FOREWORD

GRAZING MANAGEMENT

A.D. Wilson

'Cal Col', Deniliquin, NSW 2710

The management of grazing on our rangelands is a complex task that most landholders undertake on the basis of their experience. Science has made many contributions to the understanding of grazing, but currently offers few recommendations on managing pastures other than generalities, such as that one should not 'overgraze'. The dilemma is that the landholder must balance the competing demands of the livestock and of the health of the pasture, which essentially represent trade-offs between the present and the future.

The optimum strategy for any one time is difficult to discern, partly because of these long and short-term trade-offs, but also because of interactions with economic outcomes and sociological factors, and the confusing effect of rainfall variability. When variability is high the lessons learnt from last year, or the year before that, are unlikely to be applicable to the current year. With this combination of complexity and variability, it is perhaps not surprising that research on this topic has so far led to much knowledge about grazing management, but apparently little practical scientific advice.

Nevertheless, I perceive that this might be about to change. Climate variability is now being accepted as a major driving force in rangeland management and explicitly addressed. And the complexity of the landscape, the production system, the ecosystem and people's economic overlay, is at least being encompassed, if not understood, through the power of the computer. The ability of the advanced decision support systems to combine information from a whole range of sources, such as land system maps, models of biological processes and expert experience, into aids to decision making, is indeed awesome. The recognition of the importance of social values in determining the best grazing system and that landholders themselves have an important part to play in developing best systems, is also a valuable advance in methodology.

It is this new world of grazing management that has, in part, been captured in this special issue on grazing management. An Editor is limited in scope by the papers that are offered and by those that can be prepared within the deadlines imposed by publication. There were many more papers than those presented here that were outlined in abstract, but did not reach the deadline. It is hoped that the Journal will be able to publish some of these in future. Each will have its value, although not with the collective force arising from the synergy of the special issue.

Each of the papers is there to be read as an individual contribution of merit. All of them are based on sound science and each has a message for the reader. But in addition, they have a wider value when viewed together. Each reader might see a different message, arising from their different situations and interests. I offer here the message that they conveyed to me.

The most prominent theme is that of setting the correct stocking rate, on both a long-term and on an immediate tactical basis. Heitschmidt and Walker introduce this theme in its theoretical framework of grazing tactics to control the severity and frequency of defoliation. They, and others, note the problem of setting this correctly when forage production is continually changing. Getting animal numbers right is the big issue and the big problem. Several authors present the value of setting this conservatively, although what conservative might be is left open to doubt, with terms such as 'moderate' and 'light' still predominating. Since one can be too 'light' just as easily as too 'heavy', the search is really for the 'optimum'. However, all these terms are value laden. We would all aspire to be 'moderate', but what is this in terms of actual stock numbers or utilization levels? Ash and Stafford Smith question the value of the standard research method of assessing such an optimum through the analysis of linear equations and instead propose the use of models for this purpose. Johnston and his colleagues do just that and present an objective, albeit static, model based on estimated forage growth and desirable utilization levels. Such an approach has been questioned in the literature, because of the vagueness with which the correct utilization rate can be assessed. However, Johnston is able to mute such criticism by fine tuning the results through reference to practical outcomes on well run properties. Such an approach is difficult to fault, given that these properties represent the collective wisdom of many landholders who have conducted some very long-term grazing trials!

Johnston's 'safe' carrying capacities represent long-term strategic target stock numbers. In the short-term, these numbers might need to be reduced to meet current circumstances. Buxton and Stafford Smith present the results of modelling exercises on the class of animals that might be most profitably retained when drought destocking is necessary. Landsberg and Stol introduce another related issue: that of animal distribution and competition with native and feral herbivores. These other herbivores contribute up to half the grazing pressure in some regions and are clearly an important component of overgrazing that is occurring there, lifting the overall total grazing pressure to about double that of the recommended 'safe' rate. Johnston notes that the inclusion of these competing herbivores in his equations is a refinement that must be added in the future. In one sense it is included already, in that the recommended 'safe' carrying capacity has been set against a background of some unknown level of forage consumption by other herbivores across the research sites and on the reference properties. It is nonetheless important that these other components of utilization be assessed directly and included explicitly in any equations. Ultimately their spatial distribution might also be included in decision making and all controlled in number, whether sheep, goats or kangaroos. The impact of overgrazing from any one of these, whilst not identical, is remarkably similar.

