- assist in solving bacteria problems

Steps to follow are:

1. Set up the Jetter cleaning system for circulation or, if not available, use a hose to form a circulation line. Ensure water temperature is above 90 degrees.
2. Flush system with hot water to heat components.
3. Circulate heavy duty

ACID detergent for 3-4 minutes (200gm/10litres). Use a flushing pulsator or pull a plug regularly to create turbulence.

4. Flush out acid detergent with clear hot water.
5. Circulate a CHLORINATED ALKALINE detergent for 3-4 minutes (200gm/10litres). Use sponges through lines and hand scrub the receival vessel after this wash is run to waste.
6. Rinse all equipment with ample hot water
7. Check and brush all parts if necessary. Replace perished rubberware.

Note: If milk stone deposits are only slight, steps 3 & 4 could be deleted.

## **Milking Machines (reverse flow systems)**

Reverse flow cleaning is a fast effective method of cleaning if used twice a day using recommended flow rates, quantities of liquids and temperatures. However reverse flow is considered to be less cost effective and less efficient than the jetter systems because of the quantities of liquids used and the shorter contact times involved. Talk to a dairy adviser for more detail on reverse flow systems.

## **Airline System**

To ensure freedom from taints, the vacuum system should be inspected, cleaned and sanitised regularly if it is not included in normal daily cleaning. Where airlines are connected via a sanitary trap directly to the milk receiver or releaser, these lines should be cleaned and sanitised daily.

## **Bulk Milk Tank (manual cleaning)**

1. Hose out the bulk tank with water at a temperature not exceeding 50 degrees C so that the direct expansion unit is not damaged by heat;
2. Clean the bulk tank and its accessories (including the outlet) with suitable brushes and a solution of general purpose detergent; and
3. After the tank and equipment have been cleaned, rinse with clean sanitised water to remove all traces of the detergent solutions.

## **Bulk Milk Tank (cleaning-in-place)**

Carry out this procedure according to the routine advised by the manufacturer, and also inspect regularly to determine the need for periodical manual cleaning.

1. Hose out the tank with water at a temperature not exceeding 50 degrees C as soon as the transfer of milk to the milk tanker has been completed;
2. Remove and manually clean the plug, thermometer, agitator and those items that cannot be effectively cleaned in-place and, after cleaning, replace them in position;
3. Arrange the circuit for recirculation and clean the tank by circulating a low-foaming general purpose detergent at a temperature not exceeding 50 degrees C; and
4. Drain the system, and rinse the tank with clean sanitised water.

Acknowledgement: Victorian Dairy Industry Authority - The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).

## 2.6 Antibiotics and Chemical Residues

Milk must be kept free of antibiotics and chemical residues.

- Residues in milk can occur from:
  - intramammary and intramuscular treatments for mastitis
  - antibiotics or other drugs used, eg, footrot treatment
  - drenches or injections for worm parasites
  - dips and sprays for lice
  - teat dips and ointments
  - dairy sanitisers, detergents and cleaners
  - contaminated feeds and grains treated with pesticides
  - sprays used for insects on pasture crops and irrigation channels
- Antibiotics and agricultural chemicals that cause residues in food and animals are required to have a recommended withholding period information label on the package or container
- Read the directions on the label carefully to determine the exact withholding period. If in doubt contact a veterinary surgeon.
- Mark all goats being treated with drugs
- Record goat number, drugs used, date treated and date that the milk can be put into the bulk milk tank.
- Always observe the recommended withholding period for the chemical or drug used.
- Ensure that you are aware of the withholding periods if a veterinary surgeon uses drugs in treating an animal.
- Discard milk from all quarters for the withholding period when using intramammary treatment.
- Use cleaning chemicals strictly in accordance with instructions.
- Ensure that weed or pasture sprays are not kept or mixed in the milk room or in any equipment that may come into contact with the milk or cleaning materials.
- Never refill empty chemical containers with a product to be used for cleaning milking equipment
- Store drugs in a closed and secure cupboard away from the milk room
- Do not graze livestock on pesticide treated pasture or crops until the recommended withholding period has elapsed
- ***Notify the factory immediately if it is suspected that antibiotic or inhibitory substance contaminated milk has been supplied.***
- ***Ensure that contaminated milk is not collected and mixed with other milk in a farm collection tanker.***

Note that due to the small volumes involved in goats milk, any residues are proportionally a greater problem than they may be in cows milk, and greater care therefore needs to be taken.

**Note also:** ‘Off-label’ use is when a substance is used on a species, or in a way, that is not specified on the label, ie, it is not registered for that purpose. Worm drenches and some other drugs are not registered for use on goats, and detection of these residues can carry legal liabilities. Such substances may only be used under veterinary direction.

Acknowledgement: Victorian Dairy Industry Authority - The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).

# 3.1 Nutritional Needs

## Daily Energy & Protein Needs

Energy and protein are the two major requirements for feeding dairy goats, and the most important factors in calculating feed rations. Energy is the most common nutritional deficiency limiting productivity, whilst protein is a vital requirement for growth, pregnancy and milk production. Good pasture provides adequate protein for these needs.

The following tables give minimum daily energy and protein requirements, according to goat size, activity, age, condition and production.

**Table 1 Weight Maintenance** (confined area)

<i>Body Weight (kg)</i>	<i>Energy per day (MJ*)</i>	<i>Protein** per day (gm)</i>
10	2.4	22
20	4.0	38
30	5.4	51
40	6.7	63
50	8.0	75
60	9.2	86
70	10.3	96
80	11.3	106
90	12.4	116
100	13.4	126

[\* MJ = megajoules of metabolisable energy(ME)      \*\* Total Protein ]

These daily requirements need to be adjusted in most cases according to grazing activity:

**Table 2 Activity Level**

<i>Grazing Situation</i>	<i>Activity Level</i>	<i>Maintenance Increase</i>
Housed – most of the time	Minimal	Zero
Even Land – intensive grazing	Low	Multiply Table 1 values x 1.25
Hilly Pastures – extensive grazing	Medium	Multiply Table 1 values x 1.5

Additional requirements for growth, milk production and pregnancy are given in Tables 3 to 5:

**Table 3 Growth (extra requirements per day)**

<i>Growth Stage</i>	<i>Energy per day (MJ)</i>	<i>Protein per day (gm)</i>
Birth to Weaning	6.5	60
Weaning to Joining	3.9	36
Joining to Kidding	4.1	38
1 <sup>st</sup> to 2 <sup>nd</sup> Kidding	0.9	8

**Table 4 Milk Production** (*extra requirements per litre*)

<b>Milkfat %</b>	<b>Energy per litre (MJ)</b>	<b>Protein per litre (gm)</b>
3%	5.1	64
4%	5.2	72
5%	5.4	82

**Table 5 Pregnancy** (*extra requirements per day*)

<b>Stage</b>	<b>Energy per day (MJ)</b>	<b>Protein per day (gm)</b>
<i>Early Pregnancy</i>	<i>Zero</i>	<i>Zero</i>
<i>Late Pregnancy (last 2 months)</i>	5.9	82

For example:

Young does, of 60 kg average weight, in their first lactation, in late pregnancy, producing 2 litres of milk @ 4% milk fat, and strip grazing reasonably even land, would have an average daily energy requirement, in megajoules (MJ), of:

[9.2 (maintenance) x 1.25 (activity level)] + 0.9 (growth) + [2 (litres) x 5.2 (4% fat)] + 5.9 (pregnancy)

= 11.5 + 0.9 + 10.4 + 5.9 = 28.7 MJ per day

## Other Nutritional Needs

Major *minerals*, such as calcium, phosphorus and potassium, *vitamins* and some minor minerals (eg, copper, selenium, etc) are essential feed components, but are rarely limiting factors if grazing or green feed is provided. There may be a need for higher intake per kg/bodyweight, than other livestock and Iodine is commonly quoted in this respect. Soil or plant testing will identify any likely need for these to be supplemented.

*Fibre* is required in a balanced ration to control rumen acidity and aid digestion. Most bulky feeds (pastures and fodders) have a sufficient fibre component. However, rapidly growing spring pasture or a heavily grain based diet can be deficient in fibre and may lower milk fat test, or in extreme cases, result in acidosis.

*Water* is of course essential for body needs plus production. The requirement varies according to weather conditions, however the basic need for adult goats is about 2-3 litres per day.

### *Nutrient Composition of Feeds*

The following table lists the typical nutrient composition of the most common feeds. Values given are averages and the actual nutrient composition can vary slightly according to feed quality and condition. If a feed analysis is not supplied with purchased feed, or in the case of green and conserved fodders, samples of feed can be sent to a testing laboratory for analysis.

