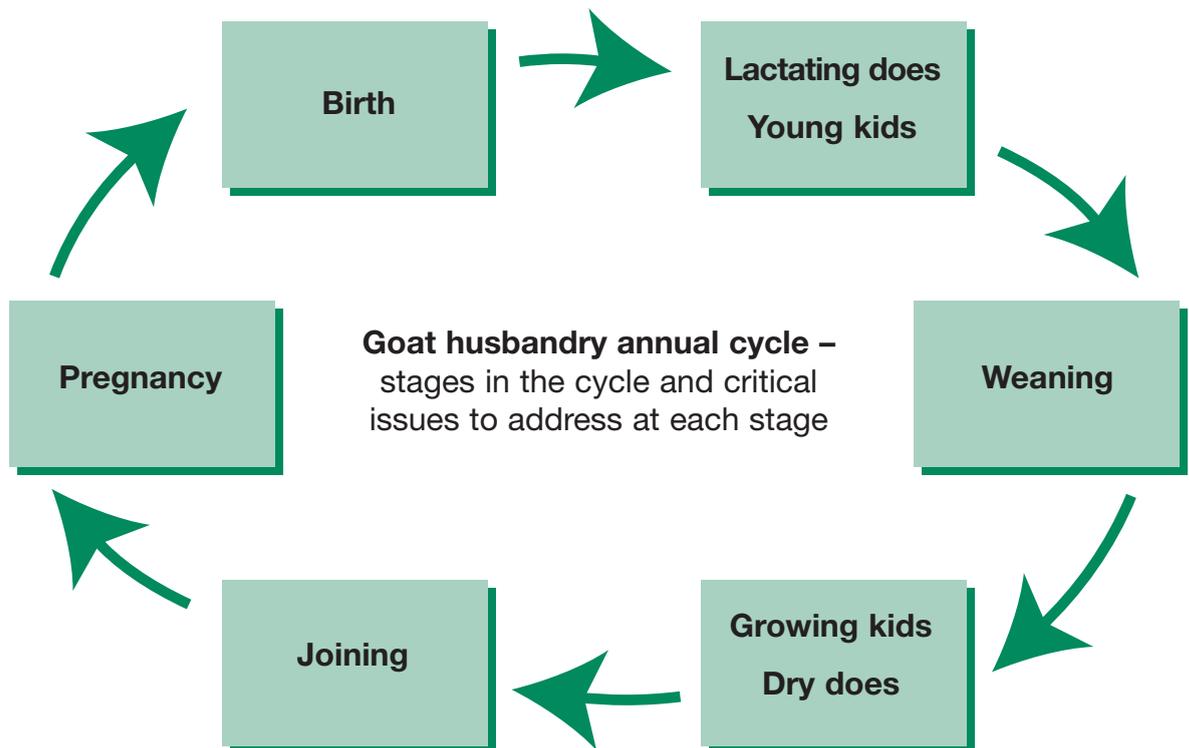




Husbandry

Module 6 - Husbandry

What to do?



Management decisions relating to livestock – to make good decisions, you need to know what your goats require and what you, as a producer, are trying to achieve at different stages throughout the animal’s life.

The Goat Husbandry Annual Cycle presented above outlines the key events that occur throughout the year in a goat enterprise. The types of husbandry activities that will occur at each stage will be enterprise-specific. You need to decide which activities are required for your enterprise. Complete the chart for your business by listing the relevant husbandry activities under the appropriate headings. You may like to put a date on each box, so that you create a calendar of events.

As you plan your annual cycle think about practicalities such as:

- Matching husbandry activities with the pattern of your annual pasture/fodder supply.
- Spreading activities to suit your labour supply.
- Achieving balance with other enterprises on the property and other commitments in your life. For example, avoid timing clashes between labour-intensive activities.
- Ensuring that husbandry activities are timed with due consideration for animal health and welfare. For example, avoid mustering heavily pregnant animals and does with newborn kids.

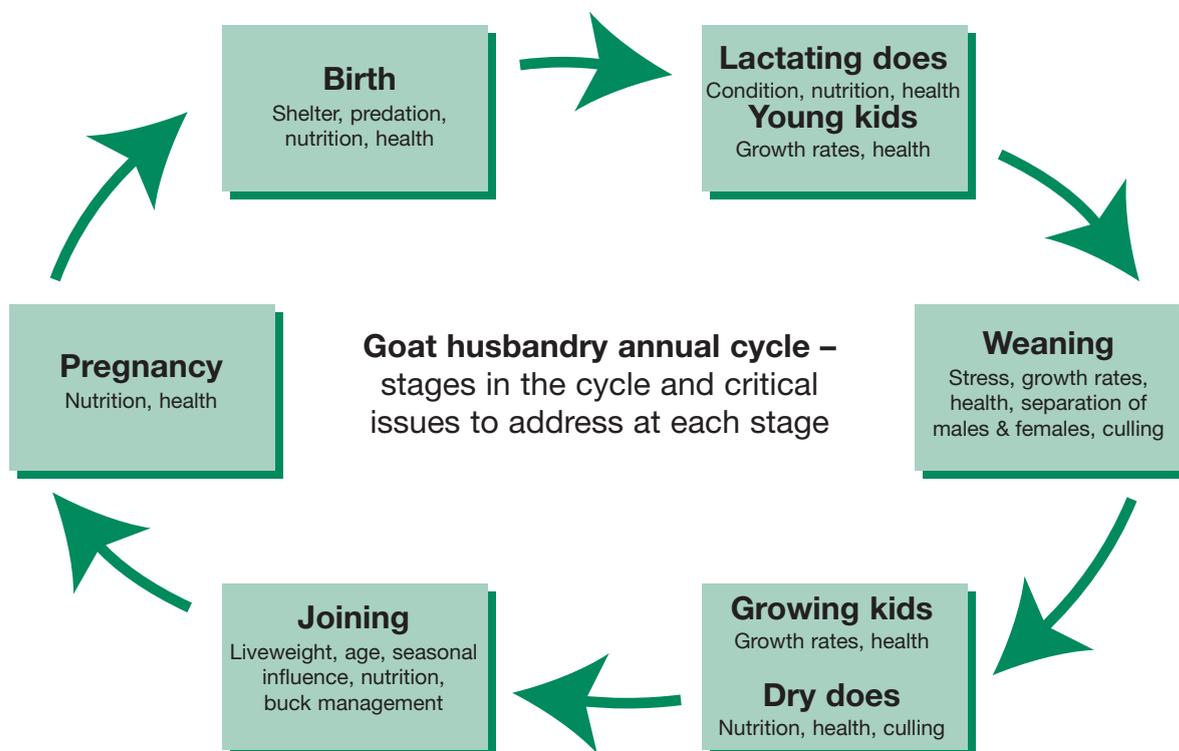
How to do it?

There is a long list of potential husbandry activities that can be undertaken in a goat enterprise, but they may not all be relevant to your situation or the type of operation that you are running. To give you an understanding of what might be involved, the following section has been divided into two parts:

1. **Extensive** – an example is provided of a goat husbandry annual cycle for an extensive goat enterprise. This example takes a very minimal, but achievable approach to animal husbandry.

2. **Intensive** – an example is given of a goat husbandry annual cycle for an intensive goat enterprise, including a comprehensive list of activities and issues to consider.

You may find that the husbandry activities required for your enterprise fall somewhere between the two examples presented. These examples have been provided as a guide only. Tailor your annual cycle to suit the needs of your enterprise.



The annual cycle of goat husbandry comprises six distinct phases as outlined in the diagram above. In the text which follows, each of these phases will be explored in some depth, identifying the key issues of concern, explaining their relevance and outlining the appropriate management responses for an extensive grazing enterprise.

Extensive system – Birth

Issues requiring attention	Explanation	Management tasks
Shelter	Low levels of subcutaneous fat make newborn kids very prone to exposure – more so than lambs and calves.	<ul style="list-style-type: none"> • Select paddocks with suitable shade and shelter for protection from extreme conditions. • Provide suitable protection for kids to be safely ‘planted’.[‡]
Predation	Newborn kids are easy prey for predators, such as dingoes, feral and domestic dogs, goannas, foxes, birds of prey, crows and wild pigs, especially when they are ‘planted’ in an isolated spot away from the main mob. The main risk of predation is in the kid’s first week of life. Coloured goats tend to have better natural camouflage from predators.	<ul style="list-style-type: none"> • Provide an adequate supply of easily accessible food and water; this will reduce the amount of time that the doe spends away from her newborn kid(s). • Undertake an on-farm predator-control program to reduce predator numbers. This may take the form of pest-control measures (eg fox baiting), or use of fencing to exclude predators. A predator-control program will be most effective if undertaken on a district basis, rather than as individual properties. <i>Bruce Foott, Queensland</i>, relates a story of the affect that predators were having on his enterprise: Prior to undertaking a baiting program for foxes and pigs, the marking percentage on the property was 30%. After baiting that figure increased to 100%. Baiting is now a regular part of Bruce’s annual program. • Select kidding paddocks with shelter to protect kids from birds of prey. Tree/shrub cover, fallen logs and branches, etc will interrupt the birds’ flight patterns. • Kidding during the most common lambing/kidding period in the district will spread the impact of predators, ie same number of predators, larger numbers of potential prey.

[‡] Planting – one of the natural instincts of a doe is to ‘plant’ her kids for the first few days after giving birth. The intent of the doe is to keep her newborn kid hidden and protected, away from the mob. The doe will then move off to seek food, returning regularly to feed her kid(s). The ‘planting’ site will be in a location which offers some privacy eg behind a log, in amongst tussocks, etc.

Extensive system – Birth *continued*

Issues requiring attention	Explanation	Management tasks
Nutrition	Lactating does have increased nutrient demands. If the doe is under significant nutritional stress she may leave her kid to ensure her own survival.	<ul style="list-style-type: none"> • Provide adequate quantities of high-quality feed to support lactation. See <i>Module 7 – Nutrition</i>. • Plan ahead to ensure adequate feed supply or use supplementary feeds.
Health	Kidding does are physiologically vulnerable.	

Extensive system – Lactating does

Issues requiring attention	Explanation	Management tasks
Nutrition	Lactating does have high nutrient demands. Meeting these demands is essential if the kids are to achieve high growth rates.	<ul style="list-style-type: none"> • Provide adequate quantities of high-quality feed to support lactation. See <i>Module 7 – Nutrition</i>. • Supply supplementary feed if necessary.
Condition	In early lactation, does will struggle to eat enough food to fulfill the high energy demands of milk production. During this phase they will lose condition.	<ul style="list-style-type: none"> • Monitor the body condition score of does.
Health	Does need to be in good health to maximise milk production.	<ul style="list-style-type: none"> • Monitor the health status of does. • Does may bleed a week after kidding – this is normal.

Extensive system – Young kids

Issues requiring attention	Explanation	Management tasks
Growth rates	This period in a goat's life is critical in terms of muscle, bone and skin development and for fibre production. It also sets the young animal on a path towards achieving breeding target weights or market specifications.	<ul style="list-style-type: none"> • Provide adequate nutrition to support rapid growth and to ensure that the kids will achieve a weaning weight appropriate for its breed and age. Refer to <i>Module 6 - Husbandry Toolkit 6 page 16</i>. • Set appropriate weaning weight targets for your herd. • Monitor growth rates.
Injury	Kids are naturally playful and curious, and thus prone to injury/death from misadventure.	<ul style="list-style-type: none"> • Plan to kid in paddocks with low risk of misadventure. Risky items include uncovered or unfenced wells, troughs, dams, fence post holes and steep sided drains.
Health	To maximise their growth potential kids need to be in good health.	<ul style="list-style-type: none"> • Monitor the health of kids and record any problems that you detect.

Extensive system – Weaning

Issues requiring attention	Explanation	Management tasks
Stress	Weaning is a stressful time for both does and kids. Minimising stress levels will reduce production loss and the potential for injury due to misadventure.	<ul style="list-style-type: none"> • Reduce the amount of walking and calling by either confining does and kids to separate but nearby yards or, alternatively, keep them out of sight and hearing range of each other. The latter is the preferred method. • Select paddocks or yards that are securely fenced. • Young does do not necessarily have to be separated from their mothers; they can stay with the mature does until the next joining, without any ill effects. The important consideration is the impact that prolonged nursing has on maternal body condition.
Growth rates	To achieve market specifications as quickly as possible, aim to minimise the growth check that kids experience after weaning.	<ul style="list-style-type: none"> • Draft and manage kids according to sex, size and behaviour. • Separating large kids from small kids will reduce bullying and allow the small kids to develop. • Goats can be successfully raised on high quality grass-based pastures, without the need for additional supplementation.
Health	To maximise growth potential kids need to be in good health.	<ul style="list-style-type: none"> • Plan to graze on worm-free pasture.
Separation of entire males and females	Goats reach puberty between 3.5*-12 months of age. ⁴³ The onset of puberty is weight dependent – usually 40% of mature weight. ⁴⁴	<ul style="list-style-type: none"> • Remove bucks before they are 12 to 18 months of age. “Large bucks are too aggressive on the environment and they will disperse the does.” <i>Will Scott, Mt Magnet, Western Australia.</i>
Culling	Does that are found to be unsound are less likely to get pregnant and successfully rear a kid in the future.	<ul style="list-style-type: none"> • Check for physical soundness: udder structure, teeth and feet. Cull does that have physical problems.

