

Managing livestock numbers

Dry sheep equivalent, stocking rate and carrying capacity are important concepts for goat grazing enterprises. Understanding these terms and how they relate to goats with different physiological needs is critical to optimising pasture utilisation, productivity and profitability.

This factsheet explains the differences between these terms and how they may be applied to a grazing enterprise.

Understanding the numbers

The number of livestock within a grazing environment relates to the stocking rate and the carrying capacity of the land, both of which are underpinned by the dry sheep equivalent measurement.

Dry sheep equivalent (DSE)

DSE is a standard unit of measurement to compare the nutritional requirements of certain types of livestock and assess the ability of the land to fill these requirements.

It is the metabolisable energy (ME) requirement of a 50kg Merino wether at maintenance walking 7km/day, which equals 9.44 megajoules of ME.

An adult 40kg dry goat at maintenance would require 6.7 MJME energy multiplied by 1.25 to allow for activity. This equals 8.38 MJME or 0.9 DSE. The requirements of other goats are shown in Table 1. DSE rating

Table 1: Grazing goats of various weights at maintenance with activity factor of 1.25 expressed in DSEs

	Body weight (kg)					
	20	30	40	50	60	70
Dairy goats						
Male castrates and dry does	0.6	0.9	1.1	1.2	1.4	1.6
Intact males	0.7	1.0	1.2	1.4	1.6	1.8
Meat goats						
Male castrates and dry does	0.5	0.7	0.9	1.1	1.2	1.4
Intact males	0.6	0.8	1.0	1.2	1.4	1.6

An animal's DSE rating is rarely static as it fluctuates throughout the production cycle depending on body weight and physiological demands (Table 1).

The key to matching animal numbers, feed demand and feed supply in a grazing system involves understanding the total feed requirements of the herd and matching that to the carrying capacity by adjusting the stocking rate (see definitions below).

A livestock inventory is the starting point as it shows how many head of the various stock classes are in the grazing system at any point in time.

Key points

- Understanding stocking rate, carrying capacity, feed availability and livestock feed demand are key factors in a grazing management system.
- Dry sheep equivalent (DSE) rates are not static – they change with body weight, weight gain and production status.
- To accurately calculate carrying capacity across the production year, DSE rates should reflect the production status of the goat herd at key management points such as joining, kidding and weaning.
- In a managed rangeland grazing system, understanding the pasture and browse species, growth patterns and production capability are important to avoid overgrazing and manage stocking rates.
- In high rainfall pasture systems, understanding the pasture growth curve and the animal demand across the production cycle allows for feed budgeting and the adoption of a grazing system to maximise animal performance and production per hectare.

The effect of the reproductive cycle on DSE

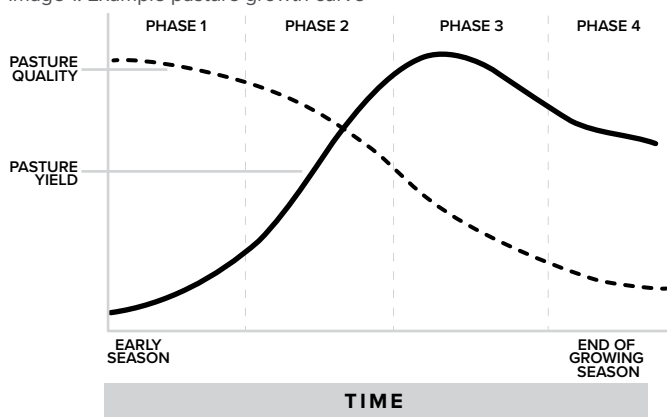
In year-round joining, the majority of the breeding does are likely to be dry in autumn and kid in early spring due to the effect of day length on fertility (does become more fertile and productive in response to shortening day length, among other factors). This seasonal influence means the same number of does will have very different feed requirements at different times of the year.

In order to ensure feed requirements are met at each stage in the production cycle, DSE values can be assigned to each class of goat at particular stages in the production cycle (Table 2).

In autumn, a herd of dry does weighing 30–40kg will carry a DSE rating of 0.75 DSE, whereas in spring when they are kidding and lactating, they will carry a DSE rating of about 1.8. This demonstrates that the stocking rate in spring will be more than twice what it is in autumn due to the increased requirements of the doe.

This increased feed requirement must be anticipated and either accommodated through increased pasture production coming into spring, the provision of a greater grazing area with increased carrying capacity or through supplementary feeding. Assessment of the pasture growth curve (example in Image 1) for the location is a good way to assess whether there is likely to be increased production in spring. The MLA Rainfall to Pasture Growth Outlook Tool can help assess the probability of average production in that particular year.