**Table 6 Nutrient Composition of Feeds**

	<i>Dry Matter (DM)</i>	<i>Kg of Feed</i>	<i>Energy</i>	<i>Crude Protein</i>
	<i>g/kg</i>	<i>for 1kg DM</i>	<i>Mj/kg DM</i>	<i>g/kg DM</i>
<b>Pastures</b>				
Mixed grasses & clovers	200	5.00	12.0	280
Mixed grasses & clovers /flowering	250	4.00	10.5	150
Phalaris,succulent and closely grazed	200	5.00	9.0	180
Annual ryegrass. Young	180	5.56	11.0	220
Annual ryegrass.early flower	250	4.00	9.0	120
Subterranean clover,young	150	6.67	11.0	270
Subterranean clover, early flower	200	5.00	10.5	200
Lucerne in flower	240	4.17	10.5	240
<b>Green Crops</b>				
Barley	190	5.26	9.5	130
Oats	180	5.56	9.5	160
Wheat	180	5.56	9.5	160
Maize	180	5.56	9.0	90
Sorghum	200	5.00	9.0	110
<b>Hay</b>				
Pasture, mostly clover	840	1.19	9.0	140
Grass and clover, mixed	860	1.16	8.0	70
Clover, (red)	840	1.19	9.0	120
Lucerne	900	1.11	9.0	170
Oaten	870	1.15	7.5	60
Wheaten	870	1.15	7.0	40
Annual ryegrass	850	1.18	8.0	110
Phalaris	860	1.16	8.0	70
Buffel grass				
standing hay	900	1.11	5.0	80
flowering hay	930	1.08	8.5	110
Mitchel grass	900	1.11	7.0	80
<b>Straw</b>				
Barley	900	1.11	7.0	40
Oaten	890	1.12	7.0	30
Wheaten	890	1.12	5.5	50
<b>Silage</b>				
Pasture (mostly clover)	220	4.55	8.5	210
Mixed grass and clover	200	5.00	8.0	120
Maize	250	4.00	9.0	80
Oats	290	3.45	8.0	90
Wheat	300	3.33	8.5	80
Barley	250	4.00	9.0	180

	<i>Dry Matter (DM)</i>	<i>Kg of Feed</i>	<i>Energy</i>	<i>Crude Protein</i>
	<i>g/kg</i>	<i>for 1kg DM</i>	<i>Mj/kg DM</i>	<i>g/kg DM</i>
<b>Seeds &amp; Grains</b>				
Barley	870	1.15	12.0	110
Linseed	920	1.09	12.5	200
Lupin (narrow leafed)	890	1.12	13.0	310
Maize	880	1.14	12.5	110
Millet (Japanese)	890	1.12	11.5	140
Oats	890	1.12	12.0	110
Peas	860	1.16	13.0	250
Sorghum	870	1.15	12.5	130
Soybean	900	1.11	13.5	500
Sunflower	930	1.08	10.5	330
Vetch	870	1.15	13.5	300
Wheat	890	1.12	13.0	140
<b>Protein rich Meals</b>				
Coconut meal	890	1.12	13.0	230
Cottonseed meal	900	1.11	12.0	430
Linseed meal	890	1.12	13.0	340
Linseed meal, extracted	890	1.12	11.5	350
Peanut meal	930	1.08	13.5	520
Rapeseed meal	920	1.09	10.5	380
Soybean meal	860	1.16	13.5	500
Soybean meal, extract	890	1.12	12.5	500
<b>Cereal and other by-products</b>				
Oat bran	900	1.11	9.5	90
Rice bran	900	1.11	8.0	60
Wheat bran	860	1.16	10.0	150
Sugar cane molasses	760	1.32	12.5	130
<b>Animal by-products</b>				
Fish meal	870	1.15	11.0	700
Meat meal (60% CP)	920	1.09	13.5	660
Meat meal (55% CP)	910	1.10	12.5	600
Meat meal and bone (50% CP)	910	1.10	11.5	550
Meat meal and bone (45% CP)	920	1.09	10.0	490
Meat meal and bone (40% CP)	920	1.09	8.5	440

*Note: High grain intake may lead to acidosis*



## Energy & Protein Costs in Feeds

The table below gives a guide to the typical digestible energy and crude protein costs of several feeds, based on nominal prices.

*Table 7 Energy & Protein Costs in Feeds*

Cost/gm	Crude Protein		Digestible Energy		
	Price/kg	MJ/kg	Cost/MJ	Grams/kg	
Lucerne Hay	44 cents	9.6	4.6 cents	170	0.26 cents
Pasture Hay	28	9.0	3.1	100	0.28
Triticale	16	12.5	1.3	108	0.15
Oats	32	10.5	3.0	96	0.33
Soya Bean Meal	87	13.1	6.6	445	0.20
Linseed Meal	70	12.3	5.7	346	0.20
Pasture (Dry)	4	10.0	0.4	200	0.02

### References:

“Nutrient Requirements of Goats”. National Research Council, USA. 1981

“Pasture Management for Dairy Farmers”. Target 10 Handbook, Victorian Department of Natural Resources & Environment

“Nutrient Composition of Feeds”. NSW Agriculture.

## 3.2 Grazing Management

### Objective

The prime objective for grazing dairy goats is to maximise the quantity of fresh pasture in the diet all through the year. This achieves the aim of minimum cost feeding, with feed of maximum nutritive value. Feed additives are not required to supplement fresh pasture which contains the ideal natural blend of energy, protein and minerals.

Supplementary feeding of hay, silage, grain, etc, to meet feed requirements is often needed in south eastern Australia when pasture is in short supply ( winter and summer), however well grown pasture, rationed through the year by a rotational grazing system, can minimise the need for expensive substitutes.

### Pasture Production

Maximising pasture feed supply is achieved through a combination of:

- vigorous pasture grass and clover species
- use of the right fertiliser types and quantities.

This can usually be done without ploughing and resowing paddocks as most grazing land has a proportion of the better species already present. Correct fertilising is often sufficient to promote the growth of these species. Oversowing can also be used to add desired species. Proper fertilising will also lead to better root systems, longer persistence of quality pasture, and healthier soil biology, eg, worms and higher organic matter.

Advice on the best pasture species and fertiliser needs for particular districts is obtainable from local agricultural department offices, farm advisers and fertiliser company representatives. Soil sampling is recommended to accurately determine plant nutrient deficiencies and fertiliser needs.

### Grazing Management

Best use of pasture feed is achieved by a combination of:

- budgeting feed supplies and requirements for the herd through the year, and
- rotationally or strip grazing pasture areas to maximise supply for the milking herd.

These strategies allow planning for the best use of available feed and land, and forecasting supplementary feed needs.

### Feed Budgeting

Energy and protein requirements for maintenance, growth and milk production for the different classes and ages of the goat herd should be plotted through the year, using the tables in *Note 3.1*, and compared against monthly feed supply from pasture, and other sources as needed. The emphasis should be on the needs of milking does' as this will comprise the major proportion of the total herd feed budget.

Protein is rarely a limiting nutrient factor where pastures are grazed, except when there is a large amount of dry grass. Energy is the most common nutritional deficiency limiting productivity. Energy deficiencies can occur when feed availability is low and when pastures are dry. Feed budgeting based on grazing can be simplified by concentrating on energy supplies and requirements.

An example of a simple Feed Budget, based on Energy needs, for a strip grazed herd increasing from 150 to 200 milking does (average weight 60 kg, producing 2.5 litres @ 4% fat) on 20 hectares, from late winter through early spring, is:

	August	September	October
<b>Pasture Feed Supply</b>			
Kg of Pasture Dry Matter grown	6,000	12,000	18,000
Megajoules (MJ) at 12 per Kg	72,000	144,000	216,000
<b>Energy Needs (MJ)</b>			
Maintenance & Activity	51,750	60,375	69,000
Milk Production	58,500	68,250	78,000
Total MJ needed	110,250	128,625	147,000
Surplus/Deficit of Energy	- 38,250	+ 15,375	+ 69,000

Energy deficits can be made up from pasture saved prior to the budget month, and/or supplementary feeds. Energy surpluses can be carried forward to future months, or in the case of spring growth, cut for silage or hay. Early spring pasture may also need supplementation with fibre rich feeds to aid digestibility. Advice on Feed Budgeting is available from most independent or government dairy advisors.

### Rotational Grazing

Providing rationed, pre-determined quantities of pasture feed, according to herd requirements is achieved by matching the feed budgets with pasture quantities, supplied in strips (strip grazing with electric fence) or small paddocks (grazed in varying rotation lengths according to season and pasture growth rates). As a guide, strips or areas giving a stocking rate equivalent of 500-1000 goats per hectare per grazing period, eg, 200 does on 0.25 hectare per day, are typically used.

These systems have the twin advantages of providing fresh, nutritious pasture at each grazing, maintaining even pasture quality by preventing over or under grazing, and avoiding grazing of very short pasture to minimise worm larvae intake.



## Feed Available from Pasture

For dairy goats to get enough energy from pasture, the feed must be above a certain quality and there has to be enough of it. Pasture availability is measured as kilograms of dry matter per hectare and can be estimated by measuring the height of the pasture, as shown in the following table:

<i>Average Pasture Height (cm)</i>	<i>Pasture Dry Matter (kg/ha)</i>
1	500
2	800
3	1100
4	1400
5	1700
6	2000
7	2300
8	2600

Pasture height can be measured by special meters developed for the purpose, or by simple measuring sticks. Both techniques require some practice, but once mastered, visual assessments of pasture height can often be confidently made as an alternative from time to time. Advice and tuition concerning these techniques are available from agricultural advisors and research institutes.

## Pasture Height Targets

The aim of rotational grazing is to access pasture when it is a suitable height, before it becomes rank or too many grass leaves die off, and quickly graze the pasture down to a height from which regrowth will be fast. The following table gives several ideal ‘before and after’ pasture height targets:

<i>Goat Stage</i>	<i>Pasture Range (kg DM/ha*)</i>
Dry does at mating	2500 - 1800
Late pregnancy	2400 - 1300
Milking does – high quality pasture	2500 - 1800
Milking does – mod. quality pasture	2500 - 2000

\* the last figure is the level to which the pasture should be grazed.

