Northern Territory Government

DEPARTMENT OF
PRIMARY INDUSTRY, FISHERIES AND MINES

Comparison of rotational grazing and continuous grazing on native pastures using a moving water point: preliminary results from Idracowra Station.

Kain, A.J.

April 2008

This report presents background, methodology and recommendations for the grazing trial initiated at Idracowra Station as part of the Desert Knowledge CRC project "Rangelands grazing management strategies for improved economics and resource stability" funded by the National Landcare Program. The project was completed by a partnership including DPIFM, CLMA, DKCRC and CSIRO. Unfortunately, due to a change in property ownership the project was aborted soon after establishment.

Northern Territory Government

CSIRO

Australian Government
Department of Agriculture, Fisheries and Forestry
National Landcare Program

CLMA CENTRALIAN LAND MANAGEMENT ASSOCIATION

DESERT KNOWLEDGE CRC

Table of Contents

Acknowledgements 3

Abstract 4

1. Background 5
   Study Site 5
   Hypotheses 6
   Objectives 6

2. Methodology 6
   Grazing Strategies 6
   Stocking rate 7
   Seasonal Conditions 7
   Pasture Assessment 7
   Stock Performance 8

3. Results 9
   Seasonal Conditions 9
   Stocking Rates 9
   Pasture Assessment 10
   Stock Performance 10

4. Discussion 10
   Technical recommendations 11

Acknowledgements

The Department of Agriculture, Fisheries and Forestry's National Landcare Program provided funding through the Desert Knowledge CRC to finance this project in conjunction with the Northern Territory Department of Primary Industry, Fisheries and Mines. This project was completed by a partnership including the Department of Primary Industry, Fisheries and Mines, the Centralian Land Management Association, CSIRO and DKCRC.

Many individuals were involved with this project throughout its course. Andrea Tschirner, Joanne Rodney, Leigh Hunt, Dionne Walsh, Ben Norton, Chris Materne, Robyn Cowley and Neil MacDonald were involved in the initial setting up of the project. Mark Stafford Smith from the DKCRC was instrumental in sourcing funding and getting the project off the ground. Staff from the Department of Primary Industry, Fisheries and Mines, Alice Springs, including Sally Leigo, Ellena Hannah, Coral Allan, Chris Materne, Bryan Gill and Greg Crawford were involved with pasture and cattle field work. Coral Allan provided assistance with processing laboratory samples and data entry. Special thanks to Robyn Cowley for her invaluable assistance in reporting.

Jillian Fisher, project manager based with the Centralian Land Management Association, provided invaluable assistance throughout the entire project. Jillian managed the overall project, liaised between partners, reported to the funding organisations and assisted with both cattle work and pasture assessments.

The concept of the rotational grazing strategy was designed by Jim Murphy, owner and manager of Idracowra Station. Jim had complete responsibility for the ongoing management and implementation of the grazing strategy. Unfortunately, Jim was not able to see the results of his hard work as the station was sold but his dedication to the strategy was always 100%.

Abstract

There has been widespread interest by the industry in spelling practices, which hold out the potential for increased production without damage to natural resources, and may lead to sustained production with recovery of the natural resources. The benefits of rotational grazing in the semi arid rangelands have been little documented and it is therefore difficult for managers to commit to these new grazing strategies. Cost of intensive infrastructure and increased management input is often prohibitively expensive when considering alternative grazing strategies. The trial at Idracowra Station, 180km south-south-west of Alice Springs, incorporated rest from grazing by moving a water point through the paddock. The hypothesis was that as pastures became remote from water they would be spelled from grazing without the need for fences. The moving water treatment was compared with continuously grazed watering points. Both the treatment and control paddocks are dominated by native pastures.

The study aimed to test the hypotheses that it is possible to train cattle to move around a paddock by shifting a water point. The study also aimed to test the hypotheses that rotational grazing will result in more even utilisation of pasture, maintain land condition and improve animal productivity. Unfortunately, only one year into the trial, Idracowra Station was sold and the trial was prematurely concluded. Whilst there is no data available to support the hypotheses, the author felt that there was anecdotal information of interest. The manager found that the majority of the herd could manage to follow the watering point if it was only moved 500m at a time and that whilst cattle were grazing less favoured country immediately adjacent to the watering point, opportunistic observations noted that they were still walking in excess of 5km to access more favoured pastures. One of the most important elements to arise from this trial is the comparison of actual stocking rates with forage budget recommendations. While the manager felt that the cattle on the moving water pipeline were performing better than those in the continuously grazed system, this may have been attributable to the lower stocking rate of the treatment compared with the control.