Image 1: Example pasture growth curve



The DSE ratings in Table 2 can be applied to the different classes of goats counted at critical stages in the production cycle, such as joining, kidding, marking or weaning and then applied to projected goat numbers and classes to ensure sustainable stocking rates in future. This is also shown in Image 2.

Table 2: DSE for classes of goats

Class	DSE rating (estimated across common breeds)	Weight range
Dry doe	0.8 DSE	30–40kg
Breeding doe	During pregnancy: 1.4 DSE During lactation – with single kid: 1.6 DSE During lactation – with twins: 2.2 DSE	40–60kg
Weaner	From weaning to one-year-old and growing at 100g/day): 1.00 DSE	20–40kg
Buck	1.5–2 DSE	60–80kg

Image 2: DSE ratings for various classes and body weights of goats



As the key variable in a livestock production enterprise is typically the number of livestock rather than the area of land able to be accessed, it is advised to begin the consideration of stocking rate with an assessment of the carrying capacity of the land.

Stocking rate

Stocking rate is a short-term measure (usually calculated over a 12-month period) and refers to the number of livestock on a particular area of land at a point in time. It is typically expressed as the DSE per area of land. For example:

- If 800 wethers graze a 100ha property for 12 months, the stocking rate would be calculated as follows:
 $800 \text{ DSE} \div 100\text{ha} = 8 \text{ DSE/ha}$.

Stocking rate may or may not necessarily reflect the carrying capacity although there is usually a strong correlation in sustainable enterprises.

Carrying capacity

Carrying capacity is essentially the stocking rate that is considered sustainable in the long-term (5–10 years) and relates to the number of livestock that may be maintained on an area of land on an ongoing basis. It takes into account the mix of land types, their condition, the climate and animal production and land condition objectives.

As with stocking rate, carrying capacity is considered in terms of DSE for goats and is often assigned in consideration of total grazing pressure. This assumes a certain level of grazing from other herbivores including native and feral animals.

Current infrastructure development also influences the carrying capacity, since grazing efficiency is often reduced as distance to water increases. Short-term applications of carrying capacity may also be applied on a seasonal basis, although it is important that any short-term measure be clearly defined and understood as this may lead to overgrazing or underutilisation in the long-term.

When estimating carrying capacity, producers must consider factors such as land class, type of vegetation, palatability of the vegetation and the amount of residual feed that should be retained to allow for regeneration between grazing intervals.

Adult equivalents

An alternative approach to reporting stocking rate and carrying capacity is considering adult equivalents (AE). An AE is the ME requirement of a 450kg *Bos taurus* steer at maintenance walking 7km/day. This equates to 72.6 megajoules of energy, which is equivalent to the requirement of 8.6 dry goats weighing 40kg. Adult equivalent ratings can be used to:

- Estimate the potential carrying capacity and therefore income that can be generated from different properties.
- Make comparisons between livestock enterprises, e.g. compare goats with sheep and cattle.
- Compare potential carrying capacities when buying land or stocking newly acquired land.

One 40kg dry goat is equivalent to 0.9 DSE or 0.115 AE.

An adult equivalent is an alternative approach to stocking rate and carrying capacity



Farmed grazing systems

Farmed or intensively managed grazing systems are usually in higher rainfall areas and involve small well fenced paddocks and improved pastures. This combination delivers higher carrying capacities than are common in extensive rangeland systems. Such systems are typically intensive with defined breeding cycles and well understood inventories. This allows the DSE rating of the herd to be estimated with reasonable accuracy over a 12 month period and the stocking rate to be managed over the short and long term to reflect the carrying capacity of the land.

Rangeland grazing systems

A rangeland goat system with year-round joining will have breeding does as well as young animals and breeding bucks in the inventory at varying stages of pregnancy and growth. In such a system, control of the inventory is typically less uniform, making an assessment of stocking rate based on different classes of livestock more difficult.

A good practice is to consider the number of each class of goat whenever the herd is yarded, for example for drafting or marking. At this time, the current and future stocking rate can be calculated and compared with carrying capacity.

While stocking rate may exceed long-term carrying capacity at particular times of the year, for example in spring when there is an abundance of feed, it is important that this be monitored on an ongoing basis to avoid the situation where the condition of the vegetation declines due to overgrazing.

This is particularly important in breeding operations where the requirements of the herd can grow exponentially over a relatively short period if left unchecked due to the changing requirements of the does, their tendency to have multiple births and ability to produce three litters in two years. While the increasing numbers as a result of kidding is obvious, the changing requirements of the doe throughout the production cycle are less obvious but just as important.

In a rangeland grazing system, control of inventory is typically less uniform



Case study:

Calculating stocking rate in a rangeland production system

1. Calculate carrying capacity

In this example, 6,000ha of rangeland is assessed based on type, quality and quantity of feed to be 1 DSE per 4.5ha of land and is therefore considered to have a carrying capacity of 1,333 DSE ie total area / carrying capacity/ha = total carrying capacity (6,000 / 4.5 = 1,333). This is the number of DSE that may be maintained on the land.

