Impacts of Strategic Grazing on Herbage Accumulation and Nutritive Value of Naturalised Hill Pasture

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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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Key words : Deferred grazing , herbage mass , digestibility , protein , neutral detergent fibre

Introduction Steep hill country is an important part of the landscape in southern Australia . Despite lower productivity , this land plays a critical role in controlling recharge , water and nutrient runoff and soil erosion . A major problem in steep hill country is overgrazing on hilltops , which leads to poor groundcover by perennial pasture species and dominance of annuals in winter and spring . Restoration of perennial pastures including perennial native grasses that are well adapted to Australian environment is the key to improve the sustainability and profitability of the farming systems . Previously Nie *et al* . (2005) revealed that a series of strategic grazing strategies can increase perennial grass population by 30% ～47% , and groundcover up to 90% in summer/autumn . This paper reports the effects of strategic grazing on pasture production and nutritive value .

Materials and methods This study was conducted on a commercial farm (143°08′E , 37°25′S) near Ararat , Victoria , Australia from 2002 to 2006 . The soil was a sedimentary clay loam with low fertility (e .g . Olsen P=4 mg/kg soil) and low pH (pH_{H_2O} =5 .2) . The average annual rainfall during the experimental period was 450 mm . Four treatments were imposed in a randomised complete block design with 3 replicates . They were : 1) a short-term deferred grazing treatment (SD) (pastures not defoliated between October and January each year) ; 2) long-term deferred grazing (LD) (from October to May) ; 3) late-start deferred grazing (LSD) (the starting time varied according to stem elongation of annual grasses each year to remove the growing points of these species ; generally from October/November to May) ; and 4) set-stocking (ST) . The pasture was initially dominated by exotic unimproved annual species and perennial species were mostly Australian native grasses . Herbage accumulation (HA) was estimated by measuring pre-and post-grazing herbage mass (deferred grazing treatments) , or herbage mass in 3 randomly located pasture cages per plot (ST) from July 2005 to July 2006 . Samples from 30 toe cuts per plot were collected on a seasonal basis for nutritive value analysis . The samples were oven dried at 60℃ for 24 hours for lab test and mean nutritive values calculated over 4 seasons .

Results and discussion There were significant ($P<0.05$) differences in HA between treatments (Table 1) . Compared with ST , LSD increased HA by 67% , LD by 56% , and SD by 31% . There were also significant ($P<0.01$ or $P<0.05$) differences in nutritive characteristics (Table 1) . Overall , with few exceptions , deferred grazing treatments increased dry matter digestibility (DMD) and crude protein content (CP) , but reduced neutral detergent fibre (NDF) , in comparison with ST . The increases range from 2% ～13% for DMD and 10% ～30% for CP . SD and LD reduced NDF by 7% and 3% , respectively , but LSD did not , compared with ST . Major reasons for improved yield and nutritive value under deferred grazing were probably attributed to longer growing season , higher yield and better nutritive value of the perennial native species than the exotic annuals , which were observed and reported by Nie & Mitchell (2006) .

Table 1 *Herbage accumulation (HA , kg DM/ha) from July 2005-July 2006 and nutritive value : DMD-dry matter digestibility (%) ; CP-crude protein (%) ; and NDF-neutral detergent fibre (%) under various grazing regimes .*

Treatment	HA	DMD	CP	NDF
SD	3500	59 .1	12 .7	62 .0
LD	4141	56 .0	11 .1	64 .5
LSD	4433	53 .4	10 .8	66 .8
ST	2662	52 .2	9 .8	66 .5
s .e .m .	284 .5*	0 .95**	0 .30**	0 .89*

* $P<0.05$; ** $P<0.01$

Conclusions While various deferred grazing treatments improve the plant population density and groundcover by perennial pasture species (mostly Australian native species) in this marginal land class , they also have a positive impact on pasture yield and nutritive value . Deferred grazing could achieve both environmental and economical benefits for difficult landscapes such as steep hills .

Reference

Nie ZN , Mitchell M (2006) Managing and using native grasses (Chapter 11) . In ZN Nie and G Saul (Eds) : *Greener pastures for south west Victoria* . Victorian Department of Primary Industries , Hamilton . pp99-106 .