* Boer goats, dairy breeds and rangeland goats are particularly virile and can be potentially fertile from 3.5 months of age.

⁴³ Hungerford, T.G. (1990). Diseases of Livestock. 9th revised edition. Angus and Robertson.

⁴⁴ McGregor, B. (2002). An introduction to reproduction management of fibre and meat goats. Agricultural Note, AG1003. Department of Natural Resources and Environment.

Extensive system – Growing kids

Issues requiring attention	Explanation	Management tasks
Growth rates	To maximise potential returns, the aim is to get kids to reach market specifications as quickly as possible. If female kids are to be kept as breeders, the aim is to achieve adequate weight and condition for their first mating. Growth rates will vary between breeds and according to nutrition.	<ul style="list-style-type: none"> • Provide a high quality diet for growing kids. See <i>Module 7 – Nutrition</i>. • Set appropriate growth rate targets to achieve your production goals. • Monitor growth rates. • Expected growth rates⁴⁵ given reasonable seasonal conditions: <ul style="list-style-type: none"> o Boer goats aim for 200grams/day; o Rangeland goats 100-200grams/day. <p>Note: growth rates increase after the winter solstice and decrease as day length declines.</p>
Health	To maximise growth potential kids need to be in good health.	<ul style="list-style-type: none"> • Monitor health status and record any problems that you detect.

⁴⁵ McGregor, B. (2005). Compendium of growth rates of Australian Goats. Primary Industries Research Victoria.

Extensive system – Growing kids

Issues requiring attention	Explanation	Management tasks
Nutrition	<p>To optimise reproductive performance, does need to be in good condition for joining ie condition score 3 for mature does, or 40% of mature body weight for maiden does.</p> <p>A dry doe has less energy demands than a lactating doe, thus it is often easier to put condition on a dry doe.</p>	<ul style="list-style-type: none"> • Provide adequate nutrition to support maintenance or increase body condition as required. • Monitor body condition via visual assessment. Refer to the condition scoring chart in <i>Module 6 - Husbandry Toolkit 6 page 18</i>. • Ensure that weaning occurs early enough to allow the doe enough time to recover body condition before joining.
Health	For maximum performance, does need to be in good health and condition.	<ul style="list-style-type: none"> • Monitor health status.
Culling	It is not economically viable to carry and join does that are not going to perform well, or that produce low value progeny.	<ul style="list-style-type: none"> • Set culling criteria according to the enterprise goals, goat age, physical soundness and production levels. <p>Note: goats with very high levels of reproductive performance tend to age more rapidly.</p>

Extensive system – Joining

Issues requiring attention	Explanation	Management tasks
Liveweight/age	<p>To ensure that a maiden doe is cycling she needs to have reached puberty. Puberty is reached at about 40% of mature body weight. This may be achieved as early as 3.5 months of age, or, more commonly, 7 months.</p> <p><i>Module 6 - Husbandry Toolkit 6 page 16</i> provides a guide to the mature body weights that can be expected for a range of goat breeds.</p>	<ul style="list-style-type: none"> • Culling should be carried out at weaning and reviewed before joining.
Seasonal influence	<p>Spontaneous breeding occurs from February to July, as a result of a hormonal response to shortening day length. However, goats can breed all year – depending on temperature, stress, rainfall and feed supply. If feed supply is sufficient does can return to oestrus five days after giving birth. “In really good seasons, does get in kid very soon after kidding and go close to two kiddings in a year.”</p> <p><i>Tim Perrottet, Dirranbandi, Queensland.</i></p> <p>Boer goats tend to breed all year round, except in coastal areas.</p>	<ul style="list-style-type: none"> • To maximise the percentage of does falling pregnant, joining periods should be timed in accordance with the goat’s natural fertility patterns. • In extensive enterprises, given reasonable rainfall and nutrition, does can kid three times in two years, so you need to plan feed supply and husbandry activities accordingly.

Extensive system – Joining *continued*

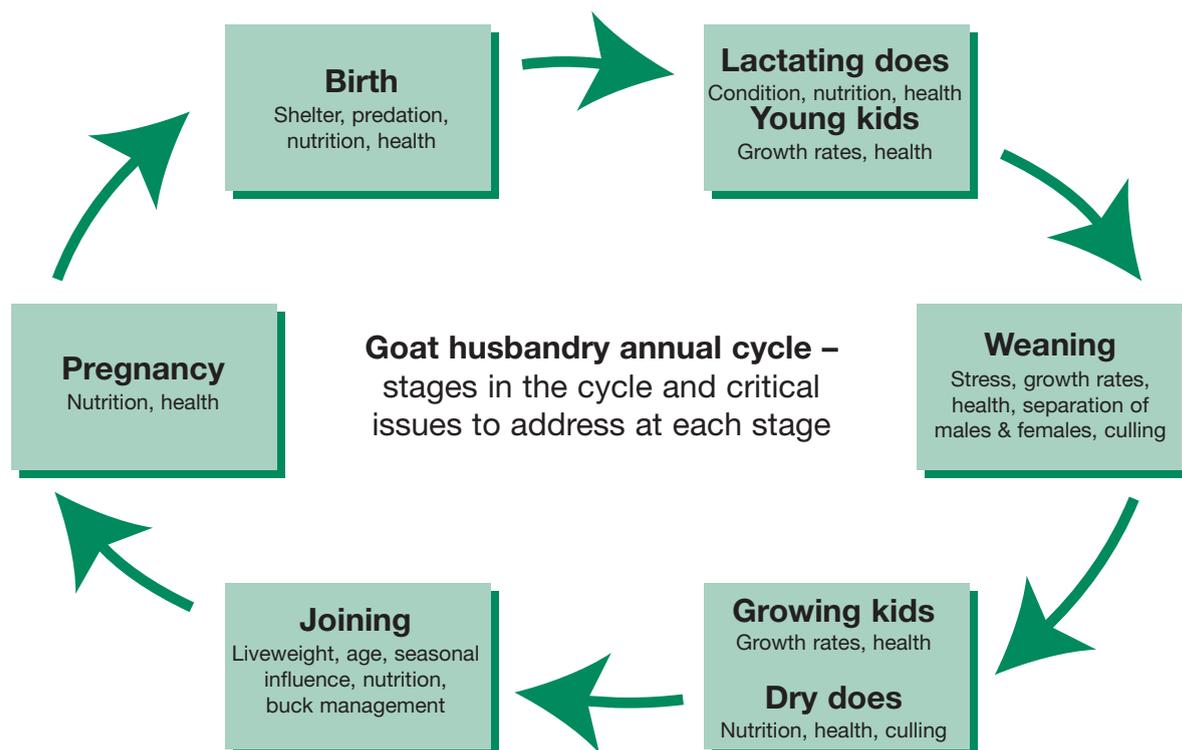
Issues requiring attention	Explanation	Management tasks
Nutrition	A boost in nutrition (rising plane of nutrition) at joining increases ovulation rates. Does are more fertile in the second cycle.	<ul style="list-style-type: none"> • Provide does with a rising plane of nutrition leading up to the mating period, ie increase the quality and quantity of available feed. Refer to <i>Module 7 – Nutrition</i> for further information on this topic. • Good nutrition will encourage multiple births. Success with multiple births requires careful management of doe nutrition.
Buck management	Buck performance is critical to ensure high pregnancy rates and a tight kidding pattern.	<ul style="list-style-type: none"> • Select bucks according to the enterprise breeding goals. • Test bucks for fertility, health and physical (feet, teeth and testicles) soundness prior to introduction to the does. All such checks should be completed two months prior to joining, which allows time for corrective actions or replacement if required. • Manage bucks to ensure that they are in good condition prior to the start of the mating period – aim for condition score 3. • Use the appropriate ratio of bucks to does: <ul style="list-style-type: none"> o In extensive systems 5% of the mob as bucks is appropriate; o Increase ratio if using young bucks (7-8 months old).

Extensive system – Pregnancy

Issues requiring attention	Explanation	Management tasks
Nutrition	<p>The doe's nutrient demands will increase as the foetus grows, with peak demand coming in the last six weeks of pregnancy. The developing foetus gains 70% of its birthweight in the last six weeks of the pregnancy.⁴⁶ The nutrition of the doe will directly impact on the birthweight of her kid(s). If does are put under significant nutritional stress they may abort the foetus.</p>	<ul style="list-style-type: none"> • Provide adequate nutrition to support the pregnant doe. • Ensure that feed supply increases in the last six weeks of pregnancy. See <i>Module 7 – Nutrition</i>. • Avoid joining over-fat does and feeding does in early pregnancy as this can lead to kidding problems and pregnancy toxemia.
Health	<p>The health of the doe has a direct impact on her ability to carry, give birth to and raise her kid(s).</p>	

⁴⁶ Greenwood, P. (1992) Dairy Goats: Nutrition. Agfact A7.5.5. New South Wales Agriculture.

An Intensive System



The annual cycle of goat husbandry comprises six distinct phases as outlined in the diagram above. In the text which follows each of these phases will be explored in some depth, identifying the key issues of concern, explaining their relevance and outlining the appropriate management responses for an intensive grazing enterprise.

Intensive system – Birth

Issues requiring attention	Explanation	Management tasks
Shelter	Low levels of subcutaneous fat make newborn kids very prone to exposure – more so than lambs and calves.	<ul style="list-style-type: none"> • Select paddocks with suitable shade and shelter (man-made if necessary) for protection from extreme weather conditions. • Provide suitable protection for kids to be safely ‘planted’.[‡]
Predation	Newborn kids are easy prey for predators, such as dingoes, feral and domestic dogs, goannas, foxes, birds of prey, crows and wild pigs, especially when they are ‘planted’ in an isolated spot away from the main mob. The main risk of predation is in the kid’s first week of life. Coloured goats tend to have better natural camouflage from predators.	<ul style="list-style-type: none"> • Provide an adequate supply of easily accessible food and water; this will reduce the amount of time that the doe spends away from her newborn kid(s). • Undertake an on-farm predator-control program to reduce predator numbers. This may take the form of pest-control measures (eg fox baiting), or use of fencing to exclude predators. A predator-control program will be most effective if undertaken on a district basis, rather than as individual properties. • Consider using guarding animals, such as Maremma dogs, female alpacas or donkeys. • Select kidding paddocks with shelter to protect kids from birds of prey. Tree/shrub cover, fallen logs and branches, etc will interrupt the birds’ flight patterns. • A compact joining will in turn generate a compact kidding, reducing the time span over which predation is an issue. • Kidding during the most common lambing/kidding period in the district will spread the impact of predators ie same number of predators, larger numbers of potential prey. • Attach a bell to a quiet wether. The noise will discourage dingos/dogs.

[‡] Planting – one of the natural instincts of a doe is to ‘plant’ her kids for the first few days after giving birth. The intent of the doe is to keep her newborn kid hidden and protected, away from the mob. The doe will then move off to seek food, returning regularly to feed her kid(s). The ‘planting’ site will be in a location which offers some privacy eg behind a log, in amongst tussocks, etc.

Intensive system – Birth *continued*

Issues requiring attention	Explanation	Management tasks
Nutrition	Lactating does have increased nutrient demands. If the doe is under significant nutritional stress she may leave her kid to ensure her own survival.	<ul style="list-style-type: none"> • Provide adequate quantities of high-quality feed to support lactation. See <i>Module 7 – Nutrition</i>. • Plan ahead to avoid the use of supplementary feeds. This will reduce the risk of mismothering.
Health	Kidding does are physiologically vulnerable.	<ul style="list-style-type: none"> • Monitor kidding does carefully, watching for signs of birthing difficulties and metabolic problems. Intervene where necessary. • Minimise stress factors that may cause weight loss, reduced production or disrupt the birthing process. • Test for intestinal worms and treat prior to kidding, if required. Select a clean worm-free paddock for kidding – a paddock that has been spelled or grazed by adult dry stock or cattle.

Intensive system – Lactating does

Issues requiring attention	Explanation	Management tasks
Nutrition	Lactating does have high nutrient demands. Meeting these demands is essential if the kids are to achieve high growth rates.	<ul style="list-style-type: none"> • Provide adequate quantities of high-quality feed to support lactation. See <i>Module 7 – Nutrition</i>.
Condition	In early lactation, does will struggle to eat enough food to fulfill the high energy demands of milk production. During this phase they will lose condition.	<ul style="list-style-type: none"> • Monitor the body condition score of does. Aim for controlled weight loss. Condition score should not be allowed to fall below 2 as this could have negative impacts in the next reproductive cycle.
Health	Does need to be in good health to maximise milk production.	<ul style="list-style-type: none"> • Monitor the health status of does; intervene when necessary. See health chart for a guide to potential problems, <i>Module 6 - Husbandry Toolkit 6 page 3</i>. • Does may bleed a week after kidding – this is normal.

