Topic 14: Grazing Management

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Learning objectives

On completion of this topic you should be able to:

- demonstrate a thorough understanding of grazing management concepts and principles
- discuss relevant literature relating to grazing management
- access and utilise recent research and extension efforts describing sustainable grazing systems
- understand terms and definitions used for describing different grazing methods/systems including benefits and limitations to these systems
- discuss the influence of grazing management on livestock production

Introduction

Grazing Management can be a useful and powerful tool for livestock producers to achieve a number of goals.
It can achieve the following:

- use feed efficiently and sustainably to meet livestock production and market targets
- be a cost-effective tool to obtain the most from a pasture
- optimise pasture growth rate, which can also affect carrying capacity
- manipulate ground cover and herbage mass
- more effectively use rainfall and hence reduce the potential for waterlogging, nutrient loss, evaporation and the risk of salinity
- improve livestock performance by matching pasture supply and quality to satisfy the needs of stock
- maintain stable pastures and increase pasture persistence by protecting desirable perennial grasses and manipulate pasture composition
- reduce and limit weed invasion
- in some instances, control insect and disease infestations
- be done in conjunction with other management tools such as herbicides (e.g: spray-graze), insecticides, fertilisers, introduction of new species, tactical cutting (slashing, hay or silage) etc

Grazing management is a tool that can be used to manipulate pastures for livestock and pasture benefits. It is the link between pasture production (influenced by climate, pasture species, adequate leaf area, soil fertility, etc), pasture utilisation and livestock production (Figure 14.1).

Grazing management involves an understanding of enterprise and property goals (production/finances/environment etc), the landscape (pasture composition, seasonal growth potential, aspect etc) and the grazing systems/methods that are available.

Chapman (1997) notes that "*Grazing management becomes more important when other factors like soil fertility and pasture species are not seriously limiting production. So if, for example, soil fertility is the main factor holding back production, there will be little or no gain from changing any aspect of grazing management".* Following on from that, if fertility is increased there will be a change in management because of the need to maximise the returns on investment which may also change other management decisions on livestock production cycles and effect pasture production.

Conversely, a trial on the North West Slopes of NSW showed that changing from a set stocking system to a rotational one lifted the stocking rate from 2.5 DSE/ha to 5.0 DSE/ha. The change also improved the groundcover, and increased the percentage of better species, without nutrient status changing (L McCormick *pers. comm*. 2011).

Furthermore, grazing management can be used to manipulate botanical composition, ground cover and litter percentages. This can be at the expense of optimal animal production but may fulfil natural resource benchmarks.

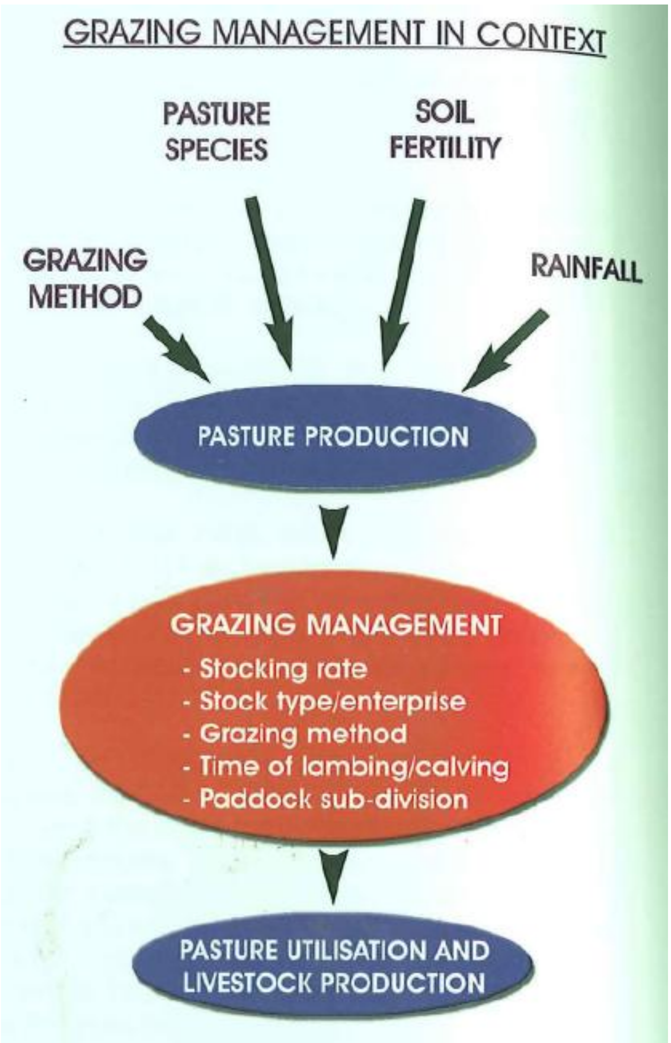

Figure 14.1: Grazing Management is a set of management actions and decisions that link pasture production with pasture utilisation and livestock production (Anon 2003).