Note: Dairy goats have an upper pasture intake limit of 4.0 kgDM/goat/day

### References:

“Milk Production from Pasture”. Jim Shovelton, Murrindindi Workshop, 1996

## 3.3 Weight & Condition Score Targets

### Weight Targets

Generally accepted weight, growth rate and age targets are similar worldwide. However mature does can range from 50-100kg (average 60kg).

Birth	3-4 kg
Weaning (off milk)	16 kg (7-8 weeks)
Mating	30-35 kg (7 months)
Kidding	50-55 kg (12-15 months)
Mature does	average 60kg
Mature bucks	80-100 kg

### Condition Score Targets

Score targets are based very closely on the system for dairy cows:

Growing kids	5-6
Joining	5-6
Kidding	6
Milking	3-5 (35 litres extra/unit)
Bucks (mating start)	7

An averaged size doe will need to gain approximately 6 kg in order to increase one condition score.

#### Acknowledgments:

1988 Seminar on Dairy Goats: Department of Primary Industry & Fisheries, Tasmania.  
Proceedings – 7<sup>th</sup> International Conference on Goats. May, 2000.

## 3.4 Condition Scoring

### Condition Scoring of Dairy Goats

Measuring and quantifying are an important part of a dairying business; e.g. pasture assessment, feed budgets, production levels, costs and returns.

#### Why Condition Score?

**Accurate measurement of body condition is an important management tool, especially in reproduction and milk production.**

A doe in good condition (score 5-6) is more likely to get in kid than a doe in poor condition, and is more likely to have twins. She is more likely to have a quick birth, a healthy kid and good milk production.

Based on dairy cow data, improving one score in the score range 3-6 will give an extra 35 litres per doe over a lactation, and increase protein and fat test by about 0.2% during the first five weeks of lactation. Improving a doe's condition score by one is equivalent to increasing her liveweight by 6kg.

If farmers can accurately assess body condition, they can plan in order to achieve the desired body condition before kidding. This ensures that feed is used efficiently and that optimum production per doe is achieved.

Some practical and economic factors will affect management but the underlying principle is that the higher the condition score at kidding, the greater the body reserves available for production in early lactation.

#### Using Condition Scores

**“A good milker milks off her back.”** Does in early lactation cannot actually eat enough food to support the milk production that they are capable of. They must draw on their body reserves, and may lose weight dramatically.

Score 6 is considered ideal for dairy cows to calve. Increased incidence of metabolic disorders and calving difficulties at higher scores would offset any production benefits. Experience suggests that score 6 is also the ideal target for does.

In practice, most farmers are unable to put more than half a condition score on does during the dry period. It is advisable to dry the does off in the condition you wish them to be in at kidding, rather than try to gain condition when dry.

Some does, in particular young in-kid stock who are still growing, will need to be managed separately.

Bucks should be in good condition at the beginning of mating, as they will drop considerably during the season. Score 7 is ideal.

Energy intake needed to maintain condition, improve condition, provide for growth needs, and for different levels of milk production, is discussed in Goat Note 'Nutritional Needs'.

## How To Condition Score

**An objective scoring system enables farmers to know they are all discussing the same thing.**

Farmers often have different ideas of body condition, and a common language that everyone can understand is valuable. Dairy cow farmers have found the scale of 1 - 8 useful, and it is adapted here for use with goats. The range is from emaciated (score 1) to very fat (score 8).

**This system is based on a hands-on assessment. Visual assessments alone is not reliable as coat condition can be misleading, especially over winter and spring when accurate condition scores are most likely to be needed. A full belly can also be misleading.**

Goats do not have much fat under the skin, but the amount of flesh does change.

### Main Indicators

**Loin area:** backbone, forward of hips









**Short ribs:** ie. The projections sideways below the backbone

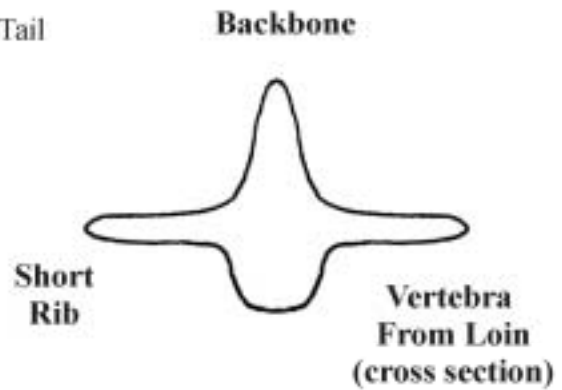
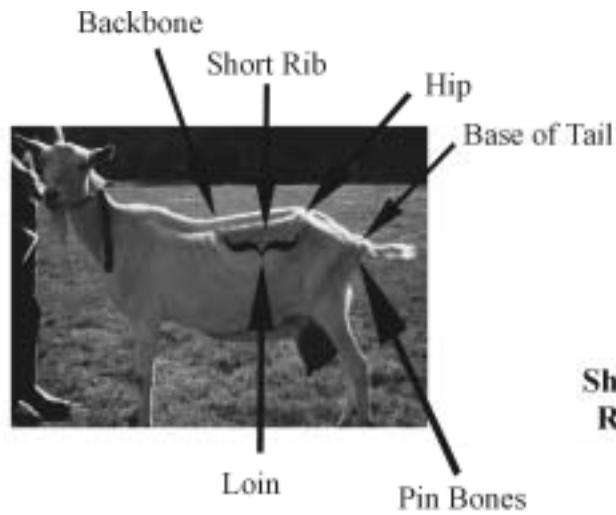
**Loin:** the muscle area between ridge of backbone and short ribs

**Hips**

**Pins**

**Base of tail:** Sometimes the tail head may be raised especially pre and post kidding, giving a misleading impression of poor condition. The backbone on the rump may also be raised, an individual conformation factor not a condition score issue

<b>Score 1</b>	<b>Score 2</b>	<b>Score 3</b>	<b>Score 4</b>
<p>Minimal flesh over skeleton  <b>Backbone:</b> a sharp prominent ridge, vertebrae clearly felt / visible along its entire length  <b>Short Ribs:</b> very sharp, fingers fit easily underneath</p>	<p><b>Ribs:</b> easily felt / visible  <b>Backbone:</b> a very prominent ridge.  <b>Short ribs:</b> sharp, can easily feel underneath.  <b>Loin:</b> slight muscle, deeply concave.  <b>Hips:</b> very prominent.  <b>Pins:</b> prominent.  <b>Base of tail:</b> deep hollows.</p>	<p><b>Backbone:</b> a prominent ridge.  <b>Short ribs:</b> prominent, can feel under.  <b>Loin:</b> moderately concave.  <b>Hips:</b> prominent.  <b>Pins:</b> slight cover.  <b>Base of tail:</b> small hollows.</p>	<p><b>Backbone:</b> slight cover.  <b>Short ribs:</b> smooth edges.  <b>Loin:</b> slightly concave.  <b>Hips:</b> slight cover.  <b>Pins:</b> light cover.  <b>Base of tail:</b> slightly sunken.</p>
			
			



Score 5	Score 6	Score 7	Score 8
<p><b>Backbone:</b> light cover.  <b>Short ribs:</b> light cover.  <b>Loin:</b> flat between 3 points.  <b>Hips:</b> light cover.  <b>Pins:</b> rounded.  <b>Base of tail:</b> almost filled out.</p>	<p><b>Backbone:</b> smooth cover.  <b>Short ribs:</b> well covered.  <b>Loin:</b> slightly rounded.  <b>Pins:</b> well rounded.  <b>Base of tail:</b> filled out.</p>	<p><b>Backbone:</b> smooth and rounded.  <b>Short ribs:</b> hard to feel.  <b>Loin:</b> well rounded.  <b>Rump:</b> slightly rounded.  <b>Hips:</b> well covered.  <b>Pins:</b> well covered.  <b>Base of tail:</b> some fat roll across rump above tail.</p>	<p><b>Backbone:</b> can only just be felt.  <b>Short ribs:</b> can't be felt.  <b>Loin:</b> very well rounded.  <b>Rump:</b> rounded.  <b>Hips:</b> not obvious.  <b>Pins:</b> not obvious.  <b>Base of tail:</b> fat roll across rump above tail.</p>



## 3.5 Mating Management

### Objectives

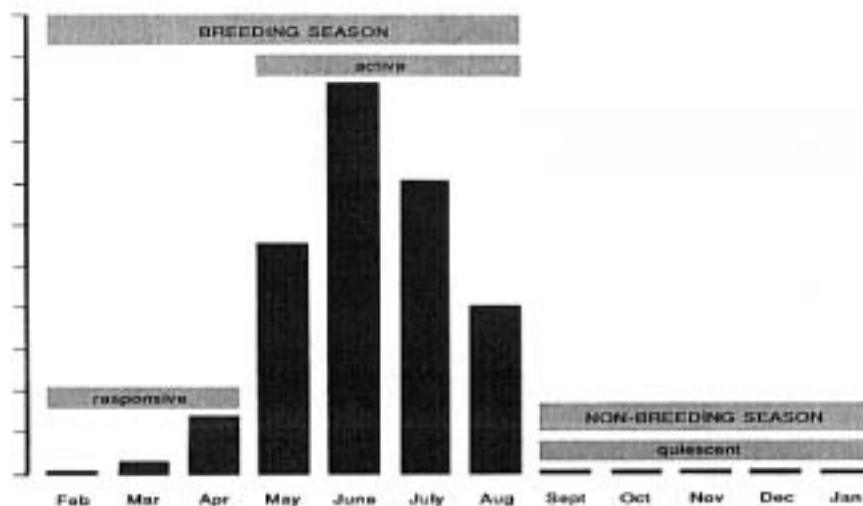
Major aims for managing mating in a dairy goat herd are to:

- breed sufficient doe kids for herd replacements/increases
- boost annual milk flow resulting from pregnancies
- concentrate kidding periods to suit herd management
- depending on market needs, to achieve 'out of season' milk production by spreading kidding beyond the 'normal' periods.
- to facilitate herd improvement activities by identifying individual matings.

