

Stocking rate affects soil moisture under pasture

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The competing effects of lower evapo-transpiration and lower infiltration rates with higher stocking rate (SR) on soil moisture found by Langlands and Bennett (1973), are likely to be complicated further after long-term grazing where botanical composition is also changed (Hutchinson 1992). This research examines the relationship between soil moisture tension and SR after long term grazing by sheep.

Methods

The experimental site is a 30 year grazing trial at CSIRO's "Chiswick" Pastoral Research Laboratory, Armidale, NSW. Soil moisture tension was measured using puncture-type tensiometers (Marthaler *et al.* 1983) when the soil was moist, and filter papers (Greacen *et al.* 1989) during dry periods at depths of 10 and 20 cm. Fortnightly measurements were taken between September 1993 and January 1995 – a period which included a severe drought – at four random sites in two replicate plots grazed at 0, 10, 15 and 20 sheep/ha.

Results and Discussion

At most measurement times, the upper 20 cm of soil under the lower SRs was wetter. However, after long, dry periods in winter and spring, there was still plant available moisture at the high SR (Table 1). During summer and autumn, the high SR was much drier possibly due to the dominance of summer growing plants in this pasture. Evaporation from the ungrazed pasture would be much lower due to the mulching effect of approximately 5 cm litter. In contrast, at the high SR, litter was minimal and this may also contribute to the drier soil moisture conditions at some times of the year.

Table 1. Soil moisture tension (kPa) for a range of SRs. The drier the soil, the higher the soil moisture tension: 10 kPa is field capacity, 1500 kPa is permanent wilting point. At the highest SR, the soil was driest after rain in summer, and yet soil moisture was still available after two weeks without rain in spring.

Date	17.2.1994		27.9.1994	
Prev. 7 day rainfall (mm)	43		0	
Prev. 14 days rainfall (mm)	57		0	
Depth (cm)	10	20	10	20
Stocking rate (DSE/ha)				
0	398	162	1500	1500
10	591	302	1500	1360
15	420	212	800	900
20	1000	446	720	728

Conclusion

The relationship between soil moisture and SR after long term grazing by sheep may depend not only on evapotranspiration and water infiltration rates, but also changes in the botanical composition of the pasture.

References

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