

**PROCEEDINGS OF THE AUSTRALIAN RANGELAND SOCIETY
BIENNIAL CONFERENCE**

Official publication of The Australian Rangeland Society

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The reference for this article should be in this general form:

Author family name, initials (year). Title. In: Proceedings of the nth Australian Rangeland Society Biennial Conference. Pages. (Australian Rangeland Society: Australia).

For example:

Anderson, L., van Klinken, R. D., and Shepherd, D. (2008). Aerially surveying Mesquite (*Prosopis* spp.) in the Pilbara. In: 'A Climate of Change in the Rangelands. Proceedings of the 15th Australian Rangeland Society Biennial Conference'. (Ed. D. Orr) 4 pages. (Australian Rangeland Society: Australia).

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Early wet season burning and pasture spelling to improve land condition in the Victoria River District (NT)

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Keywords: savanna burning, cattle, 3P grasses

Abstract

A new trial investigating wet season spelling (with and without early wet season burning) to improve land condition commenced on Delamere station in the Victoria River District (VRD) in 2010. The site is situated on productive “black soil” country that supports the native grass *Dichanthium fecundum* (Curly Bluegrass). Curly Bluegrass is a resilient and productive perennial grass which grows on heavier soils across northern Australia. It is valued for pastoral production but declines under constant heavy grazing. The previous manager of Delamere had noticed that the vigour and seed production of this and other valuable pasture grasses was enhanced by burning early in the wet season followed by rest from grazing. The trial is thus comparing spelling (with or without burning) at two- and three-year intervals to determine which regime will be the most practical and effective way to improve land condition, pasture productivity and seed production.

Introduction

The former manager of Delamere started experimenting with prescribed burning to protect pastures from wild fires early in the dry season, and to remove rank unused pasture in the lead up to the wet season. He noticed that early wet season burning and wet season spelling appeared to improve the growth, nutritional quality, seed production and species composition of the perennial grasses in his black soil country. In 2010 he sought assistance from Greening Australia and the Australian Government’s Caring for our Country Program to commence a trial to see if there was scientific evidence to support his observations.

The purpose of the trial is to compare practical wet season spelling and burning practices for recovering and maintaining land condition and pasture productivity on black soil pastures in the VRD. Research activities at the site are currently managed by the NT Department of Resources and Team Savanna (a local environmental consulting business).

Methods

The trial site is situated on a lightly timbered, basaltic cracking clay plain on Willeroo 1 land system (Stewart *et al.* 1970). Two trial paddocks have been fenced, starting at 1km from an existing water point and heading away from the water for 1.6km. At 1km from the water, the trial paddocks are in C land condition (Chilcott *et al.* 2010) and improve to B land condition as the distance from water increases. The location and orientation of the paddocks allows distance from water effects to be analysed in addition to the burning and spelling treatment effects. One paddock has the burning/spelling treatments applied every two years and the other paddock has them applied every three years (Fig 1).

Within each trial paddock there are six treatment plots (each ~14ha in size). The following treatments are being applied:

- Wet season spelling only – every two years, every three years, none (outside of plots)

- Burning with wet season spelling – every two years, every three years, none (outside of plots)

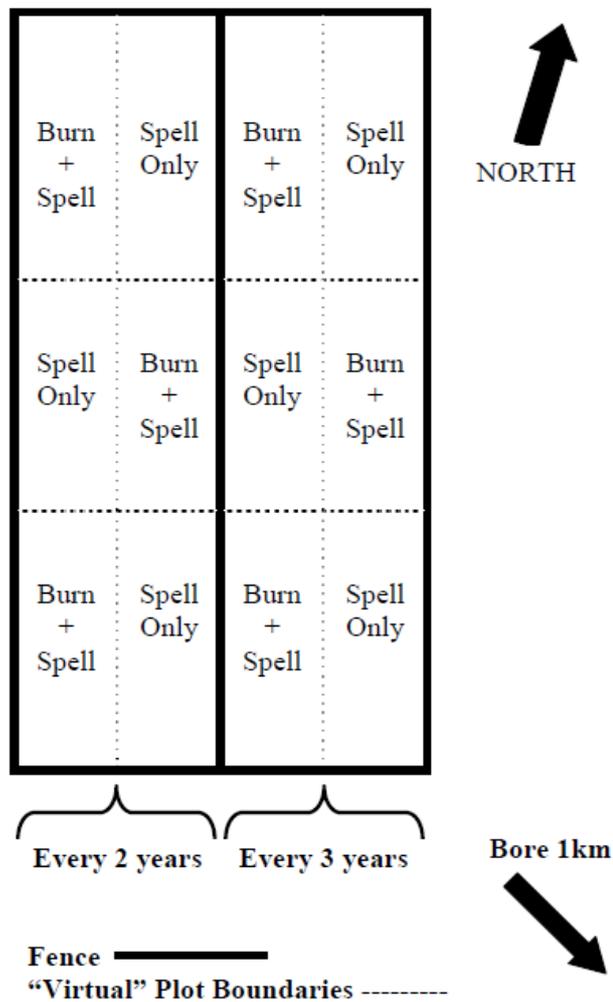


Fig. 1. Layout of the Delamere trial site.

