Sustainable Land Use for Red Meat and Wool Production in the Ranges & Cross Border Creeks sub-region (Limestone Coast, SA)

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Key messages:

- Sustainable Dry Sheep Equivalent (DSE) figures for the Ranges & Cross Border Creeks sub-region ranged from less than 2.5 DSE/ha to 14 DSE/ha
- There are many factors that must be taken into account to work out a potential sustainable carrying capacity on your property/ies
- Management strategies can be implemented to increase carrying capacity, however farmers should be aware that there are also many constraints that impact carrying capacity

Background

This sub-region covers a vast range of rainfall and growing season length from north of Wolseley (370mm with a 5½ - 6 month growing season) to near Penola (650mm with an 8 month growing season). Determining the correct carrying capacity on the varied soils and climate of the Ranges & Cross Border Creeks sub-region for an individual property will depend on many factors including rainfall, soil type and the type of enterprise. Carrying capacity will also depend on what area of a particular property can be cropped and if there is an irrigation license available.

Working out a potential sustainable carrying capacity is complex and this fact sheet has been compiled using data supplied by producers who are farming in the Ranges & Cross Border Creeks sub-region, to provide locally relevant information.

Finding a balance in the grazing enterprise between optimum production from each animal and per hectare of land is needed. Overstocking, particularly on sandy soils, will result in severe land degradation, particularly due to wind erosion which is difficult and expensive to remediate. Overstocking will also result in the loss of productive pasture species which in turn will significantly reduce livestock production and reduce farm profitability. Loss of productive pasture species increases infestations of weeds, which can reduce overall productivity, and in some instances impact on livestock health.

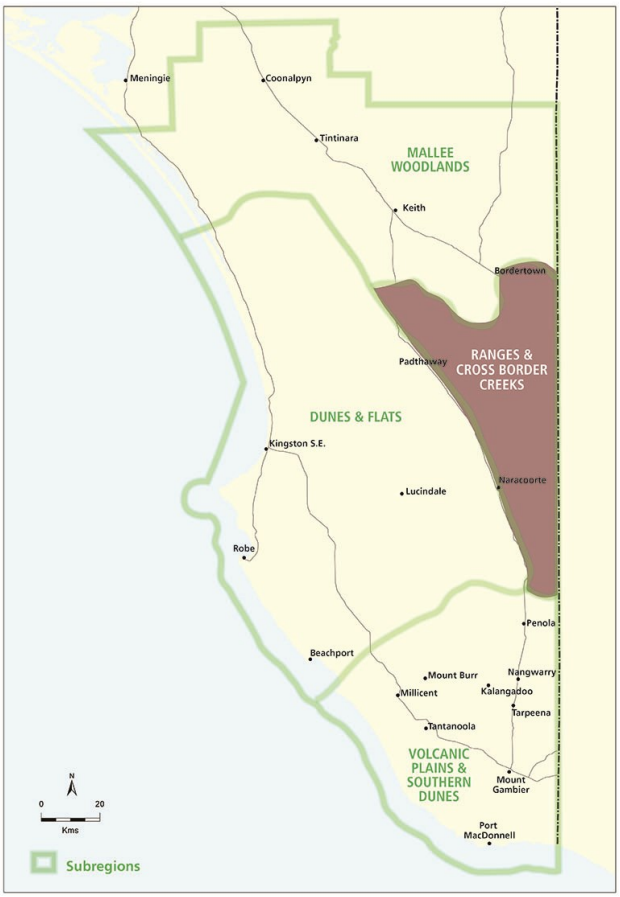

Figure 1: Map showing Ranges & Cross Border Creeks sub-region (Limestone Coast SA)

For many producers in the Ranges & Cross Border Creeks, utilisation of irrigation for livestock as well as an integrated mixed farming approach involving cropping, small seed production or vineyards offers additional grazing opportunities. Irrigation can significantly increase overall carrying capacity by extending the growing season either before the break of the season or as rainfall declines at the end of the growing season. Irrigation also provides opportunity to grow high quality fodder crops without having to rely on stored soil moisture or variable summer rainfall.