2. Calculate stocking rates in autumn and spring

Now that the carrying capacity of the land has been calculated, the size of enterprises that may be managed on the land can be considered. To do this, the different requirements of livestock classes needs to be considered throughout the production cycle with the key times in a breeding enterprise being autumn (joining) and spring (lactation). In a breeding enterprise it is particularly important to consider the changeable requirement of the does, in particular their requirements during lactation.

By applying the DSE ratings in Table 2 to this rangeland scenario, the total DSE and stocking rate can be calculated throughout the production cycle (Tables 3 and 4).

A reasonable use of this land in this example may be the operation of a goat breeding enterprise based on 620 does joined to bucks at 5% joining rate with a weaning rate of 120% as this will utilise the available carrying capacity.

Table 3: Autumn production period

	DSE rating	Total DSE
620 dry does at 30–40kg lwt	0.8	496
31 bucks at 80kg lwt pre-joining (5% joining rate)	2	62
744 mixed sex weaners 20–40kg lwt	1	744
DSE total		1,302

Table 4: Spring production period

	DSE rating	Total DSE
620 lactating does at 40–60kg lwt 120% kidding	1.5	930
29 bucks at 80kg lwt post-joining	2	58
Inventory total		988

3. Compare the carrying capacity to the stocking rate

In this example, the stocking rate is maintained below estimated carrying capacity.

As dry stock numbers can be more readily adjusted on a year-round basis, weaners may be retained or sold early to allow the short-term stocking rate to be adjusted to reflect seasonal feed availability.

A stocking rate calculator has been developed to assist with these calculations and can be accessed from the MLA website: mla.com.au/stockingrate

Case study:

Calculating the area of land required to support an enterprise in a farmed goat production system

An alternative approach used in the rangeland example is to calculate the area required to support a particular enterprise.

This example involves a controlled autumn joining season for three cycles (eight weeks), with a spring kidding. Kids are weaned at 20–25kg live weight and grown out to 30–35kg market weight. Replacement does are grown out to 35–40kg live weight for joining. Bucks are joined to does at a rate of 2%.

The inventory for this production system is quite different to the rangeland system:

- Breeding does – 600 does at average live weight 60kg (120% kidding)
- Maiden does – 120 does at average 40kg live weight
- Mixed sex weaners – 600 weaners growing to 35kg market weight
- Bucks – 12 bucks at average 80kg live weight

1. Calculate carrying capacity

The carrying capacity will vary across the production cycle, as shown in Tables 5 and 6.

Table 5: Carrying capacity in autumn

	DSE rating	Total DSE
600 does at 60kg live weight	1.2	720
120 maiden does at 40kg	0.9	108
12 bucks at 80kg pre-joining	2.0	24
840 mixed sex weaners 25–40kg live weight growing at 100g/day	1.0	840
Inventory total		1,692

This tells us that the area of land to support this enterprise must have a carrying capacity of at least 1,692 DSE in autumn.

Table 6: Carrying capacity during spring

	DSE rating	Total DSE
600 does at 40–60kg live weight (120% kidding)	2.0	1,200
120 maiden does at 40kg (100% kidding)	1.5	180
12 bucks at 80kg post-joining	2.0	24
120 doe weaners at 30kg growing at 100g/day	1.0	120
Inventory total		1,524

This implies the area of land required to support the enterprise in spring would need to be able to support 1,524 DSE.

The average carrying capacity for this example is 1,608 DSE (1,692 in autumn + 1,524 in spring / 2 = 1,608 DSE). If the average carrying capacity of the land is 10 DSE/ha based on pasture type and production, this enterprise will require 161ha of grazing land (1,608 DSE / 10 DSE/ha = 160.8 or 161ha).

Understanding stocking rate, carrying capacity, feed availability and livestock feed demand are key factors in a grazing management system



The grazing management template available on the MLA website considers pasture production and livestock feed demand throughout the production cycle to allow producers to determine feed surpluses and potential deficits throughout the year. This provides a solid base for decisions regarding grazing management of high rainfall based pastures.

More information

- *Going into Goats: Profitable producers' best practice guide - Module 7: Nutrition*
- MLA Stocking rate calculator: mla.com.au/stockingrate
- MLA Feed demand calculator: mla.com.au/feeddemand
- MLA Rainfall to Pasture Growth tool: mla.com.au/tools and select Pasture Tools and Calculators. Click the first option
- *Understanding your stocking rate and feed supply demand profile.* Go to evergraze.com.au and search 'stocking rate feed supply demand'. Select final option
- *Regional pasture growth rates.* Go to evergraze.com.au and search 'regional pasture growth rates'. Select option second from the bottom



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