

or table for each page. This enhances the visual appearance of the book and avoids having to read lengthy and unbroken slabs of text. There are over 900 references; quite a few from 1988, an odd one from 1989 and I even noted one from 1990. These references will be very useful to readers who wish to follow up particular points. Although most of the references are from Australian studies, there is a reasonable coverage of published information from Asia, Africa and South America.

This book is a must for all libraries, large or small, where there is an interest in tropical pastures. I would also suggest that individual scientists with a strong interest in the grazing of tropical pastures seriously consider buying one for their own use.

R.M. Jones

Ecosystems of the World

Vol. 17A Managed Grasslands — Regional Studies

A.I. Brey Meyer (ed) 398 pp. Published 1990.

Vol. 17B Managed Grasslands — Analytical Studies

R.W. Snaydon (ed) 286 pp. Published 1987.

Available from: Elsevier Science Publishers
P.O. Box 330, 1000AH Amsterdam, The Netherlands or P.O. Box 882, Madison Square Station, New York, NY 10159, USA

Price: Vol. 17A US\$194.25/Dfl. 340.00

Vol. 17B US\$146.25/Dfl. 300.00

These two volumes are complementary in that Volume 17A is a review of managed grasslands of temperate areas while Volume 17B deals with ecological and physiological processes occurring in those grasslands. However, the temperate grasslands of Australia and New Zealand are covered in Volume 17B rather than 17A. There is little discussion of the managed grasslands of North America.

The absence of a major effort to include the experience of ecologists and physiologists working with improved or managed tropical grasslands will be disappointing to those in the tropics. There are now several texts published on the management of tropical grasslands, in addition to a very large number of scientific articles. Mention of

tropical aspects of grassland do occur in Volume 17A in the chapter on the grasslands of South Africa and in that on seasonally flooded savannas in Venezuela. Nevertheless, there is sufficient of interest to workers in the tropics to warrant these books being made accessible through libraries.

Volume 17A consists of 13 chapters grouped into three sections. The first section gives examples of managed grasslands in Great Britain, Spain, the Central Massif in France, South Africa, Japan and northern Patagonia in Argentina. These chapters are essentially descriptive but with the various authors emphasising different aspects of the grasslands in those countries. That on Great Britain gives a historical perspective but also mentions that grassland is only one component of a feeding system that also relies on inputs of supplementary feed. The chapter on Spain describes the complexity that has developed through the evolution of different husbandry systems in the various parts of the country. An ecological perspective is developed in describing the grasslands in the upland areas of France, particularly with respect to nutrient cycling and biological activity. The chapter on South Africa is quite comprehensive and would be a good introduction for those interested in the grasslands of that country. That on Japan is a good introduction to the native grassland but does not do justice to the improved grassland research and practices in that country. In contrast, the chapter on Patagonia would be of immediate interest to many pasture workers in northern Australia as it specifically deals with structural and dynamic characteristics of overgrazed grasslands.

The next section in Volume 17A gives examples of strong human impact on grasslands. The chapter on the creation of seasonally flooded savannas by the use of dykes in Venezuela should be of interest to all those who have been involved in developing and promoting ponded pastures. Following a primitive method used by the local population more than a hundred years ago, some 300,000 ha have now been modified by the use of dykes. Details are given of species adapted to various degrees of flooding. It was interesting to note that *Hymenachne amplexicaulis* and other grasses of the deeply flooded areas are C₃ grasses. The other chapters on grasslands on peat soils and turfgrasses in temperate humid climates will be of minor interest to those in the tropics. It was surprising to see that the impact of heavy use of

fertilizers on grasslands was not included in this section. However, some mention is made of this topic in the next section of the book.

