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Book reviews

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Agricultural Biotechnology: Country Case Studies – A Decade of Development (*Biotechnology in Agriculture Series, No. 25*), edited by G. J. PERSLEY & L. R. MACINTYRE. xix + 228 pp. Wallingford: CABI Publishing (2001). £45.00 or US$85.00 (hardback). ISBN 0 85198 816 4.

This book presents a selective overview of the current and potential applications and impact of modern biotechnological methods in countries on three continents. Much of the analysis contained in the introductory chapter applies equally to the application of genetic modification (GM) and other biotechnologies in Western Europe and the USA. However, the bulk of the book, and its real value, lies in the description of the current status of such approaches in a range of countries in Asia/Pacific (China, India, Indonesia, Pakistan, Philippines, Thailand), Africa (Egypt, Kenya, Zimbabwe) and Latin America (Brazil, Colombia, Costa Rica).

As might be expected there is much focus on GM technologies, their potential to increase agricultural productivity and the attendant issues of regulation, environmental impacts and intellectual property rights (IPR). However it is noticeable, in some countries with the longest histories of biotech investment, that although the use in agriculture of GM crops may be high (e.g. in China), considerable future potential is attributed to the development of molecular marker-assisted selection and genomics-based approaches. More 'traditional' biotechnologies, in particular tissue culture, remain important in many crops in the countries discussed in this book.

The case studies have been written by experts from the countries concerned. They are in fact overviews of developments in that country and some of them suffer slightly from their very wide remit: covering livestock, fisheries, forestry and other aspects as well as crop improvement. The bulk of the book is, however, devoted to this latter topic and it may well have benefited from a more detailed approach to particular examples where GM or other methods have been implemented.

Nonetheless, the book very usefully portrays the range of issues that are involved in the application of biotechnology to crops and the traits targeted. The former include socio-economic considerations, biosafety, ethical issues and IPR. The latter focus not only on productivity gains through manipulation of single genes (pest and disease resistance for instance) but also increasingly on quantitative traits such as quality and stress tolerance.

Many of the chapters include a study of the policy framework and institutional infrastructure involved in biotech developments. Although it might be expected that these will evolve rapidly, the analysis is interesting particularly in the various attempts made to balance public investment with the involvement of the private sector and the attendant issue of legislative regulation and IPR.

This book will be of value to students, researchers, policy-makers and all those interested in the potential role of biotechnology in alleviating the many problems facing world agriculture.

M. ABBERTON

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Environmental Policies for Agricultural Pollution Control, edited by J. S. SHORTLE & D. G. ABLER. x + 224 pp. Wallingford: CABI Publishing (2001). £45.00 (hardback). ISBN 0 85199 3990.

The first point to make about *Environmental Policies for Agricultural Pollution Control* is that the title is misleading: the book is largely concerned with water pollution and gives little attention to other 'negative externalities' associated with agriculture (for instance, the FAO estimate that 25% of global warming gases originate from agricultural sources). However, unlike many edited compilations, the book covers this more specific topic thoroughly (rather than just reflecting individual authors' research interests) and can therefore be recommended to anyone who wants a comprehensive reference on the advantages and disadvantages of different policies for controlling water pollution. The emphasis of the book is on the economics of pollution control: agricultural pollution imposes a cost on society which is not reflected in the

costs of production of farmers, the economist's solution is thus to internalize these costs by imposing a tax on polluting output (for example nitrate in water). The problem in agriculture is that much of this output is from 'non-point sources', which are often prohibitively expensive to monitor. Much of the book is concerned with discussion of the relative merits of alternative policies, either compulsory (Chapter 2) or voluntary (Chapter 3) for controlling non-point water pollution. Chapter 4 discusses the analysis of benefits and costs of pollution control polices, with emphasis on methods for estimating the benefits of improved water quality. Policies that have already been implemented in the US and the EU are discussed in Chapters 5 and 6 and the book closes with an assessment of the impact of international trade on the environment. A summary chapter drawing together 'main findings' from previous chapters would have helped, but overall, *Environmental Policies for Agricultural Pollution Control* is a well written and useful source of information on the economics of controlling water pollution.

S. RAMSDEN

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Plant Pathologist's Pocketbook, 3rd Edition, edited by J. M. WALLER, J. M. LENNÉ & S. J. WALLER. x + 516 pp. Wallingford: CAB International (2002). £30.00 (paperback).
ISBN 085199 459 8.

At 15·5 cm × 23·4 cm × 3 cm thick this can hardly be described as a 'Pocketbook', a point acknowledged by the editors in the Preface and explained by the fact that the first edition was truly 'pocket sized' and the title has been retained to maintain continuity. The term 'Handbook' would be more appropriate but even that would not give an accurate impression of the wealth of information provided.

This edition has been revised and expanded compared with the 1983 2nd edition and consists of 44 separate chapters, each written, or revised from earlier editions, by an accepted authority in the field. In the contents, chapter topics are loosely combined to cover five key areas: recognition and evaluation of plant diseases, causes of plant disease, disease diagnosis, disease management and general techniques and information. Throughout the book, however, the topics deal with one of two themes: those imparting a summary of the science of plant pathology, and those giving practical advice and information.

