Using the GrassGro decision support tool to evaluate the response in grazing systems to pasture legume or a grass cultivar with improved nutritive value

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Keywords: cultivar evaluation, nutritive value, simulation

Introduction Decision support tools (DST) based on models of grazing systems allow the evaluation of changes in enterprise management on productivity and profitability. The Grassgro DST (Moore *et al*., 1997) uses historical weather data on a daily time step to simulate pasture growth and the resultant productivity of either grazing sheep or cattle. Different pasture species are represented within a parameter set that describes the response of pasture species to their environment. Manipulation of these parameters provides a means of evaluating, *a priori*, the likely responses of livestock production to 'improved cultivars'. We report the results of simulations conducted within grazing enterprises at three locations in southern Australia: a breeding ewe enterprise at Benalla; a wool-producing enterprise at Hamilton; and a beef breeding enterprise at Corryong.

Materials and methods All simulations were conducted using GrassGro and daily weather data for the above locations for the period 1957-1996. Simulated pastures contained either an unimproved grass cultivar, with or without legume (UC+, UC-) or an improved cultivar with or without legume (IC+, IC-), each grazed at five stocking rates (SR). The legume was subterranean clover. The legume content of the pasture was predicted by the simulations. The 'improved' cultivar was generated by altering parameters for the rate of pasture digestibility decline over summer so that IC herbage was 3-4% more digestible than UC herbage during summer. All results were evaluated by expressing enterprise gross margins/ha relative to that obtained at the lowest SR, with UC-.

Results Predicted enterprise gross margins responded in curvilinear fashion to increases in SR (Figure 1; Table 1). The higher summer digestibility of the IC- resulted in marked increases in gross margin. However, the advantage of having legume in the pasture was always much greater than the advantage of having the IC (e.g. Table 1, column 5 v. column 4). The results also indicated that the IC and especially the legume allowed increases in enterprise SR. Simulations based on IC+ suggested that there was little or no advantage relative to having legume alone, partly because the IC no longer made up all of the sward, but also because the legume helped to fill gaps in digestible pasture supply from UC grass.

Table 1 Relative gross margins/ha in response to SR, grass cultivar and legume for sheep enterprises in Australia

Location	SR/ha	Cultivar (UC, IC), legume status (±)			
		UC, -	IC, -	UC, +	IC, +
Benalla	5.0	1.00	1.12	1.39	1.37
	7.5	1.49	1.73	2.08	2.13
	10.0	1.81	2.19	2.7	2.78
	12.5	1.83	2.35	3.03	3.13
	15.0	1.48	2.15	2.96	3.18
Hamilton	5.0	1.00	1.5	1.92	1.68
	7.5	1.66	2.59	3.28	2.98
	10.0	1.58	3.04	4.36	4.24
	12.5	0.61	2.51	4.68	4.57
	15.0	-1.44	1.11	3.14	3.09

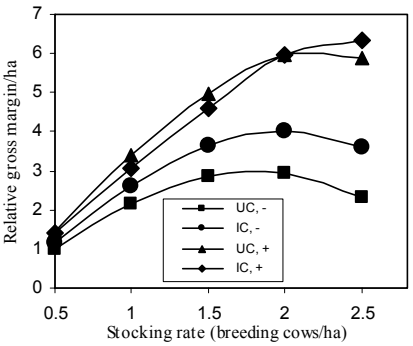

Figure 1 Relative gross margins/ha for a beef breeding enterprise in Corryong, Australia

Conclusions The use of the GrassGro DST allowed evaluation of the relative effects of either an 'improved' grass cultivar or legume inclusion on the long-term profitability of the chosen enterprises. In all systems, the presence of legume was more important than improved grass digestibility over summer and the combination of legume and IC grass was no more profitable in the long term than legume alone. The use of such DST is thus a powerful tool for making *a priori* comparisons of the profitability of different plant breeding and management objectives.

References

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