THE EFFECT OF STOCKING RATE ON BREEDER PRODUCTIVITY IN THE VICTORIA RIVER DISTRICT

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Abstract

Preliminary results of field trials held in the Victoria River District over the past five years indicate stocking rate appears to be the primary determinant of breeder herd productivity in this area. Branding rates reduce and cow mortalities increase as stocking rate increases. The turnoff per square kilometre peaks at a low stocking rate and then rapidly decreases.

Introduction

Cattle rearing in the Victoria River District (VRD) has traditionally operated under a system of minimal management. Some weaning and heifer segregation has been practiced but most properties cull very few heifers. Consequently the female turnoff in these areas is very low. Historically stocking rates have only been considered by researchers and the Lands Department whose recommendations were felt, by most producers, to be far too low.

The Relationship between Stocking Rates and Production

The relationship between stocking rates and productivity has been extensively studied in temperate and subtropical areas. Jones *et al* (1981) considered stocking rate to be the major management variable influencing animal production and pasture stability.

Reductions in liveweight gains of cattle as stocking rate increases has been widely documented (Conway 1963, Bement 1969, Delgado and Alfonso 1974, Harrington and Pratchett 1974, Winks *et al* 1974, Chestnutt 1984, Walker *et al* 1987). It appears that at very low stocking rates there is a plateau in weight gains as animals are at maximum growth unrestricted by nutrition. Then, as selectivity decreases, lower quality pasture needs to be consumed and weight gains reduce (Shaw & 't Mannetje 1970). As numbers increase further pasture quantity is reduced too and gains can reduce at a greater rate (Walker 1980).

However, Norman and Phillips (1970) found no significant difference in weight gains of shorthorn steers grazing Townsville stylo in the wet season at three different stocking rates. They concluded that the experimental stocking rates had not reached the level where weight gain was effected.

Another problem with increased stocking rates could be smaller, slower growing calves as has been observed in sheep by Russel and Blackburn (1973) and Donnelly *et al* (1985). They found that lamb weights decreased as stocking rate increased but weight of dressed lamb per hectare reached a peak at an intermediate stocking rate and then dropped.

Some increase in stocking rates does increase the weight gain per hectare (Delgado & Alfonso 1974, Harrington & Pratchett 1974). However, as the rate continued to increase, per hectare gains levelled off and then reduced (Mears 1973, Mears & Humphreys 1974, Walker 1980).

Another factor that needs to be considered is the different value of different types of turnoff cattle (Bement 1969). Lower stocking rates will enable higher weight gains and, consequently, younger turnoff with a possible price premium. Walker *et al.* (1987) found it also increased dressing percentages because of greater fatness.

The effect of stocking rates on fertility was recorded by Axelsen *et al* (1972) on a *Phalaris*/subterranean clover pasture at a research station near Canberra. They ran two groups of Aberdeen Angus cows at stocking rates of $2.16ha^{-1}$ and $1.08ha^{-1}$ over two seasons. The average calving rates were 67% and 86% respectively. The difference was more pronounced in the drier year. In between the two seasons there was a drought year when the higher stocking rate could not be maintained. This year was not used in the analysis.

Weaning weights were lower in the high stocking groups. Furthermore one of these cows died of malnutrition and the cows in this group were fed more supplements. The difference between groups would probably have been more pronounced in the absence of differential supplementation. A similar relationship between stocking rate and fertility was reported by Hart *et al* (1988).

Other researchers, however, found no relationship between stocking rates and fertility (Gunn *et al* 1991).

Very heavy stocking results in severe overgrazing, loss of pasture quality and changes in botanical composition (Shaw and 't Mannetje 1970) that can change the carrying capacity of the area. In drought years, where survival depends on utilisation of dry grass buildup from past years, the consequences can be disastrous (Shaw and 't Mannetje 1970).

However the definition of overgrazing is open to debate. Wilson and Macleod (1991) define the occurrence of overgrazing as a point where a loss of linearity in the animal production versus stocking rate relationship will be observed. This occurs as pasture species are lost and the productivity of the area diminishes. If there is no change in the basic linearity of the relationship over time, the pasture has not been "overgrazed". Though animal productivity may be low because the stocking rate is higher than optimum there is no definite evidence of permanent pasture damage.