14.1 Elements of Grazing Management

(adapted from Clements *et al.* 2000)
Grazing management can affect the quality and quantity of the pasture on offer. It can also affect the botanical composition, height, utilisation and groundcover. All these factors can influence animal production.

The main elements of grazing management include:

1. **stocking rate**
2. **stocking density**
3. **type and class of stock**
4. **length and frequency of rests**
5. **stage of plant growth when grazed**
6. **livestock management, landscape and other considerations**
7. **grazing management system or grazing method applied**

1. Stocking rate

Stocking rate is one of the most important determinants of the profitability of a livestock enterprise. It is a term used to describe the number of stock on a paddock, on several paddocks or over the whole property. It is often referred to, and calculated over a 12 month period and can be described as DSE's/hectare or head/hectare. Stocking rate can affect different components of the system and different enterprises in a range of ways, as shown in figures 14.2 and 14.3.

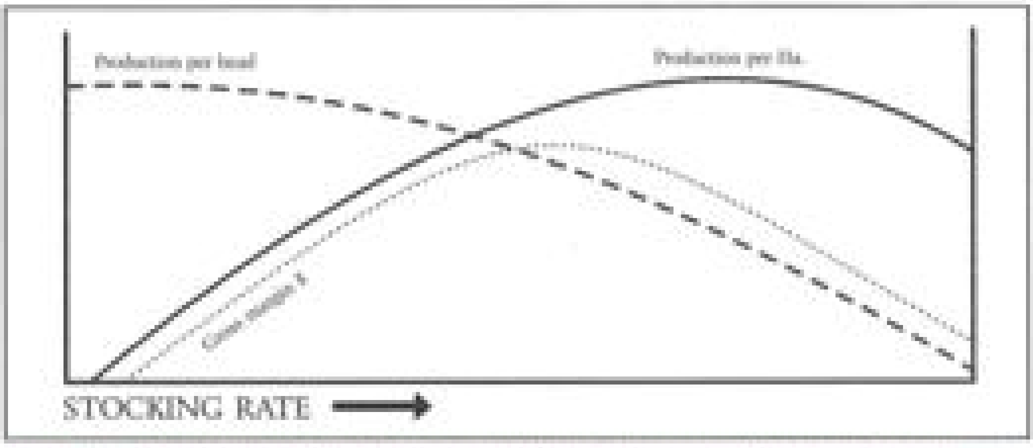

Figure 14.2: The fundamental relationship between stocking rate, livestock production and gross margin (Prograze Manual 2006).

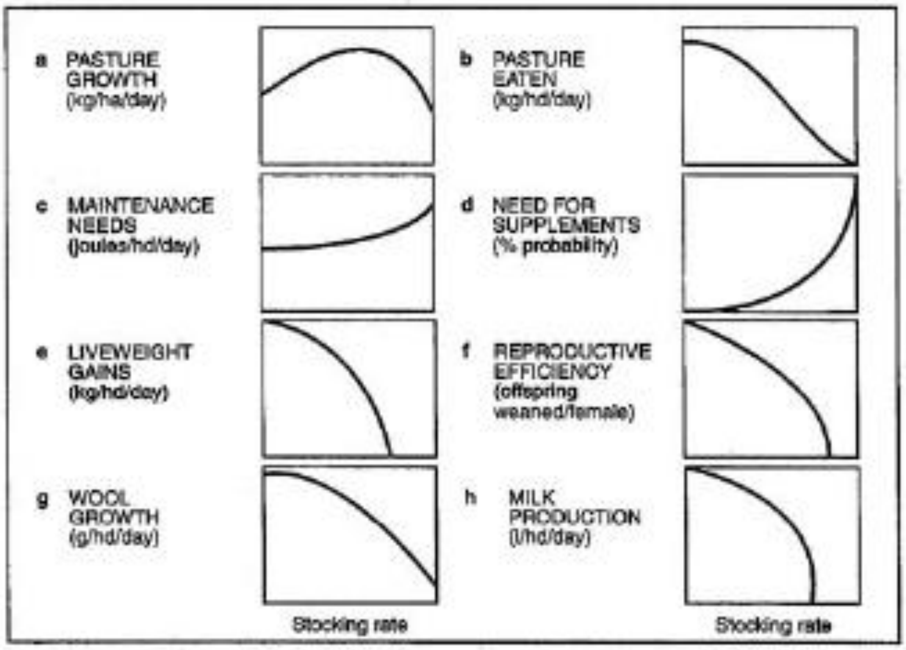

Figure 14.3: The relationship between stocking rate and some components of animal production systems (Andrews 1997 (adapted from Morley 1978)).

At high stocking rates, wastage of pasture is reduced (unless the stocking rate is so high that the pasture is soiled or trampled), so more of the plant production is utilised by the animals. At very high stocking rates (animal demand is higher than pasture growth rate), the pasture fails to support the animals, and weight loss and possible deaths can occur. In Australia, year-round stocking rates on highly improved pasture can reach 15 DSE/ha and sometimes even more. The more productive a pasture is, the more complex management becomes.

