Evaluating short term cropping for restoration of native perennial grasslands in western NSW

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Keywords: INS; restoration; grasslands, ground cover

Abstract

Invasive Native Scrub (INS) is a major problem in the pastoral lands of western NSW. The objective of the project was to test the hypothesis that native perennial grasslands do regenerate in areas that have been cropped following removal of INS. A total of 30 paddocks that had been cropped during the last 20 years were selected. Vegetation surveys were conducted in each paddock in March/April 2008. Results indicated that ground cover, native perennial grass cover and standing dry matter were highest under light/rotationally grazed conditions and availability of soil seed did not appear to be a limiting factor. We conclude that short term cropping can be used successfully to remove INS and restore native perennial grasses if post-cropping grazing management is appropriate.

Introduction

INS remains one of the major natural resource threats in the rangelands of NSW. Its impact on vegetation structure, pastoral productivity, land value and susceptibility of encroached landscapes to further degradation has been well documented (Harrington *et al.* 1984, Date 1987, Wilson and MacLeod 1991, Noble and Walker 2006).

A range of management options that are capable of controlling INS have been identified but in most instances the cost is not justified by the economic benefit obtained (e.g. Pressland 1981).

There is anecdotal evidence to show that native perennial grass species re-establish successfully in the post-cropping environment if seasonal conditions are favourable (G. Brooke, pers. comm.). However, other observations indicate that former cropping paddocks may support only further stands of INS. Furtheremore, Noble *et al.* (1984) cautioned that accelarated erosion and salinisation can follow farming in marginal rangelands. The aim of this study was to determine whether native perennial grassland does reestablish following removal of INS and short term cropping on the Cobar pediplain.

Method

Paddocks that had been cropped since 1987 were identified using the RAMS (Resource Assessment and Monitoring System) database (DL&WC 1999). Thirty paddocks from 11 properties were selected for sampling and stratified by geographic location, number of crops, and years since last crop.

Paddocks were classified into four types based on cropping history and grazing management. Paddocks (4) that were encroached with INS and had never been cleared, but were adjacent to cropped paddocks, were classified as 'INS'. Paddocks (7) that were last cropped 10 years or more previously and were mostly reinvaded by INS were classified as 'regrowth'. Thirteen paddocks that had been cropped within the last 10 years and were set stocked when not in crop were classified as 'set stocked'. The remaining six paddocks which had been cropped within the last 10 years and were either rotationally or lightly grazed when not in crop were classified as 'light/rotationally grazed'.

Grassland condition was assessed by measuring ground cover, pasture botanical composition and standing dry matter (non-woody vegetation). Ground cover and pasture composition were assessed using the step point method described by Campbell and Hacker (2000) along ten parallel transects, each 200 m in length. Standing dry matter was assessed using photo standards.

Data were analysed using general linear mixed models with 'paddock type' fitted as a fixed term and 'property' and 'property x paddock type' fitted as random terms.

Results

Total ground cover did not differ significantly between 'INS' 'regrowth' and 'set stocked' paddocks and was less than 30%, but was 50% in the light/rotationally grazed paddocks ($P<0.001$; Fig 1). Cover of native perennial grasses was more than 20% in the light/rotationally grazed paddocks compared with less than 5% in the other types of paddocks ($P<0.01$) and was the major factor contributing to the difference in total ground cover.

Forbs, perennial grasses and copperburr (*Sclerolaena* spp) were the major species groups that were related to paddock type (Fig.2). Good stands of native perennial grasses such as *Thyridolepis mitchelliana* (Mulga Mitchell grass), *Enteropogon acicularis* (Curly Windmill grass), *Eragrostis eriopoda* (woollybutt), *Eragrostis setifolia* (neverfail), Panicum spp., and Digitaria spp. were recorded in the light/rotationally grazed paddocks. The frequency of less desirable species such as copperburr was significantly lower ($P<0.01$) in paddocks that were light/rotationally grazed.

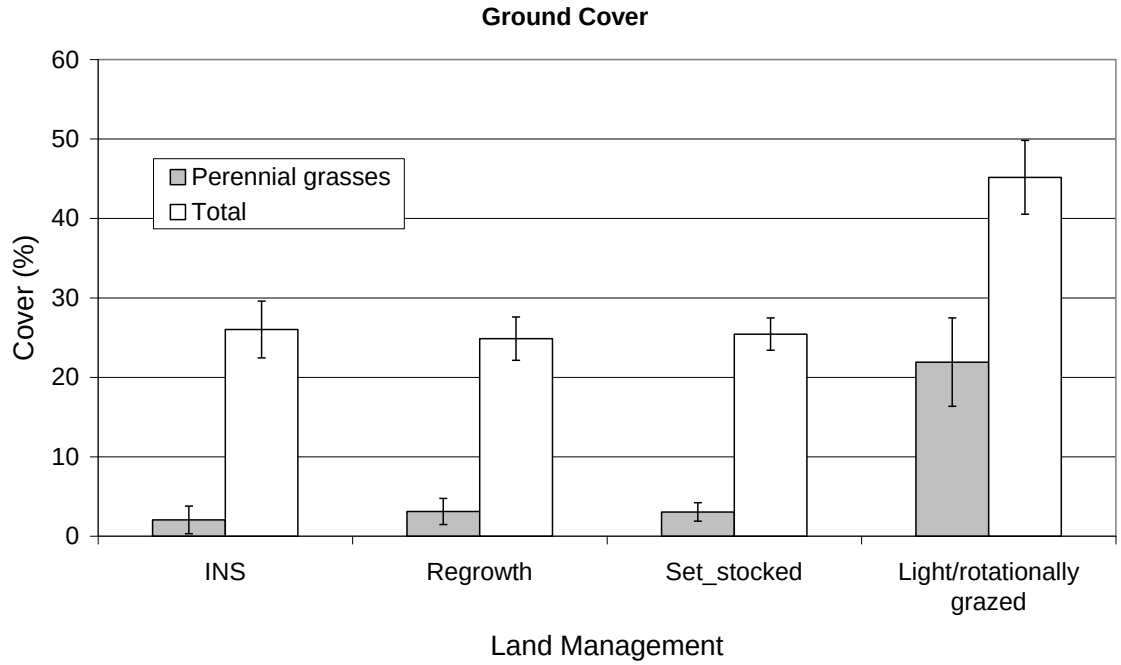

Fig.1. Total and perennial grass ground cover (%) under the different land management categories.