A second major theme is that of climate variability. Several of the papers, including those of Buxton and Stafford Smith, and Ash and Stafford Smith, indicate that climate variability is not just an additional factor to be considered: it is one of the basic driving forces in the arid rangelands. Buxton and Stafford Smith's modelling over long runs of years show how such variability impacts on the correct choice of stock numbers. Contrary to conventional wisdom, lower stocking strategies can improve economic returns because the improved biological rates in the poor and bad years can more than make up for the lower incomes in the better years.

The two papers on the use of resting and grazing strategies for improving the proportion of perennial grasses in pastures, come from higher rainfall pasture research. Dowling and colleagues show that perennial herbaceous species of the central NSW are encouraged by resting from grazing during active growth and by a conservative stocking policy, whilst Earl and Jones show that a more intense graze/rest system known as cell grazing can also lead to an increase in the biomass and cover of palatable perennial grasses and clovers. It would be easy to discount these results as being a special case of higher rainfall pastures, but I think it would be a mistake to do so. There is sufficient evidence available now to suggest that perennial grasses do benefit from rest on either a regular or strategic basis, regardless of whether the rainfall is high or low.

In the present papers the authors disagree on whether the rest need be strategic (one season) or year round. In fact these papers represent two sides of a large division between schools of thought on grazing management, which we cannot resolve in this issue. The authors do not discuss the interaction between system and grassland structure, but my expectation is that each system (and other combinations of grazing and resting) will be found appropriate for different types of grassland. Perhaps both systems will be found to be equally right, since no evidence is yet available to show that 97% rest (cell grazing) produces a different result to 25% rest (strategic grazing).

The present papers address impacts on botanical composition and present no information on the impacts of these systems on livestock production. Changes in botanical composition do not necessarily translate through into production gains and there are other impacts of the system itself on animal performance which can influence the economic outcome. A useful discussion on these issues may be found in the chapter by Heitschmidt and Taylor (1991). The strategic approach is the more appealing in the long-term because it has the potential to combine the animal production advantages of continuous grazing with the ecological advantages of pasture resting. Readers should also be reminded that no system is complete until it accounts for the interaction with stocking rate.

A further enduring theme in these papers is the importance of sociological systems and values. I have in the past thought of grazing management as a matter of hard science. That it should be possible to analyse the relationship between animal performance and pasture availability, determine the impact of grazers on pasture plants, model the outcomes and devise the optimum grazing strategy! However, the optimum is clearly a sociological function, as well as a biological one. Heitschmidt and Walker are the first to introduce this theme and are bold enough to conclude that the question of ecologically sustainability depends on human values, not science! In their view, a particular stocking strategy might be considered best simply because it delivers a high standing crop of forage that is more socially acceptable to the community at large.

On the same theme, Watson and his colleagues argue the need to recognize the mental models we hold and the power they exert on our action in both science and management. They reason strongly for the importance of 'continuous management' where managers obtain practice in making decisions (about stocking rate and fire, etc) by doing it regularly. The paradigm of episodic management, where special decisions on grazing or other management might only be taken when rainfall or other climatic events occur that are of a low frequency, has been one of the principal planks of rangeland theory over the last 10 years. Watson reasons that this is wrong. His initial reasons are that this is wrong biologically, for he is able to show the degree of continuous change in the plant populations of grazed lands at various stocking rates. His more compelling reasons are sociological. Landholders need to practise making decisions on a regular basis if they are to learn by experience.

The final theme in these papers is the application of new technology. Heitschmidt and Walker mention their belief in the likely influence of new technology in their overview paper, although they find it difficult to predict the course of this influence with any confidence. The paper from Bellamy and her colleagues shows that one such technological influence will be the computer, with its ability to integrate information from a wide range of sources into useful conclusions on the management of a large cattle station. Thus for the first time there is a tool to predict the outcomes for both production and environmental risk from a wide range of management options. Moreover, the output is visual (on the screen), which will surely be worth the output of a thousand printed tables.

These developments, taken together, suggest that we are at last finding the answer to that elusive question: what is an optimum grazing strategy for each rangeland type. This is notwithstanding the conclusion that the optimum is partly a sociological concept involving trade-offs between production, economics, risk of environmental damage and human values. Science and technology seem destined yet to conquer the complexity of optimum grazing management strategies for our rangelands.

Reference

Heitschmidt, R.K. and Taylor C.A. (1991). Livestock production. *In:* Grazing management: an ecological perspective. (Eds R.K. Heitschmidt and J.W. Stuth). Timber Press, Portland.