The final section in Volume 17A on a 'Search for Synthesis' is disappointing. There is one chapter on changes in structure and function of grasslands under the influence of man which might well have been in the previous section. A second chapter, managed grasslands and ecological experience, addresses questions of the limits to productivity, geographic diversity of ecosystems, additions of nutrients and industrial pollution. Some new material is introduced on the high productivity of tropical pastures, but there is no attempt to seriously confront the ecological consequences of the issues raised. These issues are discussed briefly in the final chapter on the future role for grassland. However, perhaps the most important point made in this chapter is that the high energy wastage involved in animal production from managed temperate grassland makes it vulnerable to being used for alternative uses.

The second volume, 17B, 'Analytical Studies' has been well planned and is developed in a logical manner. It consists of 26 chapters divided into four sections. The first section of the book deals with primary productivity, that is, the pasture, the next with secondary productivity, or the animal product, the third with nutrient cycling, while the final section deals with economic management. The authors are well known scientists from Australia, New Zealand and Great Britain and it is the work from these countries that is in the main part reviewed in this volume.

In an introductory chapter, the point is made that effective management of ecosystems, whether they be for agriculture or conservation, depends on an understanding of the ecological processes that occur within them. In contrast, empirical management is usually site specific, and often season specific, and can only be modified by trial and error. However, there is a case for applied studies which aim to increase knowledge at a relevant level of organisation rather than for fundamental studies at a lower level of organisation which cannot be incorporated into appropriate models or management systems.

In the first section, chapters on productivity in the more humid temperate grasslands as opposed to the Mediterranean and semi-arid grasslands set the scene for others on physiological aspects of pasture growth, effects of nitrogen fertilizer and defoliation, botanical composition and modelling

pasture growth. Production from beef and dairy cattle, sheep and other domestic animals, grazing behaviour, plant factors affecting uptake, minerals and supplements, and reproduction are topics covered in the second section. The topics in these two sections are treated with brevity, but in general with care and diligence to published information. They provide a comprehensive overview of most aspects of grassland and animal production. Some principles implied in the concluding remarks in the chapter on modelling could well apply to anyone who is working within the overall production system, namely, it is suggested the modeller needs to keep a sense of proportion, remember that processes do not operate in isolation and should work with others to produce standard, well-documented and efficiently coded packages!

Nutrient cycling, the third section, is treated in more detail than other topics in the book. This probably reflects the bias towards temperate pastures in the humid zone where nutrients are more limiting than moisture. Fertilizer is a key management tool and an expensive one. Pasture quality is said to be more strongly related to fertilizer use/soil fertility than to pasture composition. Nevertheless, it is a timely reminder for all pasture agronomists that soil fertility can play a major role in most grassland ecosystems even if there is not much scope for management. Topics covered in this section include nitrogen and phosphorus cycling, return of nutrients by animals, nitrogen fixation, nitrogen losses, and run-off and drainage from grassland catchments.

The final section deals with economic considerations in grassland management, including interactions with stocking rate and fertilizer input rather than the more integrated concept of 'systems management' as implied in the section heading. However, it is a useful section in that it stresses the need for an economic appraisal in addition to a biological understanding of production. The deficiency is that it deals with components of the production process on the farm rather than the farm as a whole. There is a final chapter on herbage conservation and supplements. This is a little dated as in one of the few references in the book to tropical areas, there is a lack of awareness that 'mimosine' toxicity in leucaena can now be circumvented.

This book, Volume 17B, should accomplish its main objective in convincing readers that a knowledge of component processes in the overall

production process will facilitate rational management decisions. Secondly, it is a sound presentation of most processes involved in animal production from managed grasslands. This aspect will be useful both for the specialist who wishes to become familiar with other aspects of the production process than he or she is involved with and for the generalist who is interested in the synthesis of existing knowledge. Thirdly, there is the inference that techniques used to elucidate processes in managed (or sown) grasslands might be

adapted for studies of processes in natural ecosystems.

In summary, of the two books, Volume 17B 'Managed Grasslands — Analytical Approaches', would prove most useful to lecturers, students and researchers in tropical countries. However, the first Volume 17A — 'Managed Grasslands — Regional Studies', does contain relevant chapters on degradation and 'ponded' pastures.

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