EverGraze
More livestock from perennials

More perennials
Better livestock
Healthier catchments

Exchange

# Grazing management systems explained

EverGraze is developing profitable farming systems that also improve the farm and wider environment. The steps to achieving this include the use of perennials, high performing livestock enterprises and best management practices with a whole-of-farm land class approach.

Grazing management can increase pasture production and profitability

## Exchange summary

- ***There are many different grazing systems used across high rainfall areas of southern Australia. There are pluses and minuses for all systems.***
- ***Contrasts in grazing management are continuous grazing through to intensive rotational grazing systems.***
- ***To select the the most appropriate system for your farm, you need to understand the impact of different grazing systems on soils, pastures and animals.***

## Background

Grazing management can be defined as 'where and when to move grazing animals', but the reasons and strategies behind grazing systems are complex and require explanation.

Grazing management needs to simultaneously consider the needs of the animal, the pasture, the land and farming business.

It can be a relatively inexpensive way to increase pasture production and utilisation or improve composition compared to practices such as resowing and use of fertilisers and herbicides.

EverGraze aims to increase profitability of livestock enterprises by 50% while simultaneously improving NRM (natural resource management) outcomes.

Grazing management was identified as a way in which these dual goals could be addressed.

Current research will determine what role the intensity of grazing systems (from set stocking to 20 paddock rotations) has on profitability and NRM indicators.

This EverGraze Exchange aims to help graziers determine which grazing system best suits their circumstances, for the whole or part of the farm.

It outlines the principles of grazing management, then defines and compares the merits of different grazing systems.

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*New lambs at the Orange Proof Site*

## Defining grazing systems

### Continuous grazing

Animals are grazed continuously on the one area of land and are free to choose which pasture species to consume. More palatable species can decrease while less palatable species often increase. Pasture utilisation can also be uneven, as stock may preferentially graze some areas (north facing slopes) over others. Nutrients can also be transferred to stock camps. It is uncommon for continuous grazing to always occur across a whole farm and set stocking is much more common.

### Set stocking

Grazing occurs continuously in most paddocks most of the time, however, some paddocks are rested seasonally (e.g. a greater area of the farm is grazed through winter and less through spring) or for various management reasons (e.g. hay production or for high quality forage for lambs to be weaned onto). Stocking rates can vary between grazing periods to match pasture growth and animal intake.

### Rotational grazing

In these systems, livestock are rotated between paddocks, so that each paddock is grazed and then rested. The length of the rest period is determined by pasture growth and availability or can be a fixed period of time.

### Intensive rotational grazing

Intensive rotational grazing is also called Time-controlled grazing, Cell grazing, high intensity short-duration grazing or block grazing. This is a rotational grazing system with a large number of paddocks per mob (>20 paddocks). Stocking pressure is high and animals are rotated from one paddock to the next at short intervals (1 to 7 days) to promote even utilisation of pasture. Stock movement is based on the length of the rest period, which is shorter when pasture is actively growing (40-80 days) and longer in the non-growing season (80-180 days).

## Grazing management principles

Grazing management involves complex interactions between plants, soil and livestock. A basic knowledge of pasture composition (What plants are there?), production (How much is there?) and the effects of livestock grazing (What is the impact of livestock on pasture and what is the effect of pasture on livestock?) are needed to understand how different grazing systems work.

Grazing management can be used to manipulate animal performance, pasture composition, soil health and NRM outcomes to varying degrees, depending on the intensity and frequency of grazing. The flexibility in grazing management increases as the number of paddocks per mob increases. The timing of the grazing and rest periods is important. Grazing management should not be a rigid time-based system, rather livestock movement should target particular management issues (e.g. annual weed control, seed set of desirable species or animal requirements) and can be combined with other management strategies (e.g. herbicides) to sustain the pasture base. Grazing management principles outlined below are often referred to as strategic grazing. Each management action is designed to have a specific response rather than letting time-based movements randomly affect the pastures and animal performance.

### Meeting animal requirements and manipulating pasture quality

Grazing management can be used to manipulate the quantity and quality of available herbage mass for grazing animals.

Intake (i.e. the amount of pasture animals are able to consume per day) is one of the most important factors that affect livestock production. Once Feed On Offer (FOO) or herbage mass falls below a certain level, animals are unable to consume enough to meet their requirements. Intake for sheep is severely limited when FOO is below 800 kg DM /ha and for cattle below 1200 kg DM/ha. Below these thresholds, pastures are short

*Grazing management determines pasture quality and quantity*

and it is height which limits intake. Pasture type can affect FOO benchmarks required, for example, native pastures may have lower FOO benchmarks overall if they have large leafy tussocks that are of an adequate height so intake is not limited, but there are large areas of bare ground in-between.