The burning treatments are applied in the early wet season after the first soaking rains. In burning/spelling years, the cattle are excluded from the relevant trial paddock/s for the entire wet season and are allowed to graze them during the dry season.

Data collection takes place at the end of each wet season (between April and June depending on access). Pasture yields, species composition, ground cover and grazing score are assessed in forty 2m x 2m quadrats per plot (240 per paddock) using the BOTANAL technique (Tothill *et al.* 1992). A further 240 quadrats are assessed outside the trial paddocks to monitor trends under traditional grazing management without burning. Plant demography data are being measured from 66 2m x 2m quadrats to determine mortality, recruitment and longevity rates for the perennial grass species in each treatment. All perennial grasses in these quadrats have been individually mapped and their basal diameter, height, seed production score and % dead material, survival and mortality are recorded. Other data being collected in the permanent quadrats include a land condition rating, grazing activity score and foliar cover. Stocking rate and pasture growth data will be analysed to estimate the pasture utilisation rate at the trial site each year.

The data being collected will allow us to determine the influence (if any) of burning and/or spelling on:

- (a) Land condition via
 - Pasture cover
 - Pasture yields (total and by functional groups)
 - Species composition and trends in functional groups
 - Land condition rating over time

- (b) Plant demographics via
 - Recruitment and persistence of 3P grasses
 - Mortality of 3P grasses
 - Seed production of 3P grasses
 - Plant height and grass basal area
 - % dead material in individual tussocks

The information collected at the site will allow us to ground-truth outputs from the locally-calibrated GRASP model. This will allow us to undertake bio-economic modelling that incorporates realistic land condition recovery rates. Ultimately, we will be able to undertake an economic analysis of the performance of early wet season burning and wet season spelling for producers looking to apply the recommendations at the paddock scale.

Results - 2011

The gates of the trial paddocks were closed and all the “burn+spell” treatments were burnt on the 24/11/10 to commence the trial. The 2010/11 wet season officially commenced at Delamere in mid-October 2010 (Lo *et al.* 2008) and ended in mid-April 2011. Data collection was undertaken in April and May 2011. Some of the BOTANAL results for 2011 are presented here.

In April 2011, 69% of the total yield was made up of annuals. Palatable species comprised 63% of the total yield. The most common species recorded (by yield) were Flinders grasses (*Iseilema* spp.), followed by *Wedelia asperima* and *Phyllanthus* sp. The most common perennial grass on the site was *Dichanthium fecundum*.

Not surprisingly, in 2011 there was still a noticeable effect of historical distance to water on pasture yields and cover at the site. Average pasture yields were lowest closer to the bore ($925\pm 50\text{kg/ha}$) and increased as the distance from the bore increased ($1210\text{kg/ha}\pm 47\text{kg/ha}$ in the control area $>2.5\text{km}$ from the water point). A similar pattern was found for cover (average $71\%\pm 5\%$ close to water versus $90\%\pm 3\%$ at $>2.5\text{km}$ from water). The plots that had been burnt had lower pasture yields and cover compared to the plots that had not been burnt.

Flinders grasses comprised most of the yield on the site in 2011. There was a clear distance from water effect, with the highest Flinders grass yields occurring closer to water and declining as distance from water increased. The unburnt spelled plots had higher Flinders grass yields than those that had been burnt and spelled.

In April 2011, there was still a distance from water effect apparent in the yields of Curly Bluegrass. The average yields were highest further away from the bore and lowest on the control areas closest to the bore (Fig. 2). The plots that had been burnt and then spelled had higher yields than the plots that had only been spelled (Fig. 3).