Any stocking of newly sown pastures should be lenient until the pasture plants are well established with a developed secondary root system. With surface sown pastures, the pasture may need to be left un-grazed for its first growing season.

There is an interaction between stocking rate and weight gain (per head and per hectare). The types of pastures which the animals are grazing, as well as the nutrient inputs, also impact on this relationship. It is the type of pastures their nutrient status that drives the potential for animal growth, by producing high digestible green leaf. This is one of the key principles of livestock production; ruminant livestock depend on the availability of digestible green leaf.

At low stocking rates, 'patch' grazing or low pasture utilisation can occur, leaving the more undesirable plants to proliferate. These less desirable species maybe low in quality and have adverse livestock problems. Low stocking rates can also lead to dominance of 'sheep' camps.

The plant species can determine the profitability of an enterprise at stocking rates near the optimum. For example, phalaris persists better under grazing than cocksfoot, however cocksfoot and tall fescue are more persistent than ryegrass.

The choice of stocking rate for a particular area should be made with whole-farm profitability in mind as stocking rate affects many things including the survival of perennial pastures, the amount of fodder conserved or purchased, the amount of stock trading, the degree of risk, etc.

The most important determinant of stocking rate is the growth rate of the pasture. Stocking rates affect production per head and optimum rate will vary with time and level of inputs. Thus an 'optimum' stocking rate is an elusive goal.

Meat and Livestock Australia (MLA) suggests *"An increase in pasture utilisation can be achieved simply by increasing the stocking rate (e.g buying more stock). As stocking rate increases, risk (gross margin variability) also increases to a certain extent. Improved management skills (fodder budgeting, pasture assessment and stock assessment) are also need to ensure the increases in stocking rate are sustainable and to minimise the risks"* (Anon 2003 pg 97)

2. Stocking density

It is important to understand that there can be difference between stocking rate and stocking density. Stocking density is the number of DSE (or head) that are grazing an allocated area or paddock on any one day. Stocking density can equal stocking rate but where it is used as a management tool or as part of a grazing system it can be a very powerful device. Some grazing methods use very high stocking densities to achieve their outcome e.g. 300 – 400 DSE/ha but also rely on long rest periods between grazing periods.

Stocking density is sometimes referred to as grazing pressure. High stocking densities may produce less pasture selectivity. This can be very useful in weed and pasture management. High stocking densities can also produce high pasture trampling, fouling and wastage, but will depend on the availability of feed, height etc. There may also be issues of high stocking density on livestock production systems e.g. privacy for twin lambing.

3. Type and class of stock

Different types of stock have different grazing habits and dietary preferences. Sheep tend to be more selective and eat close to the ground. While cattle, are less selective and able to graze taller growth. Both tend to select leaf over stem and green stem over dead material. Goats tend to browse fibrous over legume. They can also control some weeds such as blackberries. Selectivity is greatest when animals graze unfamiliar pastures and therefore pasture utilisation can be an issue. Sheep are more selective in their grazing habits than cattle and by using different livestock, botanical composition and quality can be influenced. Opportunities for selective grazing are greatest under lightly stocked or continuously grazed pastures.

The age and class of stock can have an influence on pasture systems. For example dry stock can be forced to eat less palatable species or lower quality feed, compared to younger or lactating stock.

4. Length and frequency of rests

Grazing can also influence the number and tillering of grasses and this can be an important grazing strategy in newly sown pastures. Grazing also influences the leaf area index, which is important for quicker regrowth and hence the quantity of quality material.

However, most plant species benefit from a rest period after a defoliation event (see readings 1 and 2). For example lucerne will die out if continuously grazed. Rest is important especially at critical times such as flowering, break of season, during a drought. Rest gives the plant an opportunity to recover from defoliation, increase its persistence and has reported animal benefits such as decreasing potential sheep internal parasites.

In some grazing systems rest is one of the determining factors in making decisions on livestock movement. Other methods such as tactical grazing can use plant based phenology e.g. number of leaves produced on a tiller or flowering and seed set, as a determinant of the rest period.

5. Stage of plant growth when grazed

The stage of growth of a grass pasture will determine; animal production, pasture growth and persistence. In stage 1 of the vegetative stage short green feed can be of high quality but lacking in quantity. Stage 2 provides the quantity with adequate quality. As the plant matures, stage 3, and goes through to the reproductive phase, the plant yield (quantity) can be high but it declines in quality (see Figure 14.4).

Strategic grazing, e.g. crash grazing at flowering stage, can reduce seed production of undesirable species. Plants that are continuously grazed at low herbage mass may not persist. This can be used as a strategy to decrease the persistence of certain species.

There is a compromise between having sufficient green herbage available, and the digestibility. The quantity and quality of the pasture influences animal intake. Not only does this affect the intake of a grazing animal, but it also affects the rate of growth of the herbage.

