THE EFFECT OF GRAZING MANAGEMENT OPTIONS ON THE PERSISTENCE OF PERENNIAL RYEGRASS IN THE TEMPERATE WINTER RAINFALL ZONE OF SOUTHERN AUSTRALIA

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ABSTRACT
This study examined grazing management options on perennial ryegrass *(Lolium perenne)* based pastures to determine if perennial ryegrass could be increased in a degraded pasture, or maintained in a newly sown pasture. Study sites were at Hamilton and Cavendish, Victoria; Delamere, South Australia, and Ross and Parattah, Tasmania. Average rainfall is 500mm at Ross, 575mm at Parattah, 700mm at Hamilton, 650mm at Cavendish and 900mm at Delamere. At all sites, 8 core grazing management treatments were imposed, and up to 4 "local options." Changes in botanical composition indicate that grazing management can influence the amount of perennial ryegrass in the sward. Rotational grazing over autumn-winter, and additional fertilizer increased the ryegrass content at Hamilton, fodder conservation, and a November and autumn rest favoured ryegrass at Cavendish, whilst at Delamere, fodder conservation and a spell during autumn with increased grazing pressure during spring were beneficial. At Ross, no treatment favoured ryegrass, however several treatments were detrimental, including spelling over spring.

KEYWORDS
Grazing management, perennial ryegrass, botanical composition, sheep

INTRODUCTION
The quality of perennial grass based pastures of the temperate high rainfall zone (HRZ) of Southern Australia has declined. Overgrazing in summer and under-grazing in spring (MRC 1992) has been linked to the problem. Quigley (1991) reported that perennial grasses made up only 10% of western Victorian pastures, and less than half of the pastures had more than 20% legume in mid spring. Eighty percent of producers surveyed throughout the HRZ expect sown species to disappear within 10 years, with 40% believing this will occur within 5 years (MRC, 1994).

The study reported is part of a larger study (the Temperate Pasture Sustainability Key Program, MRC, 1992),and aims to determine if grazing strategies can be used to increase or maintain perennial ryegrass *(Lolium perenne)* in an old, or newly sown pasture, respectively.

METHODS
In 1993, 5 sites containing perennial ryegrass as one of the sown perennial grass species were selected, the legume component being either subterranean clover *(Trifolium subterranean)* or white clover *(Trifolium repens)*. The five sites were:

(i) **Delamere**, South Australia (a newly sown ryegrass/cocksfoot/ subclover pasture), mean rainfall 900mm - predominantly winter,

(ii) **Hamilton**, Victoria, (a degraded perennial ryegrass/subclover pasture), mean annual rainfall 750mm, predominantly winter.

(iii) **Cavendish**, 20km north of Hamilton, (a newly sown phalaris(Phalaris aquatica)/perennial ryegrass/subterranean clover pasture), mean annual rainfall 650mm, predominantly winter.

(iv) **Ross**, Tasmania, (a degraded ryegrass/subclover pasture) mean annual rainfall 500mm, Relatively evenly spread, but drier in summer.

(v) **Parattah**, Tasmania (newly sown perennial ryegrass/ cocksfoot(Dactylis glomerata)/ phalaris/ subclover and white clover pasture) mean annual rainfall 575mm, relatively evenly spread, but drier in summer.

At all sites eight core grazing treatments were imposed, using a communal grazing design, whereby all livestock had access to all treatments apart from when the treatment was imposed. The treatments were:- (i) continuously grazed (control), (ii) spelling in autumn (March-May), winter (June-August) (iii), spring (September-November) (iv), and (v) summer (December-February), (vi) increased grazing pressure in spring, (vii) fodder conservation and (viii) mob stock - rotationally grazed in autumn and winter. An additional four site specific local grazing treatments were also applied at all sites, these included, rotational grazing all year round (6 week spell, 2 week grazing), a spell in autumn with increased pressure in spring, a late summer - early autumn spell, additional fertilizer (an additional 16kg P, 20kg S), and a best bet system (spring closure until seed set, grazing, and then autumn closure to encourage seed germination).