Figure 2: A producer applies fertiliser to a lucerne based pasture in the Ranges & Cross Border Creeks sub-region

Determining the correct number of livestock to run on a given area will take into consideration grazing management and livestock feed demand, relative to pasture productivity and the timing of pasture production. Landholders in the Ranges & Cross Border Creeks sub-region are using the following strategies to manage their livestock to maximise sustainable carrying capacity and to maintain pasture:

- Containment feeding, particularly during late summer and early autumn
- Feedlotting or irrigation to finish animals to target weights
- Changing lambing and calving time
- Sowing improved pasture species, both annuals and perennials
- Pregnancy scanning to remove dry animals in early pregnancy and to manage single and multiple bearing ewes separately
- Soil and pasture nutrition, especially maintaining adequate soil phosphorus levels
- Applying lime to maintain a near neutral soil pH
- Grazing management especially rotational grazing and reducing paddock size, providing additional stock water points and using temporary electric fencing
- Supplementary feeding, including the use of lick feeders to supplementary feed grain in the paddock and feeding hay roughage on high legume pastures
- Feed budgeting and storing adequate hay and grain on farm
- Clay spreading and delving
- Upgrading livestock infrastructure including yards, handling equipment, water, fencing
- Winter grazing of vineyards, grazing stubbles or potato residues
- Genetics and breeding of stock
- Grazing crops early in the season and then taking the crop through to grain or hay, or oversowing pastures with cereals and/or annual ryegrass.
- Early weaning of lambs and calves
- Trading stock
- Applying nitrogen fertiliser to annual ryegrass, cereals and phalaris pastures for additional winter pasture

Whilst most landholders are working hard to continue to improve their soils and in particular, better manage their sandy soils, individual landholders can still be caught out in a dry year. **The key is to monitor grazing paddocks closely, especially soil moisture and ground cover, and then make early decisions as required.**

Carrying Capacity and Stocking Pressure

Carrying capacity or long term stocking rate refers to the number of livestock that a paddock or whole property can support over a period of time (several years) without damaging either the soil or the pasture. This is usually measured as a dry sheep equivalent (DSE) per hectare (ha).

On the other hand, stocking pressure is how many DSE/ha are grazing or using an area of land at a particular time and is a management decision regarding how many animals you are going to put on a particular pasture or in a paddock, and for how long.

Determining your optimal carrying capacity (long term stocking rate) will rely on many factors including:

Figure 3: Stock grazing stubble in the Ranges & Cross Border Creeks sub-region

- Grazing management
- Livestock type and target markets
- Time of lambing or calving
- Soil type
- Pasture type, persistence and stability
- Labour
- Investment
- Length of the growing season

Actual carrying capacity can be calculated using historical grazing records (number of animals x DSE x number of days divided by grazing area), or by using one of the numerous grazing record computer programs available.

It is dangerous to target a higher stocking rate without a very flexible and well managed grazing system, as soils and pastures can also be easily damaged, even at lower stocking rates, if grazing and fertiliser management is neglected.

Defining a Dry Sheep Equivalent (DSE)

A DSE is a method of standardising the energy requirements of different classes of livestock, based on their metabolisable energy needs. One DSE is the amount of energy required to maintain a 50kg wether (or dry ewe) in condition score 2.5, which is equivalent to a requirement of 8.5 megajoules (MJ) of metabolisable energy (ME) per day.

A DSE does not indicate how many MJ of ME per day the animals are actually eating, as this will depend on the quality and availability of the feed on offer.

A DSE only indicates the animal ME requirements, not the actual ME intake

Table 1: DSE Ratings for Various Classes of Livestock Based on ME Requirements

Mature Ewes						
Liveweight (kg)	Dry	Pregnant (last month)		Lactating (average to weaning)		Average for Year
		Single	Twin	Single	Twin	
50	1	1.4	1.6	2.1	2.7	1.5
60	1.2	1.6	1.9	2.5	3.1	1.8
70	1.3	1.8	2.2	2.8	3.6	2

Growing Lambs				
Liveweight (kg)	Growth (g/day)			
	50	100	150	350
20	0.7	0.8	1	1.2
30	0.9	1	1.2	1.7
40	1.1	1.3	1.6	2.3

Wethers	
Liveweight (kg)	Maintenance
50	1
60	1.2
70	1.4

Breeding Cattle					
Liveweight (kg)	Dry	Pregnant	Lactating		Average for Year
			0-3mth	3-9mth	
400	4.6	6.2	10	13.8	9
500	5.4	6.9	10.8	15.4	12
600	6.2	7.7	12.3	16.9	14

Growing Cattle			
Liveweight (kg)	Growth (kg/day)		
	Maintenance	0.5	1
200	3.1	5.4	7.7
300	3.8	7.3	9.2
400	4.6	9.2	10.8

Please note that a DSE is only a rough estimate of an animal's feed requirements. The DSE rating will vary considerably depending on whether the calculation is based on actual ME intake, or ME requirements.