Intensive system – Lactating does

Issues requiring attention	Explanation	Management tasks
Growth rates	This period in a goat's life is critical in terms of muscle, bone and skin development and for fibre production. It also sets the young animal on a path towards achieving breeding target weights or market specifications.	<ul style="list-style-type: none"> • Provide adequate nutrition to support rapid growth and to ensure that the kid will achieve a weaning weight appropriate for its breed and age. Refer to <i>Module 6 - Husbandry Toolkit 6 page 16</i>. • Set appropriate weaning weight targets for your herd. • Monitor growth rates closely.
Injury	Kids are naturally playful and curious, and thus prone to injury/death from misadventure.	<ul style="list-style-type: none"> • Plan to kid in paddocks with low risk of misadventure. Risky items include uncovered or unfenced wells, troughs, dams, fence post holes and steep-sided drains.
Marking	In some circumstances, castration of male kids is desirable for management and/or marketing reasons. For further information about relevance of this procedure for your enterprise, see <i>Module 6 - Husbandry Toolkit 6 page 17</i> .	<ul style="list-style-type: none"> • Plan to castrate bucks between the ages of 10 days and 6 weeks. The older the kid, the greater the shock experienced. Also, smaller goats are physically easier to handle. • Choose a mild day for marking. • Mark early in the day to allow time for mothering-up. • Ensure equipment, yards and release paddock are clean. • Avoid any additional stresses. • Methods include knife, elastic rings/bands, or burdizzo.⁴⁷
Health	To maximise their growth potential, kids need to be in good health.	<ul style="list-style-type: none"> • Monitor the health of kids. Be aware of the symptoms for the major health problems, as outlined in the health chart, <i>Module 6 - Husbandry Toolkit 6 page 3</i>. Keep a record of any health problems. • Vaccinate and drench as required. See <i>Module 6 - Husbandry Toolkit 6 page 12</i> for further information.

⁴⁷ Wood, G. and Johnson, W. (1990). Goat Kid Marking. Agfact A7.2.6. Agdex 470/26. New South Wales Agriculture and Fisheries.

Intensive system – Weaning

Issues requiring attention	Explanation	Management tasks
Stress	Weaning is a stressful time for both does and kids. Minimising stress levels will reduce production loss and the potential for injury due to misadventure.	<ul style="list-style-type: none"> • Reduce the amount of walking and calling by either confining does and kids to separate but nearby yards or, alternatively, keep them out of sight and hearing range of each other. The latter is the preferred method. • Select paddocks or yards that are securely fenced. • Other useful strategies may include: <ul style="list-style-type: none"> o The use of ‘nurse’ does* for training; o Removing does and retaining the kids within the safe confines of a familiar paddock; o Conditioning does and kids with short periods of separation prior to weaning – this involves a lot of work and will not be practical for larger operations; o Allowing the weaned kids to settle down for a week before separating the males and females. • Young does do not necessarily have to be separated from their mothers; they can stay with the mature does until the next joining, without any ill effects. However, it is important to consider the impact that prolonged nursing has on maternal body condition. It is advisable that all kids be weaned at a stage which allows sufficient time for the doe to return to optimal condition prior to joining.

* A nurse doe is an older, quiet doe that is well accustomed to handling routines. Such an animal can be used to lead kids to feed, through gates and yards.

Intensive system – Weaning *continued*

Issues requiring attention	Explanation	Management tasks
Growth rates	To achieve market specifications as quickly as possible, aim to minimise the growth check that kids experience after weaning.	<ul style="list-style-type: none"> • Lead feed prior to weaning on the same ration that will be used after weaning to familiarise kids with the new feed source. • Draft and manage kids according to sex, size and behaviour. Separating large kids from smaller kids will reduce bullying and allow small kids to develop. • Closely monitor the mob for shy feeders. • Goats can be successfully raised on high quality grass-based pastures, without the need for additional supplementation.
Health	To maximise growth potential kids need to be in good health.	<ul style="list-style-type: none"> • Monitor worm burdens and treat as required. • Plan to graze on worm-free pasture. • Continue vaccination program. Refer to <i>Module 6 - Husbandry Toolkit 6 page 12</i> for further information. • For more information on health issues see <i>Module 6 - Husbandry Toolkit 6 page 3</i>.

Intensive system – Weaning *continued*

Issues requiring attention	Explanation	Management tasks
Identification	Being able to identify animals and keep appropriate records is important in assessing performance and ensuring traceability.	<ul style="list-style-type: none"> • Use ear tags or ear marks to indicate age and animal identity. • Use standard year colour tags, printed with the property identification code (PIC).
Separation of entire males and females	Goats reach puberty between 3.5*-12 months of age. The onset of puberty is weight dependent – usually 40% of mature weight.	<ul style="list-style-type: none"> • To prevent unwanted matings, buck and doe kids need to be separated before the bucks reach puberty. • This separation process is also relevant for young bucks and their mothers, if the age of weaning is to be carried beyond 3.5 months. Doe kids can be left with their mothers for longer.
Culling	It is uneconomic to carry does that do not produce or rear a kid as they present a cost (feed, health, husbandry) to the enterprise without contributing a return. Similarly, does that are found to be unsound are less likely to get pregnant and successfully rear a kid in the future.	<ul style="list-style-type: none"> • Check udders for evidence of suckling: wet/dry test. Cull dry does. • Check for physical soundness: udder structure (mastitis and blind teats), teeth and feet. Cull does that have physical problems.

* Boer goats, dairy breeds and rangeland goats are particularly virile and can be potentially fertile from 3.5 months of age.

Intensive system – Growing kids

Issues requiring attention	Explanation	Management tasks
Growth rates	To maximise potential returns, the aim is to get kids to reach market specifications as quickly as possible. If kids are to be kept as breeders, the aim is to achieve adequate weight and condition for their first mating. Growth rates will vary between breeds and according to nutrition.	<ul style="list-style-type: none"> • Provide a high quality diet for growing kids. See <i>Module 7 – Nutrition</i>. • Set appropriate growth rate targets to achieve your production goals. • Monitor growth rates closely by weighing and visual appraisal. • Expected growth rates⁴⁸ given reasonable seasonal conditions: <ul style="list-style-type: none"> o Boer goat aim for 200grams/day; o Angora and Cashmere goats 100grams/day; o Rangeland goats 100-200grams/day. <p>Note: growth rates increase after the winter solstice and decrease as day length declines.</p>
Health	To maximise growth potential, kids need to be in good health.	<ul style="list-style-type: none"> • Monitor health status, with particular attention to worm burdens. Treat as required. Keep a record of any problems that you detect. • See health chart for a guide to potential problems, <i>Module 6 - Husbandry Toolkit 6 page 3</i>.

⁴⁸ McGregor, B. (2005). Compendium of growth rates of Australian Goats. Primary Industries Research Victoria.

Intensive system – Dry does

Issues requiring attention	Explanation	Management tasks
Nutrition	<p>To optimise reproductive performance, does need to be in good condition for joining, ie condition score 3 for mature does, or 40% of mature body weight for maiden does.</p> <p>A dry doe has less energy demands than a lactating doe, thus it is often easier to put condition on a dry doe.</p>	<ul style="list-style-type: none"> • At weaning it may be necessary to reduce doe nutrition for a short period to help dry off milk supply. • Provide adequate nutrition to support maintenance or increase body condition as required. • Monitor body condition via visual assessment. Refer to the condition scoring chart, <i>Module 6 - Husbandry Toolkit 6 page 18</i>. • Ensure that weaning occurs early enough to allow the doe enough time to recover body condition before joining.
Health	<p>For maximum performance does need to be in good health and condition.</p>	<ul style="list-style-type: none"> • Monitor health status and treat as required. • See health chart for a guide to potential problems, <i>Module 6 - Husbandry Toolkit 6 page 3</i>.
Culling	<p>It is not economically viable to carry and join does that are not going to perform well, or that produce low value progeny.</p>	<ul style="list-style-type: none"> • Set culling criteria according to the enterprise goals, goat age (especially important for fibre goats, as fibre quality declines with age), physical soundness and production levels. <p>Note: goats with very high levels of reproductive performance tend to age more rapidly.</p>

Intensive system – Joining

Issues requiring attention	Explanation	Management tasks
Liveweight/age	<p>To ensure that a maiden doe is cycling she needs to have reached puberty. Puberty is reached at about 40% of mature body weight. This may be achieved as early as 3.5 months of age, or, more commonly, 7 months.</p> <p><i>Module 6 - Husbandry Toolkit 6 page 16</i> provides a guide to the mature body weights that can be expected for a range of goat breeds.</p>	<ul style="list-style-type: none"> • Decide whether to mate maiden does in their first or second year of life. <i>Module 6 - Husbandry Toolkit 6 page 21</i> will help you to make this decision. • Select does to be joined according to the goals of the enterprise. For more information on setting enterprise goals refer to <i>Module 1 – Property Planning</i>. • Culling should be carried out at weaning and reviewed before joining.
Seasonal influence	<p>Spontaneous breeding occurs from February to July, as a result of a hormonal response to shortening day length. However, goats can breed all year – depending on temperature, stress, rainfall and feed supply.</p> <p>If feed supply is sufficient, does can return to oestrus five days after giving birth. Boer goats tend to breed all year round, except in coastal areas.</p>	<ul style="list-style-type: none"> • To maximise the percentage of does falling pregnant, joining periods should be timed in accordance with the goat’s natural fertility patterns. • Bucks are usually removed from the mob at the end of joining.

Intensive system – Joining *continued*

Issues requiring attention	Explanation	Management tasks
Nutrition	A boost in nutrition (rising plane of nutrition) at joining increases ovulation rates. Does are more fertile in the second cycle.	<ul style="list-style-type: none"> • Provide does with a rising plane of nutrition leading up to the mating period ie increase the quality and quantity of available feed. Refer to <i>Module 7 – Nutrition</i> for further information on this topic. • Good nutrition will encourage multiple births, including triplets and quads. Success with triplets and quads requires careful management of doe nutrition and the mothering process. • Avoid joining over-fat does and over feeding in early pregnancy as this can lead to kidding problems and pregnancy toxemia.
Buck management	Buck performance is critical to ensure high pregnancy rates and a tight kidding pattern.	<ul style="list-style-type: none"> • Plan the joining period with a view to the desired length of the kidding period. This will help you to decide how long to run the bucks with the does. • Select bucks according to the enterprise breeding goals. • Test bucks for fertility, health and physical (feet, teeth and testicles) soundness prior to introduction to the does. All such checks should be completed at least two months prior to joining, which allows time for corrective actions or replacement if required. • Manage bucks to ensure that they are in good condition prior to the start of the mating period – aim for condition score 3. • Young bucks may require training in a confined yard with mature does, before introducing them to a paddock joining situation.

Intensive system – Joining *continued*

Issues requiring attention	Explanation	Management tasks
Buck management <i>continued</i>		<ul style="list-style-type: none"> • Keep bucks and does separated in the month prior to joining ie out of sight, smell and hearing of each other. This will enhance the ‘buck effect’ ie introduction of bucks can initiate and synchronise cycling in does. • Use the appropriate ratio of bucks to does: <ul style="list-style-type: none"> o For intensive systems join with 1.5-2.0% bucks; o Increase ratio if using young bucks (7-8 months old). • Introduce young bucks to the mob first, follow up with the older bucks later. This allows the young bucks a free run initially, and avoids overworking an older but still valuable buck. • Young bucks will learn from older bucks and may work more effectively when run together.
Artificial insemination/ embryo transfer	<p>Artificial insemination and embryo transfer are another option for achieving genetic improvement. These techniques are mainly used by stud breeders. There is an increased cost and husbandry input associated with these techniques, so consider the economics and practicality carefully. Reduced kidding percentages can be expected.</p>	<ul style="list-style-type: none"> • Plan ahead. • Select appropriate recipients and budget to feed them well. Refer to <i>Module 7 – Nutrition</i> for information about feed requirements. • Select appropriate genetic material. • Plan the procedure in conjunction with a vet or experienced technician. • Be prepared to spend extra time at kidding to ensure the success of the investment.

For further information to assist you in making decisions about age of first joining, time of year to join and buck management refer to Module 6 - Husbandry Toolkit 6 page 21.

Intensive system – Pregnancy

Issues requiring attention	Explanation	Management tasks
Nutrition	<p>The doe's nutrient demands will increase as the foetus grows, with peak demand coming in the last six weeks of pregnancy. The developing foetus gains 70% of its birthweight in the last six weeks of the pregnancy.⁴⁹ The nutrition of the doe will directly impact on the birth weight of her kid(s). If does are put under significant nutritional stress they may abort the foetus.</p>	<ul style="list-style-type: none"> • Provide adequate nutrition to support the pregnant doe. • Ensure that feed supply increases in the last six weeks of pregnancy. See <i>Module 7 – Nutrition</i>. • Avoid over feeding does in early pregnancy as this can lead to kidding problems and pregnancy toxaemia.
Health	<p>The health of the doe has a direct impact on her ability to carry, give birth to and raise her kid(s).</p>	<ul style="list-style-type: none"> • Vaccinate, drench and treat for lice as required. • See health chart for a guide to potential problems, <i>Module 6 - Husbandry Toolkit 6 page 3</i>.
Pregnancy testing	<p>Ultrasound examination to determine if does are pregnant or carrying multiples.</p>	<p>Divide flock into:</p> <ul style="list-style-type: none"> • Empty (cull). • Single-bearing. • Multiple-bearing – these does can be put on the highest plane of nutrition to ensure their high energy demands are met.