Materials and Methods

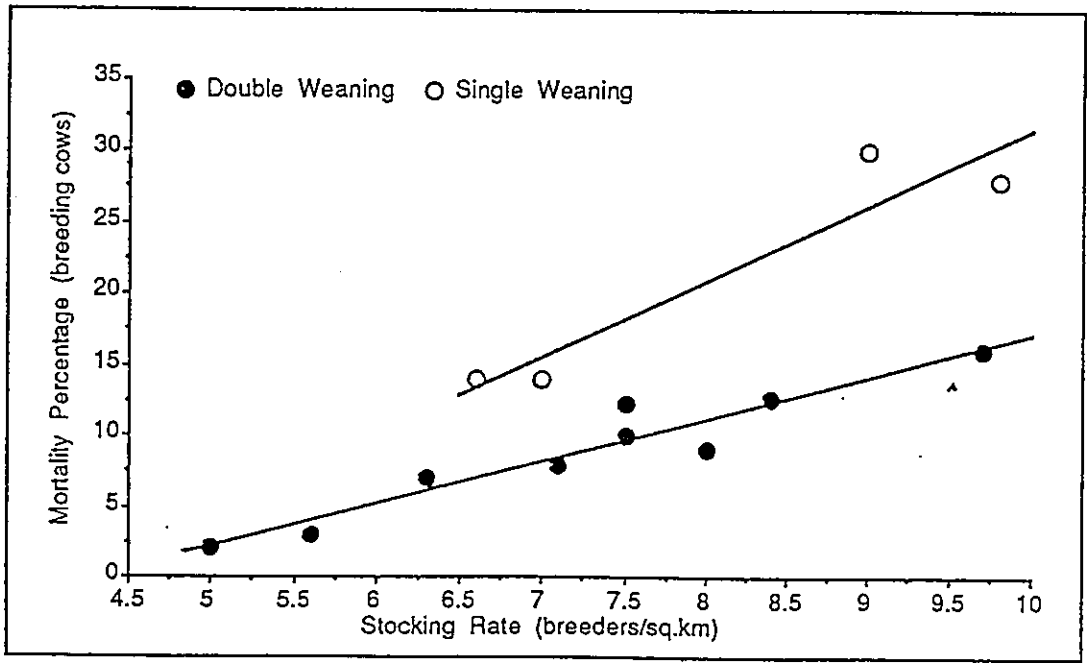
Six herds on four commercial properties in the VRD were studied for two to four years. Data was collected annually or biennially depending on the property's mustering program. As well the averages of data from two herds on Kidman Springs Research Station and another commercial property (McCool and Perkins unpub.) were used. The paddocks were a mix of black and red soils and ranged from the monsoonal tall-grass areas of the northern VRD to Flinders/Mitchell grass plains and river country in the southern VRD.

Mortalities were calculated as the number of tagged breeders missing over the yearly period. Weaning percentage was calculated as the number of weaners removed as a percentage of the number of cows in the paddock at the time of mustering.

