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# OPPORTUNISTIC CROPPING FOR CONTROL OF INVASIVE NATIVE SCRUB (INS) AND RESTORATION OF NATIVE PERENNIAL GRASSLANDS IN WESTERN NSW

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## ABSTRACT
The spread of invasive native shrub (INS) is a major problem in the semi-arid zone of western NSW. Although there are well established methods to control these plants, prohibitive cost and/or limited effectiveness have been major limitations. Short term cropping is widely claimed to be a practical and economically viable method of reducing INS and promoting the restoration of native grasslands. However, these claims have received little critical evaluation and there are at least some theoretical grounds for belief that the transition may not always be straightforward. This project aims to survey post-cropping and post-clearing vegetation in the Western Catchment to evaluate the potential of opportunistic cropping for control of INS and restoration of native perennial grasslands.

## INTRODUCTION
INS is regarded as one of the major problems threatening the pastoral lands of western New South Wales. It is estimated that 20 million hectares (almost 20% of the state) are affected by, or susceptible to, invasion by shrubs (Booth 1989; Noble and Hodgkinson 1992) costing graziers approximately $50-$100 million annually in lost production. Numerous studies over the last 30 years have shown that the woody weed problem results from both environmental (natural) and management factors (eg. Booth et al. 1996). Major establishment episodes assisted by overgrazing (by domestic, native and feral animals) and the suppression of fire are generally considered to be the principal causes of the increased density of shrubs.

Many landholders believe that opportunistic cropping is the only economically viable way of treating INS and regenerating native perennial grasslands. The Native Vegetation Act 2003 recognises that INS causes environmental degradation and lists temporary land use change (cropping) as an acceptable form of management to re-establish native vegetation. However, the claims for improved environmental outcomes following opportunistic cropping have received virtually no critical evaluation. The post-cropping scenario regarding regrowth and vegetation succession in the Australian rangelands is not well defined and there are at least some theoretical grounds for suggesting that the transition may not always be straight forward (e.g. potential effects of scrub induced changes in nutrient distributuion patterns).

Thus while short term cropping may play a key role in reduction of INS and re-establishment of native grasslands, the process may require more active management than seems commonly to be supposed. By quantifying the progression of vegetation states after cropping, and relating it to environmental and management variables, it should be feasible to assess the benefits of cropping for restoration of native grasslands and to develop an understanding of liklely vegetation dynamics based on state-and-transition concepts (Westoby et al. 1989, Briske et al 2005).

The objective of this study is to evaluate the benefits of opportunistic cropping for rehabilitation of native grasslands in western NSW so that best management practices may be recommended or limitations identified for further research.

## MATERIALS AND METHODS
### Survey site identification
Paddocks within the boundary of the Western Catchment Management Authority that have been cropped at any time since 1987 were identified using the Resource Assessment and Management System (RAMS) database. RAMS is an inter-agency program that has monitored clearing and

cropping activity annually in the Western Division, based primarily on satellite imagery analysis. Attributes of each paddock surveyed included the year of first crop, number of crops and the year of last crop.
Landholders were contacted by telephone seeking consent to undertake the survey and agreement to provide additional details of paddock management history. Thirty paddocks were finally selected representing a range of geographic locations, number of crops, and length of fallow periods. This number was estimated to be a minimum requirement for statistical analysis.

**Data collection**
The two variables selected to evaluate grassland condition were ground cover and pasture botanical composition. Both were assessed using the "Step Point Method" as described in Campbell and Hacker (2000). Forage availability in each paddock was assessed by comparing a current photograph of the paddock with biomass photo-standards in Campbell and Hacker (2000).

The impact of shrubs on the spatial pattern of nutrient (nitrogen and organic carbon) distribution was assessed by comparing nutrient distribution in post-crop grasslands with uncropped, open grasslands and shrub encroached areas. Soil samples beneath shrub canopy and mid distance from the neighbouring shrub were collected and compared with soil samples collected from open grasslands and post-crop grasslands separated by a similar distance. Soil data collected from the same or adjacent paddocks by a related project (cropping BMP project) was used to quantify the impact of soil fertility and soil structure on the restoration of native grasslands.

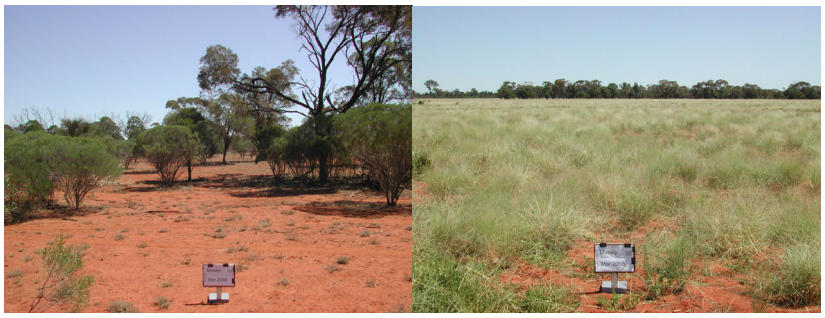
**RESULTS AND DISCUSSION**
Only preliminary results are available at the time of writing. Figure 1 shows photos of two cropping paddocks (A&B) along side adjacent none-cropped areas. Both paddocks had large number of desirable perennial native grasess. Although most of the species were also present in the uncleared paddocks their densities were low and plants were of smaller size. Based on these and other results the following observations can be made:

- Clearing scrub provides an opportunity for native perennial grasses to establish. However, in the absence of measures that encourage their persistence many paddocks revert to scrub dominance;

- Good stands of native perennial grasses such as *Thyridolepis mitchelliana* (Mulga Mitchell), *Enteropogon acicularis* (Curly Mitchell grass), *Eragrostis eriopoda* (woollybutt), *Eragrostis setifolia* (neverfail), *Panicum* spp., and *Digitaria* spp. have established in some paddocks within a year of cropping, contrary to the expectation that early successional species such as annual forbs would initially dominate the post-cropping vegetation community;

- An adequate soil seed bank of the major native perennial grasses is available in many parts of the Cobar pediplain for re-establishment of native grasslands when the required environmental conditions (rainfall and removal of competition from shrubs) are met.

A



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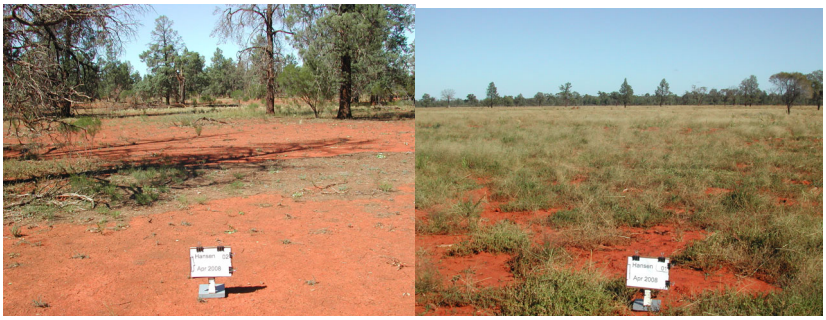

Figure 1. Pasture growth on two cropped paddocks compared to adjacent not cleared areas. Both cropped and none cropped paddocks were stocked similarly.

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