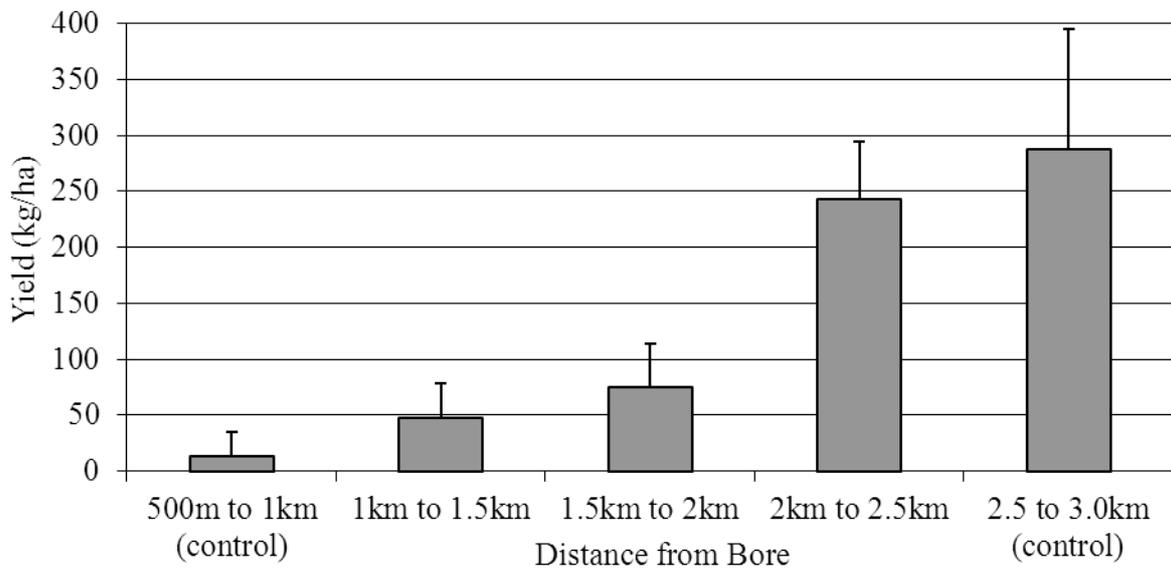


Fig. 2. Average yield of Curly Bluegrass with increasing distance from water ($\pm 95\%$ confidence interval).

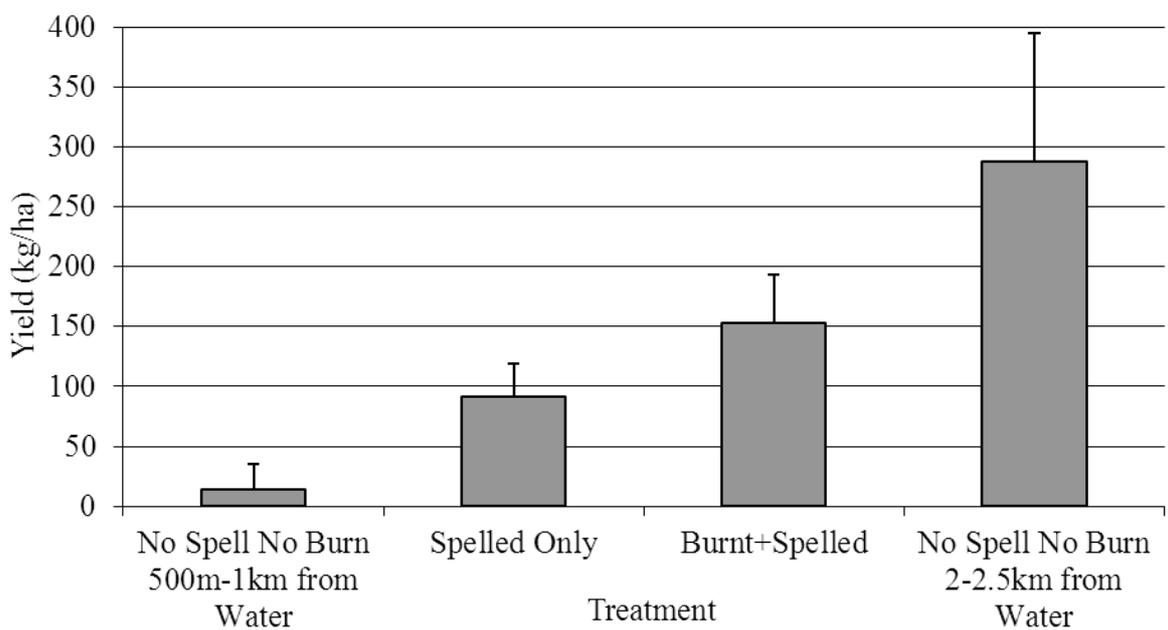


Fig. 3. Average yield of Curly Bluegrass by treatment ($\pm 95\%$ confidence interval).

Discussion

The trial is in its early stages and our understanding of the effects of wet season spelling (with and without early wet season burning) will increase as the trial continues. The collection of intensive plant demography data at the site will help us to understand the mechanism/s by which land condition change occurs on productive black soil pastures in the VRD. The partners are keen to continue the demonstration for at least 5 years but this is contingent on sourcing further funding support after 2013.

Acknowledgements

Recent research and extension activities at the site have been funded by the Australian Government's Climate Change Research Program 2010-2012. Significant in-kind support to maintain the site and implement the burning is provided by AAco's Delamere station.

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