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ROLE OF GRAZING SYSTEMS IN PASTORAL INTENSIFICATION

J.G. McIvor[1,4] *and T.J. Hall*[2]

[1]CSIRO Sustainable Ecosystems, 306 Carmody Road, St Lucia, Qld 4067
[2]DPIF, PO Box 102, Toowoomba, Qld 4350
[4]Corresponding author. Email john.mcivor@csiro.au

ABSTRACT

There is a continuum of cattle grazing systems used in the rangelands, with increasing levels of intensification from continuous, through spelling and rotations, to cells. These aim to produce environmentally sustainable, productive, economic and socially acceptable outcomes. This paper comments on some of these issues and describes a research project investigating grazing systems in the beef cattle industry in northern Australia.

INTRODUCTION

There has been slow and continuous intensification of management systems for beef production in Australian rangelands since European settlement with the establishment of more reliable water supplies, varying degrees of fencing and other infrastructure development, and improved transport. This intensification has increased markedly in recent times. With much higher land prices, increasing productivity represents a cheaper means of increasing financial returns than purchasing more land, and producers are seeking to increase production per unit of land to maintain returns on capital on the increased land values (Ash *et al.* this volume).

Past management concentrated on increasing production and minimising costs rather than managing specifically for resources. This led to some damage to pastures and soils as desirable species were overgrazed and less palatable species increased, and more severe overgrazing produced bare patches and erosion. These circumstances reduced the productive and financial capacity of the pasture and limited management options. To manage these grazing effects, controlling the timing and intensity of grazing is required. Total grazing pressure, from cattle, other domestic livestock and feral animals, especially macropods, needs to be managed.

GRAZING SYSTEMS

Grazing systems are the planned management of livestock in space and time i.e. species and class of livestock, stocking rate (numbers), grazing and resting periods, grazing intensity (frequency and severity of use), and grazing distribution. Grazing systems have evolved to maintain/improve the long-term sustainability of grazed landscapes, while providing desirable levels of animal production, financial returns, environmental health and social support. Using grazing systems to improve pastures and soils requires an understanding of local ecological systems including the principles of pasture plant growth and effects of grazing. The basic premise is to match the grazing pressure to the capacity of the individual plants within a pasture so they can perform in the manner required to meet the goals of the manager.

Grazing systems can be considered to lie along a spectrum of increasing intensity from continuous stocking in large paddocks, through rotational and/or spelling systems, to cell grazing with large numbers of paddocks (Table 1).

Table 1: Characteristics of less and more intensive grazing systems

	Less intensive (e.g. continuous)	More intensive (e.g. cell)
Paddock numbers	Few	Many
Paddock size	Large	Small
Paddock independence	Large	Little
Duration of stay	Months/years	Days
Matching animal numbers to short term feed supply	Little	Much
Pasture rest	Opportunistic/reactive	Planned
Decision making	Less frequent	Frequent
Infrastructure costs	Low	High
Applying other management	Difficult	Easier

HOW DO GRAZING SYSTEMS AFFECT ANIMAL PRODUCTION?

Pastures

If effects are due to impacts on pastures, they will do so by impacting on the quantity of pasture produced, the quality of pasture produced, and/or the amount of pasture consumed. Grazing systems aim to manipulate these three factors by controlling the frequency and severity of defoliation to prevent overgrazing.

In the long term, grazing systems may alter land condition and thus pasture production. Grasses are most sensitive to defoliation when regrowing and spelling during the wet season can produce large benefits (Ash *et al.* 2001). Land in poor condition may produce only 10-20% of the pasture produced from the same land type in good condition (McIvor *et al.* 1995). What about in the short-term? Overseas evidence suggests systems with many paddocks may give a small advantage over systems with fewer paddocks. In South Africa Tainton *et al.* (1977) found a trend for higher pasture yields with more paddocks but the differences were not significant while Heitschmidt *et al.* (1987) in Texas found no significant differences between a 14 paddock (2530 kg/ha) and a 42 paddock system (2670 kg/ha).

A number of reports show an increase in perennial grasses and native legumes with cell grazing - with long rest periods the large perennial grasses out-compete smaller plants, and a number of native legumes are trailing/climbing species that exploit the rest period and are disadvantaged by continuous grazing. Legumes improve pasture quality but what about extra perennial grass? Ash *et al.* (1995) compared animal production from pastures dominated by native perennial grasses with pastures containing less of these grasses and more annual grasses, forbs and native legumes. At low stocking rates animals grew faster (reflecting their higher quality diet) on the pastures with less perennial grass. However these poorer condition pastures grew less herbage and at higher stocking rates the perennial grass dominant pastures had the highest gains. Grazing systems may increase or decrease pasture quality.

For a given area, the more paddocks there are, the smaller the size of individual paddocks. Patch grazing is a common feature of large paddocks but with smaller paddocks, pasture utilisation is more uniform as livestock search all areas. The greater pasture utilisation in small paddocks can increase animal production per hectare while the greater opportunities for diet selection in continuous systems can produce higher individual animal production.