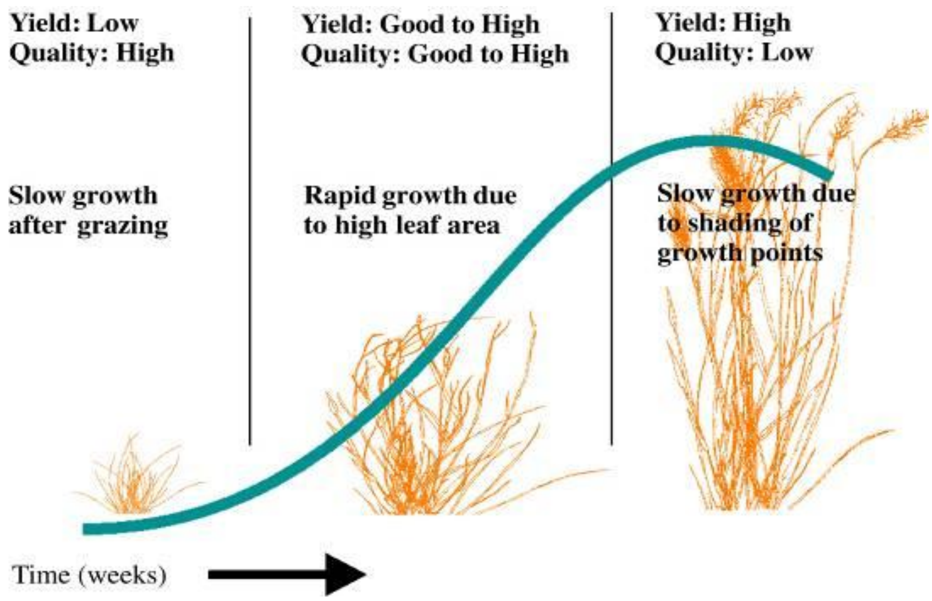

Figure 14.4: Pasture growth Stage 1 to 3 (Prograze manual 2006).

6. Livestock management, landscape and other considerations

These might include time of lambing, shearing and meeting specific market specifications. Decisions on lambing time are often made to match pasture feed supply and pasture growth curves, with the changes in animal demand e.g. late pregnancy - early lactation requirements and the increased stocking rate after lambing.

An out of season or early lambing may require an increase in supplementary feeding to fill the ‘feed gap’ of pasture quality and/or quantity. This may involve feeding while lambing. A later lambing on the feed curve may result in lambs not reaching target weights at weaning and with declining feed quality, at the end of the growing season, some form of supplementary feeding maybe required. It may also mean the ewes are not in the correct fat score for joining the following year. Some producers will operate outside the feed curve and supplementary feed to meet different market specifications.

Meeting animal requirements from pastures is an important management decision. Additional management considerations also include selecting paddocks for lambing (that have the right feed, but are also sheltered, low in predation potential etc). Livestock management policies may also include other livestock such as cattle. These will also have different demands depending on if they are breeding or trading operations.

Livestock Performance on pastures

Sheep production levels can be determined by pasture. The critical pasture parameters that can determine production are pasture quantity (herbage mass and plant height), pasture quality (digestibility) and species composition. Sheep producers require the ability to objectively assess these parameters, especially pasture herbage mass and quality, as well as the condition (or fat score) of their livestock. In this way, producers are better equipped to manage their grazing systems regardless of their approach to grazing management.

The two most critical assessments are herbage mass and digestibility. Figure 14.5 shows the relationship between herbage mass and digestibility in providing an equivalent diet for different classes of livestock. Figure 14.6 shows how digestibility of temperate grass pastures change as they mature.

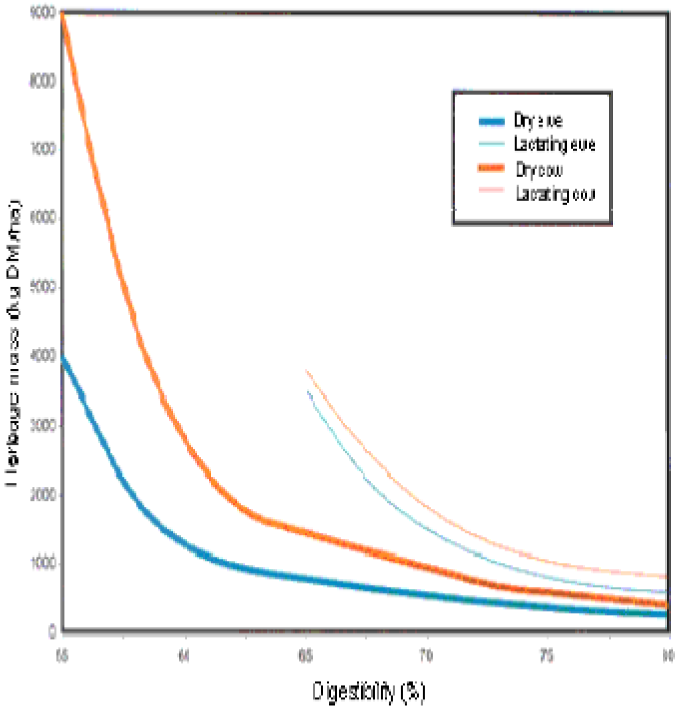

Figure 14.5: The trade-off between digestibility and herbage mass (Bell 2006).

