

Book review

Competition and Succession in Pastures

Edited by PHILIP G. TOW and ALEC LAZENBY. Published by CAB International Publishing (Wallingford: New York), 2001. 322 pp. Price £65 sterling.

Competition and Succession in Pastures is a quality CAB publication with hard cover, glossy pages and a layout that is user friendly, comprising 15 chapters and 322 pages. The first and fifteenth chapters are written by the editors of the book, Philip Tow and Alec Lazenby, veterans of university teaching in plant ecology, agronomy and agriculture in Australia. The remaining 13 chapters are written by academics and agency researchers from the UK, Canada, New Zealand, Norway, Indonesia and Australia, working mainly with temperate pastures.

The objectives of the book are multi-faceted and well defined in a Preface written by the editors. These include:

- Reviewing the research on the subject.
- Providing an understanding of how competition and succession operate in natural and sown pastures and the practical significance of these to ecology and pastoral agriculture.
- Demonstrating how competition in pastures interacts with environmental and biological factors.
- Demonstrating how competition and succession may be regulated to optimise sustainable production.
- Identifying how the concepts may be measured.

However, it is somewhat a paradox that this review is being written for *Tropical Grasslands* as there is almost nothing reviewed of competition between plants in tropical and subtropical pastures. For the book to be given its encompassing title, this seems an oversight.

Each review is detailed and comprehensive, and is written with characteristic academic style. In meeting the objectives of the book, the focus can be lost in the prejudices of each reviewing author. For example, each places his or her interpretation on the definition of competition. Is competition simply the result of interactions by plants, or should competition (in the sense of the title of the book) be influenced by environmental and biotic factors? As an agronomist, I favour the latter interpretation, which encompasses the

influence of grazing. Pure scientists may disagree. There is an excellent chapter entitled 'Competition between Grasses and Legumes in Established Pastures'. This is limited by its focus on only ryegrass-clover pastures.

The first chapter, written by the editing authors, defines the concepts of competition and succession and suggests that a better understanding of them may assist in further preventing the degradation in natural and sown pastures.

The following 13 review chapters deal with measurement, G × E regulation of competitiveness, competition between pasture plants and implications for management, diversity and stability, population dynamics, formulation of mixtures, effects of competition and management on composition, effects of global climate change on competition and succession, the effects of grazing and environmental stresses on the competitiveness of pasture components, and a simulation in which the profitability and sustainability of a crop/pasture rotation is determined by competition between herbicide-resistant ryegrass and the crop.

These are excellent reviews, each with a conclusion identifying the strengths and weaknesses of that component of the science. For example, competitive studies have focused mainly on measuring the effects of competition on growth, reproduction and survival of plants. In the future, identifying the mechanisms of competition at the molecular level is seen as a major challenge and likely to facilitate the greatest progress in plant selection *viz.* the better selection of genotypes for coexistence. In this, the competitive capacity of grasses and the significance of underground organs deserve particular focus.

The complexity of grass-legume competition and the significance and difficulty of managing mixtures have been highlighted — influenced by the soil N level, the architecture of the components, the effectiveness of the *Rhizobium* in the complex, and grazing management. Yet, a very good case is presented for sowing pastures with greater species diversity than the traditional 'grass plus one or two legume' mixtures. This, in turn, demands a scientifically-based formulation of appropriate mixtures, which is currently poorly researched.

There is an excellent chapter on legume ley pasture dynamics, which highlights the new challenges, and the current lack of solutions to ley legume performance induced by the increased cropping frequency and management changes in cropping systems. Such changes have resulted in increasing use of herbicides and the advent of herbicide-resistant weeds *e.g.* ryegrass, that compete with the crop (wheat) and thereby affect the profitability of the enterprise.

The value of understanding the processes that control change in pasture composition *e.g.* fire, grazing, fertiliser application, disturbance and the pivotal role of N, are emphasised. Although it is predicted that both C₄ grasses and legumes have future competitive advantages due to global climate change, it is emphasised that we cannot yet provide the specifications to optimise competitive outcomes in pastures because of uncertainty in the direction of such climate change. There is thus a need for ongoing research and the use of evolving models.

The complexity of the restoration of degraded pasture through the management of nutrients, the provision of appropriate propagules and the management of this renewed resource by appropriate defoliation practices, demands a better understanding of these processes relative to the objective.

The editors have distilled an excellent summary statement as the final chapter of the book although it may have better 'rounded out' the topic, if it had directly addressed each of the objectives listed. Generally, both the reviewers and editors recommend targeted ongoing

research into competition and succession in pastures, albeit temperate pastures. A plea is made, yet again, to fund genuine long-term research that enables competition and succession in pastoral systems to be better tested and understood. The editors conclude that abiotic factors, particularly rainfall and temperature, and their interaction with soil attributes, are the main determinants in the competitiveness and succession of species in native pastures. On the other hand, they argue that it is human interference *e.g.* species introduced, fertiliser applied and grazing management, that determine the competitiveness and succession of 'improved' pastures. Following the past decade of subtropical drought, we are inclined to argue that rainfall has been the overriding factor for all!

Despite veiled criticisms, the book is an excellent, contemporary addition to the literature on plant competition and succession. The font size is small but the layout in two columns with ample space between headings and well-selected line spacing makes for easy reading. Pages have been sensitively created, ensuring that there are no two facing pages without heading breaks. Graphs, tables and photos are clear and easily read.

This book will be an outstanding reference for students and a stimulus for future studies by basic and applied pasture scientists. However, it is not designed for practical agriculturalists, the farmers and graziers. The retail price for the book is £65 sterling. Therefore, students are likely to source the book in libraries.

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