Soils
Healthy pastures with high cover levels maintain good soil surface condition, with reduced runoff and erosion losses, increased soil biological activity and litter recycling. High cattle densities in intensive systems can have positive effects on nutrient cycling and may reduce cattle pad formation lowering the opportunity for erosion channels to form.

Cattle
With increased and more even utilisation of pastures, cattle numbers can be maintained or increased. However, fattening or finishing cattle may be difficult due to reduced diet selection capacity and reports of lower production from finishing bullocks need verifying. Fewer bulls may be required with breeders concentrated in larger numbers and at single or few water points. Management measures are required to avoid mismothering of calves in intensive systems where cattle are moved frequently. Cattle are quiet and easier to handle in intensive systems providing appropriate methods are used. By resting paddocks for 60-90 days several times per year, worms can be managed and regularly shifting cattle to paddocks several kilometres apart is reported to reduce buffalo fly irritation.

Costs
There are high initial capital costs in establishing intensive systems. Adequate (high flow rates) and reliable (with back-up) water supplies are the major cost, as large herds use one water point at a time. Open dams or natural waters are not usually suitable in more intensive systems. Good quality water is required for adding supplements via water medicators. Fencing is also a significant cost although much reduced with electric fences. Some large paddocks are still desirable with intensive systems in case water supplies break down, and to allow for vacations by managers.

MANAGEMENT AND DECISION MAKING
A good knowledge of pasture production and response to grazing is required to run intensive grazing systems successfully. This may require periodic intensive training. For instance, McCosker (2000) considers it takes several training events and 3-5 years practice to competently manage cell grazing. Good pastures and cattle records are required where daily decision making is needed to manage a herd at high stocking density in an intensive system. Intensification changes the amount and timing of labour demand. There are fewer water points to check at any one time but some labour is required every day for these checks. The herd is more congregated, making inspections and handling simpler, and reducing costs and time required for mustering. Individual water points can be closed off to aid pasture recovery, by preventing grazing by feral animals. Adding nutritional supplements via water medicators is cheaper and more effective with large herds on single controlled waters. The pasture yield assessments allow feed budgeting, and this information can be used to manipulate herd size, plan buying/selling strategies as opposed to being reactive if feed runs out, or allow alternative options in periods of feed abundance e.g. taking on agistment cattle.

GRAZING SYSTEMS PROJECT IN NORTHERN AUSTRALIA
Research on carrying capacities and utilisation rates has provided guidelines for long-term maintenance of pasture and soil condition, but the short-term management of grazing to optimise sustainability, production and profitability is less well understood. A joint DPIF, CSIRO and MLA research project commenced in 2005 to quantify the main inputs and outputs of commercial grazing systems, to provide such information.

Nine properties, each with two or three grazing systems (continuous, rotation, cell), have been selected as primary sites in north and south Queensland to cover the effects of amount and distribution of summer rainfall, and on brigalow and eucalypt land types to include the effects of soil fertility. Additional secondary sites have been selected to broaden the range of environments.

Data recorded in each system includes: animal performance (liveweight gain, branding percentage, condition score), diet quality (by NIRS), pastures (yield, botanical composition, basal area, utilisation), soil surface condition (Tongway and Hindley 1995), herd management, grazing pressures, finance (capital and operating costs, returns, profitability), system management (labour inputs, decision making, training knowledge and support, networks) and weather conditions. Three to ten paddocks are being monitored at each primary site, not whole properties. The pasture and soil data will be collected at the end of summer between 2006 and 2009. Animal production will be recorded as part of normal herd management. The financial and social aspects of operating the various grazing systems will be recorded throughout the four-year period. Results from these measurements will be used to describe and quantify the grazing systems and produce guidelines for producers to use as decision aids in determining the most suitable system for their land types, environments, resources, personal capabilities and desired lifestyles. Information will be used in grazing land management education packages and be available for all land managers.

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REFERENCES

Ash, A., Corfield, J. and Ksiksi, T. (2001) The Ecograze Project – developing guidelines to better manage grazing country.

Ash, A.J., McIvor, J.G., Corfield, J.P. and Winter, W.H. (1995). How land condition alters plant-animal relationships in Australia's tropical savannas. *Agric. Ecosyst. Environ.* 56: 77-92.

Heitschmidt, R.K., Dowhower, S.L. and Walker, J.W. (1987). 14- vs. 42-paddock rotational grazing: above ground biomass dynamics, forage production, and harvest efficiency. *J. Range Manage.* 40: 216-223.

McCosker, T. (2000) Cell Grazing – the first 10 years in Australia. *Trop. Grassl.* 34: 207-218.

McIvor, J.G., Ash, A.J. and Cook, G.D. (1995). Land condition in the tropical tallgrass pasture lands: 1. Effects on herbage production. *Rangelands J.* 17: 69-85.

Tainton, N.M., Booysen, P. de V. and Nash, R.C. (1977). The grazing rotation: effects of different combinations of presence and absence. *Proc. Grassl. Soc. South. Africa* 12: 103-104.

Tongway, D. and Hindley, N. (1995). Manual for Soil Condition Assessment of Tropical Grasslands. CSIRO Australia, Canberra.