For example, if a 60kg ewe with one lamb has an ME requirement of 21MJ/day, then her DSE rating is:

DSE = 21MJ ME/day (actual) ÷ 8.5 MJ ME/day (requirement)

= 2.5 DSE

If the same ewe is grazing a high quality pasture with 1800 kg DM/ha feed on offer she may have an ME intake of 28MJ/day, so her DSE rating will be:

DSE = 28MJ ME/day (actual) ÷ 8.5 MJ ME/day (requirement)

= 3.3 DSE

Actual kg of pasture/head/day disappearing from a paddock will also include wastage, which will vary from 20% in a high quality green pasture to more than 90% as quality drops.

Estimated carrying capacities for the Ranges Cross Border Creeks sub-region

The table below contains estimates of long term carrying capacity (stocking rate) based on information collected by surveying producers across the Ranges & Cross Border Creeks sub-region. There are many variables affecting the carrying capacity and performance of pastures so these figures can only be used as a general guide under normal seasonal conditions. These figures assume no irrigation.

Producers with irrigation who provided information for this fact sheet were able to carry more DSE/ha, as were some producers with a high standard of land, feed base and animal management practices.

Table 2: Estimated long term carrying capacities (stocking rate)

Area/rainfall	Growing season (months)	Soil/pasture	DSE/ha range
North of the Gap Road 370mm to 500mm	6 months	Unimproved sandy soils	2.5 and lower
		Clayed/delved sandy soils with improved adequately fertilised pasture	5.0 to 7.5
		Arable non sandy soils	6.5 to 8.5
South of the Gap Road 500 to 650mm	6.5 to 8 months	Unimproved sandy soils	4.5 to 6.5
		Clayed/delved sandy soils with improved adequately fertilised pasture	7.5 to 10.5
		Arable non sandy soils	9.5 to 14

Strategies to Increase Sustainable Carrying Capacity

Sowing improved pasture combined **with pasture nutrition and fertiliser management** are key to ensuring sustainable increased pasture production in this region. This involves regular soil testing and the annual application of phosphorus (plus sulphur and potassium if required) along with lime applications to correct soil acidity. This allows for increased stocking rates and therefore increased profitability.

Many producers in the Ranges & Cross Border Creeks sub-region are mixed enterprise farmers who run **complementary cropping and livestock programs**. Stubbles are a major feed source at the end of harvest and are used to maintain core breeding animals as well as finish and provide seed free paddocks for lambs. The cropping program also provides an opportunity for producers to grow their own supplementary feed making them less vulnerable to volatile hay and grain markets, particularly in times of widespread drought years.

Early sowing cereals for grazing (not necessarily for grain) has become very common to help fill the winter feed gap in the region. Sowing cereals for lambing ewes has enabled producers to set stock lambing ewes and to minimise feeding during the lambing period. Many producers are sowing cereals with a companion species such as vetch, sub clover/medic or ryegrass to maximise the value of the feed.

Cereals and annual ryegrass are highly responsive to **nitrogen fertiliser (N)** applied at seeding with additional applications before the three leaf stage and following each grazing. Some producers are applying several applications of up to 30-35 kg/ha N/application during early and mid-winter.

Clay spreading and delving has been used widely to modify non wetting sands resulting in improved moisture holding capacity and infiltration, reduced leaching of fertilisers through the soil profile, improved microbial activity in the soil, increased frost resistance and reduced wind erosion. This has resulted in an increase in quality and productivity of pastures.

Figure 4: Sheep being fed in containment in the Cross Border Creeks sub-region

Containment feeding of sheep to defer grazing is used to increase carrying capacity outside of dry or drought season management. Containment feeding during the autumn allows pastures to germinate, establish a root system and reach a leaf area that maximises pasture growth rate during winter. Spelling paddocks prevents sheep chasing the 'green pick' therefore expending more energy than they obtain from grazing.