⁴⁹ Greenwood, P. (1992) Dairy Goats: Nutrition. Agfact A7.5.5. New South Wales Agriculture.

Physiological facts

In the annual cycle of goat husbandry, many of the management issues discussed have a physiological basis. To help you understand

the reasoning behind these management recommendations, the table below highlights some of the basic facts of goat physiology.⁵⁰

	Average figure	Range	Comment
Puberty		3.5–12 months	Bucks average 10 months. Does 4–12 months. Weight dependent Usually 40% of mature weight.
Gestation period	150 days	147–155 (85% range)	Milking goats may not require joining each year.
Duration of oestrus	26 hours	24–36 hours	Ovulation occurs 12 hours after oestrus ends.
Frequency of oestrus (if not pregnant)	21 days	18–25 days	A 50-day joining period allows for two long cycles.
Birth weight of kids	Bucks 2–2.75kg Does 2–2.25kg	Angora 1.4–3.6kg Anglo-Nubian 1.2–4.0kg Cashmere 2.9–3.2kg Boer 2.5–5.5kg Rangeland 2.9kg	Single kids heavier than multiply births. Kids less than 1kg rarely survive.
Percentage of does with multiple births		40–60%	Dependent on breed, age and nutrition.
Length of life	10 years	Up to 18 years	Breed up to 9 years of age.
Kidding	Multiple births	1–5 kids	Less than 0.2% of does experience dystocia (birthing difficulty).
Colostrum produced		4–5 days	Essential for survival and growth of the newborn kid.
Milk production	2–3litres/day		Can produce up to 10litres/day.
Body temperature		100.4–103.1°F 38.0–39.5°C	These figures refer to daytime rectal average temperatures.
Pulse		60–80 beats/min	
Breathing		12–30 breaths/min	

⁵⁰ Information sources for this table: Hungerford, T.G. (1990). Diseases of Livestock. 9th revised edition. Angus and Robertson.
Shands, C. (1990). Goat reproduction: joining, pregnancy and kidding. Agfact A7.4.1, Agdex 470/40. New South Wales Agriculture and Fisheries.



Toolkit 6 - Goat selection

- Tool 6.1 Finding further information (page 2)
- Tool 6.2 Common health problems (page 3)
- Tool 6.3 Distribution maps showing areas prone to trace-element and mineral deficiencies in Australia (page 10)
- Tool 6.4 Vaccinating against diseases (page 12)
- Tool 6.5 Zoonotic diseases of goats (page 15)
- Tool 6.6 Growth rate and mature weight tables (page 16)
- Tool 6.7 Is marking of male kids a necessity for your enterprise? (page 17)
- Tool 6.8 Live body condition scoring – an assessment of fat reserves (page 18)
- Tool 6.9 Mustering stock (page 20)
- Tool 6.10 Joining options (page 21)
- Tool 6.11 Other health issues (page 27)

Case studies

- Healthy goats
- Trevor and Jackie Bunce (page 34)

Goat handling

Successful handling of goats requires an understanding of the behavioural patterns of the animal. Goats are naturally intelligent, inquisitive, agile, alert and of nervous disposition.

To minimise the stress on both goats and handlers, when working with goats consider the following management tips. Please note; this is a comprehensive list of behavioural characteristics and management tips for both intensive and extensive enterprises. Bear this in mind as you read this section and select those points that have relevance and practicality for your enterprise.

- Capitalise on the goat's intelligence. They are quick learners and respond well to routines.
- Goats will tend to flock together, so it is easier to move stock as a mob rather than separating out individuals.
- Goats will tend to follow. A quiet old doe or wether that is familiar with handling routines can be useful as a lead animal when moving young goats.⁵¹
- Do not rush goats; give them time to assess a situation. For example, at a gate, it is often better to wait a few minutes and allow the lead goat to find the opening and walk through, taking the others with it, rather than trying to force an unwilling mob.
- Move the herd to the yards by controlling the lead animals. "Only move as fast as the slowest goat in the mob." *Will Scott, Mt Magnet WA*
- In yards, races and on trucks, goats will tend to crowd and pack together which can cause deaths from smothering, therefore take care to avoid overcrowding in confined spaces.

"If the yard looks full, then there are already too many goats in it – take out 50%." *Scott Morton, Cassilis, NSW.*

- Well-designed yards aid stock flow and prevent smothering. See *Module 4 – Infrastructure*.
- Do not put undue pressure on goats near fences, in laneways, yards or handling facilities. If put under pressure, goats will jump or climb to escape from the perceived threat. Quiet handling is essential.
- Goats tend to squeal when distressed, so it is advisable to wear ear plugs when handling goats especially when in confined spaces, such as at shearing.
- Avoid working with or transporting goats in extreme weather conditions.
- Changes to diet, water supply and handling routines can be very stressful, increasing the risk of weight loss and dehydration, and susceptibility to illness/disease. Any changes need to be carefully planned and, where possible, introduced gradually. For example, if stock are going to be moved into a feedlot prior to processing, the new diet needs to be gradually introduced prior to transportation to the feedlot. For more information on feedlotting goats, refer to *Module 7 – Nutrition Toolkit 7 page 20*.
- When relocating goats, unload them at a water point or push/lead them to the water.
- Goats not familiar with people need a bigger flight zone than domestic animals. "Low Stress Stock Handling" courses are available.

⁵¹ Miller, J., Thompson Bros., Levinge, R., Waters, N., Squire-Wilson, L. and Browne, R.J. (2001). Handling goats. In: "Australian Goat Notes", B9, pp 42-45. Australian Cashmere Growers Association.

- There are a range of mustering techniques that can be used in extensive operations, such as aerial mustering, vehicle mustering and water point trapping. For more information on mustering refer *Module 6 - Husbandry Toolkit 6 page 20*.
- Behave in a calm and controlled manner – no sudden movements or loud noises. If using dogs, ensure that they are quiet and are not overly forceful in the way they move stock. Dogs should be introduced to goats slowly.
- Speaking to goats while you work with them can have a calming effect.

Low stress handling has productivity benefits for your farming enterprise. Reducing stress will deliver benefit in terms of goat health and production on the farm and better meat quality to the customer.

Goats that experience high levels of stress prior to slaughter will have tougher, darker meat, which is often undesirable if targeting high-return markets that are focused on product quality. Pre-slaughter stress can lead to an increased incidence of salmonella.⁵²



⁵² Meat Standards Australia (2006) website: www.msagrading.com.

Tool 6.1

Finding further information

Useful contacts

Credible sources of disease information include:

- Private veterinarians and consultants.
- State departments of agriculture and other government bodies.
- The Australian Sheep Veterinarians (ASV) – a special-interest group from the Australian Veterinarian Association. This group is the peak body for advice on small ruminant health in Australia, and has members who are willing to advise on goat health and management issues. Contact details are as follows: 3 / 2404 Logan Road, Eight Mile Plains QLD 4113. Ph: 07 34231799. E-mail: aacv@ava.com.au

Lists of state and national codes of practice are available on websites. The codes of practice should be followed as part of normal goat husbandry and welfare management. See *Module 3 – Industry obligations*

References

- Diseases of Livestock*. Hungerford, T.G. 1990. McGraw-Hill. Ninth edition.
- Livestock Handling and Transport*. 2000. Grandin, T. Bloomsbury.
- Meat Goats Breeding, Production and Marketing*. Vincent, B. 2005. Land Links.
- AgSkills Goats Home Study Program*. 1988. New South Wales Agriculture and Fisheries. Agriculture College Tocal. Useful explanation of basic husbandry practices. Ideal for new farmers.

Natural Goat and Alpaca Care. Colby, P. 2000. Landlinks Press. Second edition.

Courses and workshops

Low Stress Stockhandling School
(www.lss.net.au)

Websites

Refer to *Module 1 – Property planning Toolkit 1 page 5* for instructions on how to conduct an effective web search.

Australian Animal Health
www.aahc.com.au

NSW Department of Primary Industries
www.dpi.nsw.gov.au

Department of Primary Industries, Victoria
www.dpi.vic.gov.au

South Australia Research & Development Institute
www.sardi.sa.gov.au

Primary Industries and Resources South Australia
www.pir.sa.gov.au

Department of Primary Industries, Water & Environment, Tasmania
www.dpiwe.tas.gov.au

Department of Agriculture Western Australia
www.agric.wa.gov.au

Queensland Department of Primary Industries and Fisheries
www.dpi.qld.gov.au

Northern Territory Primary Industry
www.dpi.nt.gov.au

Tool 6.2

Common health problems⁵³

The information presented in this tool should only be used as a guide. For specific diagnosis, treatment and management advice speak to a veterinarian.

The table below will help you to identify and manage some of the more common health problems that can afflict goats. Left undiagnosed or untreated such problems can result in significant economic losses.

- Gastrointestinal parasites
- Capture myopathy
- Lice
- Pregnancy toxemia
- Ketosis
- Respiratory diseases
- Clostridial diseases

The table provides details of the prevailing conditions under which each problem is likely to occur, explains how to diagnose the problem and lists preventative management strategies.

For information on nutritional disorders such as bloat, grain poisoning and vitamin and mineral deficiencies, refer to *Module 7 – Nutrition Toolkit 7 page 14*.

Information on other less common health issues can be found in *Module 6 – Husbandry Toolkit 6 page 27*.

There are a few terms which appear in the table with which you may not be familiar, their definitions are as follows:

Chronic – a condition which has been affecting an animal for a long time, constantly recurring

Clinical – the form of a disease where the animal is displaying obvious symptoms

Acute – severe form of a disease

Gastrointestinal parasites

Examples: Brown stomach worm (*Ostertagia species*), Black scour worm (*Trichostrongylus species*), Barber's pole worm (*Haemonchus contortus*) and large-mouth bowel worm (*Chabertia species*).

Conditions when likely to occur:

- High rainfall regions (>500mm annual rainfall); higher risk above 600mm or on irrigation.
- High stocking rates, especially if the property is running goats and sheep.
- Grazing short pasture.
- Kids are most susceptible after weaning, especially over winter and early spring period when peak larval challenge occurs.
- Does are more prone to worms than males, particularly when they are kidding or under nutritional stress.
- Heat and humidity are ideal conditions for Barber's pole worm to proliferate. Summer rainfall areas with uniformly warm and wet seasons are particularly prone to Barber's pole worm.
- Black scour worm and brown stomach worm larvae prefer mild wet seasons.
- Sheep and cattle have a greater immunity to worms than goats.
- Set stocked grazing.

Diagnosis:

- History of poor performance on pasture (growth rates less than expected given the availability and quality of the pasture on hand).
- Clinical signs: scouring, weight loss, anaemia, bottle jaw. Scouring – this symptom is not a consistent sign of worms, even with heavy infestations.

⁵³ The information presented in this tool has been sourced from a number of references: Simmonds, J. (Editor). (2001). Australian Goat Notes. Australian Cashmere Growers Association. Hungerford, T.G. (1990). Diseases of Livestock. Ninth edition. McGraw-Hill. Vincent, B. (2005). Meat Goats Breeding, Production and Marketing. Land Links.

- Autopsy: high total worm counts.
- Faecal egg counts and larval cultures are valuable tools in diagnosing the level of worm burden.
- Field trials to assess growth response from drenching can be very useful if you are uncertain of the parasitological and economic benefit. This is particularly relevant in regions where gastrointestinal parasites are generally not considered to be economically important.

Strategic drenching – the timing of drenching to prevent gastrointestinal parasites will vary between regions and with differing local conditions. Sustainable worm control is about more than just a drenching program. It is important to adopt integration of ‘chemical’ and ‘non-chemical’ control options.

Preventative management strategies

Registered products for treating internal parasites in goats:

Chemical group	Active ingredient	Product name	Comments
Benzimidazoles (BZs)	Oxfendazole	Parafend Virbac Oxfen Virbac Combat Oxazole Parafend	Broad spectrum against roundworms
Benzimidazoles (BZs)	Fenbendazole	4Farmers Fenbendazole Panacur 25 WSD Fenbendazole Panacur 25 WSD Fenbendazole	Resistance noted to all members of this chemical class
Benzimidazoles (BZs)	Albendazole	Nufarm Nematet Virbac Alben Valbazen WSD Albendazole	Drench tests recommended
BZ flukicide	Triclabendazole	Fasinex Flukguard S Virbac Flukare Youngs Tricla 50 Tremacide	Active against all stages of liver fluke

Note: There are other chemicals used to treat internal parasites in sheep that are often also used in goats (unregistered). However, these chemicals should only be used under the prescription of a veterinarian.

Control strategies include: grazing management (eg avoid grazing excessively close to the ground, drench goats on to 'low-risk pastures' (see below)), herd management (does and kids are more prone to worms and should be managed accordingly; resistance increases with age), using bucks and does that are genetically resistant to worms, maintaining adequate nutrition, regular drench testing, and regular monitoring (worm testing).

