Journal of Agricultural Science, Cambridge (1997), **129**, 243–248. *Printed in the United Kingdom*

Book reviews

Rice Research in Asia: Progress and Priorities, eds R. E. Evenson, R. W. Herdt & M. Hossain. xi+418 pp. Wallingford: CAB International (1996). £55.00 or $99.00 (hardback). ISBN 0 85198 997 7.

This book is a timely addition to the literature of the rice industry, which has an important place in the future of feeding the world, a place nicely sketched by Hossain in Chapter 2. The supply of rice in Asia will be a large and important element of the world food situation in coming decades, and rice research will surely be a vital component of the success in meeting the needed supplies. The contributions in this book are predicated on the notion that, since research resources are scarce, it is important that they be applied effectively and efficiently in seeking to realise the required contribution.

The 26 authors of the mainly multi-authored 23 chapters are mostly connected in some past or recent way with the International Rice Research Institute (IRRI), the associate publisher of the book, and/or with the Rockefeller Foundation, important both in the founding of IRRI and in its support for recent efforts in the field of modern biology applied to rice improvement. The work is organized in four parts: I, Background and Methods; II, Country Studies; III, Crop-Loss Studies; and IV, Priority-Setting Applications. It has been attractively published, although some of the editing is annoyingly careless – my gripes included use of the wrong preposition in the full statement of the Consultative Group on International Agricultural Research, inconsistent (and thus often redundant) use of the definite article before 'IRRI' a missing 'L' in Bernoulli, and the occasional treatment of 'data' as a singular noun.

It is claimed on the jacket that the work will be of interest to rice-research scientists, as well as research planners and administrators. The former are probably already fairly familiar with the IRRI work on yield gaps (Chapter 1, by the editors) and on categorization of rice ecosystems (Garrity *et al*., Chapter 3), with Khush's ideas for ideotypes for increasing yield potential (Chapter 3), with crop-loss assessment issues raised by Teng & Revilla (Chapter 16) and with the weed science priorities perceived by Moody (Chapter 17). They may be less familiar with the recent assessment of yield loss due to drought, cold and submergence (Dey & Upadhyaya in Chapter 18) and the impact of rice blast in China (Shen & Lin, Chapter 20). They are bound to be much less familiar with either the country constraint studies of Part II (India, China, Bangladesh, Nepal, Thailand, the Philippines and Indonesia) and the work on the priority-setting methods of Evenson (Chapters 5, 6, 21 and 22), so for such readers (and probably also the already mentioned planners and administrators) it is to these sections that we must look primarily for the novelty and worth of the book.

The country-specific syntheses (and in the case of India, three major regional syntheses) should prove generally useful in contemporary rice-research policy work. Whether the priority-setting chapters will prove to have such popularity and appreciation will depend on the tolerance of readers for a fair dose of algebra and optimization theory in the introduction to the economic principles outlined by Evenson, but the effort made by rice researchers and planners should be well rewarded, illustrated as it is by direct application to a major rice-research budget-allocation problem facing the Rockefeller Foundation. They may, in fact, be rather heartened by the emphasis Evenson gives to the conveniently simple 'congruence rule' of research allocation, wherein effort is allocated across research problem areas (RPAs in this book) in proportion to the value of production in the corresponding research domains. If, however, potential readers are keen to have a detailed treatment of conceptual and empirical approaches to research resource allocation, they may do better to look to another recent book, by Alston, Norton & Pardey (1995), as is implicitly suggested by the present editors in their Preface (p. x),

All actively concerned with rice research should have access to this book, as it is bound to influence in a positive manner the attainment of greater efficiency in the much-needed future endeavour in this field. It is thus to be hoped that the resource-strapped rice-research institutions of Asia will somehow (perhaps once more with the help of the Rockefeller Foundation) gain such access for their research workers and their administrators.