Results

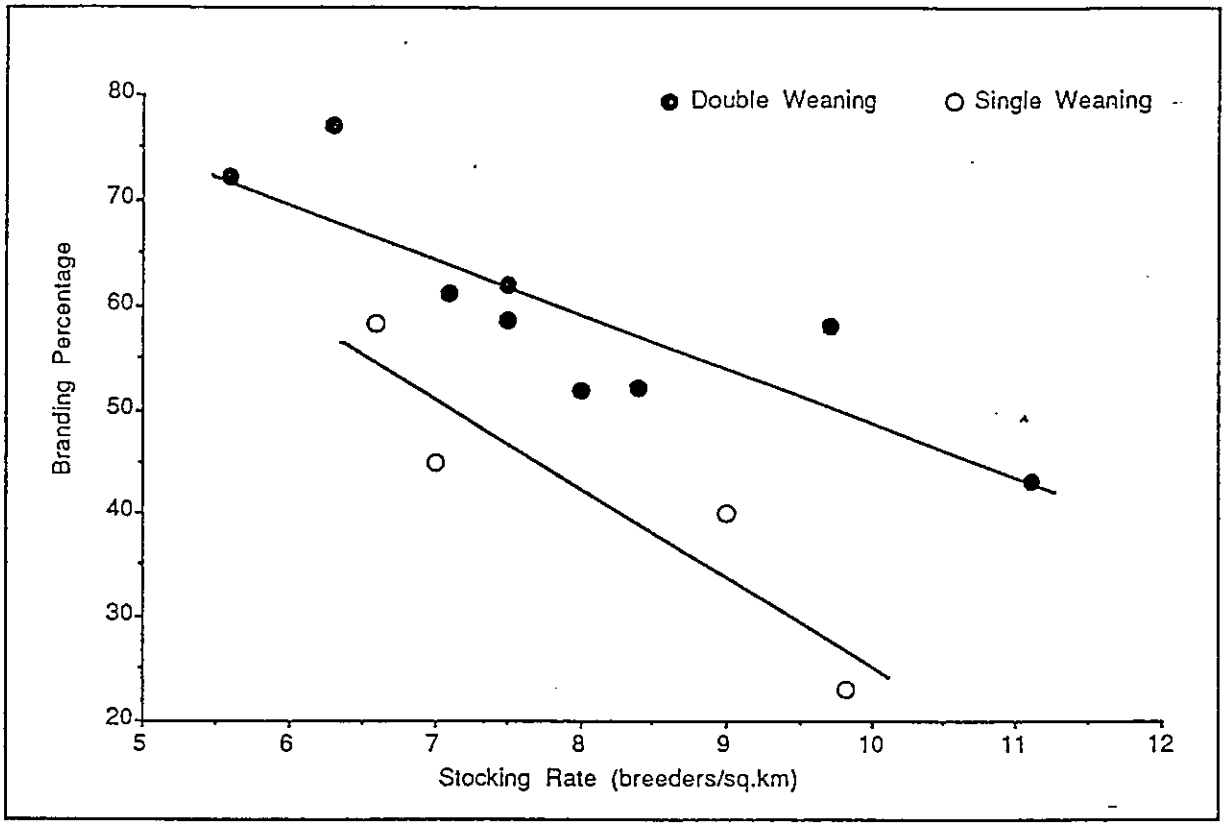
Breeder mortality was strongly related to increasing stocking rate (see Figure 1). For groups of cattle that were weaned twice yearly the linear regression was significant at p=0.0001. For single mustered groups the linear regression coefficient was significant at p=0.05.

FIG 1. STOCKING RATE vs COW MORTALITY



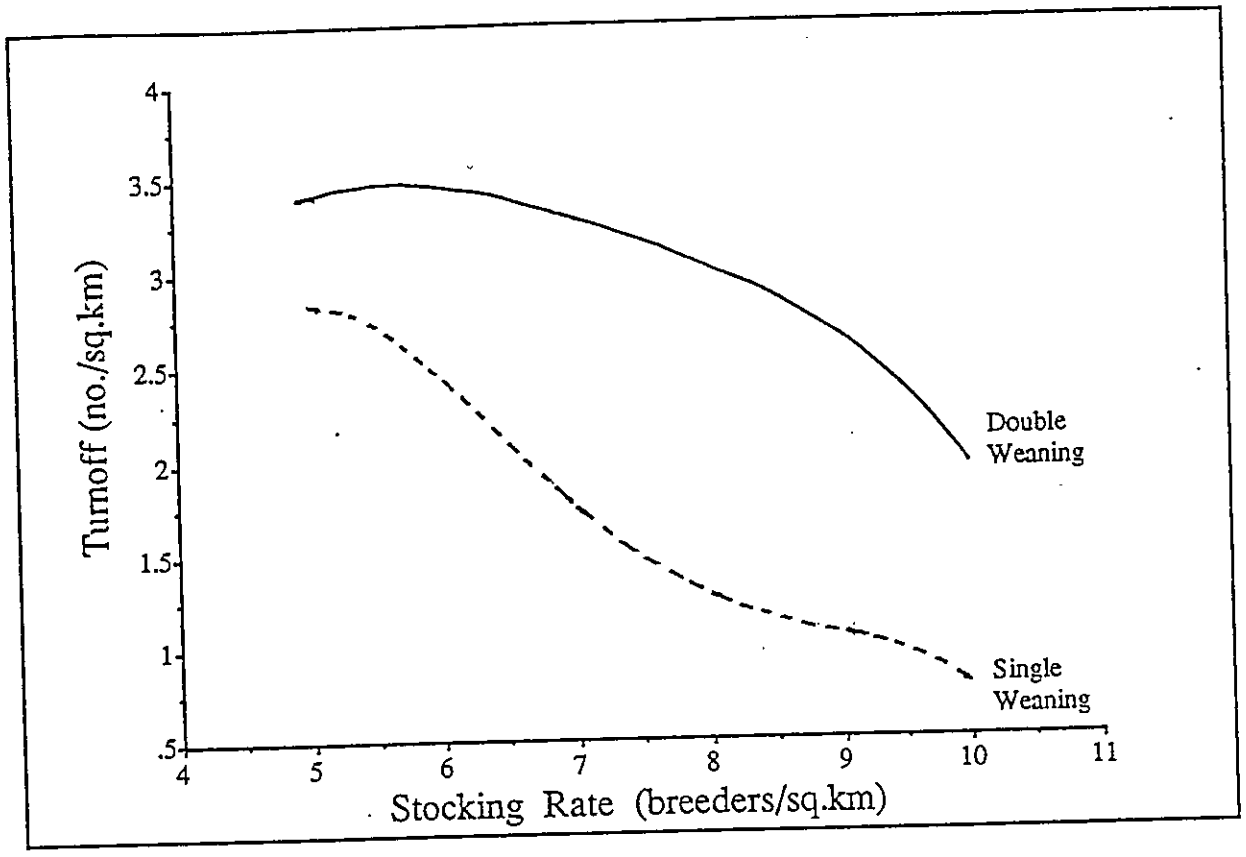
There was an inverse relationship between branding percentage and stocking rate (see Figure 2). For double weaned groups p=0.0035 and for single weaned groups p=0.08. Branding was done at weaning in these groups so the two are synonymous.