The moving water principle still deserves to be trialled in central Australia but realistic and safe estimates of carrying capacity are required in order to accurately assess the economic return that such a system is likely to generate in the long term.

This trial was conducted in association with studies on Mt Riddock station and Old Man Plains.

1. Background

There is a growing awareness amongst pastoral land managers of the need to manage their natural resources to ensure a strong, environmentally sound industry that will be sustainable into the future. Through land management extension activities, pastoralists are gaining a good understanding of how natural ecosystems function in relation to the grazing enterprise. Resting pastures from grazing during the growing season has the potential to encourage germination and regeneration of plant species. It also allows plants to achieve their maximum growth potential. Other ecosystem processes such as nitrogen and water cycling are also enhanced by spelling.

In the arid rangelands, the cost of intensive infrastructure and increased management input is often prohibitively expensive when considering alternative grazing strategies. The trial at Idracowra incorporated rest from grazing by moving the water point through the paddock. The hypothesis was that as pastures became remote from water they would be spelled from grazing without the need for fences.

Study Site

Idracowra Station lies approximately 180km south-south-west of Alice Springs. Average temperatures for Alice Springs range from a low of 21.4°C to a high of 36.3°C in January and a low of 4.0°C to a high of 19.7°C in July. Long term rainfall data from Erldunda station, approximately 25km west of the trial paddock, indicates that the median October to September rainfall is 185mm and the median summer rainfall is 122mm.

The moving water trial was conducted in Middle Dam paddock on the central western part of Idracowra Station. The paddock (577km^2) is dominated by dune fields and is dissected by the Karinga Creek (Table 1). The paddock has small areas of more productive country including calcareous shrubby grasslands, clayey stony slopes and alluvial drainage floors. The adjacent continuously grazed control watering points were located on similar country at Lucky Bore, Packhorse Dam and K2 Trough.

Table 1: ***Land types occurring within the trial area, Idracowra Station.***

	Clayey Stony Slopes Stony, pebbly slopes. Red clay soils supporting Mitchell grass and annual grasses.
	Dunefields with Calcareous Shrubby Grassland Swales Low sand dunes with cane grass and spinifex. The swales are pebbly, calcrete plains with sparse mulga shrubland over oatgrass.

	Mulga Sand Plains Broad sandy plains. Mulga woodland over erect kerosene grass & woollybutt grass. Some spinifex.
	Alluvial Drainage Floors Karinga Creek drainage consists of open samphire flats and channels with coolibah over neverfail.

Hypotheses

1. It is possible to move and train cattle to move around a paddock by shifting a water point.
2. By moving the water point around a paddock, grazing will be more uniform across the paddock.
3. A more even grazing distribution will result in better animal productivity and will maintain overall land condition.

Objectives

- To come out of dry periods with heavier cattle in better condition.
- To use pastures more evenly and reduce the impact and extent of the grazing gradient.
- Minimise labour and capital requirements in comparison with more intensive controlled grazing and spelling strategies.

2. Methodology

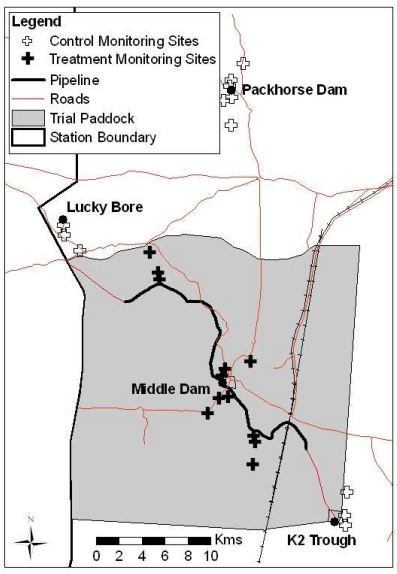

Figure 1: ***Layout of Middle Dam trial paddock and continuously grazed control watering points, Idracowra Station.***

Three continuously grazed control watering points were compared with a paddock that had a mobile trough moving along a pipeline. The continuously grazed watering points are not located in specific paddocks. Pastoral operations in central Australia don't always fence their property into discrete paddocks, stock numbers are typically controlled by watering points that are remote from one another.