JOCK R. ANDERSON

REFERENCE

Alston, J. M., Norton, G. W. & Pardey, P. G. (1995). *Science Under Scarcity: Principles and Practice for Agricultural Research Evaluation and Priority Setting*. Ithaca: Cornell University Press.

Beyond Silent Spring: Integrated Pest Management and Chemical Safety, by H. F. VAN EMDEN & D. B. PEAKALL. xviii + 322 pp. London: Chapman & Hall (1996). £24.99 (paperback).
ISBN 0 412 72810 9.

The book is one of several taking a view, more than 30 years later, of some of the issues discussed in Rachel Carson's *Silent Spring*. This silent spring has not yet appeared, nor is it likely to do so. Although Carson's book incorporated many fallacious arguments, it undoubtedly had a major impact on attitudes to pest control worldwide and, indeed, many believe that it so alerted us to the dangers that we have introduced sufficient controls to avoid such an eventuality.

Beyond Silent Spring is based on published findings and is the product of two authors who are authorities in this area and are also personally responsible for contributing to the science base for developing Integrated Pest Management as an alternative to the approaches decried by Carson. The book reads as a coherent work consisting of nine main chapters, with an extensive account of the 'Principles of IPM'. These chapters comprise a valuable, and largely successful, attempt to show objectively how the various components fit into such practices; they include, together with biological and behavioural control and host plant resistance, the use of chemical toxicants within integrated management strategies. Good coverage is provided for issues relating specifically to the 'developing countries', with case studies of particular crops and their insect pests.

My only criticism of this book relates mainly to the first chapter, 'The world of chemicals', in which rather more credibility is given to possible human health problems arising from pesticide deployment than is justified by the evidence available. Nonetheless, the extensive controls currently applied to the release of pesticides are dealt with in a manner that clearly demonstrates the efforts, often greater than are objectively necessary, being made to minimize the very low risks to human health and the environment that may be associated with such materials. Some may feel that there is an inappropriate bias towards insect control, but I believe this to be justified, since our common membership of the Animal Kingdom raises, more pressingly, the possibility of problems in human health.

The book, although definitely benefiting from its joint authorship, arose from a workshop held in 1992 in Kenya, entitled 'IPM and Beyond *Silent Spring*', and thus from the various contributions to the meeting. Although the book was not published until 1996, through, I understand, no fault of the authors, it remains topical and has an overall balance that is a credit to the authors. It is most informative and is to be recommended for those striving to understand and to improve crop protection.

J. A. PICKETT

Production and Improvement of Crops for Drylands, ed. U. S. GUPTA. x + 449 pp. Lebanon, USA: Science Publishers (1995). $88.00 (hardback).
ISBN 1 886106 17 7.

When *Physiological Aspects of Dryland Farming*, edited by U. S. Gupta, was first published in 1975, it became one of the principal books for physiologists, agronomists and other researchers in agriculture, as well as for students of crops and soil science. Since then, the understanding of problems of dryland farming has been improved by several new research findings. This book, as an update of the previous book, covers all the topics with more than half of the references published after 1975, showing the significance of problems in dryland farming and the effort expended in finding solutions to them.

Since the chapters were written independently by different contributors, the topics overlap to some extent. However, I believe this is a sign of the importance of the physiological aspects, which have a direct relationship with the problems of dryland crop production. Water is the most important limiting factor in crop production and water-use efficiency has to be maximized by the choice of crops, varieties and management practices in these areas.

The comprehensive chapter on the physiological principles of dryland crop production aims at improving the understanding of relationship between climatic factors and crop yield; the topics covered include evapotranspiration, water stress and the relationship between yield and moisture supply, crop productivity and physiology of yield, crop improvement for efficient water use, breeding objectives and management practices for increasing yields, and improving the water supply available to the crop.