FIG 2. STOCKING RATE vs BRANDING PERCENTAGE



The relationship between stocking rate and turnoff is shown in Figure 3. This was calculated from the regression lines for stocking rate versus weaning and mortality. For the comparison weaners were given a three percent annual mortality till turnoff two years later.

FIG 3. A MODEL OF STOCKING RATE vs TURNOFF



Discussion

The effect of stocking rate on animal production has been widely documented. Most of these papers have observed weight gain changes though a few saw variations in reproductive rates. There were no published records of a relationship between stocking rate and mortality, probably because few experimental herds were allowed to experience the level of breeder deaths necessary to show the effects of extreme stocking rates. Where deaths could have occurred the animals were removed or supplemented before the lack of feed became critical (Axelson *et al* 1992, Walker 1980).

Traditionally, stocking rates in the VRD have been determined somewhat arbitrarily. This approach has sometimes led to situations where animals are stocked to the point where they cannot be economically supported. In this area pastoralist perceptions of breeder mortality have been far lower than the mortality figures that have been seen in field trials. Pastoralists surveyed by the GRM questionnaire (Anon 1987) estimated an average mortality of 7.1%. However McCool and Perkins (unpub.), over two below average seasons in the northern VRD, recorded mean annual breeder mortalities of 22.9%, 35.4% and 51.4% in brahmans, crossbreds and shorthorns respectively. Comparable results have been found in adjoining regions. A mortality of 47% was reported for lactating shorthorn cows in the Kimberley (Armstrong *et al* 1968). Stockwell and Norton (1990) found 10-25% mortalities in crossbred breeders on the Sturt plateau.