Time of lambing is an important consideration as it has a significant impact on winter carrying capacity as well as lamb and ewe survival. Autumn lambing will require significant amounts of supplementary feeding (or irrigation) as dryland pasture reserves and quality are almost always inadequate for lactating ewes. However autumn lambing provides greater opportunity to finish lambs before pasture quality declines and grass seed infestations of lambs becomes a problem particularly in situations where grass seed free paddocks have not been prepared. Lambing in winter or spring ensures adequate pasture is available to meet the demands of lambing ewes therefore increasing ewe and lamb survival and lamb growth rates. However, a later lambing may impact on the ability to finish lambs particularly if adequate stubbles or alternative means of finishing lambs other than pasture are not available.

Time of calving is an important consideration as it has a significant impact on winter carrying capacity as well as cow mortality. Many producers in the Ranges & Cross Border Creeks sub-region calve their cows in autumn/early winter. In this sub-region, calving in spring compared with autumn or early winter can significantly reduce calf weaning weight due to the spring born calf spending a several months on dry summer pasture whilst still young and its nutritional requirements are high. Autumn/early winter born calves are grazing an abundance of spring pasture during this equivalent stage of growth. The impact of later calving on the growth rate of weaner calves can be mitigated if summer rainfall is received in paddocks containing lucerne or on properties with irrigation.

Early weaning calves at around six months rather than the traditional 9-10 months and weaning lambs at 12-14 weeks means better quality pastures can be allocated to weaners and cows and ewes have more time to recover. Better utilisation and allocation of pasture results in improved weaner calf/lamb performance reducing the time to make target sale weights which in turn improves the overall profitability and carrying capacity of the livestock enterprise.

Insect control on pastures is important and in particular lucerne flea and red legged earthmite should be monitored. High red legged earthmite populations cause severe damage to both established and emerging pastures. Redlegged earth mites also reduce pasture palatability. Severe infestations of lucerne flea can skeletonise the plant leaves and stunt or kill plant seedlings. Pastures are most susceptible to lucerne flea and red legged earth mite at the time of emergence.

Improved grazing and pasture management has significantly contributed to increasing carrying capacity in this sub-region, with improved pasture species and increased feed utilisation resulting from subdividing paddocks and providing additional water supplies allowing paddocks to be rotationally grazed.

Lucerne is an important pasture species and capitalises on any summer rainfall received allowing later calving/lambing, therefore increasing pasture utilisation. It is important to implement strict rotational grazing strategies with lucerne to ensure it is not over grazed and to maintain longevity (and productivity) of the lucerne pasture.

The type of livestock within an enterprise has a significant impact on the potential carrying capacity. Many producers have reduced their breeder numbers to incorporate a component of trading animals which can be introduced or off loaded depending on feed availability. Some producers are using genetics to influence carrying capacity on their properties, aiming for a more moderate frame size, which require less maintenance energy than larger-framed animals.

Frequent feed budgeting is needed to ensure there is enough feed ahead on the farm to meet future livestock needs. This is extremely important if you are running a higher than average stocking rate to ensure you are not caught out with inadequate feed resources which can result in costly damage to your soil and pastures, and may also result in you paying more than necessary for supplementary feed.

Pregnancy scanning enables individual management of ewes or cows according to their pregnancy status. Dry females can be sold, re-mated or stocked at higher rates. In ewes, single and multiple bearing ewes can be identified and managed according to nutritional requirements and enabling optimal use of pasture and feed resources. It enables producers to calculate lamb or calf losses between scanning and marking and also measure the reproductive potential of their flock or herd.

Figure 5: Autumn calving twin bearing cows in the Ranges & Cross Border Creeks sub-region. Note the clay pit in the back ground from where clay spreading has been undertaken.

Unsuccessful Strategies Implemented by Farmers

Grazing crops with the aim of also taking the crop through to grain have been trialled over the years using Grain and Graze strategies. This strategy has had mixed results attributed to the narrow window to graze crops without impacting on grain yield, larger sizes of cropping paddocks, livestock damage to cropping paddocks and drier finishes in many seasons.