Treatment plots were 15 x 20 m. Yield, percentage green and dry and botanical composition using the dry - weight rank (Botanal) technique (Haydock and Shaw, 1975) were recorded at 10 fixed points on a diagonal transect across each plot at six weekly intervals. Dry matter yield was determined using a falling plate meter (Cayley and Bird, 1991).

All sites were grazed with wethers at a base stocking rate of 12 dry sheep equivalent (DSE)/ha, 12DSE/ha, 7.0DSE, 7.5DSE and 8.5DSE/ ha for Hamilton, Cavendish, Ross, Parattah and Delamere respectively, increased during spring to simulate lambing.

A cubic smoothing spline was fitted using a mixed linear model to both compositional (Botanal %) and yield (kg/ha) data of each species (Gilmore pers com; Veryla et al., in prep). From the fitted spline a ìtî test was derived which was used to test whether individual treatments were significantly ($p<0.05$) different from the control. The data presented shows the significant upward (+) or downward (-) changes for the species shown compared to the continually grazed control.

RESULTS AND DISCUSSION
Of the core treatments (Table 1), the spring spell treatment decreased the percentage ryegrass content of the pasture at most sites, due mainly to an increase in annual weed grasses. Under utilisation of pastures in spring is considered to be a major cause of pasture decline (MRC, 1992). Fodder conservation at Cavendish and Delamere increased the percentage of ryegrass compared to continuous grazing because of a decrease in thistles, annual grasses and cocksfoot at Delamere, and a decrease in phalaris at Cavendish. However there was no increase in total yield of ryegrass compared to the control. At Parattah, fodder conservation was detrimental to the ryegrass, Probably due to decreased tillering. The summer spell at Parattah

also significantly decreased the ryegrass content, probably due to the increased competition of cocksfoot which benefited from this treatment. The only other core treatment that significantly benefited ryegrass was the autumn-winter mob-stocking at Hamilton. Spelling from grazing at the autumn break (the pasture was allowed to achieve a yield of approximately 2,000kg DM/ha prior to grazing) probably allowed the ryegrass plants to build up carbohydrate reserves and tillers, prior to grazing, whilst the heavier mob stocking decreased the onion grass content.

Of the local treatments, regimes involving autumn deferment at Delamere and Cavendish (best bet) increased ryegrass percentage. The deferment after the autumn break increased tillering, allowing the ryegrass to build up reserves prior to grazing, the increased grazing pressure in spring helped to decrease the competition from thistles and annual grasses, the late summer spell probably protected the ryegrass tillers from being over grazed, allowing higher carbohydrate reserves and increased tiller numbers to respond to the autumn break. The perennial ryegrass at Hamilton responded to the increased P and S, whilst this treatment decreased the onion grass content.

A number of treatments, both core and local, influenced perennial ryegrass content of the pastures, both in terms of decreasing or increasing competing species, and also in terms of protecting plant reserves, promoting tillering, allowing a quick response to autumn rainfall.

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Table 1

Treatment effects on perennial ryegrass at the various sites, showing significant "t" ($P < 0.05$; $t > 1.96$) values for either percentage composition and absolute yield ( ), all treatments are compared to the control. (ns = not significant)

	Cavendish	Hamilton	Delamere	Ross	Parattah
Core treatments					
Autumn spell	ns	ns	ns	-2.1	ns
Winter spell	ns	ns	ns	ns	ns
Spring spell	(-4.3)	ns	(-3.6)	-3.9	-3.7
Summer spell	ns	ns	ns	ns	-3.6 (-2.5)
Spring increase	ns	ns	ns	-2.3 (-3.5)	ns
Fodder conservation	+4.0	ns	+2.3	ns	-3.0 (-2.9)
Mob stock (autumn & winter)	ns	+2.1 (+3.0)	ns	ns	ns
Local treatments (na = not applicable)					
Increased fertilizer	na	+4.1 (+3.3)	na	na	na
Autumn defer + spring increase	na	na	+2.0	na	na
Late summer, + autumn defer	na	na	(+2.1)	na	na
Best-bet*	+4.9(+1.8)	na	na	ns	-2.0

*spring closure until seed set, grazing, and then autumn closure to encourage seed germination.