Depending on market requirements, a mating schedule may be planned to achieve consistent milk production from month to month throughout the year. This may mean several drops during the year, or autumn kidding.

### Breeding Facts

- The natural breeding season for goats in southern Australia is to mate in autumn and kid in late winter - spring.
- The main trigger for cycling is reducing hours of daylight, eg, the approach of autumn in southern Australia.
- In the peak breeding season, which lasts for about four months, does are in oestrus for about 24-36 hours every 18-25 days until they conceive. Oestrus can occur at other times of the year but is less predictable and harder to detect.
- Pregnancies last about 21 weeks.
- Kidding rate averages 2 per doe, and increases from 1 at the first kidding to 2-3 for mature does.
- Goatlings can be mated at 7-8 months if well grown (30-35 kg liveweight).



The graph illustrates the proportion of does ovulating spontaneously throughout the year. There are three phases:

- a *responsive* phase, during which the doe can be induced to ovulate, mate and conceive, eg, by the buck effect.
- an *active* phase, when oestrus and ovulation occur spontaneously.
- and a *quiescent* phase, when no reproductive activity takes place.

## Mating

Important procedures for best mating performance are:

- Does to be on a rising plane of nutrition in the month before mating
- Bucks to be used at the rate of 1 per 30-40 does
- Introduce bucks suddenly at the start of mating to achieve a rapid (7-9 days) and concentrated onset of oestrus by the 'buck effect'.

## Artificial Insemination

Artificial insemination (AI) may be considered, however this is most effectively employed for introduction of superior genetic merit to the herd. Ideally, the aim should be to use AI where semen can be obtained from bucks 'proven' through a progeny testing scheme to carry better production genes. Such proven semen is not yet available in Australia and there is currently no progeny testing scheme. AI has great potential for genetic improvement once this is addressed.

AI is more economical if used following hormonal treatment on groups of does to induce oestrus and ovulation. Conception rates with AI are slightly lower than with natural service and it is not recommended for maiden does.

## Mating Practices

Identified matings are necessary in any herd improvement program where more than one buck is used. Both does and bucks must have individual identification, ideally a tattoo backed up by ear or collar tags for ease of reading.

Facilities for bucks or teasers can be provided near milking area exits so that does in season can be easily observed. Holding areas for these does are useful, and an easily accessible wall planner/calendar or notebook to record details of cycling, mating, subsequent cycling or not, pregnancy testing and expected date of kidding.

<i>Doe</i>	<i>Oestrus Date</i>	<i>Service Date</i>	<i>Buck Used</i>	<i>Est. Kidding Date</i>
Heidi	1/5/01	2/5/01	Joe	
Heidi	21/5/01	22/5/01	Joe	22/10/01

Single does or groups can be put with a buck. A raddle may be used to indicate whether mating has occurred. Does should not have access to any other buck during that cycling period. Alternatively, group matings can occur when a buck or bucks are run with does in the paddock. Dates of buck introduction and removal should be noted to aid management during pregnancy. Teaser bucks may be used but absence of fertility should be confirmed beforehand.

## Synchronisation

Hormone induced, 'synchronised' oestrus cycling in does can be achieved if kidding needs to be concentrated at different times of the year. Does to be synchronised are fitted with intravaginal sponges or Controlled Interval Drug Release (CIDR) devices containing progesterone for 18 days.

After removal of the devices, does will come into oestrus within 2-3 days. Synchrony of oestrus can be improved by injection of Pregnant Mare's Serum Gonadotrophin (PMSG) when devices are removed.

For best conception rates from synchronised oestrus, the buck to doe ratio should be increased to 1 : 5 does unless AI is being used for insemination.

### **'Out of Season' Mating**

In southern Australia, it is possible to achieve a three month kidding interval using natural cycling, ie., matings in March and June would be expected to pose no problems without any artificial input.

However, does can be induced to come into reliable oestrus, 'out of season', by hormone administration and/or variation in lighting. The success of this technique varies with time of year and is least effective in early summer. Implantation of melatonin pellets simulates the variable lighting effect and induces oestrus cycling within a month.

Further information:

Local veterinarians, AI service providers and Departments of Agriculture.

## 3.6 Herd Improvement

### Herd Improvement

*Herd Improvement* in the dairy goat herd, put simply, is the deliberate and constant effort to increase herd performance by selection of the best goats for milking and breeding.

### Objectives

The most *economically important* herd improvement objectives should be aimed for and the fewer the better. The more objectives chosen, the less will be the rate of gain in each.

Major objectives for dairy goats should be:

- +++++ Milk yield
- ++++ Protein and fat yield (for cheese)
- ++ Udder shape

### Identification

The basis of sound herd improvement is *regular recording* and the basis of recording is *accurate goat identification*. Individual goat identification enables tracing of pedigree (for breeding and selection decisions), measurement of production (for breeding, feeding and culling) and monitoring of health (for treatment or disposal). Accurate identification and recording must start at kidding to establish pedigree connections. Immediate temporary identification (eg, by collars) is better than none.

Identification methods include :

- ear tags (metal or plastic)
- ear tattoos - most indelible
- ankle straps
- electronic chips

Identities and pedigrees should be recorded in a *permanent register* and/or on computer in readily available herd breeding programs.

### Herd Recording

*Herd recording* is mainly measurement of production, and keeping records of kidding and breeding. Such records are essential for **culling, feeding and breeding decisions**.

*Production recording*, through use of milk meters or weigh buckets, is the only way of assessing each doe's milk yield. This can be done daily, or as little as 3-4 times a lactation. All does must be measured at the same milking as production comparisons between does can fluctuate greatly from day to day.

*Milk composition* can be analysed for protein, somatic cell count (both important for cheese making) and butterfat every few months by sending samples to a herd test laboratory. Herd test laboratories will also provide production reports giving yield comparisons (Production Indexes) between does adjusted for age and time of kidding.

The range of reports available from herd test laboratories includes:

- *Progress Production Reports*
- *Annual Production Report*
- *Production Index Ranking*
- *Lactation Report (each goat)*
- *Goat Register*
- *Pedigree Certificate*

### Progress Production Report (example):

Goat Details				Daily Production					Lactation to Date				
Goat ID	Goat Name	Age mths	Kidding Date	Milk l	Prot %	Prot kg	Fat %	Fat kg	Lact days	Lact Milk	Lact Prot	Lact Fat	Prod Index
124	Sarah	68	15/09/98	4.7	3.1	.15	4.0	.19	107	488	15	20	92
133	Polly	57	24/09/98	5.2	3.0	.16	4.2	.22	98	505	16	21	105
146	Midget	45	01/10/98	3.8	3.4	.13	4.5	.17	92	358	12	16	101
179	Mary	38	25/09/98	3.4	3.8	.13	4.6	.16	97	320	12	15	98
212	Josie	30	17/09/98	2.6	3.8	.10	4.8	.12	105	268	10	13	96
234	Tara	22	30/09/98	2.8	3.9	.11	5.0	.14	93	279	11	14	110

## Breeding Programs

The ultimate use of herd records is to achieve *progressive genetic improvement* in the goat herd by using the best bucks and does for breeding replacements. This is most effectively done by measuring bucks' production transmitting ability, through their progeny, and selecting the best bucks to mate with best does to produce sons for future matings, preferably by AI. The buck has the major effect on genetic improvement because of the number of kids sired, thus buck selection is a critical aspect of herd improvement.

### Within Herd

A breeding program within the herd is the simplest to implement but results in slower genetic improvement because of the limited goat numbers. The first essential is to accurately record the progeny of each buck. This will necessitate 'hand mating', or mating individual bucks separately with groups of does (unless AI is used). Does should be randomly selected to mate with each buck.

When the resulting goatlings have completed their first lactation the average production of each buck's progeny can be compared. A minimum of 5 progeny per buck is necessary for valid comparisons. The best buck should then be used as widely as possible on the herd (ideally by AI) and his sons, bred from the best does, used for future matings and selection of future bucks.

### Across Herds

Faster and more widespread genetic improvement can be made when a number of herds combine to 'progeny test' bucks, based on the within herd approach. A buck can be bred to does in several herds, or daughters of a buck can be distributed across several herds. Either way, provided the minimum number of 5 doe progeny per buck is maintained, such exchanges of bucks or progeny between co-operating herds can result in superior bucks being identified for future breeding for mutual benefit.