In addition, drought resistance in crop improvement, root patterns of crops for improved water and nutrient-use efficiency and associated drought resistance, the role of mulches for soil and moisture conservation, the effects of humidity and wind on crop production, the mechanism of photo-respiration and its effect on productivity, and uses of anti-transpirants in dryland farming are reviewed comprehensively. The new chapter 'Crop improvement for arid environments' covers some important recent developments in stress physiology, variability in individual stress tolerance, screening and selection, genetic studies and breeding for individual stresses, and stability studies in open arid and semi-arid environments where more than one stress occurs.

Since soil, crop physiology and climatic factors are comprehensively reviewed in this book, the inclusion of a chapter on crop growth modelling would have improved its value tremendously.

In spite of the overlap of chapters on some of the topics, this book as a whole emphasises the problems of crop production in the arid and semi-arid lands which make up slightly more than 30% of the world's land area. The book will be useful to all those interested in research, extension and agricultural development under dryland conditions.

MUSTAFA PALA

Handbook of Photosynthesis, ed. M. PESSARAKLI. xix + 1027 pp. New York: Marcel Dekker (1996) $195.00 (hardback).
ISBN 0 8247 9708 6.

Photosynthesis sustains all life on earth and as such is a subject which has been studied in great depth over many years. There are, however, relatively few books on photosynthesis. The publication of this weighty volume is timely and appropriate to the needs of both research scientists and an audience that requires more general information on current advances in this area. In spite of the intensive scrutiny by scientific investigators, many of whom have provided contributions to this book, photosynthesis has not yielded up all of its secrets and the molecular basis of certain processes such as water oxidation remain largely unresolved.

This book comprises 63 chapters, divided into 14 sections. These cover the spectrum of topics that comprise photosynthesis, from primary processes to carbon partitioning and physiological studies in the field. The contents of the chapters are of variable quality, the layout is not particularly systematic and the index consists essentially of key words. The discerning reader will be able to pick out the chapters of undoubted originality and interest, but for someone starting out in photosynthesis certain chapters give rather obscure personal perspectives that could be misleading. It is, nevertheless, refreshing to read a book that has given space for the airing of less orthodox views concerning the operation of photosynthesis. While many of the authors are leading research scientists in photosynthesis, others are much less well known. This leads to considerable variation not only in the quality of the individual chapters but also in the scope of the consideration given to the topics under discussion. While some authors provide a general overview of the topic, others simply discuss their own work.

The volume commences with an introduction to the general principles of photosynthesis. This provides a valuable foundation for the chapters that follow, which describe more detailed aspects. It is very useful that certain chapters are dedicated to general topics such as the ultrastructure of the photosynthetic apparatus. These are sometimes considered to be rather old fashioned and are therefore often neglected. There follows a section on the biochemistry of photosynthesis that contains some particularly detailed and useful articles ranging from a consideration of the photosynthetic pigments to inhibitors of photophosphorylation. The third section, which considers the molecular aspects of photosynthesis, also has some first class reviews of relevant topics. There then follow sections on photosynthesis in relation to the environment for many plant systems and consideration is given to photosynthetic organisms, other higher plants and, indeed, photosynthesis occurring in organs other than leaves. The book concludes with sections concerning crop productivity in the field, the methodology and approach to the study of photosynthesis in its many aspects, and the influence of stress in limiting function, productivity and crop yield.

This ambitious volume covers many essential areas that are relevant to photosynthesis but it fails to give an integrated approach. A more in-depth appraisal of the *in vivo* regulation of photosynthesis that co-ordinates each of the individual reactions and processes would have provided the necessary glue to bind each of the individual chapters together.

This large volume considers many essential aspects of photosynthesis and incorporates the ideas and vision of many research scientists. It is important that this volume includes contributions from authors from eastern Europe that give original perspectives and insights. Those with a strong background in photosynthesis will no doubt find all of the chapters in this book a good read. Except under appropriate guidance, this book is perhaps best suited to the specialist rather than the agricultural student. Many of the chapters of this book provide a wealth of useful information and it will form a valuable reference work. Since the yield of a given crop is related to net photosynthesis over the growing season, an appreciation of the fundamental aspects of this process is essential to understanding the driving force for agriculture.