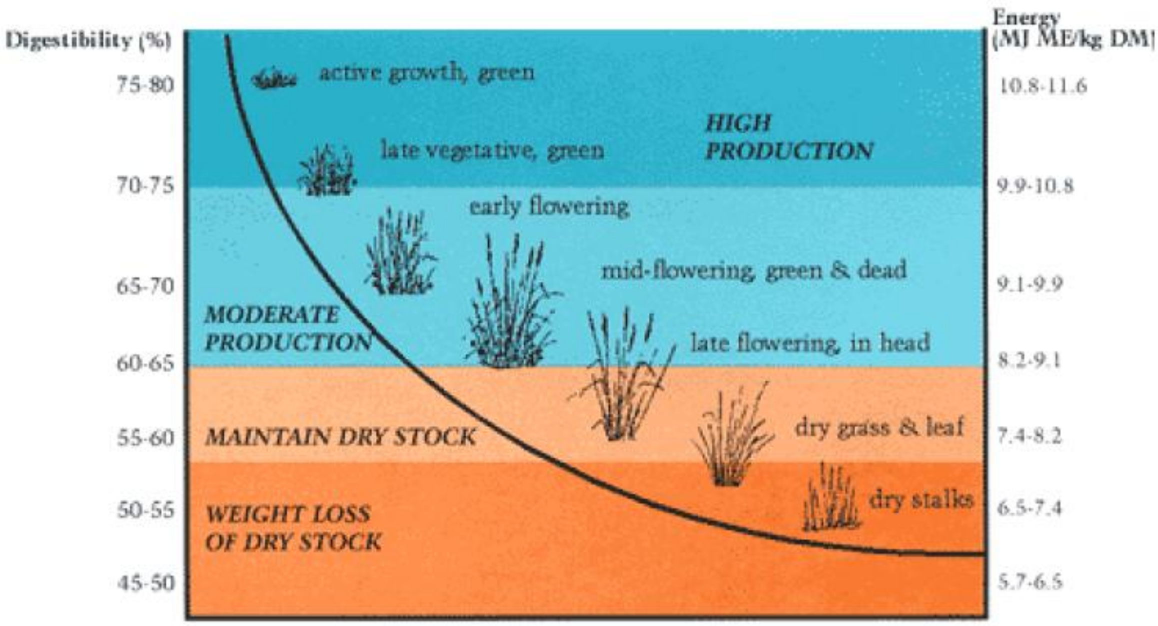

Figure 14.6: A guide to declining digestibility of temperate grass pastures as they mature (Bell 2006).

Pasture benchmarks for sheep

The minimum pasture herbage mass levels for the various classes of sheep are shown in Table 14.1. Note: that the benchmark is for green herbage mass – not total herbage mass.

Table 14.1: Minimum herbage mass (kg green DM/ha) to maintain satisfactory production levels in sheep (Bell 2006).

Sheep class	Pasture digestibility		
	75%	68%	60%
Dry sheep	400	600	1200
Pregnant ewes:			
mid	500	700	1700
last month	700	1200	ns
Lactating ewes:			
single	1000	1700	ns
twins	1500	ns	ns
Growing stock (% of potential growth):			
30 (75 g/d)*	400	700	1700
50 (125 g/d)	600	1000	ns
70 (175 g/d)	800	1700	ns
90 (225 g/d)	1600	ns	ns

*Predicted growth rates in brackets are based on a weaned 4-month-old crossbred lamb of approximately 32 kg from a ewe with a standard reference weight of 55 kg.

ns = not suitable; that is, at these digestibilities, no matter how much pasture is available, dry or pregnant stock are unlikely to maintain weight, lactating stock are likely to experience an unacceptable level of weight loss, and growing stock will not be achieving the targeted weight gain.

Additional notes

1. *the benchmarks relate specifically to the nutritional requirements of livestock. At the lower herbage masses, there is a risk of excessive run-off and soil erosion through lack of ground cover.*
2. *The predictions are based on a pasture which also includes 500 kg DM/ha of dead pasture with a digestibility of 47% and legume content of 15%.*

Estimation of stocking rate based on pasture supply and demand

If the producer knows the herbage mass and pasture growth rate, a simple calculation can estimate the stocking rates which that pasture can support. An example calculation is shown in Table 14.2 for a situation where ewes are about to lamb. Also see readings 3 and 4.