The most effective and convenient way to achieve genetic improvement across herds is through the use of AI which permits the maximum use of superior bucks and can increase the number of progeny per buck.

## 3.7 Kid Rearing

### Hygiene & Health

Hygiene and health precautions start from before birth, with the dam's health!

Kidding in the open is better than in a shed that has had many animals through it. If the weather is wet and cold, especially with wind chill, shelter is desirable. This may be natural shelter, eg, good tree or bush areas. If using sheds, avoid access to yards, which are always heavily contaminated. Make sure bedding is fresh and clean. Kids at birth can pick up coccidia, worms, Johnes Disease(JD), CAE, tetanus and general infections, eg, staphs. A young animal is much more susceptible.

Prevent suckling the dam if JD or CAE are suspected. However, colostrum (first milk) is essential to supply antibodies, ie, immunity to particular diseases. Pasteurised colostrum or that from a disease free animal may be used. It will not protect against parasites. (See 'Feeding').

Kid accommodation should be clean, dry and warm. Feed containers should also be clean and dry, designed to avoid contamination from droppings or urine. Milk feeders should be washed and free from residue buildup. Leave to drain after washing. Moulds can develop in tubing, etc. Dairy detergent and sanitiser can be used. Rats, mice and birds should be excluded.

Accommodation and feeders should be thoroughly cleaned between batches of kids. The few parasites or bacteria that all kids have will build up with successive batches. Removal of all bedding, etc., and where possible water pressure cleaning and disinfection, should be carried out. Leftover feed is best discarded (milk, hay and pellets) for both hygiene and palatability reasons.

Don't let kids out into yards. These quickly become contaminated, and coccidia in particular is difficult to treat once it develops. Parasites have a devastating effect on kids. Kids should be vaccinated against the clostridial diseases, enterotoxaemia and tetanus, probably at about 5 weeks of age. They will have some passive immunity from these via colostrum if the doe has been vaccinated. Vaccines available are 5 in 1 or 6 in 1. Sick kids should be removed to isolation, to prevent spread of infection and protect the sick kid from stress.

Drenching is not usually necessary until kids are on pasture. If parasites are suspected use a 'Worm Test' through the vet.

In areas with known trace element deficiencies, kids normally receive enough through maternal supply and normal feeding until weaned. This may occasionally be inadequate. Check with your vet before giving potentially toxic substances.

Disbudding should take place at 3-7 days for best results with minimal stress to the kids. A calf dehorner should be suitable, but some models supply insufficient heat. The ring of skin should be burnt right through; but be careful, there's a fine line between enough and serious injury

## **Feeding**

### **Colostrum**

Colostrum, as noted above, is highly nutritious and contains specific antibodies. It needs to be given soon after birth. Colostrum may be from the dam or another doe, preferably not first lactation, and preferably from the same herd. Young does may have lower antibody levels, and another herd may not have antibodies to bacteria that are present in your herd.

Cow colostrum may be used as it appears in practice that the antibodies present are available to the kid. Colostrum may be stored frozen - an icecube tray is ideal. If none is available, use 600ml milk, 300ml water, 2ml castor oil and one beaten egg as a substitute. This is nutritious but will not protect against disease.

### **Milk**

It is worth considering saving colostrum/early unsaleable milk from all does to raise kids. 7 days' production should equal about 21 litres, ie, more than 3 weeks' feed for a kid. If 50% of kids are raised (the does), you have half their ration. NB, this practice is not suitable in CAE or some other disease control programs.

Cows milk or quality milk powder/replacer is suitable for kids. The stock feed quality of powder is variable, and some are indigestible even for calves. Powder should feel fine and soft, and set with rennet. Mix it at recommended strength or levels of nutrition will be inadequate. It can be yoghurtised. This may lessen lactose intolerance. Additives, such as coccidiostats and vitamin/mineral supplements may be used, and are a very good idea if coccidia have been a problem in the past.

Don't overfeed. 1 litre/day is enough at peak, in 1-2 feeds. Double strength mixture can be used and fed once a day, but you need to be sure some kids are not getting too much, ie, individual feeders are needed. Flanks should fill out nicely, not be bulging, especially when very young. Not all kids need the same amount. Overfeeding is a major cause of death, and it also limits the early intake of solids, which is necessary for early weaning. Free access milk feeding will likewise delay weaning.

Putting a fresh feed on top of undigested milk can lead to bloat; frequent feeding can thus be dangerous. If a kid is not keen to drink, don't persist. It's safer to wait till next feed. Most scour is dietary. If it occurs, give electrolyte solution instead of milk for 1-2 feeds.

Feeds can be cool, but it makes sense to feed warm milk in cold weather. Water should be available. If it is important that water be drunk, eg, if double strength mixture is used, it may need to be warmed.

### **Solid Feeds**

Calf pellets are suitable for kids. These should be fed fresh daily, not held over from one year to the next, and not powdery. Increase to appetite to about 220gm/kid/day.

Roughage is essential for the good rumen development needed for early weaning. Grass hay or clean oaten straw is recommended, nothing too palatable or they will eat too much and not eat the pellets. When they are eating well, quality hay can be used.

Hay and pellets should be available from a few days old, no more than they will eat a day at a time. They learn quickly when young and seem to have peak learning periods. If you miss these they can be very slow to get onto solids, weaning has to be postponed, and you will lose out in time, convenience and dollars.

Kids need to be fed rations at the rate of 11 MJ/day of energy and 15-18 % protein for growth.

## Weaning

The critical target is when they are cudding. Kids need to be eating a reasonable amount to avoid a setback, say 200gm/day of pellets, plus straw or hay. By this time they should be about 7-8 weeks old and weigh about 16kg.

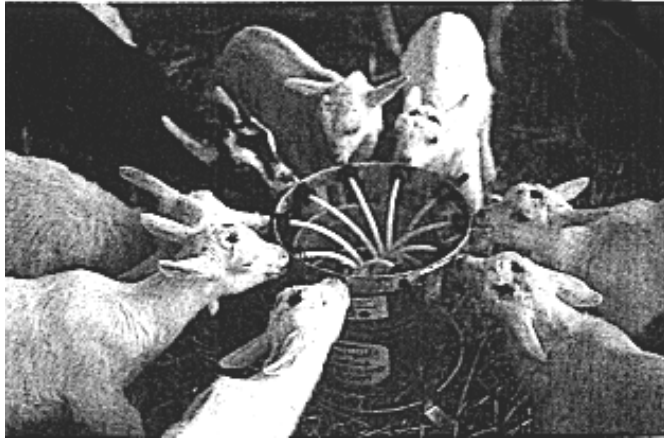
After weaning it is prudent to leave them on the same solids ration for a week or so, and gradually introduce them to high quality pasture and rotational grazing, or substitutes such as silage/grain.

### *Feeding Summary*

- 1 litre per kid per day in 1 or 2 feeds, or free access; 125gm powder/litre.
- Pellets: start with a few and increase as eaten, to approx. 200gm/kid
- Hay (or straw); remove stale pellets/hay daily.
- Water available

## Equipment

Kids may drink direct from a container, or through a teat. They may be group or individually fed.



Feeding equipment options include:

1. A trough or buckets may be placed outside the pen so it cannot be knocked over or jumped in, feeding with heads through holes or wire or timber dividers.
2. A commercially made feeder with individual moulded sections and teats and tubes to each, can hang outside or inside pens.
3. You can easily make up a plastic 'lambar' bucket, about 10 L, with 8-9 holes around the top to take black lamb teats, with plastic tubing reaching to the bottom of the bucket. Narrow tubing that fits inside the teat makes sucking easier. Use teats that flow freely.
4. Free access feeding can be used, ie, a drum with teats, once kids have been taught to drink. Allow 6 kids per teat. Don't allow the milk mixture to run out, as kids will overeat and possibly bloat when it is filled again. As kids consume more, the mixture will need to be diluted so they do not consume too much milk and so reduce their appetite for solid feeds. A milk solids allowance of 125g/kid/day should be maintained. For example, if kids are each drinking an average of 2 litres day, the mixture should be offered at 125g/2 litres to the group. Alternatively, once/twice daily feeds can be substituted as appetite increases, to ensure intake of pellets.



Kids need to be trained individually to drink. The younger they are the easier it is. One feed from a bottle is usually enough for them to learn to suck a teat, although they may need a feed or two individually on the 'lambar' after this.

Pellets can be fed in hanging containers made from plastic drums with the sides cut out. Kids can't jump in or contaminate the feed. The drums are raised higher as kids grow. Alternatively, troughs outside the pens can be used, with heads through as for milk.

Hay can be fed, inside or outside pens, in 'bails' with slats or wire to give access to kids' heads to keep feed clean. Hay racks that need hay pulled out are a problem with excess spillage and seeds getting in eyes. Feeders outside pens, or within reach from outside, are easier to manage.

Water can be provided outside pens with allowance for access, or fairly high so kids need to stand on hind legs to drink, or stand on a narrow platform such as a bale of hay. This keeps water clean. Automatic waterers are ideal.

## **Warmth & Shelter**

Very young stock with no body fat reserve need warmth and shelter from cold, damp and draughts. The level of protection can be decreased as they grow and are able to tolerate more. Kid accommodation must be clean, warm and dry at all times.