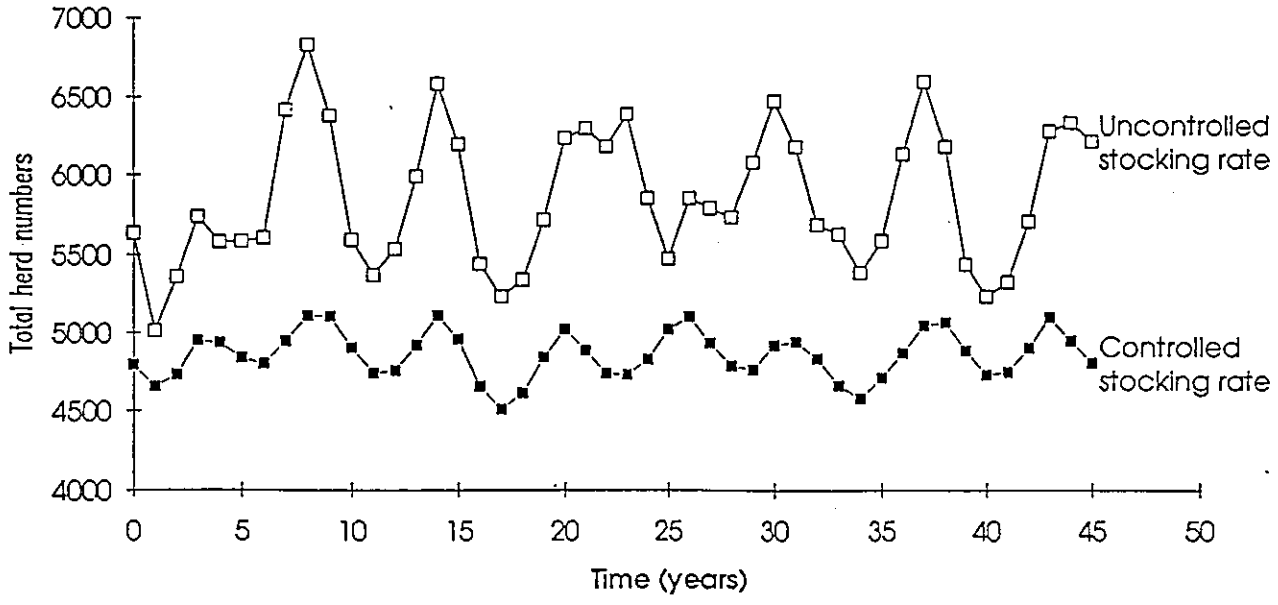
Many pastoralists have felt that their branding percentages have been too low to provide adequate profits. They have then attempted to increase the number of calves weaned by increasing their cow number. This has continued to the point where few properties turn off any heifers and some properties are buying females in a vain attempt to become viable.

Another factor that has increased the overstocking problem has been the increase in brahman content of the district's herd. Brahman cattle have better reproductive and survival rates under poor conditions than cattle of British breeds (Holroyd *et al* 1979, McCool and Perkins unpub.). Where numbers are not controlled this has led to unprecedented demands on the pasture resource. Consequently the full potential benefit of increased turnoff, because of the brahman's improved productivity, has not been realised.

The nett result of this is that cow numbers have been allowed to rise to a point where an equilibrium is maintained by cow deaths and heifer introductions. As animals die and are moved between paddocks the stocking rates in different areas vary from year to year with corresponding changes in mortalities and branding rates. The effects of high stocking are exacerbated by a poor season.

Figure 4 shows a Rangepack Herdecon (Stafford Smith and Foran 1988) simulation of changes in numbers under a system of no heifer turnoff compared to a system where numbers are stabilised. The herd with a controlled stocking rate produced a higher annual cash surplus with far less fluctuations than the herd with no control over numbers or stocking rates. The controlled stocking option produced a 33% higher running cash surplus over forty years even though they ran, on average, 40% fewer breeders (Jayawardhana and Zuill 1992).

Fig 4. Comparison of herd number fluctuations.



The solution to these problems appears to be the use of lowered stocking rates for optimum production. Stockwell *et al* (1991) felt reduced stocking rate was the key and over-riding principle for viable production from a sustainable pasture resource. This can only be achieved by increasing female turnoff. Pastoralists need to think more in terms of maximising turnoff for increased viability rather than maximising the property's cattle number.

The following issues also need to be considered:

- Reducing stocking rates to a sustainable and profitable level should be recommended before programs such as supplement feeding are implemented. Unfortunately pastoralists sometimes tend to think of supplements as an expensive but necessary panacea for all problems.

- Annual female turnoff of cull cows and heifers should equal about 65-75% of the female weaner number. This should maintain cow numbers at a level where production is optimized. Properties with a low female turn off and no corresponding increase in breeders cannot be operating efficiently.

- Humane heifer speying and live export should be encouraged. An effective, humane and economic method of speying is urgently required. Markets need to be found for store speyed heifers to reduce the problem of having to carry large numbers of these animals through to fattening. It is vital that excess heifers are turned off early as their retention appreciably increases property stocking rates with consequent production loss.

- The turnoff of fat, dry cows should be encouraged. Even though these are mostly pregnant they tend to calve out of season and also contain the infertile animals and lazy breeders.

Conclusion

The effect of stocking rate on breeder production appears to be of overwhelming importance. The maintenance of realistic stocking rates by female turn off should increase property viability and profitability while promoting sustainable agriculture.

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