Table 14.2: Estimation of stocking rate example

Supply	
Present pasture mass	1500kg green DM/ha
Less required minimum pasture mass	1200
Available pasture	300
Plus pasture growth (42 lambing days x 20kgDM/ha/day)	840
Total available pasture	1140
Less 30% wastage for trampling/fouling	342
Balance available	798
Demand	
Requirements 2.3kg green DM/hd/day for 42 days	96 kg green DM/hd
No. of ewes = Total available/livestock demand	=798/96
Stocking rate	8.3 ewe/ha

Note: If a pasture is not actively growing, it can only support livestock grazing until the existing herbage is depleted.

Grazing Management within landscape considerations

Grazing Management decisions can be determined by goals other than just animal performance. Grazing management goals might be for soil moisture and to change soil nutrient levels, however further studies are required to clarify the feasibility and ability to do so.

In recent years, grazing management was a tool used for reaching environmental targets such as grasslands with a high conservation value, achieving biodiversity goals and enhancing remanent woody vegetation. Native vegetation legislation may also influence grazing management strategies in some states.

Waters and Hacker (2008) literature review found that *"Continuous grazing results in lower native species richness-structural and compositional changes occur under increasing grazing pressure that are linked to declines in biodiversity. A move from set stocking/continuous grazing to a non-continuous grazing regime is beneficial to both biodiversity and production. Strategically managed, high intensity, short duration stocking rates appear to have both production and biodiversity benefits, particularly in low-input situations*"

Other

Other management goals may determine the grazing method and tactics used. For example grazing decisions maybe based on pasture renovation, reducing insect and disease problems, manipulating weed problems or to minimise animal health issues such as internal parasites.

7. **Grazing management system or grazing method**

There are a number of terms to describe grazing management systems used in Australia. Figure 14.7 and Table 14.3 describe and illustrate some grazing management options and terms used in the industry.

Table 14.3: Contrasts between different grazing management options (Adapted from Hacker 2008 and McCosker 2000, in Waters and Hacker 2008).

Grazing management options	Examples	Paddocks per flock	Other features	Stock density relative to continuous grazing
Continuous	Continuous grazing Set stocking	1	Stocking rate varies but no movement of animals in relation to either plant or animal requirements	-
Rotational resting	Deferred rotation grazing Merrill system	Generally 2 or less	Calendar based movements	Moderate
Low intensity rotational grazing	High intensity low frequency (HILF)	3 – 7	Calendar based movements	Moderate – high
High intensity rotational grazing 1 (High utilisation grazing)	Non selective grazing Crash grazing Short duration grazing	>7	Each paddock severely grazed before moving; can be calendar based movements	High
High intensity rotational grazing 2 (High performance grazing)	Controlled selective grazing Short duration grazing	>7	Each paddock lightly grazed before moving; calendar based movements	High
Time control grazing methods 1 (production focus)	Block grazing Strip grazing Rational grazing High density, short duration grazing	20 – 40	Moves based on pasture growth rate and physiological requirement for rest; requires high stock density. Focus on maximising plant and animal production	Very high
Time control grazing method 2 (holistic focus)	Savory grazing method cell grazing management intensive grazing Ultra high density grazing Planned grazing	20 – 40	Moves as above; focus on ecosystem sustainability and optimising profits	Very high
Tactical grazing	n/a	Variable	Movements determined by defined objectives and management strategies for individual paddocks	Variable

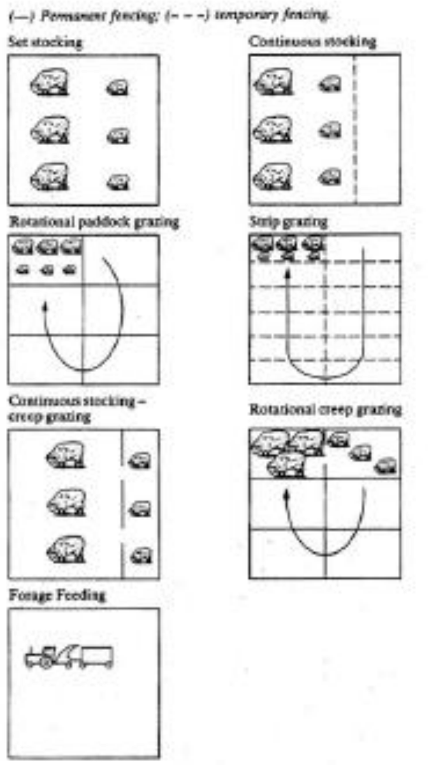

Figure 14.7: Methods of grazing management. Diagrammatic depiction of various methods of grazing management from set stocking through to rotational grazing (Hodgson 1990).

Rotational vs continuous grazing

Grazing method may affect different plants differently. Some species are more upright than others, others have high crowns, some have physical and chemical barriers to deter ingestion. Some pasture species are relatively tolerant of grazing (eg kikuyu) through to others which can disappear if grazed continuously (eg perennial ryegrass). Chapman *et al*. (2003) investigated phalaris (a perennial grass) and subterranean clover (an annual legume). Both these species are well adapted to withstanding animals with their prostrate habit under grazing. Some species varieties are now breed for different purposes including grazing time.

