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PASTURE CHANGES FOLLOWING EXCLOSURE IN EASTERN SEMI-ARID WOODLANDS

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INTRODUCTION

One important determinant of rangeland condition is the species composition of its vegetation (1). Major compositional changes have taken place since European settlement, the most noted being the proliferation of endemic shrubs (2), (3). Our knowledge of changes in herbaceous species composition is less thorough. Exclosure studies in N.S.W. semi-arid woodlands suggest that there is potential to use grazing management to manipulate pasture composition. I will list likely responses of the herbaceous layer to effective spelling and discuss possible pastoral implications.

THE "SOFT RED" COUNTRY

Dune-swale systems ("soft red country") between the Cobar peneplain and the Darling River floodplain support *Eucalyptus*-*Acacia* woodlands. Typically, dunes are dominated by the long-lived *Eragrostis eriopoda* (4). In the swales, *Stipa nitida*, *Aristida contorta* and *Enneapogon avenaceus* are the commonest grasses though dicotyledonous annuals such as *Erodium* spp., *Medicago* spp. and Asteraceae, often dominate.

LIKELY CHANGES IN PASTURE COMPOSITION FOLLOWING EXCLOSURE (Table 1).

1. Average above-ground herbaceous biomass increases. Much of the accumulated material may actually be dead and contribute little to animal production.
2. The biomass of longer-lived, warm season grasses increases. In the short-term much of this increase is from growth of existing individuals rather than an increase in the number of individuals. This effect is especially notable for *E. eriopoda*. Comparable grasses are scarce in the swales but *Stipa tuckeri* and *Paspalidium constrictum* respond well to exclosure.
3. The less desirable shorter-lived grasses (*Aristida* spp. and *Stipa* spp.) may at times have lower populations on ungrazed areas (not apparent in Table 1), especially where *E. eriopoda* is present (5). This suggests that competition between long-lived and short-lived grasses may be important.
4. The response of cool-season annuals is reduced by high grass biomass.
5. Perennial forbs and sub-shrubs increase. *Sclerolaena diacantha* responds particularly well to exclosure.

The time frame for these changes depends upon rainfall received. The average to above-average seasons experienced during the study period meant that differences emerged in 1-2 years.

IMPLICATIONS FOR ANIMAL PRODUCTION

The importance of maintaining the perennial elements of the vegetation of arid and semi-arid areas, whether they be grasses or chenopods, is often emphasised. There has, however, been little quantification of the relative merits of rangeland pastures of different species compositions. Graetz was

unable to show that animal production varied with the proportional contribution of the perennial chenopodiaceous shrub *Atriplex vesicaria* (6).

The interactions between annual and perennial, and warm and cool season plants are important when considering the possible effects of compositional change on animal production. Perennial grasses may increase the forage available after warm season rains but reduce the response by cool season annuals.

In central western New South Wales there have been few incentives to develop grazing strategies that encourage the perennial grasses. Managers have depended on the relatively reliable and effective cool season rains and tolerated a deterioration of animal condition over the warm season. The proliferation of woody species in the absence of fire and strong grass competition is the deleterious result. Management should focus on how the less reliable warm season rains are utilised.

FURTHER WORK

Research must (i) quantify the interactions between the various herbaceous components and (ii) examine the costs and benefits, to both animal production and land condition, of maintaining semi-arid grasslands of different compositions. Particular attention should be given to the response of cool season annuals to high grass biomass.

Table 1: Biomass (kg/ha) of grazed and ungrazed herbaceous components at four sites. Ungrazed plots were exclosed for five years. (-) not present.

Site / treatment	Total herbaceous	Grasses	<i>E. eriopoda</i>	<i>Stipa</i> spp.	Annuals
1 Dune ungrazed	868	824	549	23	17
1 Dune grazed	347	265	234	4	45
2 Swale ungrazed	1057	802	-	520	2
2 Swale grazed	187	41	-	28	119
3 Dune ungrazed	1286	1162	906	117	41
3 Dune grazed	176	167	149	18	7
4 Swale ungrazed	1213	849	-	576	82
4 Swale grazed	644	429	-	378	138

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