Grazing management:

- Graze weaners on pastures with low worm larvae contamination.
- Low risk pastures include:
 - o new pasture or fodder crop,
 - o pasture grazed by cattle (not sheep) for the last six months,
 - o paddocks with a good supply of browse.
- Moderate worm-risk pastures include:
 - o pasture grazed by mature dry goats.
- High worm-risk pastures include:
 - o pasture grazed by young wormy goats or kidding does.

Introducing new stock:

- Drench with a product that is suitable for the time of the year and in accordance with your animal health strategy.
- Observe the withholding periods (WHP) and export slaughter intervals (ESI) of all products used. These are available at www.mla.com.au/esi – note: the information on this website will change as more products become available.
- Things to note when using products that are more commonly associated with sheep :
 1. Not all drugs or formulations are registered for use in goats. Care should be taken to avoid those not

registered, unless the particular circumstances require their use. In this case, the drug should only be used with written approval from a veterinarian.

2. The dose rates as prescribed for sheep are often too low for goats. Dose rates should be based on bodyweight – measured not estimated.
3. The pharmacokinetics of some drugs differ between sheep and goats. Plasma concentrations of levamisole in goats declined rapidly after about 40 minutes, whereas the same concentration in sheep was maintained for up to 300 minutes. New Zealand research has noted that goats excreted oxfendazole, thiabendazole and levamisole more rapidly than sheep.

WormBoss

WormBoss is a tool that has been developed by the Australian Sheep Industry Cooperative Research Centre (Sheep CRC) and Australian Wool Innovation Ltd (AWI) to assist sheep producers with worm control problems.

The guiding principles of worm control in goats are very similar to those in sheep. Four basic management practices should be observed:

- 1) Monitor worm populations using worm egg counts to detect infestations early.
- 2) Conduct drench resistance tests so that you know which drenches are effective on your property.
- 3) Maximise the use of non-chemical management strategies.
- 4) If you are unsure of anything seek professional advice.

A list of advisers is included on the *WormBoss* website www.wormboss.com.au or the *WormBoss* CD-ROM. The CD is available free of charge from state

government offices or rural retail stores such as *Landmark*. Most of the state departments of agriculture or primary industries will be able to provide recommendations for specific areas.

The use of anthelmintic drenches is necessary for goat health and welfare in most intensive systems. However over-reliance on chemical treatments can lead to chemical resistance, and increases the risk of residue violations. In order to enhance the “healthy meat” image that the goat industry is trying to promote, growers should be aware of the principles of “Integrated Pest Management” and develop non-chemical means of worm control.

Worm control programs

All producers should consider the threat that internal parasites pose to their enterprise, and devise a worm control program specific to their conditions. The best way of doing this is to ask an adviser for assistance.

Capture myopathy

Conditions when likely to occur:

- Occurs in rangeland goats transported over long distances.
- Induced by the stress of capture and changes in the feeding/watering routine.

Diagnosis:

- Muscular degeneration occurs. It is not immediately fatal, but causes death by kidney malfunction later in life.
- Goats that have travelled may die of induced enterotoxaemia, pregnancy toxaemia or transit tetany.

Preventative management strategies:

- Losses may be reduced by vaccinating for clostridial diseases and drenching for parasites two weeks before transport.

- Dietary changes should be as gradual as possible, both before and after transport.
- Reduce the level of stress experienced during transportation.
- Goats should be in good condition when transported.

Lice

Examples: Biting louse (*Bovicola species*), sucking louse (*Linognathus stenopsis*)

Conditions when likely to occur:

- Crowded conditions enable rapid spread.
- Problems mostly arise in cooler months.
- Goats in poorer condition with a long hair-coat and low-quality feed – well-fed goats in good general health will carry very few lice.
- Sucking lice (*Linognathus stenopsis*) will cross-infect both sheep and goats.
- Biting lice (*Bovicola caprae*) do not transfer from goats to sheep.
- *Bovicola ovis* are readily transferred from sheep to goats. They can thrive and reproduce on goats and then be transferred back to sheep.

Diagnosis:

- Clinical signs: animals rubbing against trees etc. Goats shedding fibre. Lice-egg casings and dead skin in the fleece.

Registered chemicals for the treatment of lice on sheep:

Chemical group	Active ingredient	Product name	Comments
Organophosphate (OP)	Diazinon	Coopers DiJet WSD Diazinon Di-Shield sheep dip Nucidol 200 EC	Dip or jet. Use all OPs with care, overdose may result in toxicity.
Synthetic Pyrethroid (SP)	Deltamethrin	Coopers Clout-S	Pour-On. Only registered for sheep lice on goats, not registered for control of the other lice types mentioned above.
Amidine	Amitraz	Taktic Coopers Amitik Tickoff	Registered to clear ticks from goats entering NSW from QLD.
Combinations	Chlorphenvinphos + cypermethrin	Coopers Blockade S	Registered to treat ticks on goats.
Combinations	Rotenone & sulphur	Pestene	Powder. Registered against lice, mites and fleas on goats.

Note: There are other chemicals used to treat external parasites in sheep that are also often used on goats. These should only be used under the prescription of a veterinarian.

Preventative management strategies:

- Transfer of lice between sheep and goats does become important in relationship to control and eradication of lice from both groups.
- Methods for treatment are similar to sheep ie dipping, spraying, pour-on and strip application.

Care must be taken to use only those products registered for use with goats and to apply them with strict adherence to recommendations and precautions. This is due to the susceptibility of some breeds to the toxic effects of lousicides.

Pregnancy toxaemia

Conditions when likely to occur:

- Pregnancy toxaemia occurs in pregnant does, in the last six weeks of pregnancy, when does are grazing dry, poor-quality pasture. It can affect either over-fat or light does.
- In extensive grazing situations, it may occur if the last third of pregnancy coincides with a late break, followed by cold weather, resulting in little pasture growth.
- Short periods of starvation (yarding and transporting) can result in problems.
- Stress (due to climatic conditions, handling, being chased or management procedures) is also a concern as it can affect feed intake and hormonal balance.

Diagnosis:

- Clinical signs: with pregnancy toxaemia, in the terminal phase, the doe will moan and have labored respiration and sunken eyes. In the paddock, the doe is usually found near shelter, unable to rise and surrounded with mucous-covered droppings, indicating she has not eaten for a few days. This will generally occur two or three days before the doe is due to kid.
- Autopsy: liver is swollen, friable and greasy. Fat in the abdominal cavity has whitish flakes. Necrosis throughout the developing foetus.

Preventative management strategies:

- Pregnancy toxaemia treatment is seldom successful. It is better to avoid getting does too fat during early pregnancy. In the last two months of pregnancy, gradually increase the plane of nutrition by offering better pasture or supplement. Avoid periods

of sudden stress during the last two months of pregnancy.

Ketosis

Conditions when likely to occur:

- Ketosis may occur after kidding in over-fat does and those not adapted to the concentrate ration, or a change in feed.
- The problem usually appears during the period leading up to peak lactation (six to eight weeks after kidding).
- Short periods of starvation (yarding and transporting) can result in problems.
- Stress (due to climatic conditions, handling, being chased or management procedures) is also a concern as it can affect feed intake and hormonal balance.

Diagnosis:

- In the clinical form, ketosis presents as a decrease in appetite and milk production, rapid loss in condition, hard droppings (which tend to have pointed ends). The doe is moderately depressed and frequently exhibits signs suggestive of abdominal pain. A sweet smell may be detected on the doe's breath or in the milk.
- Diagnosis can be confirmed by using Acetest tablets in a urine sample.

Preventative management strategies:

- The recommendations for preventing ketosis are similar to those for pregnancy toxaemia listed above. Introduce a production ration about one month before kidding to allow the rumen to adapt. Follow up with a quality roughage diet, up to peak lactation.

Respiratory diseases

Examples: pneumonia, lungworm, cheesy gland abscesses in the lungs, *Mycoplasma*, viral infections.

Conditions when likely to occur:

- Dairy breeds appear to suffer from pneumonia more than other breeds.
- Pneumonia is often associated with lungworm, cheesy gland abscess and other bacteria. Alternatively, it may be preceded by a *Mycoplasma* or viral infection.
- Respiratory diseases can spread rapidly through herds housed in poorly ventilated sheds or where overcrowding occurs.
- Intensive feeding (mainly in feedlot or drought feeding) with dusty feed.
- Lungworm infection is most likely to occur when goats are transported from a dry area to areas of higher rainfall, especially in autumn or winter.

Diagnosis:

- Lungworm can be diagnosed by finding larvae in faecal samples. A drenching program will be necessary.
- Cheesy gland may not show any external evidence. Treatment is usually not successful. Prevention is preferred. See *Module 6 - Husbandry Toolkit 6 page 12*.
- *Mycoplasma* pneumonia in kids can cause coughing, laboured breathing and swollen joints. There is no effective treatment.
- Autopsy: often shows the presence of all the above diseases, and therefore it is difficult to establish the exact cause of death.
- Veterinary advice should be sought for accurate diagnosis.

Preventative management strategies:

- Goats suffering from respiratory diseases should be promptly treated and isolated from healthy goats.
- Provide shelter for goats and if sheds

are provided make sure they are well ventilated.

- Faecal examination can be used to monitor lungworm levels. It is important to control lungworm, as infestation will predispose goats to other types of infection.
- Isolate infected goats with discharging cheesy gland abscesses until satisfactorily treated, then cull them.
- Try to reduce the risk of physical injury. In particular, take steps to reduce the risk of head and neck wounds. Damaged or poorly designed head bails, fences with protruding nails, wire or splinters are high-risk items.
- Disinfect shearing equipment after use on infected goats.
- Vaccinate at six to eight weeks with a second dose in four to six weeks, followed by an annual booster dose.
- *Mycoplasma* pneumonia has no effective treatment. Isolate infected goats and disinfect the premises.

Clostridial diseases

Examples: the main clostridial diseases that are of concern in goats are tetanus and enterotoxaemia (pulpy kidney). Other clostridial diseases that you may hear about are black leg, black disease, malignant oedema and botulism.

A detailed discussion of clostridial diseases appears in *Module 6 - Husbandry Toolkit 6 page 12*.

With all health problems, assess the risk based on the history of problems in the district and, if available, property history. Seek information from local veterinarian, state government officers and local consultants.

Intensification of the goat production system is likely to increase the risk of diseases such as gastrointestinal parasitism, clostridial infections and respiratory diseases.

Tool 6.3

Distribution maps showing areas prone to trace element deficiencies in Australia

It should be noted that trace element levels can vary markedly within local areas, so the maps presented below should be considered as a guide only.

Selenium deficiency

This map highlights the main regions where selenium deficiencies occur. It is a guide only and does not cover all incidences of selenium deficiency.

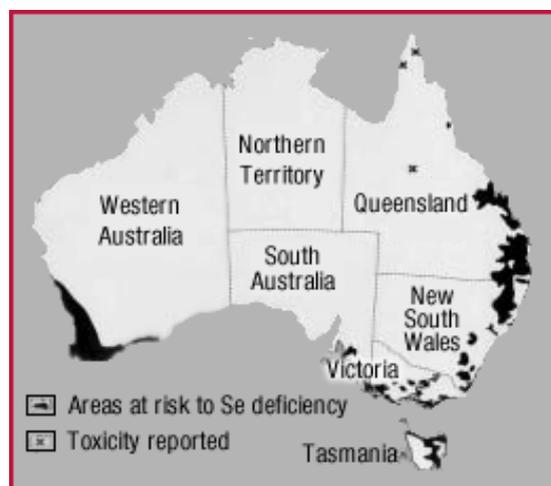


Figure 1. Areas where livestock may be at risk from selenium deficiency or toxicity

Source: Judson, GJ and Reuter, DJ 'Selenium', in KI Peverill, LA Sparrow and DJ Reuter (eds), *Soil Analysis: An Interpretation Manual*, Melbourne: CSIRO Publishing, 1999; 325–329.

Cobalt deficiency

The map below highlights the main regions where cobalt deficiencies commonly occur. It is a guide only and does not cover all incidences of cobalt deficiency.



Figure 2. Areas where livestock may be at risk from cobalt deficiency

Source: Peverill, KI and Judson, GJ 'Cobalt' in KI Peverill, LA Sparrow and DJ Reuter (eds), *Soil Analysis: An Interpretation Manual*, Melbourne: CSIRO Publishing, 1999; 319–323.

Further information on mineral deficiencies:

More specific state details on mineral deficiencies can be found on state department of agriculture and primary industries websites:

New South Wales
www.dpi.nsw.gov.au

Victoria
www.dpi.vic.gov.au

South Australia
www.sardi.sa.gov.au
www.pir.sa.gov.au

Western Australia
www.agric.wa.gov.au

Tasmania
www.dpiwe.tas.gov.au

Queensland
www.dpi.qld.gov.au

Northern Territory
www.dpi.nt.gov.au

Hosking, W.J., Caple, I.W., Halpin, C.J., Brown, A.J., Paynter, D.I., Conley, D.N., and North-Coombes, P.L. 1986 "Trace elements for Pastures and Animals in Victoria". Department of Agriculture and Rural Affairs. 1986.

KI Peverill, LA Sparrow and DJ Reuter (eds), Soil Analysis: An Interpretation Manual, Melbourne: CSIRO Publishing, 1999.

