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I HAD THE RIGHT NUMBER OF SHEEP, BUT THE WRONG AMOUNT OF RAIN

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ABSTRACT

Pastoral managers who over-estimate the chance of good rainfall are likely to carry too many livestock and retain them too long into a dry period. By having an overly optimistic, rather than realistic, view of rainfall pastoralists lose their ability to critically judge their stocking decisions against their rainfall environment. This is particularly the case in arid environments where average rainfall is low and variability high.

INTRODUCTION

Perhaps the most important set of operational decisions a pastoral manager can make are those that *"get the stocking rate right"*. The penalties for getting it wrong affect both financial and environmental outcomes and can have long-term, permanent impacts on the viability of the pastoral enterprise. Getting the stocking rate right relies on matching animal numbers to land capability in the medium to long term and to feed availability in the short to medium term. The task is not easy. High variability in rainfall, particularly in arid rangelands, means that it is not possible to settle on a single, definitive carrying capacity. Even the concept of "carrying capacity" in such rangelands is seen to be unhelpful (Stafford Smith 1996).

Pastoral managers make stocking rate decisions based on a number of factors. One of the most important of these is an estimate of the amount of rainfall that will be received between one stocking decision and the next (note: this is not based on a forecast, but on historical records). How well the estimate of rainfall is made will depend on how accurate is each manager's perception of the rainfall environment for their station. If that perception is inaccurate, because it is overly optimistic, then when the time comes to review the stocking rate decisions they will be reviewed against unrealistic expectations of rainfall. Poor stocking decisions will be justified by considering the rainfall atypical, rather than considering that stock numbers were too high.

RAINFALL REALITIES AND PERCEPTIONS

Rainfall from Cue (27.43°S, 117.88°E) was used as an example in this paper. The records were generated from the Silo climate surfaces (http://www.nrme.qld.gov.au/silo/) for the period 1895 to 2004. They give an average (i.e. mean) of 223 mm and a median of 201 mm. While the proportion of winter (May-Oct) to summer (Nov-Apr) rainfall was close to 50:50, the coefficient of variation for winter was 51.6 and that for summer was 77.6. The characteristics outlined below are typical for most of the southern rangelands of Western Australia. Winter provides the most reliable rainfall, with good summer rain in a minority of years.

Dry conditions can persist for a long time

Between February 1948 and February 1975, a period of 27 years, Cue did not receive a rainfall event over 100 mm (an event was defined as a period of consecutive wet days, broken by a day in which no rain fell, Stafford Smith and Morton 1990). Over ten years have passed between events of at least 50 mm and almost three years between events of at least 25 mm. There have been five occasions in Cue's 109 year rainfall history when more than two years passed between events of more than 25 mm and four occasions when more than five years passed between events of at least 50 mm.

The longest sequence of below average rainfall was seven years from 1935 to 1941. To compound this, 14 of the next 18 years were also below the mean giving an extended sequence from 1935 through to 1959, in which only four of 25 years exceeded the mean.

Asymmetry of dry and wet conditions

There are more dry years than wet years. For the 109 year record at Cue there have been 62 years above average and 47 years below average. That is, there are 32% more years below average than above.

It takes a lot of dry years to even out the wet ones. For example, a total of 481 mm above average fell at Cue during the consecutive summers of 1998/1999 and 1999/2000. This is equivalent to just over four years of summer rainfall. Assuming the long-term average doesn't alter it will take four years of zero summer rain, or eight years of half average summer rain (and so on) to even out the two very good years.

Management perceptions

Inaccurate perceptions of the rainfall environment are manifested in several ways. If the potential for prolonged dry periods isn't well understood then a succession of poor stocking decisions will be made on the basis that *"We haven't had a good year for a while now, so we are bound to get a good year this time"*. If wet summers are considered typical, then gambling on summer rain becomes a frequent management decision because *"We haven't had the summers we should be getting"*. This leads to an excess of livestock being carried into the driest part of the year. If the asymmetry of rainfall is not well understood then for every year below average received, a year above average will be expected.

The period in which a manager "learnt the trade" can also affect perceptions of the rainfall environment. If a manager's formative years included an atypically wet period, often a sequence of good summer rain, then this may come to be considered "normal". Stocking rate decisions based on these "normal" years will invariably be too high, with the risk that the low rainfall will be considered the cause of having more stock than feed, rather than the cause being an inaccurate perception of the chance of good rain.

Sequences of good seasons tend to recalibrate carrying capacities upwards in the minds of many managers. At Cue, the period from 1992 to 2001 saw seven out of ten years above average. While high numbers of livestock could comfortably be carried during such a period, there is a risk that stocking rates will be permanently recalibrated upwards.

CONCLUSIONS

Judging the number of stock to put into a paddock is not easy and from time to time the wrong decision will be made. However, it is important that when stocking rate decisions are reviewed, as part of a learning cycle, they are reviewed against realistic chances of rainfall and not optimistic perceptions.

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