The shed should be weatherproof with good ventilation and no draughts. Construction may be simple - a three sided metal construction facing NE is fine. For maximum convenience, power and water should be available. Access for machinery for cleaning out is important, and also for feed delivery and stock trucks. A passage for access to pens and convenient, vermin-proof storage for feedstuffs are also important.

Pens may be individual or group. Individual penning minimizes transfer of infection. Small groups provide shared body warmth, but too many or mixed vigour can lead to squashing and suffocation of the smallest. Eight is about the upper limit when managing periodic milk feeding. As they get older more are manageable. Free access feeding can be managed with 50-60 together. Kids are best grouped according to size and vigour; small, slow- drinking or weak ones in together. Movement between pens is not ideal as cross infection and aggression can occur.

A pen size of 1m x 2m for 8 kids is adequate up until weaning. Wire walls, to allow air circulation, should be about 1m high, and rigid to avoid kids getting caught. Welded wire of under 100cm mesh will do. A step-over (say 300cm) at the entrance will stop kids getting out too easily when the door is opened.

A pen floor of sheep mesh is good for hygiene, but wooden slats less so. These can be over a concrete floor, or well off the ground like a shearing shed. As such raised, open floors are cold, the subfloor should be enclosed, and a bed area is needed at least initially. A few bales of hay/straw to enclose a tarpaulin, etc, holding bedding material will do. Rice hulls or wood chips 40-50cm deep may be used.

A concrete slab with a damp-proof membrane incorporated and using rice hulls, etc, 40-50cm deep, is also a satisfactory floor. Damp bedding must be removed or topped up as moisture allows the free movement of bacteria. Rice hulls can be raked over and stay dry for months.

## Setbacks & Stress

Much of the above has been to do with minimising stress. Stress leads to setbacks, resulting in less than optimal results that can have permanent effects. At the least, a stressed kid will cost you more in time and money, maybe vet bills, later weaning, slower growth and later joining, or permanent undersize and therefore lower productive capacity. The aim is to maximise growth, economically.

Practice observing kids, to pick up on differences in appearance and behaviour early. Problems can be dealt with sooner and simpler, before perhaps it's too late. Bigger problems can be avoided.

Better than that, think ahead and forestall problems. Good routine management and good habits are an excellent preventative. Be quiet and reassuring around the kids. Stress created by poor handling is real and measurable, and benefits are quantifiable too. A kid that won't drink may do so simply if you hold it comfortably on your lap and stroke it.

'Success or failure in raising calves depends to a large extent on the rearer's attitude to the calves...' John Moran "Calf Rearing", Dept of Agriculture Vic 1993.

## Costs

Feed is the major cost in kid rearing. Requirements are for energy and digestibility, as well as adequate protein, calcium, etc. These can be obtained in various ways. Cost, time and convenience are factors. Pellets may not be cheaper than powder/milk but are easier to feed, and develop capacity to eat solids, so weaning is earlier and setback at weaning less.

As a guide, approximate feed costs to about 7-8 weeks & weaning are:

1 x 25kg bag powder for 6 kids @ \$60	= \$10.00 / kid
1 x 40kg bag pellets for 40 kids @ \$18	= \$ 0.45 / kid
30 x bales hay/straw + bedding for 40 kids @ \$160	= <u>\$ 4.00 / kid</u>
Total	= \$14.45 / kid

Further information: "Calf Rearing: A Guide to Rearing Calves in Australia", John Moran, Department of Agriculture, Victoria

## 3.8 Goat Age Determination

The age of individual goats can be checked by examination of the number and condition of their teeth:

**Milk (kid) teeth** – from birth to 13-15 mths.  
- not all milk teeth are fully erupted at birth



**2-tooth** – 2 permanent (central) teeth (plus 6 milk teeth) – erupt from 13-15 mths.



**4-tooth** – 4 permanent teeth – erupt from 18-21 mths.



**6-tooth** – 6 permanent teeth – erupt from 22-24 mths.



**Full mouth** – 8 permanent teeth – erupt from 27-32 mths.



**Gummy** – all teeth broken, worn down to gums or fallen out



# 4.1 Foot Problems

Foot problems, especially in higher rainfall areas, can cause significant loss of production.

## Genetics

Choose stock, especially bucks, with sound feet. The outer hoof should be hard without being brittle, the inner firm and resilient. There should be no space between inner and outer layers. Some goats have naturally compact hooves. Some grow straight and will break off at a good angle. Other animals will rock back on their feet and long curls develop at the toe. An experienced farmer has suggested that spread toes and rocking back lead to the biggest problems, and feels that the 'show' point of low or sagging pasterns is less important.

## Environment

The environment should be as mud free as possible. Mud packing in between the outer layer of the hoof and the soft inner hoof is a major problem. This can cause lameness from pressure alone, and also predisposes to infections. Untreated hoof infections can progress to bone infection and loss of the animal.

*Laneways* are a major culprit. Make sure they are well formed and drained, with an impervious surface. An added benefit will be mud free udders and better quality milk. A leaflet 'Details of Farm Track Design & Construction' is available from DFSV (see below). Moveable water troughs can help minimise pugging at drinking points. Alternative gateways may be possible with electric fencing.

## Disease

Such as foot abscess or footrot (which is a specific bacterium, and a notifiable disease in most States) should be avoided, and treated effectively with veterinary assistance if present.

## Management

*Adequate nutrition and general health of animals is most important.* Stress periods will be visibly reflected in later hoof growth. In some areas and circumstances, micronutrients such as zinc may be indicated.

*Foot baths* are commonly used for prevention and treatment of problems especially in wetter areas, usually at milking shed exit races. Feet should be monitored to ensure that they do not dry out too much and crack.

Mats soaked in formula may be used instead of liquid baths, and are reported to be more acceptable to goats (less avoidance and slowing of stock flow) and present less risk of splashing. Zinc, copper sulphate or formalin are common footbaths. Follow the instructions on the label. Footbath chemicals should be treated with care as they can cause tissue damage to stock and operators.



*Hoof trimming* may be needed every 6 weeks for optimum management. All foreign material should be cleaned out and the outer hoof wall may need to be trimmed back to prevent immediate mud packing recurring. Avoid cutting to the point of bleeding. A lame animal will perform poorly.

Protective boots are available from some stock supply outlets, and some farmers make their own from inner tubing. Zinc or other applications may be mixed with petroleum jelly inside the boot.

*Equipment* used has included carpenter's surform, hand operated footrot shears, angle grinders, pneumatic hoof trimmers. Sheep equipment is suitable.

## Common Foot Problems

- Puncture type injury from a sharp object; commonly sole of foot or junction of toes
- 'Strawberry' bruise in soft hoof tissue
- Foot abscess, which can follow on from either of the above
- Footrot is caused by a specific organism, *Fusiformis necrophorus*, and is a notifiable disease
- Laminitis or founder
- Fracture of bone above toes

### Further information:

The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).

## 4.2 Caev (Caprine Arthritis Encephalitis)

This is a viral disease of goats which most commonly manifests as chronic arthritis/synovitis in adult goats and encephalitis in kids. Chronic progressive pneumonia and the condition known as 'hard udder' may also be associated with CAE virus. The disease occurs mainly in dairy goats and has been reported in Australia, New Zealand, UK, USA, and other countries.

CAE is caused by a retrovirus related to Maedi Visna of sheep. Maedi Visna does not occur in Australia. There is no treatment for CAE. Once infected, most goats remain so although fewer than 10% may ever show signs of disease.

### Transmission

CAE is transmitted mainly to kids through infected colostrum and milk, although kids may become infected prior to birth or during the birth process, and the virus can also pass from one adult to another in close contact situations, such as shared pens. It can be transmitted through machine milking and through multi-use injection equipment. It has been suggested that saliva, urine, faeces and blood may be infectious.

The virus does not survive for long in the general environment, such as soil and sheds. Heating such as pasteurisation destroys the virus, but refrigeration does not.

### Signs

The arthritis has a very long course, but may flare up with swelling, pain and lameness from time to time. The joints most commonly noticed are the carpal joints (knees) hence the name 'big knee'. Although other joints are often affected, these are less noticeable. Often the knee pads have hair present; however these are worn from kneeling in healthy goats.

'Hard udder', which may be CAEV in origin, is described as a completely rock hard udder with no milk at all, and usually occurs on freshening.

Encephalitis is uncommon in Australia. Kids, and more uncommonly adults, have hind leg weakness followed by ascending paralysis, fits and death.

It is also possible that immunosuppressive activity is present, which may lead to multiple, apparently unrelated health problems in affected stock. Studies have shown decreased productivity from affected goats.

Other causes for arthritis, mastitis and neurological disease should also be considered.

### Elimination

Elimination of the disease in an affected herd is based on:

1. Depriving kids of maternal colostrum and rearing in isolation from the infected herd. Kids should be removed from does at birth, and before suckling. They may be fed colostrum from virus free goats or cow colostrum. ***Pooled milk from goats should not be fed, as it is a very efficient method of infecting a whole drop of kids from perhaps one or two infected adults.***
2. Regular blood testing of these goats
3. Permanent isolation of CAE virus negative animals
4. Culling or permanent isolation of CAE positive animals

Some control of disease incidence may be obtained by following point 1 above. It would also be advisable to milk negative stock first, and use disposable single dose syringes for vaccinations etc. If there is high incidence of CAE, a disease eradication program may be the only viable option.