CHRISTINE H. FOYER

Biotechnology and the Improvement of Forage Legumes, eds B. D. MCKERSIE & D. C. W. BROWN. ix + 444 pp. Wallingford: CAB International (1997). £75.00 or $125.00 (hardback).
ISBN 0 85199 109 2.

This multi-authored volume is the seventeenth in the *Biotechnology in Agriculture* series and the first to be

devoted to pasture species. In 17 chapters it deals with a wide range of modern techniques applied, in the main, to alfalfa, red and white clover and birdsfoot trefoil. Sandwiched between two review chapters are four sections, of three to five chapters each, dealing with particular themes.

The first section describes progress in incorporating into plant breeding programmes techniques to increase the amount of genetic variation available for selection (germplasm conservation, embryo rescue, somatic hybridization, etc) or to exercise greater control and efficiency of utilization of existing variation (molecular markers used in mapping and introgression studies). The authors of this section, as with the others, are well known in their field and drawn from many countries, although predominantly the USA and Canada.

In the second section, major abiotic stresses limiting productivity of forage legumes (temperature, drought, salinity and aluminium) are considered in terms of improved screening procedures for tolerance, and a greater appreciation of the molecular bases underlying them.

The possible role of genetic manipulation of certain traits is examined. Given the importance currently attached to issues of forage quality, it is slightly disappointing that only one contribution (on the manipulation of condensed tannins) deals with this subject directly and in detail. The traits most accessible to improvement by genetic transformation are probably pest and disease resistance. These are considered in three chapters dealing with fungal and viral pathogens and insect pests.

The molecular basis underlying nitrogen fixation is dealt with at three levels: competition among Rhizobia, plant–microbe signalling and biosynthesis of nodule-related metabolites. The use of genetically engineered alfalfa for the farming of industrial enzymes is put forward as a possibility in an analysis which includes economic benefits. This will surely become an important area in the future utilization of a wide range of species.

The final chapter highlights some of the main areas covered by the book and points the way forward. In particular, it looks at the prospects for, and obstacles to, the incorporation of transgenics and other biotechnological approaches into the development of new varieties of forage legumes with improved agronomic performance in terms of yield and/or quality.

This book provides a reasonably comprehensive overview of the present and potential impact of biotechnology on the major forage legume species. Perhaps to some extent the tendency to focus on species and environmental stresses of major importance to North America leads to a slight neglect of areas that European readers would consider important. However, in general, the range and depth of coverage is good and this book should be of interest and use to all those concerned with the future role of forage legumes in a wide range of agricultural systems.

M. T. ABBERTON

Livestock Farming Systems: Research, Development, Socio-economics and the Land Manager, eds J. B. Dent, M. J. McGregor & A. R. Sibbald. 360 pp. Wageningen: Wageningen Pers (1996). NLG 198.00 (paperback).
ISBN 90 74134 40 8.

This collection of papers is from a 1994 symposium for research and extension workers attempting to take an integrated or holistic approach to animal agriculture. The papers, mostly in English but with some in French, cover a wide range of intensive, extensive and organic ruminant systems in Europe with some examples from Asia, Africa and South America. Collectively, they illustrate the diverse nature of ruminant grazing and farming systems and the difficulties of describing and defining such systems by means of a few simple rules even on a local, let alone a national or international, basis. The effects of policy and pricing structures on cattle, sheep and goat systems for producing meat and milk are discussed, and it is shown that farming methods are determined by the social needs and responses of individual farmers to external factors such as the need to maintain the heterogeneity of animal production systems. These descriptive papers provide the background for a number of papers that tackle the problem of modelling these systems in terms of using plant communities, animal production, energy and fertilizer management; and their effects on the environment. Several simulation and decision-making models are described and their merits and disadvantages discussed. They demonstrate that it is possible to characterize and define the factors controlling these systems, despite their complexity and the difficulties referred to previously, although much remains to be achieved. This publication provides good descriptions of many different animal production systems which will be of continued value for those wishing to understand and appreciate the wide range of animal production systems that are, and will continue to be, practised. In addition, it provides an up-to-date view of the approaches taken, and successes achieved, in modelling these systems as aids to description, definition, decision-making and research in livestock farming systems.