Pasture quality is influenced by digestibility and the proportion of legumes in the pasture. Digestibility is the proportion of the forage consumed which is used by the animal for its nutritional requirements. The higher the digestibility, the more benefit the animal gets from the forage. When digestibility is high, the feed consumed moves quickly through the rumen and intake is greater. Digestibility is influenced by the species present and the stage of plant growth. As plants mature, from actively growing shoots to fully developed plants with seedheads and again further to dry standing feed, they decrease in quality. Legumes are important because they have higher digestibility and protein than grasses and livestock can have a greater intake for the same level of FOO or herbage mass.

If animal requirements are high (e.g. lambing ewes, or growing lambs) then pastures with higher digestibility and FOO are required for optimal production. For instance, dry sheep require a minimum FOO of 600 kg DM/ha at 68% digestibility whereas a twin bearing lactating ewe requires 1500 kg DM/ha at 75% digestibility.

Grazing management can be used to move animals to new paddocks before pasture drops below critical benchmarks and quality declines. Rested pastures should have higher levels of green leaf and legume which improves the quality, making it suitable for animals with higher requirements. If paddocks are locked up for too long then pasture becomes rank and quality declines. Through dry periods rotational grazing can be used to ration green and dry feed, improve utilisation and reduce wastage provided the quality of dry feed is not too low (e.g. dry redgrass is of little value through winter).

Animals show strong preference for certain plants, but this selectivity decreases as stocking density increases. Animals can be forced to eat lower quality forage and if these animals have low requirements (e.g. wethers or dry cows) then production may not significantly decrease. This means animals with low requirements can be used to consume rank feed. After a rest period, regrowth of higher quality pasture will be available for livestock with higher requirements, provided soil moisture is adequate for growth.

Grazing management can also be used to manage animal health problems. Animals may be introduced to fresh pastures with a lower worm burden after drenching; sheep can be introduced to pastures previously grazed by cattle because the larva does not cross between species. In contrast, high stocking densities may facilitate the spread of some diseases between animals (e.g. footrot and OJD).

Other production efficiencies can be gained from the manner in which different animal classes graze. For example, sheep and cattle may be grazed together. Cattle cannot graze pasture as low as sheep. Sheep are more selective avoiding tall rank areas or undesirable species. Sheep select a higher quality diet than cattle do.

For more details on pasture quantity and quality and animal demands see the ProGraze® manual or use the Grazfeed® program.

## Maintaining healthy pastures

To use grazing management in a tactical way, it is necessary to understand the growth and development of different pasture species, so the desirable species can be promoted and undesirable species can be reduced. For example, improving a degraded cocksfoot pasture was best achieved with summer and autumn rests in the NSW Central Tablelands. The benefit comes from allowing the plant to replenish carbohydrate reserves, to set seed and for seedlings to germinate and grow. It is important to watch and manage the plants in your pasture as the timing may change from area to area and from season to season.

In fertilised native pastures on the NSW Tablelands, competition from annual grasses and clovers can be high through early spring. Heavy grazing at this time can increase the persistence of the native grasses.

*Orange Proof Site - managing systems in a variable landscape*

Livestock systems that have increased demands in spring (e.g. spring lambing) can help to achieve increased grazing pressure at this time.

Grazing management can be used to maintain a healthy pasture primarily from resting pastures, but also from exerting grazing pressure at key times. Resting or reducing grazing pressure at appropriate times will:

- maintain ground cover that reduces erosion, improves moisture infiltration, increases root growth and encourages the persistence of perennials;
- maintain higher minimum FOO (e.g. 1000 to 1500 kg DM/ha) that improves the regrowth of perennial grasses by maintaining them in Stage II (see Prograze®);
- allow desirable perennial and annual species an opportunity to set seed (e.g. late spring) and recruit new plants (e.g. seedlings germinate after suitable rain through summer or autumn).

At other times heavy grazing may be required:

- to open up the pasture to allow sub clover to establish and improve flowering; or
- to reduce the dominance of less palatable species.

Grazing systems with high levels of subdivision may reduce nutrient transfer to sheep camps and uneven or patch grazing. Although, patch grazing is detrimental in the over-utilised areas, it can be beneficial as it also provides under utilised areas that allow species that are less tolerant to grazing but have high biodiversity value (e.g. native forbs).

For grazing management to successfully improve pasture composition:

- there needs to be an adequate level of the desirable species present;
- the fertility of the paddock needs to be suitable for the species that is being encouraged; and
- the correct seasonal conditions are needed.