As in many chronic diseases, eradication may be long term, difficult and expensive. However it is economically important to aim at least for disease minimisation, and preferably eradication. Accreditation programs are available in some States. Consult your Department of Agriculture.

When buying stock, the purchaser should enquire about herd health and obtain a Vendor Declaration. This Declaration may indicate as little as 'unknown health status', or may be quite specific with regard to disease/s. It can clarify health issues and offers legal protection to the purchaser.

Acknowledgments:

Victorian Institute of Animal Science, Attwood  
Dr Helen Chapman, Murdoch University, Western Australia

## 4.3 Johnes Disease

Johnes Disease (JD), or paratuberculosis, is present in many ruminant species. It is an insidious disease which causes considerable loss of stock and production in infected herds. A high level of infection in a herd is probably incompatible with economic viability. It is present in many dairy cow and goat herds in Australia.

The bacterium mostly affects the gut, and less commonly the reproductive tract and udder. Infected animals that are not showing symptoms will intermittently pass the bacteria in their droppings, thus spreading the disease widely. It can survive in the soil for years under moist conditions. It is usually caught by young stock from the dam or from infected surroundings. Unlike cattle, older goats remain susceptible to infection.

The infected animal typically shows no sign of disease for years, and then starts to lose weight rapidly in spite of a good appetite, and dies. Scouring is uncommon in goats.

Goats are susceptible to both cattle and sheep strains of Johnes Disease. This has serious implications in some States. In Victoria, identification of JD in sheep on the same or adjoining properties means that goats are subject to the same control measures as the sheep. In practice this means culling the stock.

### Management

Consult with your local Department of Agriculture and veterinarian regarding disease and control measures. Diagnosis should be confirmed before action is taken.

On a herd basis, several pathology tests are useful, but individual diagnosis is more difficult. Animals that are infected but not showing signs of disease are particularly difficult to diagnose. Faecal cultures are used but do not always show disease when it is present, and take 6-8 weeks. Post mortem examination of the ileo-caecal node is recommended.

There is no practicable treatment for infected livestock. Vaccination is not available in Australia as it makes subsequent disease test interpretation difficult.

Kids should be removed from does at birth and fed heat treated colostrum (54 degrees C for 30 minutes) from disease free goats or cows. Kids from known or suspected infected dams should not be kept as transmission can occur *in utero*. Kids should be raised in an environment free of faecal contamination (away from yard and shed drainage, etc) and away from adults.

Farmers who run or agist cattle should be very certain about the disease status of these.

Stock which test positive, and their progeny, should be culled immediately. Areas where they have grazed should be destocked and allowed to dry out over two summers. Areas that do not naturally dry out may act as reservoirs and should be drained. Dams should be fenced off.

There is no compensation scheme for goats. (The cattle compensation scheme is funded by an industry levy.) A Market Assurance Plan scheme can provide risk assessment of herd status with regard to Johnes Disease. Details are available from your Department of Agriculture.

Animals in poor condition, or from a herd in poor condition or with a known history of Johnes Disease, should not be purchased. When buying stock, the purchaser should enquire about herd health and obtain a Vendor Declaration. This Declaration may indicate as little as 'unknown health status', or may be quite specific with regard to disease/s. It can clarify health issues and offers legal protection to the purchaser.

#### Acknowledgments:

Victorian Institute of Animal Science, Attwood



## 4.4 Mastitis Control & Scc

*Clinical* mastitis occurs when the animal has signs of infection; maybe has a hot udder, an uneven udder, lumps in the udder and/or in the milk, etc. Goats rarely have stringy milk, and are much more likely than cows to develop lumps, abscesses and fibrosis in the udder. Initial inflammation may be missed by the farmer.

*Subclinical* mastitis has no outward signs. Subclinical cases of infection may be detected when Somatic Cell Counts (SCC) are done. We cannot be confident as to what level of SCC is significant in goats (see below). However does with a SCC of around 1,000,000, or an increase in the number of high SCC does, should be investigated further. Discuss this with your vet.

### Somatic Cell Counts

Cell counts are used as a method to determine levels of mastitis infection in individual goats, or in bulk milk samples taken from a vat. They may be taken at regular intervals by dairy companies, or by herd improvement centres when individual goats are tested.

With dairy cows, a SCC over 250,000 indicates infection (Countdown Downunder 2000). Ideally this should be measured between 30 and 250 days of lactation. A BMCC (Bulk Milk Cell Count) above 200,000 indicates that either clinical or subclinical mastitis is present to a significant degree within the cow herd.

In the USA, a BMCC under 1,000,000 is the standard for goats (750,000 for cows). However in Vermont, following serious efforts to address mastitis, the average BMCC in goat herds was reduced from 912,000 to 335,000 in one year.

French requirements for goats are for a BMCC of less than 1,000,000 with a target of 300-400,000 being considered. A clear relationship is claimed between SCC, milk production and milk quality, with counts over 1,000,000 giving a 17% reduction in cheese yields. A French study has shown that if the SCC rolling average is less than 500,000, 72% of goats are considered healthy, and if it exceeds 2,000,000 more than ½ the herd is probably infected, and more than 15% of these with major pathogens. SCC's are declining in France since they have been a milk payment factor.

Fossomatic results are considered to be reasonably accurate.

### Do not confuse SCC and Plate Count results.

A plate count is an indication of *bacterial* levels in the milk. The SCC is an indication of the number of *cells* (most of which are white blood cells) being shed in the milk. White blood cells are part of the animal's defence mechanism to fight infections, including mastitis.

### What if the cell count is rising?

Immediate steps should be taken if the cell count is increasing:

1. Inspect udders for teat damage (a sign of machine malfunction).
2. Have your milking machine technician check the rubberware, pulse operation, vacuum levels and efficiency of the regulator.
3. Investigate machine operation during milking, ie check for milk line flooding, cup slip and other telltale signs of poor milking performance.
4. Check the milking machine for capacity, in relation to liquid flow rates, and individual goat production.

Seek veterinary advice to identify the type of infection.

## **Mastitis Prevention**

Some steps which can be undertaken to prevent mastitis include:

1. Minimise further spread of mastitis in the herd by correct identification and treatment of clinical and subclinical mastitis
2. Use a teat spray (or dip) after milking each goat. Ensure each teat is treated throughout lactation. Emollient in the spray according to instructions will assist maintaining healthy teats.
3. Have your milking machine tested regularly by a qualified milking machine technician.
4. Cull goats with persistent cases of mastitis.
5. Use an effective dry cow treatment (discuss program with your veterinarian).
6. Consult your vet with regard to end of lactation treatments.

## **Mastitis Treatment**

Steps used to treat mastitis include:

1. Identify goats with clinical mastitis, and treat in consultation with your vet. Clinical mastitis may be treated during lactation. Subclinical cases of mastitis should be monitored, and treated at drying off.
2. Have bacteria identified by sterile culture. This can show whether the cause is of environmental or animal origin, and indicate useful preventative measures. It will also indicate the most suitable antibiotic treatment.
3. Cull goats with persistent cases of mastitis.
4. Teat spray all goats in the herd.

*The strongest weapon for the long term reduction of mastitis levels in your herd is the correct use of available control measures in conjunction with veterinary advice. Hygiene requirements and the basics of infection spread and control are the same regardless of species.*

### Acknowledgments:

Victorian Dairy Industry Authority - The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).

7<sup>th</sup> International Conference on Goats, May 2000

Dr Bruce Robertson, Robertson & Brady's Veterinary Clinic, (03) 5623 4822

Rob Greenall, NRE Ellinbank

### Further information:

Countdown Downunder Guidelines (2000) (information about cows is relevant)

# 4.5 Mastitis Control Program

## The “3x3x3” Program

### A. Prevent New Infections

#### Milking Machines

- Check and service annually
- Avoid slipping teat cups
- Ensure effective pulsation

#### Milking Management

- Keep udders clean; maintain lanes and gateways in good repair; clip udders.
- Put cups on clean dry teats
- Remove teatcups gently

#### Post Milking Hygiene

- Use freshly prepared teat disinfectant at recommended strength all year round
- Ensure the glycerine emollient concentration is not above 10%
- Ensure complete coverage of all teats.

### B. Remove Existing Infections

#### Treatment of Clinical Cases

- Consult your vet with regard to treatment.
- Use the recommended antibiotic in the recommended manner, and use the full course of treatment
- Clearly mark treated goats and withhold the milk for the recommended period

#### Treatment at Drying Off

- Consult with your vet. Treat or cull all does that have persistently high SCC's or have a history of mastitis problems. If individual details are not available, consult your vet who may recommend to blanket treat the whole herd.
- Clean and sanitise teats before and after treatment.
- Do not use one tube/syringe in more than one teat.

## **C. Monitor Progress**

### **Monitor the Bulk Milk Cell Count**

- Counts below 300,000 are achievable
- Counts below 400,000 are desirable
- Plot the rolling 6 month average as a guide to performance.

### **Identify Subclinical Cases**

- SCC's above 1,000,000 should be further investigated
- Plate counts are probably the best way to confirm infection
- Treat subclinical cases during lactation only under veterinary advice.

### **Records**

- Record each quarter treated or suspected for all goats
- Monitor the rate of clinical cases detected
- Check antibiotic sensitivity pattern of the bacteria involved.