Tool 6.4

Vaccinating against diseases

The table below lists the clinical signs of some of the most common diseases that can be prevented by vaccination. An outbreak of these diseases can cause significant production and economic losses.

Preventable diseases:

Disease	Diagnostic tool
<p>Clostridial diseases – caused by spore-forming anaerobic organisms.</p> <p><i>The main clostridial disease that are of concern in goats are tetanus and enterotoxaemia (pulpy kidney).</i></p> <p><i>Other clostridial diseases that you may hear about are black leg, black disease, malignant oedema and botulism.</i></p>	<p>Clinical signs:</p> <ul style="list-style-type: none">• Tetanus: may follow management procedures such as marking bucks. Symptoms include stiff limbs and tail, jaws clamped together (lockjaw), saliva drooling from mouth, pricked ears, third eyelid prolapsed across the eye, eventually a rigid paralysis, and death within about two days.• Enterotoxaemia (pulpy kidney): most often seen in kids in good condition on high-quality feed. Some develop diarrhoea and pain. Others may have convulsions and die suddenly. <p>With all clostridial diseases, veterinary assistance will be required to assist in diagnosis with autopsy, bacteriology and histopathology.</p>
<p>Caseous lymphadenitis (CLA) – more commonly known as cheesy gland. Bacterial disease.</p>	<p>Clinical signs:</p> <ul style="list-style-type: none">• Lymph nodes grow to become large abscesses, containing thick green/yellow pus.

Available vaccines

The table below is used to help identify conditions when diseases are likely to occur and identify vaccines that can be used to protect against the diseases.

Disease	Conditions when likely to occur	Vaccine
<i>Clostridial diseases:</i>	Penetrating wound, including marking and foot-trimming wounds, dog bites, grass-seed punctures and dehorning.	2 in 1 (tetanus and pulpy kidney)
Tetanus Pulpy kidney	Muscle bruising in growing animals. Lush pasture, heavy grain feeding, sudden change of feed. <i>With all clostridial diseases, consider the local risk based on the history of the district and, if available, property history.</i> <i>Intensification is likely to increase risk of clostridial diseases such as pulpy kidney.</i>	3 in 1 (tetanus, pulpy kidney and cheesy gland)
<i>Cheesy gland</i>	Bacteria are abundant in the pus inside the abscesses. Transfer can occur between goats through rubbing and contamination of wounds and broken skin. This can be direct transfer between goats or indirect via contact with contaminated surfaces. Small yards, direct physical contact and close grazing of contaminated grass or feeds in feed troughs encourages spread of the disease. Dairy goats are prone to infection from head bails. With Cashmere and Angoras infection can spread on shearing equipment.	Glanvac 3 (tetanus, pulpy kidney and cheesy gland) Glanvac 6 (tetanus, pulpy kidney, black leg, malignant oedema, cheesy gland, black disease) <i>Glanvac 6, B12.</i> <i>These products are registered for use in goats.</i> ⁵⁴

⁵⁴ North, R. (2004). Goat Health – Caseous lymphadenitis (cheesy gland). Agfact A7.9.8. Second Edition. New South Wales Department of Primary Industries.

Vaccination strategies

The table outlines the appropriate timing of vaccination to prevent diseases:

Vaccine	Strategy for range of stock classes
Clostridial and cheesy gland vaccines	<p>For maximum protection of newborn kids:</p> <ul style="list-style-type: none"> • Vaccinate does 2–6 weeks before kidding. <p>For protection of kids from unvaccinated does:</p> <ul style="list-style-type: none"> • Vaccinate early with a booster 4–6 weeks later. <p>For protection of kids from vaccinated does:</p> <ul style="list-style-type: none"> • Vaccinate kids at 6–8 weeks, with a second 4–6 weeks later. <p>Older stock:</p> <ul style="list-style-type: none"> • Annual booster timed before known high-risk periods. More frequently in high-risk situations, such as grain feeding in drought. <p>New stock:</p> <ul style="list-style-type: none"> • If goats come from a herd with a known history of vaccination, simply slot the animals into the existing herd program. • If vaccination history unknown, give a sensitising dose, then a booster 4–6 weeks later. Follow with annual boosters as per the rest of the herd. • All new stock should be quarantined and carefully monitored for signs of illness/disease for at least seven days, prior to introduction to other animals on the property. For more information refer to the Biosecurity section in <i>Module 3 – Industry obligations</i>.

Important considerations when vaccinating goats:

- Seek veterinary advice where required.
- Follow the manufacturer’s instructions closely.
- Store and handle vaccines correctly to ensure the effectiveness of the vaccine is maintained.
- Carefully adhere to safety precautions for workers handling vaccines and associated equipment.
- Dispose of used equipment safely, avoiding environmental contamination.
- To optimise the immunity gained, ensure animals are in good health.
- Full protection does not occur until up to four weeks after the initial dose of the vaccine.

Note: The information contained in these pages is intended as a general guide only. Always obtain professional advice about your specific situation.

Tool 6.5

Zoonotic diseases of goats (ie diseases of goats that can infect humans)

This table outlines diseases that affect goats and which can also infect people.

Disease	How it is spread	Common signs in people
Leptospirosis	Urine contamination with skin or mucosal surface.	Headache, chills, fever, muscle pain malaise, inflamed throat/pharynx.
Q-fever	Inhalation of dust or contact with fluids from reproductive tract.	Headache, chills, fever, muscle pain malaise, coughing, vomiting.
*Goat pox	Handling teats of does.	Initially, dark pustules which heal spontaneously.
Cryptosporidiosis	Faeco-oral route.	Mild watery diarrhoea.
Yersiniosis	Faeco-oral route.	Acute watery diarrhoea, fever, headache.
Salmonella	Faeco-oral route.	Acute watery/blood-flecked diarrhoea, fever.
Listeriosis	Food-borne disease, especially chilled foods.	Transient mild flu-like symptoms, through to acute meningoencephalitis with case fatality rate of 30%. Foetal infection can lead to abortion.
Ringworm	Direct contact with skin or from goat handling equipment.	Dry, reddened skin, hair loss, inflamed skin.
*Anthrax	Respiratory, ingestion or local through break in skin.	Respiratory or gastrointestinal forms have a very high mortality rate, as does local skin infection if left untreated.
Cheesy gland	Direct contact with skin through cuts and abrasions.	General malaise, fatigue and fever.
Hydatids tapeworm	Contact with dogs carrying the disease.	Development of cysts which require surgery. Disease can be fatal.

* These diseases are on the National Notifiable Animal Disease List refer *Module 3 – Industry Obligations*, Tool 3.3 (page 83) for further information.

Note: With all diseases or suspected disease outbreaks seek medical advice immediately.

Tool 6.6

Growth rate and mature weight tables

The tables presented below provide some guidelines on the sorts of growth rates that can be expected from young Boer and rangeland goats. This information has been provided to assist you in making management decisions about feeding regimes and establishing strategies to achieve market specifications.

Growth guide for full-blood Boer goat in rangeland conditions

Stage of development	Liveweight (kg)	
	Bucks	Does
Birth	3.7	3.4
Weaning	24	22
7 months	40-50	35-45
12 months	50-70	45-65
Mature	90-130	80-100

These figures equate to an average daily weight gain of close to 200grams/day. These figures apply to the first 12 months of life.⁵⁵

Sexual maturity in Boer goats can be as early as 3.5 months, with a related body weight estimated at 40% of the mature weight.

Growth rate guide for first cross (Boer x rangeland) and rangeland goats

Data taken from a Western Australian trial involving male goats born between June and August 1996⁵⁶ (note the value of hybrid vigor):

Weight gain: daily growth g/day		
Period	Boer X rangeland	Rangeland
Dec – Mar	49.5	47
Mar – Jun	62.9	55
Jun – Aug	138.2	117

NB: growth rates increase as day length increases after the winter solstice.

Mature body weights⁵⁷

The table below provides a guide to the mature body weights that can be expected from different goat breeds.

Breed	Mature body weight (kg)
Anglo-Nubian	80-90
Angora	60-80
Boer	100-110
Condobolin	80-100
Kalahari	100-110
Rangeland	45-80
Saanen	90-100

Note: these are average figures only. The variation within breeds and between sexes is large.

⁵⁵ Patrick, S. and Patrick, G. (2001). Introduction to Boers. In: Goat Notes, A3, pp 6-9. Australian Cashmere Growers Association.

⁵⁶ Pearce, D., Eliot, G., Nickels, R.J., White, K., Blood, D. and Shackelton, K.R. (1998) Findings and Observations from the Winderie Goat Domestication Trial. Agriculture Western Australia.

⁵⁷ Most of the information in this table was sourced from: McGregor, B. (2002). Meat and Offal Yields of Goats. Agricultural Note Ag0999. Department of Natural Resources and Environment.

Tool 6.7

Is marking of male kids a necessity for your enterprise?⁵⁸

Reasons for marking:

- It is easier to handle wethers than adult bucks.
- Wethers do not develop the strong odour that entire males do – some meat consumers complain that buck odour contaminates the meat.
- Meat from wethers can be more tender than that from bucks.
- Wethers do not tend to fight as much or as violently as bucks.
- Wethers and does can be run together for most of the year. However, they do have different nutritional requirements (refer to *Module 7 – Nutrition*), so separation will make it easier to manage their different needs.
- Wethers have a better dressing percentage.
- Some markets require male goats to be castrated.

Reasons for retaining entire males:

- Breeding purposes.
- Entire males have better growth rates than wethers.
- Entire males generally have a larger mature size and are leaner at any particular liveweight than wethers.
- Islamic customers require entire males.
- The behavioural problems associated with entire males are not expressed until the animals reach puberty, so if selling animals prior to this stage eg capretto and some chevon products, marking is unnecessary.
- Avoiding the marking process reduces the level of stress imposed on young animals hence they maintain their growth rate.
- At this stage, there is no market penalty for entire males.

⁵⁸ Information sources for this section include: Vincent, B. (2005). Meat Goats Breeding, Production and Marketing. Land Links.
Woods, G. and Johnson, W. (1990). Goat kid marking. Agfact A7.2.6, Agdex 470/26. NSW Agriculture & Fisheries
McGregor, B. (2005). Compendium of growth rates of Australian goats. Primary Industries Research Victoria.

Tool 6.8

Live body condition scoring – an assessment of fat reserves

Condition scoring is important in all aspects of goat management, but especially so in the breeding of does. Does with condition scores of between 3 and 4 are more likely to get into kid, conceive earlier and conceive twins. Condition scores of between 3 and 4, when giving birth, allow the doe to kid more quickly, produce a healthy, active kid and produce more milk for the kid.

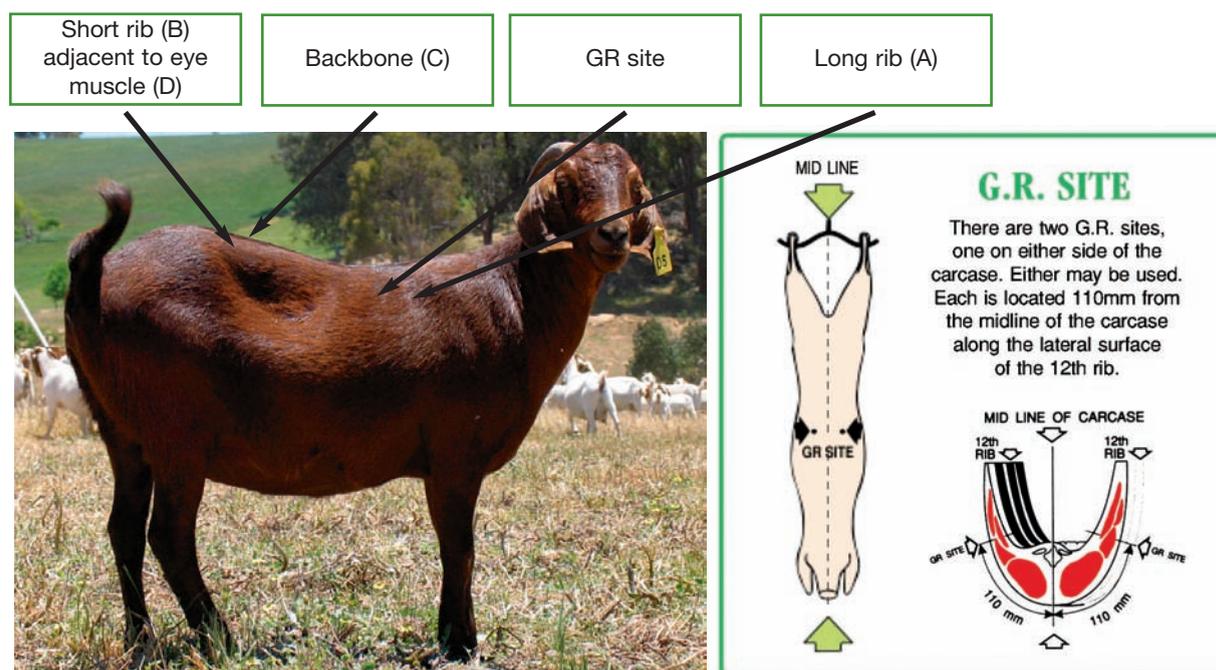
The body condition score of a live goat is a good indication of carcass conformation. If the live goat has a high condition score (tissue depth), the carcass will generally have more meat. The 'expensive' cuts will be heavier.