Grazing Strategies

The moving water treatment consisted of one 577km^2 paddock, somewhat larger than the district average of 335km^2 (Leigo 2006). A 28km long pipeline traversed the paddock diagonally from the south east to the north west with watering outlets located every 500m (Figure 1). The strategy involved moving a mobile watering trough 500m every few days. Middle Dam was fenced to exclude stock so that they could not water from this site. The location of the pipeline was determined by topography and land type. For example, steep, sandy dunes were avoided and the pipeline was located in less favourable grazing country to avoid potential overgrazing of more useful country.

The control consisted of three continuously grazed watering points (Packhorse Dam, Lucky Bore and K2 Trough). These watering points were not fenced. The grazing area was defined by the distance cattle can walk from water.

Stocking rate

The manager, Jim Murphy, set the stocking rates in the trial paddock based on water limitations yet still having a herd large enough to create an impact on the soil surface in the immediate area of the trough. Stocking rates in the control remained at the numbers that have been historically run at these watering points. These numbers are extraordinarily difficult to estimate as a lack of subdividing fencing means there is no way of ensuring that the same group of animals remains at a given watering point. It is also rare for musters to account for all of the animals in a given area further compounding the issue.

Seasonal Conditions

Rainfall records were collected via an automatic rain gauge located at the northern pumping relay station in Middle Dam paddock.

Pasture Assessment

Stratified site sampling was used to gauge pasture status, quantity and cattle grazing distribution. All of the pastures were assessed in April 2006 and again in April 2007. It is not possible to compare this data as the grazing strategy did not progress far along the pipeline prior to the second pasture assessment. Any differences in the data would have been a result of seasonal conditions as compared to treatment effect.

Four sites at 500m, 1km and 3km from water were located in different land types along the pipeline and at the control watering points. Sites were selected to ensure that the vegetation was representative of the dominant vegetation communities within the trial. At each site, 50 x $1m^2$ quadrats were laid out in a one hectare grid.

Each quadrat was assessed for cover, total yield, top three species by percentage yield, species diversity, cattle activity and defoliation.

Cover was described as a percentage of soil surface covered with vegetative matter, living or dead. The assessment of cover was a visual estimation.

Yield assessments were also visually estimated with observers calibrating their estimates at the end of every day with ten dry weight samples. Yield was described as the amount of non rank standing dry matter.

The ***three species ranked highest by percentage yield*** were identified along with their percentage of yield. The total does not equal 100% where there are other species present eg. Species 1 = *Enneapogon avenaceus* 60%, Species 2 = *Tribulus terrestis* 25%, Species 3 = *Sida fibulifera* 10%

All plants occurring within a quadrat were identified to at least genus and then species where possible. This provided an assessment of plant ***species diversity***.

Cattle activity was described using a qualitative index based on the relative abundance of dung and/or hoofprints (Table 3).

Table 3: ***Cattle activity index.***

Score	Description
0	No sign of cattle activity
1	Light activity
2	Moderate activity
3	Heavy activity

Heavy activity was described as either a well used stock pad or where nearly all of the non-vegetated part of the quadrat was covered with either manure or hoofprints. Whilst it did not refer to actual grazing it provided an insight into how cattle moved around a paddock.

Defoliation was described using an index based on estimated percentage of yield that had been removed (Table 4).

Table 4: ***Defoliation index.***

Score	% Defoliation	Description
0	No defoliation	No grazing
1	>0 and ≤5%	Slight grazing
2	>5% and ≤25%	Moderate grazing
3	>25% and ≤50%	Heavy grazing
4	>50% and ≤75%	Very heavy grazing
5	>75% and ≤100%	Severe grazing

Stock Performance

The initial induction of cows and calves into the trial (May 2006) included both the treatment and control animals. Within the control, stock performance was recorded from the herd at the K2 Trough only.

Pregnancy status, calving percentages, branding percentages and animal weights were to be collected throughout the year. Indicator steers were also included in both the treatment and the control.

