Pasture and soil effects of superphosphate under cell grazing management

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Abstract

The response of pasture to 250 kg/ha of superphosphate applied annually in a 12 paddock study area as part of a larger cell or time control grazing system on a commercial farm in the Lower Midlands of Tasmania was assessed over 4 years. Despite a series of dry years the fertiliser increased pasture growth by up to 45% in the spring. The proportion of clover in spring was also increased. Soil tests showed an increase in Olsen P but soil pH remained unchanged. These results and the farmers grazing charts indicate an advantage in pasture production and grazing days to the addition of superphosphate, by up to 30% increase in carrying capacity.

Keywords

Pasture growth, sheep, soil testing.

Introduction

Claims have been made that the requirement for fertiliser of grazing systems based on cell grazing (1) is reduced if this system of intensive grazing management is used (2). This project was developed to attempt to assess the response to applied single superphosphate (SSP) of pastures and animals under an existing sheep cell grazing unit.

Methods

The project was conducted on a private property in the Lower Midlands of Tasmania from April 1997 to December 2001 on a pasture of perennial ryegrass, cocksfoot, annual grasses and subterranean clover. The mean annual rainfall is 490mm and the soil-type a sandy loam. The area had been managed as part of a larger grazing cell of 140 ha for 3 years prior to the treatments being imposed. A 67 ha area divided into twelve paddocks was used for this work. No fertiliser had been applied to the area for 6 years before the autumn of 1997. The paddocks were allocated to 3 classes: 5 F paddocks which had fertiliser applied annually in early May with 250 kg/ha SSP: 5 unfertilised C (Control) paddocks and 2 T (Transitional) paddocks which were also unfertilised and used as part of the rotation when stock were to be grazed on the C paddocks to reduce nutrient transfer. All 12 paddocks received a base application of Cu, Mo, B and Zn at commencement. A flock of 1500 breeding Merino ewes were used to graze the area. Stock movements were managed by the farmer on the basis of herbage mass falling to 1000 kg DM/ha in any grazed paddock. Soil samples to 75 mm depth were taken at 3 marked locations on all paddocks before the treatments were imposed, and again each May before SSP application. Soil samples were analysed for pH (water) and Olsen P. Pasture growth was assessed by means of 4 cages in each of the F and C paddocks. Cages were moved at random after each assessment of pasture growth. At each assessment the contents of the cage were cut, the plant separated and dried for determination of dry matter yield and pasture composition. At the new site the pasture was cut to assess availability and the cage placed on a site of similar herbage mass. Statistical analysis (t test) was performed on paddock means. The farmer kept detailed paddock records of grazing days for each paddock and mainatined daily rainfall records.

Results and Discussion

The seasons were extremely dry as the area received only 70% of average rain in 1998 growing season and only 68% in 1999. Effects of fertiliser were only apparent in 2000 and 2001. Superphosphate application increased the P status of the soils under pasture (Table 1).

Table 1. Mean soil test results over time under cell grazing.

	Nil P		Plus P	
Date	$pH_{(water)}$	Olsen P (mg/kg)	$pH_{(water)}$	Olsen P (mg/kg)
May 1997	5.5	21	6.3	13
May 2000	5.5	13	5.9	22
May 2001	5.6	18	5.8 36The seasons were extremely dry	

Table 2. Mean pasture growth and growth rates for year 2000 and 2001.

	Growth (kgDM/ha)		Growth Rate (kgDM/ha/day)			
Date	Nil P	Plus P	Nil P	Plus P	Days	s.e.d (8df)
2000 - 18/5 to 5/9	1008	1138	9	10	110	0.8 n.s.
5/9 to 5/10	788	1079	26	36	30	2.5 *
5/10 to 14/11	908	1335	23	33	40	2.9 *
2001 – 1/4 to 2/8	1263	1152	10	9	122	0.9 n.s.
2/8 to 3/10	1400	1425	22	23	63	0.8 n.s.
3/10 to 5/11	1959	2237	59	68	33	3.0 *
5/11 to 23/11	407	331	23	18	18	2.5 n.s.

* P<0.05 n.s. not significant at P>0.05 for Growth Rate data.

In the spring of 2001 the proportion of clover was higher in the fertilised paddocks, (Table 3).

Table 3. Mean percent clover composition per treatment at each harvest in 2001.

Treatment	1 April	2 August	3 October	5 November	23 November
Nil P	7	14	6	17	15

Plus P	9	11	29	25	25
s.e.d. (8d.f)	1.0 n.s.	1.7 n.s.	2.4 *	2.5 *	2.6*

From farmer records the mean time spent per paddock was 26% higher for the fertilised area based on 12 months DSE/ha grazing days. The growth rate of the pasture with applied fertiliser was higher in the final two harvests of 2000 and in the third harvest of 2001 (Table 2). Olsen P levels were reasonably high on both treatments, but in any grazing system nutrients are removed in product and this should be replaced to maintain fertility.

Conclusions

The soil test results, the higher clover content, and the higher growth rate of the pasture in the treated paddocks indicate a response to applied superphosphate in these two years records. These results highlight that cell grazing can work better when some fertiliser is applied to maintain nutrients removed in products from grazing systems.

References

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