To determine the condition score, you feel the grid reference (GR) site of the goat. This

point is located 110 millimetres from the backline along the second-last long rib. The condition score relates to the tissue depth (in millimetres) at the GR site.

It is important to get practice in condition scoring and to monitor your scoring accuracy by comparing your results with the corresponding measurements for carcasses. The chart on the following page describes the five different condition scores of goats, as seen from the side of a live goat and from behind a live goat. For each of the five condition scores, it also illustrates a cross-section of the eye-muscle area on a carcass.

The associated table also gives further information on what to feel for when condition scoring. As the table indicates, the live condition scores assigned in Australia are from one to five. Refer to the diagram to locate the positions on the goat indicated by A, B, C and D in the first column of the table.



Source: AUS-MEAT

Condition scoring of goats⁵⁹

Live condition score	1	2	3	4	5
GR site tissue depth (mm)	1–3	4–6	7–9	10–12	Over 12
Long ribs A	Individual ribs can be felt very easily; cannot feel any tissue over the ribs.	Individual ribs can be felt very easily but slight amount of tissue is present.	Individual ribs can be felt easily but some tissue is present.	Individual ribs can still be felt but tissue is prominent.	Individual ribs can be felt or just felt; tissue is very prominent and may be fluid.
Short ribs B	Short ribs are prominent; it is easy to feel between them. The muscle mass extends two-thirds or less of the way along them.	Ends of short ribs feel square; it is easy to feel between them. The muscle mass extends to the end of the short ribs.	End of short ribs are rounded; it is still possible to feel between them.	Ends of short ribs are rounded; it may be possible to press between them with pressure.	None or only one or two bone ends nearest the rib cage may be felt. It is not possible to press between them.
Backbone C	Bones are raised and sharp; it is easy to feel between them. The muscle mass extends two-thirds or less of the way along them.	Bones are slightly raised and can be easily felt, with noticeable dishing between them.	Bones are raised and the ends are rounded; it is still possible to feel between them.	Bones are slightly raised; it is still possible to feel them but not between them.	Some bone ends may still be felt, or backbone may be recessed in fat and difficult to feel. It is not possible to feel between bone ends.
Eye muscle D	Feels noticeably dished.	Feels straight or slightly dished.	Feels slightly rounded.	Feels well rounded.	Feels very well rounded.

Producers can add value to the goats they cull from a fibre production or dairy enterprise, by weighing, condition scoring and consigning the goats when they fit a market specification.

⁵⁹ Source: Greenwood, P.L., May, T.J. and Finn, J.A. (2001). Live Condition Scoring. In: Goat Notes, H3, pp231-232. Australian Cashmere Growers Association.

Tool 6.9

Mustering stock

Mustering and moving stock from the paddock to the yards must be achieved with minimum stress on the stock and the operator. Animal and operator health and welfare are the prime concerns; however, this operation can have an impact on animal performance and meat quality.

The main principles of stock handling are understanding the flight zone, the point of balance of the animal and the behaviour of the animal. These factors can be used to advantage to help move stock from a large open area into yards. Move animals in a calm and orderly manner and minimise noise and pressure. Moving animals in yards requires the same principles and well-designed yards to assist the flow through gates, race and draft.

Reduce stress

Goats will be stressed by:

- Confinement
- Exposing them to different stockhandlers
- Strange noises
- Smells
- Fighting
- Overly forceful, loud or aggressive dogs
- Cold/hot weather, change in the weather
- Handling/management procedures
- Time off feed and change in feed
- Time off water and change of water
- Transportation

All of these stressors can be experienced on the farm but they become even more stressed as they move down the marketing chain eg transporting long distances, saleyards and abattoirs.

The end result of stress is shown as bruising, losses in carcass weight and reduced carcass quality. Dark cutting meat is often the result of stress on the live animal.

Stress due to mustering has been reduced by using the Total Grazing Management (TGM) mustering system. More information on this system is on the Western Australian Department of Agriculture web site (see address in *Module 6 - Husbandry Toolkit 6 page 2*).

“The goats should not be in the trapping yard for more than 48 hours. They should be drafted and the sale goats removed to the main holding and feeding area.” *Will Scott, Mt Magnet, Western Australia.*



For information on feedlotting goats, refer to *Module 7 – Nutrition Toolkit 7 page 20*.

This topic has been covered in a number of publications by Temple Grandin, Livestock Handling Systems. Inc, Colorado State University, and a number of publications are available. See *Module 6 - Husbandry Toolkit 6 page 2* for the titles and the web address for more information.

Tool 6.10

Joining options⁶⁰

Decision to be made	Options	Things to consider	Management required
What age to commence joining?	Join maiden does in their first year at about 7 months of age.	<ul style="list-style-type: none"> • Does need to achieve 40% of their mature body weight before they will cycle. • In addition to the above, the liveweight target for joining should be at least 25 kg. Low body weight can reduce conception, fertility levels and lifetime kid production. • At 7 months of age, the young doe is still growing, thus her demand for energy and protein is high. Pregnancy and lactation put additional demands on the body. If these demands are not met, the doe may not be able to reach her full growth potential, which has implications for lifetime performance. • Be aware that if feed supply is inadequate to support growth and pregnancy, the doe may abort. Late term abortions are a waste of energy and protein. • With cashmere and angora goats, fibre production may be compromised. • Provided young does are in good condition, the fact that they join early can be a distinct advantage. It means that as one-year-olds, they are already producing saleable product. 	<ul style="list-style-type: none"> • Provide the young doe with a high quality diet to encourage growth and ensure that she reaches the target weight for joining. Energy and protein will be the nutrients in greatest demand. Supplementary feeding or specialty pastures may be required. • Address all animal health issues. • Minimise the risk of does picking up worms by providing clean (worm-free) pastures. • Continue to provide a high-quality diet throughout pregnancy and lactation. • For more information refer to <i>Module 7 – Nutrition</i>. • Extra management may also be required in subsequent pregnancy and lactation.

⁶⁰ The major source of information for this tool is: McGregor, B. (2003). An introduction to reproduction management of fibre and meat goats. Agricultural Note, Ag 1003. Primary Industries Research Victoria.

Joining options *continued*

Decision to be made	Options	Things to consider	Management required
What age to commence joining?	Join maiden does in their second year at about 19 months of age.	<ul style="list-style-type: none"> • You will be carrying an unproductive doe for twelve months. This needs to be weighed against the practicalities and costs associated with feeding to achieve joining targets at an earlier age. • The rate of genetic improvement will be slower because there will be a longer generation gap. • It will be necessary to run the maiden does as a separate mob through to their first joining. This will have implications for managing the grazing rotation. 	<ul style="list-style-type: none"> • Provide the young doe with a high quality diet to encourage growth and ensure that she reaches the target weight for joining. • During pregnancy and lactation dietary requirements will still be high, but without the added demand from a growing body.

Joining options *continued*

Decision to be made	Options	Things to consider	Management required
What time of year to join?	Autumn joining.	<ul style="list-style-type: none"> • Autumn is the optimum time for joining, because one of the key triggers for oestrus is declining day-length. • Autumn joining usually provides a good match between feed supply and demand, with the peak of lactation coinciding with the flush of spring pasture growth. • The pasture supply in summer, in most non-irrigated areas, is typically quite low quality (dry feed). You need to consider whether feed availability during this period is sufficient to allow does to reach target liveweights or condition scores for autumn joining. • If the autumn break is poor, the availability of pasture or forage may be quite low at the point of joining. The reliability of the autumn break will influence the level of supplementary feeding required. 	<ul style="list-style-type: none"> • Plan ahead to ensure that high quality supplements are available should they be required. • Provide a rising plane of nutrition prior to joining. • Provide adequate feed during lactation to ensure that amount of condition required to be gained over summer and autumn is achievable. • Think about the body condition of the doe when deciding when to wean the previous drop of kids. Weaning needs to be timed to allow the doe sufficient recovery time prior to joining. Seasonal conditions and feed availability should play a large part in this decision. • Address all animal health issues.

Joining options *continued*

Decision to be made	Options	Things to consider	Management required
What time of year to join?	Joining out of season ie not in autumn.	<ul style="list-style-type: none"> • Premium prices may be achieved for out of season product turn-off. • Conception rates are typically lower outside the peak autumn period. • Summer and winter joining comes with the additional stresses that can be posed by excessive heat or cold. • Kidding may occur at a time when feed availability is low. 	<ul style="list-style-type: none"> • Hormonal treatments may be required to increase conception and induce earlier kidding. • Utilise the buck effect to promote and synchronise oestrus eg teaser bucks. • Ensure that a rising plane of nutrition is available for does at joining – supplementary feed may be required if pasture supply is inadequate. • Carefully manage pastures/crops to supply adequate feed for does at kidding. Annual pasture production may be more suitable for early kidding. Whereas perennial pastures will be required when kidding occurs later in the year. Again, if pasture or forage is insufficient, supplements will be required. • Address all animal health issues.

Joining options *continued*

Decision to be made	Options	Things to consider	Management required
Separation of bucks and does after joining, in an extensive system?	Remove bucks after joining.	<ul style="list-style-type: none">• If not pregnant, the oestrus cycle will last on average 21 days, with a range of 18-25 days.	<ul style="list-style-type: none">• Decide how long you want to leave the bucks with does ie how many cycles do you want to join for, how compact do you want your kidding period. A 50 day joining period allows for two long cycles.• To maintain control of the breeding program you need to ensure that genetically inferior bucks are not getting in with your does. Good fencing is essential.

Joining options *continued*

Decision to be made	Options	Things to consider	Management required
Separation of bucks and does after joining, in an extensive system?	Allow bucks to run with does continuously.	<ul style="list-style-type: none"> • If feed supply is sufficient does can return to oestrus five days after giving birth. • Spontaneous breeding occurs from February to July, as a result of a hormonal response to shortening day length. However, goats can breed all year – depending on temperature, locality, stress, rainfall and feed supply. • The availability of feed to support growing kids, born at different times of year. • This method will reduce the influence of genetically inferior bucks. Even though does may kid out of season, the progeny are more likely to be sired by bucks with improved genetics. • Doe kids will join at a young age, as they reach joining weight. 	<ul style="list-style-type: none"> • Any mustering or trapping events must be planned to avoid times of year when there are large numbers of heavily pregnant animals, as the stress related to such activities can cause abortion. Similarly, does with newborn kids should not be yarded as handling can result in mismothering. • Bear in mind that in good seasons there will be more than one major kidding event per year. The timing of major kidding events can be linked to rainfall events – cycling will often be triggered by increased feed availability after rain events. • Plan your marketing strategy to accommodate potentially two kiddings per year. • Manage your feed supply to ensure that kids are grown out to meet the desired market specifications.

Note: the management advice given in this table should be read in conjunction with the information provided under Joining options in the body of the Husbandry module.

Tool 6.11

Other health issues⁶¹

This summary below will help you identify and manage the following less common health problems that can afflict goats.

Health issues:

- Liver Fluke
- C.A.E.V. – Caprine arthritis encephalitis virus (big knee)
- Coccidiosis
- Yersinia
- Lameness
- Mastitis
- Urinary calculi (kidney stones)
- Pink eye/conjunctivitis
- Mange
- Scabby mouth
- Milk fever (hypocalcaemia)
- Grass tetany (hypomagnesaemia)

This summary provides details of the prevailing conditions under which each problem is likely to occur, explains how to diagnose the problem and lists preventative management strategies.

There are a few terms that you may not be familiar with. Their definitions are as follows:

Chronic – a condition which has been affecting an animal for a long time, constantly recurring.

Clinical – the form of a disease where the animal is displaying obvious symptoms.

Acute – severe form of a disease.

For information on nutritional disorders such as bloat, grain poisoning and vitamin and mineral deficiencies, refer to *Module 7 – Nutrition Toolkit 7 page 14*.

⁶¹ The information presented in this tool has been sourced from a number of references:
Simmonds, J. (Editor). (2001). Australian Goat Notes. Australian Cashmere Growers Association.
Hungerford, T.G. (1990). Diseases of Livestock. Ninth edition. McGraw-Hill.
Vincent, B. (2005). Meat Goats Breeding, Production and Marketing. Land Links.

Liver fluke

Conditions when likely to occur:

- Previous history of liver fluke on the property.
- There are many farms where infection is not recognised, yet it is causing production losses. A blood test is required to detect antibodies in combination with faecal egg counts.
- Presence of fluke snail (*Lymnaea tomentosa*) on the property.
- Liver fluke reside in wet areas. Grazing access to springs, swampy areas, water courses, coastal areas and irrigated pastures presents a risk.
- Acute fluke disease usually occurs from early summer to late autumn.
- Chronic fluke disease can occur any time, but typically late summer to winter.
- If no effective control program is in place, clinical disease is more likely. In this case, animals may not show any obvious symptoms. Deaths may occur. Production will suffer.