3. Results

Seasonal Conditions

Seasonal conditions for the duration of the trial to date are described in Figure 2. The monthly totals suggest that useful rain fell in the middle of summer and then again at the end of summer. This is likely to have allowed pasture to become robust and more resilient to grazing.

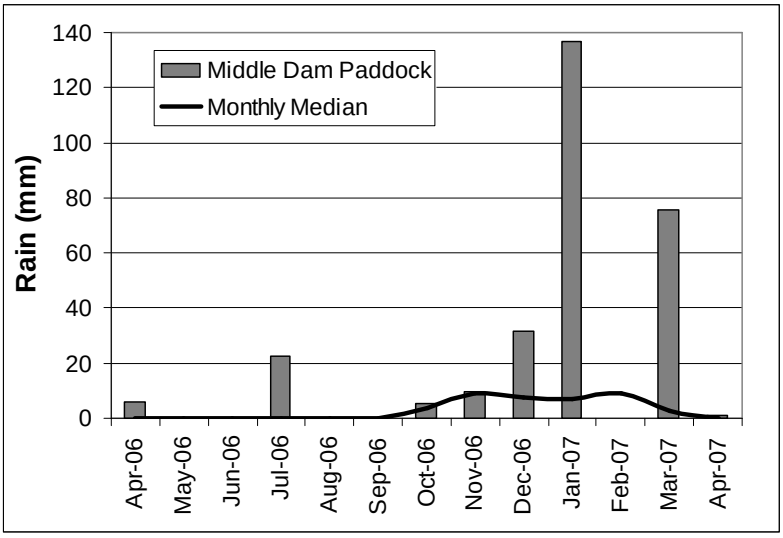

Figure 1: ***Idracowra Station, Middle Dam Paddock, monthly rainfall from April 2006 to April 2007. The median is from adjacent Erldunda Station.***

Stocking Rates

Whilst cattle can travel large distances from water, it has been found that grazing intensity declines with distance from water (Norton 2003, Quirk & McIvor 2006, Low 1972, Fisher 2001, Hunt *et al.* 2007). To simplify our calculations, we assumed that most grazing occurs within 5km of water and that grazing is even within this area. 317km^2 (55%) of Middle Dam paddock was within 5km of water. The combined area of land within 5km of water adjacent to the continuously grazed watering points was 175km^2.

The herd on the moving water totalled approximately 600 animal equivalents (Table 5). Jim would have liked to run more cattle but was not confident that the pumping system would supply enough water. As of April 2006, there were 345 animal equivalents at the continuously grazed K2 trough. As described previously, it was not possible to get accurate figures on the number of animals at the other control waters.

Table 5: ***Stocking rates within Middle Dam Paddock and K2 control water.***

	Area within 5km of water	Animal Equivalents	Stocking Rate
Middle Dam (Trial Paddock)	317km^2	600	1.9AE/km^2
K2 Trough (Control Water)	55km^2	345	6.2AE/km^2

Pasture sampling in April 2006 provided an estimate of forage available at this point in time (Table 6). It is important to note that the forage budget methodology did not take into account available top feed.

Table 6: ***Recommended stocking rates based on forage budgets at Middle Dam Paddock and K2 control water, April 2006.***

	Area within 5km of water	**Yield kg/km^2**	**Discounted for Utilisation (20%) Palatability (75%)**	**Stocking Rate**
Middle Dam (Trial Paddock)	317km^2	18,706	4,350	0.8AE/km^2
K2 Trough (Control Water)	55km^2	9,520	1,428	0.4AE/km^2

Pasture Assessment

Pre-trial assessment was undertaken in April 2006. Pasture assessment was repeated in April 2007 however the results have not been analysed as the grazing strategy had not progressed along the pipeline far enough to have any meaningful results.

Stock Performance

There was no stock performance data collected as the project concluded prior to the collection date.

4. Discussion

This project ended prematurely due to the sale of the property. Whilst there is no data available to support the hypotheses, the author felt that there was anecdotal information of interest.

Hypothesis 1. It is possible to move and train cattle to move around a paddock by shifting a water point.

- On implementation of the moving water principle, a small mob (approximately 20 animals) consistently returned to the permanent water in the south east corner of the paddock. It may be possible that a breeder herd could be culled to remove this trait.