P. J. BROADBENT

Biotechnology in Animal Feeds and Animal Feeding, eds R. J. WALLACE & A. CHESSON. x + 358 pp. Weinheim: VCH Verlagsgesellschaft mbH (1995). DM 164.00 (hardback).
ISBN 3 527 30065 1.

This is a welcome book, containing many excellent review papers. It does not, apparently, represent the proceedings of a symposium (which sometimes yields patchy results) but is a collection of invited papers from experts in the application of biotechnology to the improvement of animal feeds and supplements.

Seventeen chapters compiled by 40 authors deal with antibiotics, probiotics, enzymes, oligosaccharides and supplementary amino acids in both ruminant and non-ruminant diets, the use of silage additives, fermentation of feeds, plant improvement by transgenesis and the application of biotechnology to the treatment of animal manures and control of methane emissions. There is also a chapter on relevant legislation, with contributions from authors in the USA, Canada, Australia, Europe and Japan. Altogether a very pleasing rag-bag of contents!

Whilst most of the reviews are authoritative and critical, it is necessary to recall from time to time that some authors have a vested interest in the subject which they are reviewing. In the survey of enzyme supplements as a means of improving the energy available from pig and poultry diets, the appropriate balance appears to have been nicely struck by inviting collaboration between two authors, one whose income derives from selling such products and the other an academic, who might find it easier to be objective (though even academics can be hoping for more research grants, tempting them to reach for the rose-coloured spectacles). The review of the effects of oligosaccharides on animal performance appears to be an unfortunate example of lack of objectivity, since the Table on page 238 (the only direct evidence presented on the subject) clearly does not support the claims made on page 237 for a substantial improvement in the health of calves as a result of adding an oligosaccharide to the diet.

The editors could have improved the book a little by exercising stronger control over the material submitted. For example, the first 10 pages of the chapter on amino acids for non-ruminants deal with the structure of amino acids, amino acid metabolism and the requirements of the animal. This has nothing to do with biotechnology and should have been heavily pruned. The chapter on antibacterials in poultry and pig nutrition contains much excellent material but is in a very unreadable style: this again calls for ruthless editing.

The book is important, though not for the reasons advanced by the Editors in their Preface or by Dr Perry in his introductory chapter. Farmers and feed manufacturers will always look for ways of making their businesses more profitable, whether food is in short supply or in surplus and whether world population is increasing or decreasing: the opening platitudes could thus have been dispensed with. But most of the topics discussed are comparatively new and knowledge is advancing swiftly. It is timely, therefore, to have a book which brings one up-to-date in subjects which are not one's own speciality and to read with interest what the several authors have to say about the potential for development in their own fields.

T. R. MORRIS

Global Climate Change and Agricultural Production, eds F. BAZZAZ & W. SOMBROEK. xi + 345 pp. Chichester: John Wiley & Sons (1996). £50.00 (hardback).
ISBN 0 471 95763 1 (hardback).
ISBN 0 471 96927 3 (paperback).

This book is the product of an FAO consultation supported by the United Nations Environment Programme. The result is a comprehensive tour de force bringing together contributions from 25 experts from around the world.

The editors have performed a remarkable feat in rationalizing the material into a structured and comprehensible presentation. To refer to the work as a book is an understatement, for I cannot imagine anyone reading the whole in one sitting. Neither, however, can I believe that there is anyone who could not find something of interest here. The result is a massive compendium of facts and ideas covering a wide spectrum of relationships between agriculture and climate. It could easily be double the size, and yet somehow the editors and contributors have managed to compress the information without obfuscation.