Continuous grazing is where animals graze a particular area over more or less the entire year. It is the least controlled of the grazing systems. Because graziers commonly move stock between paddocks (for a range of reasons), continuous grazing is rarely used.

Rotational grazing involves moving the stock from paddock to paddock thus permitting each grazed area to recover somewhat before another grazing; it requires a higher investment in fences and watering points than continuous grazing.

Rotational grazing is claimed to improve the botanical composition of a pasture, reduce animal 'camp' effects, result in less waste, and create higher quality pastures (this may depend on the rest period). In some systems, favoured plants get a chance to express them selves and get bigger, ground cover and litter levels can increase and some systems allow the producer to fodder budget. The down side is long rest periods can allow unattractive plants to get larger and dominate because with a short grazing period these larger unpalatable plants are not eaten (but these may depend on stocking density).

Under Australian conditions, the supposed benefits of some types of rotational grazing over continuous grazing have not been proved in practice, except where the species are intolerant of continuous grazing (e.g. lucerne) or where stocking rates are very high. This may be due in part to the fact that under continuous grazing systems, animals can be more selective in their grazing whereas, under an intensive rotational grazing system, animals are forced to eat what is on offer. Following rotational grazing, the grazed paddock is shut up and allowed to regrow for 21-90 days depending on the time of year and growth rate. During periods of slow regrowth, such as during droughts, rest periods of up to 200 days have been recommended by some.

Some examples of rotational systems include those which are time controlled such as cell grazing. Others which are time controlled are based on plant growth such as the ryegrass leaf stage that is used to predict maximum potential growth and quality, often found in dairy regimes. Strip grazing is particularly used in feeding out fodder crops to dairy cows and to other intensively managed livestock and often uses portable electric fences. Creep grazing on the other hand, uses specially modified fences that permit young lambs or calves to feed ahead of their mothers, and thereby getting access to the best quality feed.

In New Zealand, some sheep graziers have adopted a rotational grazing system where large numbers of stock are moved each day to a rested pasture paddock. The most recent version of this technique is 'Technograze™', which involves restricting mobs to very small paddocks using electric fences across narrow electrified laneways. This is now being adopted by some graziers in Australia. Some reported benefits include an increase in pasture utilisation, animal health benefits and allowance of (long) rest periods.

Tactical grazing management is also referred to as a method that does necessarily prescribe livestock movements. It tends to reflect the over objectives of the livestock production systems and that of the requirements of the pasture (and in some cases environmental considerations). It often reflects the fact that not every paddock has the same botanical composition, aspect etc. and different species have different requirements of herbage mass, seed set etc. It also reflects that different seasons require different strategies such as maintaining ground cover at 70% and pasture utilisation goals may change. Some paddocks also may have different needs such as set stocking as part of a pre pasture improvement strategy. It may also cover animal requirements as part of the management plan, to set up a paddock with a pasture benchmark or minimise animal worm burdens on lambing paddocks. Tactical grazing is a complex, and dynamic system of management, but it is a flexible system taking in a number of goals.

Writing about the management of native pastures in Queensland, Scattini *et al.*(1988) said: *"rotational grazing systems do not increase short-term animal production, the botanical change brought about by a grazing system must either increase the density of desirable species or replace an undesirable species by a desirable one, grazing systems are more likely to lead to a useful change in botanical composition when the vegetation contains a number of perennial grasses, rotational grazing systems favour perennial species and continuous grazing favours annual species, the advantage of a grazing system requires many years to become evident, the adoption of grazing systems requires additional expenditure in fencing, watering and stock movement."*

Research by Lodge *et al.* (2003) on the North West Slopes of NSW looked at shifting from continuous grazing to a rotationally based system over four years. The shift increased total herbage mass, ground cover and litter on a Redgrass based pasture. There was also an advantage in soil microbial activity, increases in soil organic carbon, earth worm numbers and in reduced runoff rates. The rotationally grazed system had a high economic return. The trial showed how important the rest period (time- not plant-based) was.

There are relatively few comparative studies of different grazing management systems, especially over time. It is recommended you read about the Cicerone Project on the Northern Tablelands, the Sustainable Grazing System project and the current EverGraze project at Orange, in the Central Tablelands of NSW.

See readings 8 – 12.

Some concluding remarks on grazing management systems

Rotationally grazed systems can favour perennial species and continuous grazing favours annual species. The advantages of a grazing system may take years to become evident. Adoption of complex grazing systems often requires additional expenditure in fencing, water and stock movement. Adoption of any rotation requires a greater understanding of pasture growth, what influences growth and what to expect. An understanding of your animal production goals is also important.

The profitability of grazing systems is more likely to be affected by the species, the fertiliser used, the feed quality and the stocking rate than by the grazing system used. There is often a reason to use more than one type of grazing management system, as one size doesn't always fit all situations. Monitoring soils, pastures, animal performance and assessing the economic side needs to be investigated.