Dryland fodder crops sown in spring and summer have been found to be unreliable and a less cost effective option compared to feeding grain by many farmers within the Ranges & Cross Border Creeks sub-region. However, early spring sown brassica crops are an effective way of cleaning a run-down pasture and still providing useful high quality feed for livestock during summer/autumn, depending on the amount of summer rainfall and water storage capacity of your soil.

Some improved pasture species have been sown and not persisted well. These have included annual ryegrass and biserrula on sandy soils, and chicory in paddocks prone to water logging and inundation.

Increasing multiple bearing ewes via treatments to increase ovulation rates in ewes or genetics has been tried by some producers unsuccessfully. Ewes must be in an optimal condition score of around condition score 3, and the nutritional

needs of the ewes met throughout pregnancy and lactation. In addition, good management and husbandry practices must be implemented as more lambs per ewe places additional demands on the ewe and increases the risk of both ewe and lamb losses.

Constraints Impacting on Potential Carrying Capacity

Soil constraints in surface and subsoil layers are common in the Ranges & Cross Border Creeks sub-region, and may be a barrier to increasing carrying capacity. Constraints include poorly structured sodic subsoils, which cause water logging, particularly in areas where the water table is high. Acidity may also be present in surface and subsurface layers. Plant Available Water Capacity (PAWC), can also be low on shallow calcareous soils.

Thorough investigation is warranted to determine the chemical and physical condition in the top 30cm prior to conducting any soil amelioration activity (such as deep ripping or mixing) to avoid causing further degradation. Additionally, soil testing is essential to identify the need for beneficial amendments, such as gypsum (for sodicity) or lime (for acidity).

Inadequate fertiliser application, particularly phosphorus, sulphur, potassium and nitrogen are major constraints to maximising pasture productivity. If soil nutrients are lacking, pastures will be unable to reach their potential regardless of how much water and sunlight is available and how effective grazing management is.

Weed infested pastures impact on carrying capacity. Weeds are often a lower feed value (especially in spring), affect animal health and lower the value of animal products as a result of grass seed infestation. Weeds may arise from livestock baring paddocks in autumn, or by livestock preferentially grazing desirable pasture species rather than weeds, highlighting the importance of grazing management in weed control. Good weed control is critical when establishing new pastures.

Figure 6: Ewes lambing in autumn in the Ranges Cross Border Creeks sub region prior to the break of the season

The autumn/winter feed gap can be a challenge, particularly in seasons with a late break when there is a narrow window of time before ground temperatures drop significantly, reducing pasture growth. Producers in the district use various strategies to combat this issue including dry sowing cereals to maximise early feed production, soil testing and applying adequate phosphorus, sulphur and potassium, applying nitrogen fertiliser and/or gibberellic acid in early winter and containment feeding and supplementary feeding.

Poor utilisation of pasture occurs either through under or over grazing as a result of inadequate grazing management. Good grazing management makes the best use of pasture grown through managing the frequency and intensity of livestock grazing the pasture. Different pastures have particular characteristics meaning they respond differently to grazing and it is important to understand this to maintain productive pastures.

Figure 7: Ewe lambs grazing pasture in late spring with a broadacre crop in the background in a mixed farming system

Sub dividing paddocks enables more even grazing across all paddocks and within paddocks and helps prevent the "baring out" of areas favoured by livestock. Smaller paddocks can help to increase pasture utilisation, improve the quality of feed, increase pasture productivity and protect the soil from erosion. This in turn can increase the profitability and productivity of the livestock enterprise.

A labour shortage on many properties as a result of movement of people in this sub region to cities and large regional centres, along with competing industries such as mining, have reduced the capacity of some farmers to intensify their grazing system due to labour shortages and the ability to pay a competitive wage.

For further information, please contact your local livestock consultant, soils consultant, or agronomist.

This fact sheet has been compiled by Tim Prance, Pastures and Grazing Systems Consultant, T Prance Rural Consulting and Tiffany Bennett, Livestock Consultant, Rural Solutions SA with information sourced from producers farming across the Ranges & Cross Border Creeks sub-region. The aim of this fact sheet is to capture and formalise local intel on sustainable land use for red meat and wool production in the Ranges & Cross Border Creeks Sub-Region.

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