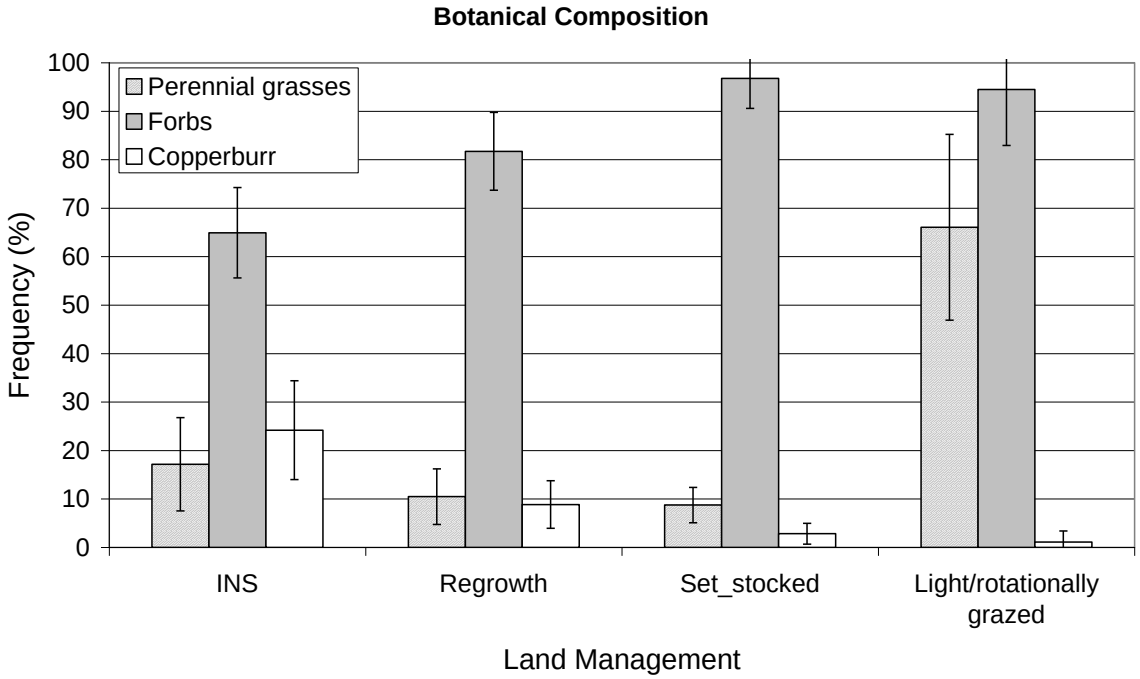

Fig.2. Frequency of the major pasture components under the different land management categories.

Standing dry matter varied from about 100kg/ha in both 'INS' and 'regrowth' paddocks to about 300kg/ha in 'set stocked' paddocks and 1100kg/ha in light/rotationally grazed paddocks ($P<0.001$).

Discussion

The study showed that native perennial grasses were able to re-establish successfully in the post-cropping period with effective grazing management. Sufficient viable seed appeared to remain in the soil for the marked response to favourable seasonal conditions recorded here. The combination of nitrogen application and light/rotational grazing may have promoted seed production from the perennials that first established after cropping, providing a larger perennial soil seed pool for the current seasonal response. Moreover, the combination of soil disturbance, by removal of the shrubs and by cultivation for cropping, probably contributed for the response observed in some paddocks. In addition, physical or chemical suppression from shrubs and/or litter could have prevented the germination of grasses in uncleared (INS) paddocks (see Tighe *et al*. 2009), conserving the soil seed pool. The removal of shrubs may therefore have contributed directly to the re-establishment of grasses.

Appropriate post-cropping management of paddocks is thus essential if the benefits of the cropping phase are not to be lost. Apart from appropriate grazing management it might be

desirable to sow a crop in regenerated paddocks every few years with minimal disturbance of soil and ground cover using the principles of 'pasture cropping' (Millar and Badgery 2009). This could prevent the re-establishment of INS, facilitate better water infiltration and improve soil fertility by increasing organic carbon build up and by direct addition of fertiliser.

Total ground cover was influenced by the proportion of perennial grass cover and both of these were probably determined by the grazing management system. Murphy and Lodge (2002) recognised ground cover as a key indicator of 'rangeland sustainability' and several studies in the Western Division of NSW have demonstrated its importance for control of infiltration, run-off and soil erosion (e.g. Tongway and Ludwig 1997). Restoration of native perennial grasslands can thus be expected to improve ecological processes resulting in more productive and resilient landscapes.

Acknowledgements

The cooperation of Western Division landholders who participated in the field survey is gratefully acknowledged. Funding was provided by NSW DPI (now I&I NSW) and the Western Catchment Management Authority.

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Alemseged, Y., Hacker, R.B., Smith, W.J. and Melville, G.J. (2010). Evaluating short term cropping for restoration of native perennial grasslands in western NSW. In: *Proceedings of the 16th Biennial Conference of the Australian Rangeland Society*, Bourke (Eds D.J. Eldridge and C. Waters) (Australian Rangeland Society: Perth).