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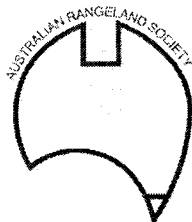
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STOCKING RATES AND SHEEP PRODUCTION IN FAR WESTERN NSW

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With the notable exception of Morrissey and O'Connor(1) objective animal production data from commercial properties in the semi-arid rangelands is rarely available. Consequently many assumptions are made about the nature of wool and lamb production in semi-arid environments. This often results in simplistic conclusions about the effects of stocking rates and the options available to managers for improving the productivity of their flocks.

I have analysed historical production records from 12 properties in the Broken Hill area. There are large differences between properties in average stocking rates and year to year variation in stock numbers (see Table 1). However, annual within property variation in woolcuts per head is generally independent of short-term changes in stocking rates. Rainfall accounts for 50-70% of the annual variation in woolcuts on most properties whether they are in good or poor condition, lightly or heavily stocked or on chenopod or mulga landsystems. This relationship is a non-linear function of the form:

$$y = a \exp(-b/x) \quad \text{where } y = \text{wool/head, } x = \text{rainfall}$$

This function was significant on 64% of the properties.

**Table 1.** Property stocking rate and production averages.

	Landtype	ha/DSE	Wool/ha	Wool/hd	Lambing %
a	Saltbush	4.3 (24)	1.1 (23)	6.5 (10)	87 (33)
b	Saltbush	4.0 (9)	1.0 (16)	6.4 (12)	76 (18)
c	Mulga	8.5 (83)	0.8 (53)	7.1 (13)	77 (28)
d	Saltbush	3.4 (26)	1.2 (25)	6.0 (14)	90 (12)
e	Saltbush	4.2 (21)	1.0 (29)	6.1 (15)	67 (31)
f	Bluebush	4.5 (21)	1.1 (19)	6.4 (19)	82 (31)
g	Mulga	3.3 (15)	1.4 (19)	6.7 (8)	82 (18)
h	Saltbush	4.4 (52)	1.0 (37)	5.6 (20)	72 (14)
k	Mixed	3.5 (26)	1.2 (25)	6.2 (16)	63 (40)
m	Saltbush	3.3 (53)	-	-	81 (18)
n	Saltbush	5.1 (15)	0.9 (23)	6.5 (20)	89 (17)
o	Saltbush	3.6 (21)	1.2 (14)	6.8 (6)	67 (33)

\* value in brackets=coefficient of variation.

Relationships between stocking rates and wool production at the property level vary with circumstance. Property 'h' has average longterm stocking rates but high (53%) year to year variation in numbers. It also shows a significant positive relationship between stocking rate and woolcuts per head. During the 1982/83 drought stock numbers were reduced primarily through losses and woolcuts dropped significantly (6.4 to 4.0 kg/hd). Better seasons since then have lifted wool cuts (7.3 kg) and flock numbers. Property 'b' has average stocking rates and low year to year variation (9%) yet woolcuts show a significant negative response to stocking rate. These effects were dependant on rainfall. However, on property (k), stocked at least 25% above the sample average, stocking rate alone had a significant negative impact on woolcuts per head, accounting for 22% of the annual variation.

Lamb marking percentages were analysed against three monthly rainfall periods from 12 months prior to joining up to the lambing and lactation period of the ewe. Half of the properties analysed showed significant relationships with rainfall for the periods between joining and when ewes had young lambs at foot. The significance varied but accounted for up to 63% of the observed annual variation (property 'b'). On all properties showing no relationship between lamb marking percentage and rainfall both longterm stocking rates and year to year variation in numbers were average or above average. This suggests that a threshold level of nutrition of the ewe and/or rams needs to be reached before improving seasonal conditions can be expressed in more lambs being marked.

#### DISCUSSION

The effect of rainfall, stocking rate and pasture condition on animal production through short-term limitations of available forage and longterm changes in pasture biomass and composition are well recognised (2). However, in semi-arid environments these effects may vary in direction and magnitude. At the stocking rates typical in this area significant effects are seen only at the extremes of management. That is, for relationships between animal production and management to be significant particular criteria of rainfall, stocking rate and pasture condition need to be met (3). The relationships between the variables across these various criteria appear not to be constant.

The "state-and-transition" model of Westoby et.al. (4) provides a framework for understanding ecological processes in semi-arid environments. The same framework may be as important to our understanding of animal productivity and management options for improving that productivity.

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