#### References:

The Dairy Book (Farms) & Dairy Tech Notes (available from DFSV).  
7<sup>th</sup> International Conference on Goats, May 2000 (various papers)  
Countdown Downunder: Farm Guidelines.

## 4.6 Worm Control

### Objective

The sole objective in parasite management in dairy goats is to minimise the effects of parasitological worm burdens, thereby achieving improved productivity and general health and vigour. Problem worms can never be eliminated from a herd but can be controlled to an acceptable degree.

Worm problems can increase in severity with small farms, high stocking rates (especially where animals are picking at poor quality contaminated pasture), inadequate nutrition, too frequent drenching, too low drench dose rates, high rainfall areas, and buying in goats.

### Implementation

Effective worm control relies on a three pronged attack:

- Prevention
- Drenching
- Monitoring

### Prevention

*General health and nutritional levels* - are the first priority. It has been observed that a healthy herd with acceptable body condition score and production for the time of lactation may nevertheless have a fairly high egg count. This may indicate *resilience* to worm burdens. However the long term significance of this is unknown.

*Worm resistance* - there have been suggestions that goats should be bred for *resistance* to worms. This is a long term possibility for a formal breeding program. It will naturally occur to a certain degree as animals are selected (or select themselves) for productivity and vigour, in systems that cannot afford to maintain problem animals. However farmers cannot afford high losses of production in the meantime.

*Grazing management* - rotational grazing is a useful management tool for worm control. Most worms have been identified as being in the bottom 5cm of pasture, so grazing of fresh pasture of at least double that height should always be the aim. This is best achieved by strip or rotationally grazing pastures containing vigorous species that have been properly fertilised.

Apart from making maximum use of pasture feed, grazing on a rotation can reduce the number of larvae ingested, by goats grazing the pasture tops. However with highly productive pasture these general rules may be less effective. Some worm larvae may migrate much higher in moist growing environments.

Paddock spelling to reduce larvae numbers is usually ineffective in high producing areas due to the short length of rotations that must be used.

Another form of grazing management that can assist reduce worm numbers in pasture is to graze paddocks occasionally with horses or cattle, which do not share most of the same worm species with goats and can 'clean up' without re-contaminating.

## Drenching

When done, this should be well done! Successful drenching relies on attention to the following:

- Ensure the drench will be effective by conducting a drench test (see Monitoring).
- Drench all goats at a dose rate suitable for the heaviest goat in the herd.



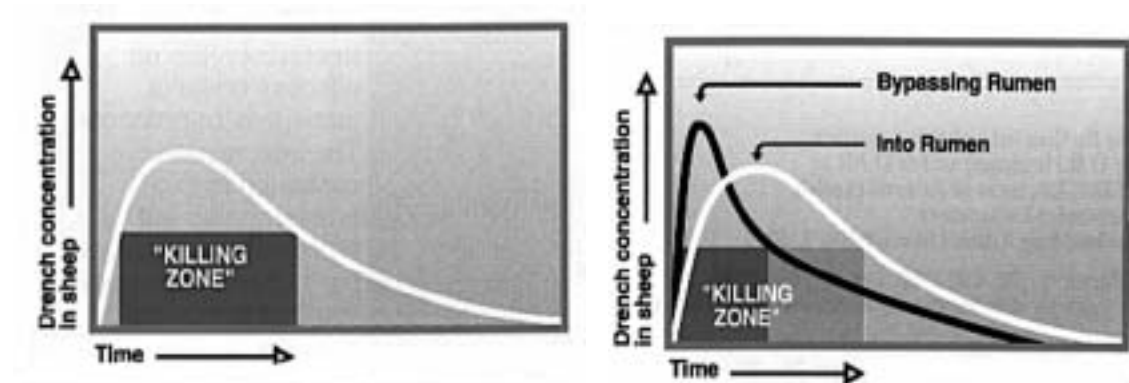
- Place the drench gun over the tongue to make sure the full dose goes where it is needed, ie, to the rumen. If given at the front of the mouth it may bypass the rumen and be much less effective.

- Apply drenches strategically to get maximum effect and to avoid over frequent drenching, which results in drench resistance.

- Goats remove drench from their body faster than sheep do. This shorter 'killing zone' will allow more worms to survive and will speed the development of drench resistance. The CSIRO recommends a 2<sup>nd</sup> or 3<sup>rd</sup> dose of white drenches be given 12 hours after the 1<sup>st</sup>, especially if resistance is suspected. Some experience in Tasmania suggests that a 2<sup>nd</sup> dose of levamisole given ½

hour after the 1<sup>st</sup> has good results.

- Slow release drenches stop worms establishing, eg, Valbazen with extender pellets/bullets.
- Yard "dry" stock the night before drenching to allow the animals to empty out prior to administration of a drench.



A suitable drenching program for SE and SW Australia is:

*First Summer Drench* (Nov-Dec) – to reduce the number of egg laying adult worms in goats before the main summer dry period, when hot weather will help destroy worm eggs and larvae on pasture.

*Second Summer Drench* (Feb-March) – to further reduce the already low numbers of adult worms in goats. The two summer drenches ensure that the autumn begins with low worm burdens in goats and on pasture.

*Autumn Drench* (May-June) – to reduce the worm burden which tends to rise in autumn.

*Winter Drench* (Aug-Sept) – to reduce pasture contamination before spring, and may be the post kidding drench. Avoid drenching does heavy in kid.

*Weaning* – unless weaning coincides with one of the summer drenches, kids should be drenched at weaning.

Some farmers may prefer to monitor and drench according to the egg count results, rather than routinely.

## **Monitoring**

Worm egg counts on dung pellets (Faecal egg counts) are the surest way to determine drench requirement and effectiveness. Routine monitoring by this technique will eliminate unnecessary drenching and indicate the best drench to use. It is best done early in the morning, or at least at the same time of day, each time.

If the whole herd cannot be done, target groups can be determined in consultation with your vet, eg, a random 10% of the herd, excluding top and bottom 5%.

Agricultural department offices, private vets, private labs and stock agents can supply collection kits for worm egg counts, which are usually performed by a vet laboratory.

Drench requirements should be monitored 4 weeks after each strategic drenching, particularly after the autumn drench, to determine whether extra drenches are needed, and is best done on weaned kids. Drench effectiveness is determined by comparing worm egg counts just prior to a drench, with those 10 days later.

## **Withholding Period**

A withholding period (WHP) applies after use of drenches and some other veterinary chemicals to prevent residues being transmitted to consumers through milk or meat. Precautions are printed on drench containers and should be carefully followed. Note that Ivermectins have been detected in goats milk 6 weeks after administration. Residues are monitored in some States. Care should be taken when using veterinary chemicals at off label dose rates – the WHP published on the label is no longer applicable. Multiple treatments with the same product can also affect the WHP.

**Note:** ‘Off-label’ use is when a substance is used on a species, or in a way, that is not specified on the label, ie, it is not registered for that purpose. Worm drenches and some other drugs are not registered for use on goats, and detection of these residues can carry legal liabilities. Such substances may only be used under veterinary direction. Veterinary advice should be sought when off label treatments are given.

N.B. No drenches are approved for use in goats

Acknowledgments: Bob Barwell, Ausmeat

References: “Successful Worm Treatment”. CSIRO

## 4.7 Caseous Lymphadenitis (Cla) or 'Cheesy Gland'

Caseous lymphadenitis causes chronic and recurring abscesses, usually in lymph nodes, both superficial (under the skin) and internally. It is caused by *Corynebacterium pseudotuberculosis*. It can survive for many months in the environment, eg soil, feed troughs, fences. Abscesses are typically thick walled, layered capsules containing a very thick, cheesy, odourless, green-white pus.

Superficial abscesses usually do not affect the animal's general health or productivity, however as they drain they may spread infection throughout the herd, and if the udder is involved, affect milk quality. Common sites of abscesses are lymph nodes at the angle of the jaw, the neck, in front of the shoulder, in the flank, or the back udder attachment. If abscesses affect internal lymph nodes and organs, the goat may become chronically ill and wasted. Lung, liver and spleen are often involved.

A herd which has a high incidence of infection may develop some immunity, however a herd that has not been exposed previously may be very susceptible.

Vaccination sites (5 in 1 etc) frequently develop abscesses that appear like CLA. These are nearly always sterile abscesses, caused by irritation rather than infection. Pus collected in a sterile bottle can be cultured to confirm the cause of these or other abscesses.

### Treatment

Consult your vet for a confirmed diagnosis, excluding other causes of abscesses, and if multiple abscesses or generalised ill health are present. Antibiotics may be prescribed.

When an abscess is ready to burst, ie, has a soft 'head' developing in the centre, open it vertically to the lowest edge with a sharp razor blade or similar and allow the pus to drain freely. Flush the cavity with disinfectant or debriding spray. Collect all drainage and contaminated materials (which is the main means of spread) and dispose of by disinfecting or burning. Your vet may prescribe antibiotics for the cavity.

Use disposable gloves when handling infected goats, and follow general handwashing and personal hygiene guidelines.

### Prevention

Treat and isolate infected goats. A vaccine is available and is recommended for use in infected herds. It will not help animals already infected. When purchasing goats, enquire about any history of abscesses. A Vendor Declaration can be requested.