Stocking Rate Theory and Profit Drivers in North Australian Rangeland Grazing Enterprises

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Introduction Setting correct stock numbers is a key decision for successful pastoralism. In marginal environments, typified by northern Australia, this involves careful cattle herd management across landscapes and seasons characterised by heterogeneous land condition and extreme climatic uncertainty. Stocking rate theory which links animal production to stocking rates concentrates only on liveweight gain of sale animals and ignores complex herd (e.g. reproduction, mortality) and pasture dynamics (e.g. land condition) and costs of maintaining stock numbers (e.g. supplementary feeding). Related economic models are generally naïve and incomplete, being based on liveweight gain, meat prices and variable husbandry costs (e.g. Workman, 1986). Modelling approaches, which simulate whole herds (including breeding animals) with dynamic links between animal numbers, pasture availability, management effort and profits are more realistic. This paper explores the economic implications of changing stocking rates, animal production and management effort in the form of supplementary feeding.

Methods Modelling is used to examine the relationship between stocking rates, land condition, animal production and net profit for a 28,000 ha farm in Queensland. A pasture simulator was linked to an economic herd model (MacLeod *et al.,* 2004) for 3 levels of stocking rate, 10.0, 6.7, and 5.0 ha/adult equivalent (AE) and 2 land conditions (State 1 = Perennial grasses dominated by digestible tussock spp.; State 2: Perennial-annual grasses dominated by less digestible perennial grasses, annual grasses and forbs) for 100 simulations. If annual liveweight gain of animals fell below a threshold (<50kg/animal), supplementary feeding (8% urea:molasses) is imposed, consistent with local practice.

Results While average number of stock carried is similar between States 1 and 2, highest profit per animal is at the lowest stocking rate for the State 2 pasture (Table 1). Profit per hectare is highest at the highest stocking rate for State 1 pasture and almost the same as for the lowest stocking rate for State 2. Although mean branding rates are similar for between land classes, and decline with stocking rate, the ability of the herd to self-replace breeding cows declines, and is more difficult for State 2 land. Feeding costs per hectare are much higher for State 2 pasture for a given stocking rate, contributing to the rapid decline in profitability as stocking rate increases.

Table 1 Mean values of stock carried, net profit and feeding costs from 100-year simulation

	State 1			State 2		
Stocking rate (ha/AE)	10.0	6.7	5.0	10.0	6.7	5.0
Total stock carried (AE)	2948	4429	5922	3014	4425	5922
Net profit/AE ($AU)	35	34	26	50	21	-15
Net profit/ha ($AU)	3.7	5.3	5.5	5.4	3.3	-3.3
Branding rate (calves branded/100 breeders mated)	68	64	60	72	66	59
Proportion of years that heifer calves are insufficient to maintain current herd size (%)	10	22	26	14	28	39
Feeding costs/ha ($AU)	0.4	1.7	3.5	1.7	5.1	12.5
Proportion of years that net profit is negative (%)	22	23	21	19	29	40

Conclusions Profitability is co-determined by stocking rate and land condition. While total stock carried is similar between land classes, moderately degraded pastures can yield profits similar to good condition pastures, but only at lower stocking rates. Profitability is the interplay of herd management (especially reproduction efficiency and feeding costs), climatic patterns and land condition. Stocking rates based on a less than complete understanding of the complex relationship between herd dynamics, climate and pasture response can be misleading.

References

MacLeod, N.D., A.A. Ash & J.G. McIvor (2004). An economic assessment of the impact of grazing land condition on livestock performance in tropical woodlands. *Rangeland Journal,* 26, 49-71.
Workman, J.P. (1986). *Range Economics*, Macmillan Publishing, New York.