14.2 Grazing Management during drought/wet periods etc

Treading injury has a cumulative effect during grazing. Damage is greatest under wet conditions. In a study of impacts of trading, reductions of pasture yield were by 6, 9, and 12% in years 2, 3, and 4 of respectively compared to year 1 when the pasture was newly sown. The zone of compaction is about the top 15 cm. However, stocking rate doesn't appear to have a large effect. Perennial pastures may rehabilitate compacted areas but this may take many years and will largely depend on livestock management and seasonal conditions.

Greenwood *et al.* (1997) investigated the effects of stocking rate on soil physical properties on a long term (> 30 year old) grazing trial, near Armidale in NSW. There were differences in the soil physical measurements between the ungrazed and grazed (low, medium and high stocking rates) pastures. *"Compaction by sheep was limited to the upper 5cm of the soil profile and resulted in lower porosity, mainly due to loss of pores larger than 1.2mm equivalent diameter".* Interestingly, the grazed pastures (10, 15 and 20 sheep/ha) reportedly had similar soil physical properties after the 30 years. Root lengths for all four treatments, 0–25 cm, were not significantly different. "*The grazed pastures had a greater proportion of fine roots than the ungrazed pastures, although after 30 years grazing, there were large differences in botanical composition".*

Lack of rainfall and soil moisture can have negative impact on pasture growth. When animal demands stay the same, the effect of grazing pressure can have detrimental effects on the pasture persistence and composition.

Understanding grazing management during a drought is critical for the survival of pasture species. Pasture species need to assessed and monitored during this time, especially under continuous grazing systems. Minimum herbage needs to be monitored, not only for livestock but also for plant persistence and retaining minimum groundcover, litter and leaf area. Decisions need to be made on whether to destock, feed, sell or agist. In some cases, sacrifice paddocks need to be investigated as a possible means to rest other paddocks/pastures. Water for livestock can also have a major influence in the decisions of grazing management during a drought.

Grazing management as the drought breaks is just as important as during a drought. Good management is critical for persistence and also for the regeneration of pasture species. Assessing paddocks is critical for monitoring weeds, opportunities for re-sowing and perhaps selecting some paddocks for seeding down. False breaks can have a detrimental effect on the likelihood of species survival.

14.3 Grazing Management – the use of decision support tools/systems

There are a number of models and producer workshops that can help the producer and advisor in supporting decisions on grazing management and assist in managing risk. The following are examples which are available:

Prograze™

The focus of this extension package (over 10, 000 farmers have undertaken Prograze training across southern Australia) is on assessing pastures and animals in order to determine the optimum pasture requirement.

GrazFeed™

GrazFeed, decision support program is one of the best tools for assessing the consequences of varying amounts of herbage mass and feed quality on livestock production. GrazFeed predicts animal growth and reproduction based on intake which is linked to herbage mass, height and quality. This is a computer-based version of the Australian Feeding Standards for Ruminant Livestock.

GrassGro™
GrassGro is a comprehensive decision support tool, based upon systems science, which provides a powerful tool for understanding complex ecosystems. GrassGro uses daily climate data to drive a soil, water and pasture growth model which then interacts with GrazFeed on a daily basis to predict animal growth. Management rules are provided in GrassGro to allow for various joining, shearing dates, stocking rates, etc.

Remote sensing of feed on offer and pasture growth
Over recent years, technology for measuring pastures from space has improved dramatically. The technology involves satellites being able to scan parts of the earth's surface with light reflectance detectors measuring various parts of the spectrum, both visible and invisible, including the infrared and near infrared wavelengths. (It is common for laboratories to measure pasture quality using near infrared spectrometers – NIR). These detectors mounted on satellites are basically a flying NIR reporting back to earth with data, which is transformed by computers and can be made available for particular farm areas. This technology is very suitable for measuring paddocks greater than six hectares.

As this technology improves, not only will herbage mass be measured, but so will herbage quality. An additional factor that can the measured by remote sensing is an estimate of pasture growth rate; this one of the key factors governing the stocking density that can be supported by pastures at any one time.

Thus, ultimately we will have increasingly valuable assessments from space of herbage mass, herbage quality and growth rate and, in time, the pixel size (or resolution) of these images will improve as satellite technology improves.

See reading 13.

Readings

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10. The Cicerone Project http://www.cicerone.org.au
11. Evergraze website http://www.evergraze.com.au
12. MLA website - 'Tips & Tools' http://www.mla.com.au
    - Grazing Management 1 - tactical grazing to maximise whole farm pasture and animal productivity
    - Grazing Management 2 - getting the best out of set stocking
    - Grazing Management 3 - getting stated with simple time-based rotational grazing
    - Grazing Management 4 - intensive rotational grazing systems
    - Grazing Management for productive native pastures

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Revision Questions

1. List the main elements of grazing management. Describe in detail one of these elements and how it influences grazing management.

2. Name some of the grazing management strategies used and which situations they are best suited to.

3. How can decision support tools/technology be used for grazing management?

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