Diagnosis:

- History of fluke on the property – identification of problem paddock(s).
- Clinical signs: bottle jaw, scouring, weight loss. General ill-thrift, which may include reduced production and quality of milk, lower growth rates and lower feed-conversion rates in growing goats.
- Autopsy: fluke in liver, haemorrhagic tracts in the liver caused by migration of immature flukes.
- Blood biochemistry: Liver enzyme – evidence of immature fluke causing damage to liver.
- Faecal egg counts indicate presence of

adult fluke – in young animals this occurs at least 12 weeks after fluke are picked up from forage.

- Abattoir surveillance and feedback on the prevalence of liver fluke.

Preventative management strategies:

- Chronic fluke: Strategic drenching with triclabendazole in late autumn and early winter to kill all fluke picked up over summer and autumn. Early spring treatment to remove adult infections missed by the autumn/winter treatment. This will prevent contamination of snail habitats for the next year.
- Acute fluke: Early drenching with triclabendazole may be required.
- New stock: Drench with triclabendazole if risk assessment indicates likely infection.

Caprine arthritis encephalitis virus C.A.E.V. – (big knee)

Conditions when likely to occur:

- Widespread disease of dairy goats.
- All goats can become infected if fed on infected goats' milk.
- Transfer is from infected doe to kid through colostrum and milk.

Diagnosis:

- Clinical signs: In kids 1-4 months of age – initially the kid will have a defective gait which develops into a marked hind-limb paralysis, and leads to death.
- The big knee or arthritic form starts as a swelling around the knee joint. Further damage causes swelling and pain leading to lameness. The goat will display a proppy gait.
- Blood testing is available.

Preventative management strategies:

- There is no known treatment for this infection.
- Where CAEV has been diagnosed in a herd, separate kids and does at birth. Do not allow kids to suckle from their mother. Raise them on cows' colostrums/artificial colostrum and milk.
- The kids must be kept absolutely separate from adult goats. Double fencing is recommended. Planning and careful scrutiny are required to avoid contact with infected animals.
- The disease is mostly found in dairy goats, but all breeds are susceptible.
- Source goats from reputable suppliers, whose CAEV status is declared. Most dairy goat studs are on a CAEV control program and regularly blood test their stock.

CAEV is a nationally notifiable disease in Australia (see Module 3 - Industry obligations Toolkit 3 page 7).

Coccidiosis

Conditions when likely to occur:

- Most common in young goats.
- Can occur during periods of stress, most commonly at six weeks of age and weaning.
- Goats can develop immunity with age. However, this can breakdown under stress.
- Close confinement of does and kids in warm damp conditions will encourage the spread of the disease.
- Goats become infected by consuming coccidial eggs while grazing. Does shed very large numbers of eggs in dung after kidding.

Diagnosis:

- Clinical signs: bleeding into the gut. Anaemia evidenced by pale membranes in the eyes and mouth, pale skin and weakness.
- Foul-smelling, dark, profuse scouring, with or without blood in the faeces.
- Often confused with worm burden, but does not respond to worm drench.
- A veterinarian would identify the disease by examining dung samples.

Preventative management strategies:

- Most adult goats have some coccidia present in their gut which have the potential to cause infection.
- Avoid subjecting goats (especially kids) to stressful situations or damp confined areas.
- If there is a high risk of coccidiosis, feed does prior to and immediately after kidding, with coccidiostats. This should be reinforced at weaning by feeding kids with supplements containing coccidiostats.
- If a disease outbreak occurs, treat all kids with a product recommended by your veterinarian.
- If you suspect worms but animals continue to scour after drenching, consult a veterinarian for an accurate diagnosis of the problem. Examination of dung samples by a veterinarian will enable differentiation between worm resistance, drench ineffectiveness and coccidiosis.

Yersinia

Conditions when likely to occur:

- Tends to occur in late autumn and winter.
- Birds and rodents are considered reservoirs of infection.
- Has been linked to stress caused by shearing, transport, inadequate feeding, cold wet weather and inadequate shelter.
- Young goats, one to six months, are most at risk, but all ages are susceptible.

Diagnosis:

- Characterised by foul-smelling green or dark brown diarrhoea, depression, lack of interest in food and high temperature.
- Autopsy: difficult to diagnose, gut lesions with intestinal micro-abscesses.
- With early diagnosis, infected goats respond well to antibiotic injections.

Preventative management strategies:

- Provide shelter and adequate nutrition in late autumn and winter. It is unlikely to occur in mature, well-fed, non-stressed goats, which have adequate shelter.

Lameness

Examples: Footrot, foot abscess, bruised sole, wounds, Laminitis.

Conditions when likely to occur:

- Footrot spreads in warm, damp conditions in autumn and spring and in irrigation areas. High stocking rates and frequent yarding will aid the spread of footrot.
- Foot abscess usually follows injury to

the foot, eg penetration by grass seeds.

- Bruised sole can be caused by rocks and other hard, protruding objects.
- Wounds can be caused by wire fences, stakes, tree branches, etc.
- Laminitis can result from over-feeding on grain, or changing the diet to a lush type of herbage.
- Bone fractures: kids and aged goats are more prone to fractures.

Diagnosis:

Footrot

- Usually affects more than one foot.
- No swelling.
- No pus discharge, but a black-grey slime-like substance may be present.
- Heat may be present in some cases.
- Lesions have a putrid odour and may be fly blown.
- Spreads rapidly throughout all ages including kids, in damp, warm conditions.
- No break in the coronet skin, but separation of the inner sensitive horn and outer hard horn.

Foot abscess

- Usually only infects a few goats rather than the herd.
- Swelling – usually spreading the toes.
- Cream-white pus discharge, hot to touch, slight odour.
- Abscess usually breaks out at the coronet or in the interdigital skin.

Bruised sole

- Animal will display lameness. No sign of pain in the leg, only in the sole of the foot.

Wounds

- Obvious physical damage. Wounds require cleaning and, if severe, may require an antibiotic injection.

Laminitis

- Identified as redness and pain when pressed around the coronet, swelling may cause the coronet to bulge out.

Preventative management strategies:

Footrot

- Footrot in goats is the same disease as in sheep and research has shown that it can be transferred from goats to sheep and from sheep to goats. If running a mixed enterprise, control and treatment strategies must be coordinated across species.
- Avoid predisposing conditions for Footrot (this will also help to prevent other foot conditions):
 - o Wet, muddy and badly drained pastures.
 - o Wet muddy yards.
 - o Overgrown hooves.
 - o Warm, moist environment.
 - o Overcrowded conditions.
 - o Introduction of infected goats.
 - o Infected goats should be isolated and treated separately.
- Vaccinating the herd as a preventative is an option, but should be discussed with a veterinarian before proceeding.

Mastitis

Conditions when likely to occur:

- Milk production places a lot of physiological stress on the doe and her udder.
- Infection is likely to result from poor hygiene (mud, manure and urine) and

lack of care for the udder or physical damage to the udder.

- Dairy goats can also be infected if the drying-off process at the end of lactation is mismanaged.
- Mastitis can occur in extensive situations (non-dairy) as well.

Diagnosis:

- Clinical signs: Swollen hard udder with watery or flaky milk, associated lymph nodes may be swollen.
- Detection: measure cell counts (leucocytes) of the milk.
- Control using teat dipping and by maintaining hygienic conditions.
- Responds to antibiotic treatment.

Preventative management strategies:

- Hygiene is very important:
 - o Avoid crowded muddy conditions.
 - o Provide clean pasture for kidding.
 - o Milk newly kidded does first.
 - o Avoid transfer of infection between udders on cups, cloths or hands.
 - o Teat dip or spray with a disinfectant product after milking.
- Cell count regularly.
- Record production and investigate changes.
- Avoid injury to udders by:
 - o Removing sharp objects in paddocks, yards and sheds.
 - o Disbudding or dehorning.
 - o Allow adequate feeding space to avoid fighting.
 - o Trim feet.
- Cull if infection persists or frequently reappears.

Urinary calculi (kidney stones)

Conditions when likely to occur:

- In bucks and wethers.
- Mineral imbalance of calcium and phosphorus in the diet eg drinking highly mineralised water.
- Reduced water intake due to taste or temperature.

Diagnosis:

- Signs develop when the urethra is damaged and partially blocked.
- Frequent attempts to urinate. May dribble urine if blockage is only partial.
- Off its feed and withdrawn from the herd.
- Kicking at the abdomen in obvious discomfort.
- If the bladder or urethra bursts the animal will eventually die.

Preventative management strategies:

- Encourage stock to drink more water.
- Use ammonium chloride in the ration as a preventative.
- Formulate rations specifically for goats – cattle rations are not suitable.

Pink eye/conjunctivitis

Conditions when likely to occur:

- Damage to the eye while grazing tall grass, among seed heads or eating hay.
- Damage caused by dirt and dust.

Diagnosis:

- Eye usually closed and weeping
- Eye has a white appearance, progressing to a pink colour and rupture.

Treatment:

- Treat with appropriate antibiotics after consultation with a veterinarian.

Preventative management strategies:

- Avoid grazing tall abrasive feed and seedy hay.
- Avoid walking stock in dusty conditions. Similarly, discourage stock from congregating in dusty conditions, especially at weaning.

Mange

This condition is uncommon in goats

Conditions when likely to occur:

- Stress may pre dispose young animals to infection eg inadequate nutrition and trace element deficiencies.

Diagnosis:

- Small lumps under the skin, usually around the head, neck, shoulders and back. These lumps can be felt more easily than they can be seen.
- Intense itching.
- Skin scrapings may reveal the parasite. A microscope will be required to view the mites.

Preventative management strategies:

- Ensure that kids receive colostrum at birth and maintain good health. The reason for this is that kids with an immune deficiency are more prone to infection.
- Separate infected does from the kids.

Scabby mouth

Conditions when likely to occur:

- The condition is the same as that which occurs in sheep.

- If there is a problem, it can occur on an annual basis. Tends to affect kids.
- Puncture wounds from grazing grass seeds.

Diagnosis:

- Lesions on the lips, muzzle and coronet.

Preventative management strategies:

- Vaccination.
- Avoid any stress to young stock.

Milk fever (hypocalcaemia)

Conditions when likely to occur:

- Does that are just about to or have just given birth are at risk because blood calcium levels may drop as colostrum is produced.

Diagnosis:

- Muscles trembling. Eventually the animal will be unable to stand.
- Lying down with head turned back on to the side.
- Cold extremities.

Treatment:

- Injection with calcium borogluconate under the skin.

Preventative management strategies:

- Provide pregnant does with feeds that are low in calcium, such as grass hay, to encourage the mobilisation of calcium from the skeleton.
- Avoid feed such as lucerne and licks that are high in calcium, up to a month before kidding.

- After kidding, give does access to high calcium diets such as lucerne or clover hay.
- Avoid any practices that will put does off feed around the time of kidding.

Grass tetany (hypomagnesaemia)

Conditions when likely to occur:

- Not common in goats.
- Associated with lactating does given access to lush pasture that is low in legumes and other magnesium-containing plants.
- Transportation can cause stress and onset of the condition.

Diagnosis:

- Staggering gait.
- Lying on the side.
- Twitching muscles and ears, movement of the eyeballs.
- Convulsions and foaming at the mouth.
- Coma and death.

Preventative management strategies:

- Avoid feeding lush pasture to does if they are unaccustomed to it.
- Avoid stress or change, such as a period without food.
- Supplement at-risk does with Epsom salts or another magnesium source.

Case study

HEALTHY GOATS

NAME:	Trevor and Jackie Bunce
PROPERTY NAME:	Galinba
PROPERTY LOCATION:	180 km south east of Perth, Western Australia
PROPERTY SIZE:	604ha
NUMBER OF GOATS:	1,340
MAIN GOAT ENTERPRISE:	Meat
TARGET MARKET:	Domestic trade – capretto Live export trade
SECOND GOAT ENTERPRISE:	Livestock sales
TARGET MARKET:	Export – breeding stock
OTHER FARM ENTERPRISES:	Cropping

Trevor's philosophy on goat health focuses on balancing the goats' diet and minimising stress.

The risk of introducing diseases to the property is significantly reduced by the fact that Trevor runs a closed herd. Other contributing factors include strategic grazing practices (no set stocking), maintaining healthy soils and boosting the goats' immune system.

Trevor bases his production system on high-quality, clean pastures. He relies on homeopathics, natural fertilisers and herbal remedies, and aims to minimise the use of chemicals and artificial fertilisers. He monitors goat health by using worm egg counts and drenches only when required.

He supplements the goats' diet with mineral licks, the composition of which varies according to seasonal requirements. Trevor stresses the need to find out which minerals the goats require and to supply only those that are deficient, rather than feeding a whole range of unnecessary elements.

In Trevor's situation, the use of dolomite has been very beneficial. The intention in feeding dolomite is to supply magnesium, which Trevor explains is important for the development and maintenance of teeth and bones and maintenance of the nervous system.



All stock-handling activities on the property are carried out with consideration for the stress levels of stock. Trevor endeavors to keep his goats calm and content. He does not believe in chasing goats, preferring instead to lead them. Familiarisation, training and regular handling help to develop trust and to establish good handling routines. He advises handlers to develop an understanding of the goat's natural behaviour instincts and to use them to advantage.