Change in pastures and nutrient transfer will generally take several years to occur.

## Matching feed demand to forage supply

Optimising stocking rate is essential for a profitable grazing business as stocking rate is related to the production of meat or wool per ha, which in turn is related to profit per ha.

Feed budgeting can be used to plan forage supply and match it to livestock demands. Feed budgeting involves assessing the amount of feed in the paddock (kg DM/ha), potential pasture growth and livestock demands for a defined period. Livestock demands are related to the type of animal, their size and physiological state. For instance, a dry ewe requires 600 kg green DM/ha whereas lactating ewes require 1000 kg green DM/ha with a single lamb and 1600 kg green DM/ha with a twin lamb.

Pasture production varies throughout the year and animal demands or numbers can be adjusted to match feed supply. In the Central Tablelands of NSW, pasture production is highest through spring and most limiting through winter due to low temperatures (Figure 1). Autumn production has greater variability than spring and is limited by moisture availability in many years. Different pasture types (e.g. introduced temperate perennial, fertilised native and unfertilised native) vary in production. Unfertilised native pastures have a longer period of lower growth through winter, due to a lack of annuals species, and it is this period which most limits carrying capacity.

Animal production systems should have peak demands or numbers during spring to utilise as much of this forage as possible (e.g. ewes lambing in early September with lambs sold as weaners before pasture production and quality declines in summer, Figure 2). In this example with 5 ewes/ha, pasture growth was not sufficient to meet the animal intake in late winter, but generally enough feed was grown in autumn to cover this gap. Supplementary grain feeding occurred when pasture availability was low, which generally corresponded with several months of below average rainfall and /or with low temperature during winter.

*Wallaby Grass*

*Photos: L Rowling*

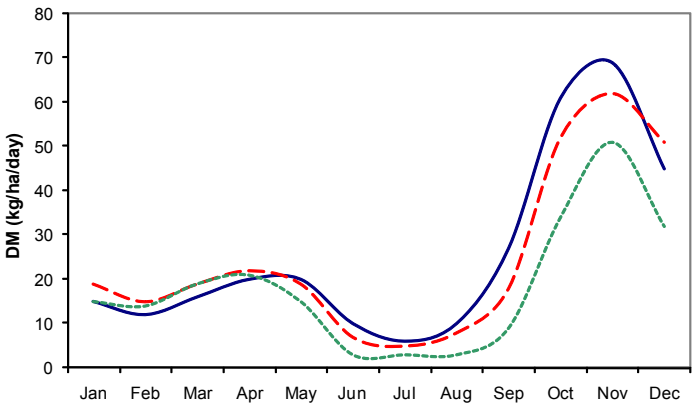


Figure 1. The growth curve for an introduced temperate pasture (blue solid line), a fertilised microlaena, wallaby grass, sub clover pasture (red broad dashed line) and microlaena, wallaby grass pasture (green narrow dashed line) on the Central Tablelands of NSW.

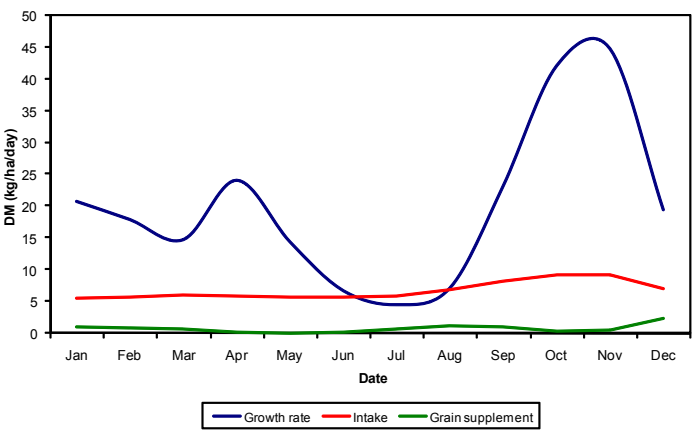


Figure 2. Average pasture growth, animal intake and grain supplemented for an August lambing Merino ewe x terminal sire system run at 5 ewes/ha on a fertilised native pasture at Panuara on the Central Tablelands of NSW.

## Weed management

Grazing management can be used to control weeds in two ways;

- by resting to develop and/or maintain a competitive pasture that prevents the establishment of weeds; or
- by using crash grazing to target a weak point in the weed's lifecycle.

