

it is due to Norris in the bacteriological field together with thorough nutritional studies of others that tropical legumes are being rightly judged as important suppliers of nitrogen—the stuff that makes pastures produce animal products.

P. W. Michael deals with the weeds of grasslands in all important areas of Australia. It is a pity that the troublesome *Imperata cylindrica* does not rate a mention in his well written review. This weed is mentioned by D. F. Paton and W. J. Hosking as a weed in wet temperate areas, whereas it is perhaps a greater problem in degenerate pastures on the Atherton Tableland and along the warm east coast generally.

The ruminants get their share of the book in a chapter on mineral nutrition by I. W. McDonald and one on disorders due to plants by A. W. H. Braden and I. W. McDonald. In the latter a large part is devoted to the important aspect of oestrogenic activity of pasture legumes.

In the penultimate chapter W. M. Willoughby discusses the once controversial subject of grassland management. Controversy raged when Australian workers found that continuous grazing of indigenous grasslands and of subclover based pastures gave the same animal production as various systems of deferred and rotational grazing. In contrast European and New Zealand workers had been—and still are—advocating rotational grazing to make better use of pasture growth. Recent investigations appear to lead to the conclusion that rotational grazing gives benefits in animal production only when very high stocking rates are used and where an essential pasture component, e.g. lucerne, will be eliminated unless rotational grazing is practised. It is no fault of Willoughby's that he does not discuss grazing management of tropical pastures. The fact is that very little work has been done in Australia on the effect of grazing systems on animal production where the new tropical species are being used.

Finally, F. H. G. Gruen required only 11 pages to give a well documented and readable account of the major livestock industries. However, a few more pages on the early history of Australian pastoral industries would have been welcome in a book of this nature.

Grassland science encompasses a very broad field and incorporates many disciplines. It would, therefore, be easy to point to fields of interest not covered or not given enough space. One of these is the physiology of grassland plants. Another criticism that could be raised is that there is quite an amount of repetition; e.g. the Townsville stylo story is recounted several times. However, this is unavoidable with so many authors and the job of editing would have been impossible. It is unfortunate that many of the photographs are too dark.

The book is very appropriately dedicated to the late Dr. J. Griffiths Davies, who has contributed more to grassland science in Australia than any man.

L. 't MANNETJE

Grassland Improvement by A. T. Semple. Plant Science Monographs—Leonard Hill Books, London 1970. 399 pp. Price \$21.35.

These monographs are intended to give up-to-date "accounts of the entire background and current progress in their fields", and to serve as a basis for further advances. They claim to be fully documented. As such, they must surely be directed primarily to research workers. If this is so, the book is disappointing.

It is easily and clearly written, well illustrated with six figures and 127 black and white photographs, very well produced, well indexed, and remarkably free of errors; my chief criticism is that the book is unbalanced, somewhat superficial, not sufficiently up-to-date, and expensive.

This book is a greatly enlarged successor to the author's earlier work "Improving the World's Grasslands", 1951, and its purpose is "to show how present grasslands

can be made to produce livestock products with maximum efficiency and also show how some now unproductive areas can be converted into productive grazing lands" (Foreword by Dr. Ralph W. Phillips). The author has tried to place "more emphasis on the problems of improving tropical pasture than those of the temperate regions" and this aim would appeal to readers of Tropical Grasslands.

Chapters deal with the history of grasslands, kinds, areas, components, nutritive value, trees and shrubs, arid and semi-arid lands, management in humid areas, seeding and fertilizing, irrigated and wet lands, weeds, pests and diseases, livestock behaviour and management, silage and hay, national programmes, and the need for more research.

The author has tried to cover too much ground and this of necessity results in some scrappiness. He could, to advantage, have omitted the components of grasslands, the last two chapters and appendix II, and expanded elsewhere.

Regrettably, the emphasis in the book is directed to grassland practice rather than to improvement, and to the Americas far more than other regions. Australian readers will be disappointed that although Australia is represented 34 times in the index, one looks in vain for references to so many well known research workers who have made substantial contributions in recent years both in temperate and in tropical pasture work. For example, under fertilizer use, in which Australia is a leader in research, the only Australian references are 1946 and 1958 and deal almost exclusively with South Australia. The most recent reference to work on oestrogens in Australia is 1951, the only reference to the toxicity problem with *Indigofera spicata* is a 1952 Hawaiian paper. There is no real understanding of the place of mulga in Australia. Although mimosine is mentioned in connection with *Leucaena*, there is no reference to Queensland work. There are only three passing references to Townsville stylo. Any reader might wonder at three pages devoted to lichens and only two to *Rhizobium*. The effects of applying nitrogen occupies two pages but the latest reference is 1961. These are indications of my disappointment that the book does not meet the objectives stated earlier.

The author has drawn heavily on his own wide experiences and contacts. Much of the book is interesting and there are many items from out of the way places that the author knows from first hand.

Although the book is packed with detail, much of the information is given as factual rather than as illustrating principles, and as a guide to pasture improvement it tends to leave one up in the air.

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