Pasture response to amelioration of exposed subsoils I

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Subsoil of red-brown earths in the Goulburn Valley is frequently exposed when landforming to improve irrigation layout. Such practice is known to reduce pasture production. Methods of restoring productivity are needed. This experiment studied several methods aimed at overcoming limits to productivity associated with soil water supply and soil fertility in exposed subsoil.

Methods

The experiment began in spring 1985 on an irrigated pasture (perennial ryegrass/white clover) that had been sown on an exposed subsoil with 4 t/ha of gypsum in 1982. Main plots were two irrigation frequencies (35 and 70 mm Evaporation - Rainfall) and subplots were a factorial arrangement of three soil treatments, control (subsoil ES), paraplowed (PP) and gypsum enriched slots (GS) (1), two rates of P (45, 180 kg/ha) and two rates of N (nil, 50 kg/ha/defoliation). Four harvests were made during summer (growth period 6.11.85-19.3.86), two during autumn-winter (20.3.86-28.8.86) and two during spring (29.8.86-4.11.86).

Results and discussion

Table 1. Effects of irrigation, soil and fertilizer treatments on pasture production (tDM/ha) with l.s.d.'s (P=0.05) in parentheses.

Treatment		Summer		Winter	Spring
Irrigation	35	5.11		2.06	5.54
	70	3.72 (1.08)		1.95 (n.s.)	5.49 (n.s.)
		I 35	I 70*		
Soil	ES	4.62	3.00	1.73	5.48
	PP	5.58	3.24 (0.93)	1.81 (0.18)	5.36 (0.22)
	GS	5.13	4.95	2.48	5.72
Phosphorus	45	4.34		1.84	5.38
	180	4.50 (n.s.)		2.17 (0.15)	5.65 (0.19)
Nitrogen	0	3.88		1.67	4.66
	50	4.95 (0.39)		2.35 (0.15)	6.37 (0.19)

* Interaction between soil treatment and irrigation frequency.

After an initial reduction in growth associated with applying the PP and GS treatments, pasture production of ES and PP soil treatments responded to frequent irrigation. The GS treatment did not respond to irrigation frequency. No irrigations were applied in autumn and winter with GS being more productive than ES and PP treatments in these periods. Increasing P application above the district rate (45 kg P/ha) increased winter and spring growth, with nitrogen use increasing productivity at all harvests.

The data shows the importance of increasing water supply and improving fertility, particularly nitrogen, on pasture productivity. The use of gypsum enriched slots as an amelioration technique on exposed subsoil combined with high rates of fertilizer can increase yield to approx. 80% of the 18 t DM/ha average yield reported for the Goulburn Valley.

1. 1. Jayawardane, N.S. and Blackwell, J. 1985. Aust. J. Soil R. 23, 481-92.