Successful grazing managementneeds to be planned on the growth stage of both the weed and desirable pasture species. An example demonstrating management of barley grass in a Wallaby grass (*Austrodanthonia* spp) pasture is shown in Figure 3. The barley grass population decreases as gaps in the pasture or the amount of bare ground diminishes. Resting in summer and early autumn promotes flowering and seedling establishment of wallaby grass and decreases the amount of bare ground for barley grass to establish. The barley grass that does germinate can be managed using a sequence of targeted rest and heavy grazing. If barley grass is rested during tillering, the developing seedhead grows up the elongating tiller and can be removed by grazing in late winter-early spring before the seedhead emerges from the stem.

In contrast, if barley grass is grazed earlier, the elongation of seedheads in the stem stops just above the soil surface and is not removed by grazing because it is below the grazing height of sheep. Barley grass seedheads cannot be removed by grazing once they have emerged from the stem. An additional advantage of resting in early winter is that sub clover establishment is improved, and becomes dominant when barley grass is removed by heavy grazing in late winter - early spring. Grazing in late winter should not damage the wallaby grass provided it is lightly grazed or rested through spring and summer.

*Grazing management in a drought is important to reduce damage to pasture*

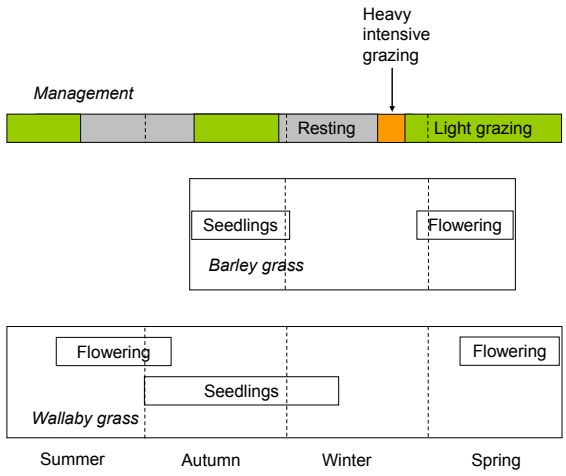


Figure 3. Grazing management to reduce barley grass in wallaby grass pasture based on development stage.

## Drought management

Drought management is important because much damage may be done in drought by over-grazing a pasture. It is important to be proactive, rather than delaying decisions in the hope that it will rain. Animals should be removed from a pasture when critical levels are reached (1000 kg/ha DM /ha or 70% ground cover) to minimise damage to pastures and soil. The benchmark for removing animals from pasture will vary over a farm. On steep areas that are prone to erosion, 90% ground cover should be maintained. Minimum bench marks also decrease in more arid climates where it is more difficult to maintain cover. There are several options to reduce the animal's impact on pastures including selling livestock, feeding animals in drought feed lots, or agisting stock off the property. Examining the full cost of each management option is an important step to determine the correct management option.

See the NSW DPI Managing drought guide, 2006 for further details (http://www.dpi.nsw.gov.au/agriculture/emergency/drought/managing/general/managing-drought)

## Comparing the impacts of different grazing systems

Grazing systems exist on a continuum from set stocking to intensive rotational grazing. It is clear some level of grazing management is desirable but the intensity (or the number of paddocks per mob) needed is often debated. Figure 4 shows how the intensity of grazing management, from continuous grazing through to intensive rotational grazing can affect important on-farm issues.

Under continuous grazing, animal production per head is usually greater than with intensive rotational systems. Continuous grazing systems often have lower FOO levels, which allow greater runoff to fill farm dams. There is often more clover in pastures with lower FOO levels, provided phosphorus levels are adequate. Continuous grazing can produce reasonable clover growth but some level of grazing management (e.g. heavy grazing before the autumn break and resting in winter or spring) is needed to maximise clover production.

The greater the intensity of grazing management, the more effectively pasture can be budgeted, there is more even utilisation and animals can be rationed to make standing herbage mass last longer. Perennial grasses can be maintained in a healthy state across a greater area of the farm as there is more opportunity to set seed and for new plants to germinate and maintain ground cover to minimise erosion.

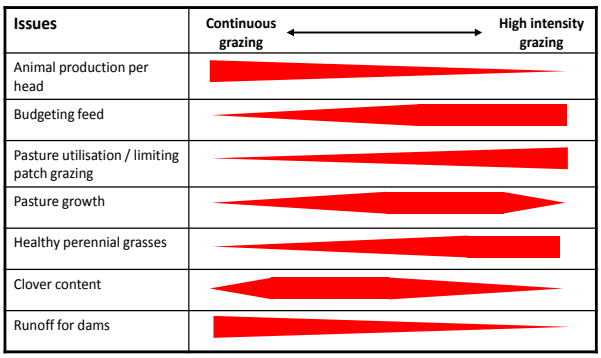


Figure 4. How common management issues are affected by the intensity of grazing management, from continuous grazing through to intensive rotational grazing.