- Initially, the manager had planned to move the stock 1km, once a week. He found that the majority of the cattle were unable to follow the trough after such a large move. Jim reduced the distance to 500m every few days and had a much greater success rate.

- During the early moves, Jim actively mustered cattle to the new trough location. After a period of a few weeks this was no longer necessary as the cattle had worked out to follow the trough.

Hypothesis 2. By moving the water point around a paddock, grazing will be more uniform across the paddock.

- The moving water pipeline was deliberately located through some of the less preferred grazing country in the paddock. Indeed, much of the paddock is dominated by sand dune fields with low palatability and pasture production. Observations by Jim Murphy suggested that cattle were still walking in excess of 5km to access more favoured calcareous country.

Hypothesis 3. A more even grazing distribution will result in better animal productivity and will maintain overall land condition.

- Whilst the manager felt that the cattle on the moving water pipeline were performing better than those in the continuously grazed system this may have been attributable to the lower stocking rate of the treatment compared with the control.

- It is also worth noting that the moving water pipeline paddock had not been grazed for several years prior to the commencement of the trial so the cattle had access to a "haystack" of feed not available to them in the continuously grazed areas.

- Even though there was a difference between stocking rates of the two treatments, it is worth noting that the actual stocking rates were much higher than would have been recommended based on a forage budget. There are real concerns that the stocking rates used to date are too high to maintain land condition.

The moving water principle still deserves to be trialled in central Australia but realistic and safe estimates of carrying capacity are required in order to accurately assess the economic return that such a system is likely to generate in the long term.

Technical recommendations

This trial demonstrates the importance of working with land managers to set stocking rates to meet forage availability for trial and control paddocks. When selecting sites to work on, a criterion should be that land managers agree to stock paddocks according to recommended guidelines, with assistance with forage budgeting from DPIFM. This would not only improve the validity of the trials, but also be a valuable learning exercise for both DPIFM and land managers.

Stocking rates applied in the trial suggest that the stocking rates being applied in these systems are unsustainable in the longer term, if the 5km grazing radius assumption is relevant to this region. Stock waters were placed 20km apart at this site, suggesting managers assume cattle will graze 10km from water. While cattle are known to graze up to 10 kilometres from water there is no local data on time spent with distance from water, which is needed to clarify an appropriate watered area assumption for this region.

If the stocking rates applied in this trial are indicative of the broader region, there is an ongoing and urgent need for research and extension relating to carrying capacity. Until the fundamental basics of grazing management are addressed (matching stocking rates to forage supply), trials that seek to finetune grazing strategies are likely to provide little benefit to the industry in the Alice region.

There is a need to work with industry to investigate sustainable carrying capacities for different land types in the region, including: what are the current levels of utilisation in the region?; what are the levels of utilisation in areas that have good land condition?; can infrastructure development improve carrying capacity, or just make the current levels of stocking more sustainable?; are there factors influencing carrying capacity that are currently not being taken into account in DPIFM's carrying capacity methodology?

5. References

Allan, C. & Wilson, D. (2006) *Central Australian Grass Guide: the essential glove box guide for pastoral lands.* Department of Primary Industry, Fisheries and Mines, Alice Springs, NT.

Fisher, A. (2001) Biogeography and conservation of Mitchell grasslands in northern Australia. PhD Thesis, Northern Territory University. Darwin

Hunt L.P., Petty S., Cowley R., Fisher A., Ash A. and MacDonald, N. (2007) *Factors affecting the management of cattle grazing distribution in northern Australia: preliminary observations on the effect of paddock size and water points.* The Rangeland Jnl. V29, 169-179.

Leigo, S. (2006) Pastoral Industry Survey 2004, Alice Springs. DPIFM, Alice Springs, NT.

Low, W.A. (1972) *Community preference by free ranging shorthorns in the Alice Springs district.* Proc. Aust. Soc. Anim. Prod. 9:381.

Norton, B.E. (2003) *Spatial management of grazing to enhance both livestock production and resource condition: a scientific argument.* Proceedings of the VIIth International Rangelands Congress, Durban, South Africa.

Quirk, M. & McIvor, J. (2006) *Grazing Land Management Technical Manual* Meat & Livestock Australia