The approach has been to highlight a sequence of possible effects of climate change: the World hydrological cycle, the problems due to changing soil conditions, the effect of elevated CO_2 levels, changes due to temperature deviations and increases in ultraviolet radiation and ozone levels. Consideration is also given to likely regional changes and consequent management response for food production.

Whilst most of the early chapters explore individual environmental factors affecting agriculture in considerable depth, the final chapters provide a comprehensive review of contemporary research programmes and summarize current knowledge, together with its many uncertainties and gaps. These chapters make a valuable contribution, providing indications of the possible effects of climate change and the adaptations which may be required in terms of food production. Emphasis is placed on the need for development of integrated models of climate and food production systems, once again highlighting the current lack of understanding.

This is a challenging work which should be in every academic library concerned with the global environment and global food production. It raises many more questions than answers, provides much food for thought and with over 700 key references, should provide the basis and inspiration for much future research effort.

KEITH GREGSON

Pasture and Forage Crop Pathology, eds S. Chakraborty, K. T. Leath, R. A. Skipp, G. A. Peterson, R. A. Bray, G. C. M. Latch & F. W. Nutter, Jr. xvii + 653 pp. Madison: American Society of Agronomy (1996). $55.00 (paperback). ISBN 0 89118 129 6.

This is the record of an April 1995 workshop in Mississippi of 30 pasture pathologists from Australia, New Zealand and the United States of America. It includes 28 papers, together with summarized discussions. There are overviews of the crops and their diseases and of loss assessment; and detailed papers on diseases attributed to fungi and bacteria, to nematodes and to viruses. There are also sections on the seed industry, disease complexes and strategies for disease management, concluding with four case studies of disease and a perspective on the future of pasture and forage crop pathology. Most of these sections include contributions from each country, written by an impressive range of specialist pasture scientists.

The authors are well-known authorities in the three countries: their chapters provide contrasts between the larger and more diverse grasslands of Australia and the USA, and those of New Zealand, whose reliance on grassland production has become legendary. As with all Proceedings, the intending purchaser or reader will want to know whether it is good value for money.

There are valuable descriptions of research structures and of the economics of grassland crops in each country. Each chapter has a different emphasis, ranging from the need for diagnostics and quantification (Australia), through the importance of herbage quality and its impact on animal production (New Zealand), to documenting the diversity of USA systems. The book is entirely focused on grasses and herbage legumes. The questions of loss assessment are taken in some detail and give a very good, up-to-date literature coverage, extending beyond the countries of the participants. The reviews of the different pathogens in different grassland systems are also impressive for their coverage of the literature. The breadth of coverage is notable for its focus on resistance and tolerance not just to disease but to non-infectious diseases (e.g. soil-related stresses): however, no pests, apart from nematodes, are included. The conclusions of these surveys stress that 'more work needs to be done' in many cases. There is a general emphasis throughout the book on the contribution that disease resistance can make to pasture persistence as well as to its productivity, and also an emphasis of the need for public funded R & D programmes to underpin the work of commercial breeders.

In addition to breeding, the prospects for biological control (especially of pests by the beneficial endophytes of grasses) and for molecular approaches to disease management are reviewed. Many grasslands are heterogeneous, with spatial and temporal variability associated with long term indirect or direct animal feeding. In practice, this complexity can provide substantial control of pests and diseases through integration of a range of approaches. In spite of the section on disease complexes, much of the book focuses on control methods specific to particular diseases, and it is not always certain that such approaches will be readily introduced into farm practice. Similarly, it is not clear that transgenic plants will have a role in grassland, especially given the increasing public awareness of the interrelationships of production systems, animal welfare and human health.

The answer to the question about the value of this book is a resounding endorsement of its contents and coverage. It is a great shame that the publishers have not taken the trouble to prepare a subject index. Without one, the book reflects what was clearly a stimulating interchange of views; with one, it would have been a very authoritative reference work in grassland pathology. Nonetheless, it is clearly a book which should be consulted by grassland specialists throughout the world.

ROGER COOK