*Orange Proof Site*

Pasture growth can be higher with increased grazing intensity, which increases leaf area and reduces over grazing. However, if the rest period is excessive (e.g. >120 days), this can lead to shading, tie up nutrients, and allow plants to become rank with lower digestibility leading to lowering of animal production.

The right grazing system is a personal preference and will be influenced by the environment in which the farm is located, existing infrastructure, the enterprise and management objectives. Different grazing systems can be used on the one farm at different times of the year (e.g. rotational grazing to budget feed through autumn and winter and set stocking in spring to improve animal performance when minimal pasture damage is likely) or at the same time on different landscapes within the one farm (e.g. set stocking in the inaccessible hills and rotation grazing on the more productive areas of the farm). Often the simplest way to improve grazing intensity is to combine several mobs together (e.g. age classes of livestock) into one large mob. Paddock subdivision, which can be expensive, should be the second option to increase grazing intensity.

Grazing systems comprise of several components and grazing management is only one part. Other issues such as stocking rate, pasture type, animal enterprise, and fertiliser inputs can have a greater influence on pasture production, animal performance and environmental outcomes than grazing management. For instance very high stocking rates will reduce pasture availability over time regardless of what grazing management is used. Optimising stocking rate is essential for a profitable grazing business.

There has been increasing interest in high intensity grazing systems from information provided at holistic grazing training courses. These courses focus on a triple bottom line decision process, which accounts not only for profit, but also for the welfare of the environment and the people who are involved. When analysing a farm business under this framework, it is often found that traditional enterprises (e.g. self replacing Merino sheep) are not as viable as other options (e.g. trading cattle).

Participants also increase their awareness of issues such as pasture supply and biodiversity.

A change in grazing management may also be accompanied with changes in livestock enterprise and stocking rate, which affect the way the farm business derives profit. This makes it difficult to determine exactly what role the change in grazing management played in the profitability or sustainability of the new grazing system. Therefore the focus of EverGraze research in the central slopes and tablelands of NSW is to determine exactly how grazing management affects profitability and NRM issues in native pastures.

## Grazing systems compared at Orange

The research Proof Site at Orange has a mixed native pasture comprising of microlaena, wallaby grass, redgrass and annual grasses and legumes. The site is located about 25 km southwest from Orange at Panuara and is grazed by Merino ewes mated to terminal sires and lamb in September. The site has a highly variable landscape with multiple, aspects, soil depths and pasture types. Superphosphate fertiliser is applied to the most productive areas.

The three grazing systems are;

- Set stocked: Pastures are continuously grazed by ewes all year.
- Low intensity rotational grazing: The grazing area is split into four paddocks and animals are moved based on FOO.
- High intensity systems: The grazing area is split into 20 paddocks and sheep are moved based on FOO and pasture rest period.

For the first year of the experiment, the stocking rate across the site ranged from 4.9 to 6 ewes/ha, depending on the proportion of productive area. The stocking rate was the same between grazing treatments. In the second year stocking rates were adjusted to maintain a similar FOO across all systems. i.e if one system produces more forage than another, additional livestock will be added to use this pasture.

Further information & the latest results are available at ***www.evergraze.com.au/CentralNSW/latest-results.htm***

*Orange*
*Proof SIte*
*Field walk*


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### *Further information*

www.evergraze.com.au/CentralNSW/latest-results.htm


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Managing drought guide, 2006 (NSW Department of Industry and Investment) http://www.dpi.nsw.gov.au/agriculture/emergency/drought/managing/general/managing-drought

Perennial Pastures on the central Tablelands (Central West CMA)

http://cw.cma.nsw.gov.au/pdf/Information/BMPs/CWCMA_Information_BMP_0290_Perennial%20Pastures%20on%20the%20Central%20West%20Tablelands.pdf


## EverGraze on line: **www.evergraze.com.au**

For further details of EverGraze and to find out about activities in your area go to <www.evergraze.com.au> or write to Geoffrey Saul, National EverGraze Coordinator, 98 Leura Lane, Hamilton, VIC 3300.

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Established and supported under the Australian Government's Cooperative Research Centres Program. Through the implementation of innovative research outcomes and new technologies, the Future Farm Industries CRC is developing new and adaptable farming systems for Australia that will improve livestock and cropping industries productivity, offer new woody crop options, make better use of limited rainfall and create more diversity in landscapes.