The range of topics covered by the 'science' chapters is very broad, much more than provided by standard texts on plant pathology. As an example, most plant pathology texts restrict themselves to diseases caused by fungi and bacteria and, possibly, viruses. In this book you will find all these plus summaries for nematodes, insects and other arthropods, weeds, parasitic higher plants, non-infectious disorders, air pollution and climate change. Chapters on topics such as seed health, cultural control, disease resistance, fungicides and their application, biological control, epidemic modelling and disease forecasting and, most welcome in a book like this, design of experiments, produce a good all-round text. Obviously with so many topics the space devoted to each is not great, averaging 12 pages, but the extensive reference lists soon direct the interested reader to more information.

The 'practical' chapters cover standard laboratory practice for most techniques, including laboratory safety, photography and molecular methods as well as providing recipes for culture media and isolation/cultivation tips. New pathologists may find the chapter on 'Publication' valuable. These detailed practical chapters are ably supported by chapters providing information sources for topics such as disease lists for a wide range of countries (although some of the lists are rather dated), quarantine, health regulations and import/export regulations. The 'Addresses' chapter is very good in providing mailing and e-mail addresses plus a few internet addresses. It is a pity the addresses or locations of other organizations such as CropLife International and the specialist Resistance Action Committees were not included.

The content is thus very comprehensive, and herein lay a problem. For whom is the book intended? On the one hand it contains a summary of information normally found in specialist textbooks, while at the same time it offers the hands-on pathologist or technician help and advice in understanding, developing and using relevant techniques. My conclusion is that the established pathologist would not need to refer to the majority of chapters but may delve into topics outside his/her own expertise. In this case the chapters will certainly whet the appetite with basic information, while offering a contact name and extensive references should the topic be pursued. Undergraduates, new post-graduates and technicians will find the general review chapters excellent in developing their understanding of plant pathology as a whole. On this basis the book is most likely to find a place on the laboratory book shelf rather than in the library, although as stated above, undergraduates could well benefit from reading the excellent 'science' summary chapters. I recommend it.

P. E. RUSSELL

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Redesigning Rice Photosynthesis to Increase Yield (*Studies in Plant Science, 7*). Proceedings of the workshop on the Quest to Reduce Hunger: Redesigning Rice Photosynthesis, held in Los Banos, Philippines, 30 November to 3 December 1999. Edited by J. E. SHEEHY, P. L. MITCHELL & B. HARDY. vi + 293 pp. Amsterdam: Elsevier Science B.V./International Rice Research Institute, Los Banos, Philippines (2000). Eur 129.33 (US$149) (hardback).
ISBN 0 444 50610 1.

Redesigning Rice is an admirable aim. Most of the additional billions of people (2–4 or possibly more) expected in the next 50–100 years will live in Asia, where rice forms 60–70% of the total energy supply in the poorest countries and 50% in the wealthier ones. Attempting to do so by altering photosynthesis to increase biomass, which can then be used to form more reproductive organs, and thus grain, is currently much to the fore in plant molecular biological thinking. The justification for believing that photosynthesis of C3 crops, such as rice, can be increased by removing photorespiration has existed since the discovery of the C4 mode of photosynthesis. In C4 plants, such as maize, absence of photorespiration leads to the large rates of carbon dioxide assimilation and large biomass production of many tropical crops. Rice is a tropical plant, where photorespiration is a large drain on productivity. If its photosynthesis could be converted to C4 mode then a large increase in biomass would result. Once the role of ribulose bisphosphate carboxylase-oxygenase protein in photorespiration was known, then the aim was to engineer that enzyme to stop photorespiration. However, the vision has been tempered with reality as a consequence of the complexity of the protein and problems of redesigning it. That may be the fate of current concepts: complexity of photosynthetic systems raises practical problems in how to go from concept to achievement – talk is cheap, money buys bread as an old saying has it. Now the view, driven by the tidal wave of enthusiasm for genetic engineering, is that the C4 syndrome must be introduced into C3 plants to limit photorespiration. A number of studies introducing enzymes of C4 metabolism into C3 plants have shown that there is advantage for CO_2 assimilation. These claims are not universally accepted. Also, the C4 syndrome includes substantially more complex anatomical features associated with photosynthesis than found in C3 plants. It is important not to get carried away with enthusiasm with the novel, at the expense of more pedestrian but potentially productive pursuits, a current problem worldwide where the promise of genetic modification is often grossly over-sold.

Evaluation of the role of photosynthesis in biomass and yield production, summaries of the literature about C3 and C4 photosynthesis, and how to alter the rice plant's photosynthesis, particularly by introduction of C4 traits, are some of the important topics considered in this timely, useful and interesting book. The range of papers is very balanced, with excellent quality analyses, ranging from crop physiological aspects of limitations to biomass and grain production, through to the genetic engineering and molecular biological problems of modification. The latter consider analysis of the performance of genetically modified plants. There is a section on practical issues of rice production, related to work from IRRI. The authors are internationally respected, and the papers are well edited, illustrated and referenced. The 'Reflections' and 'Discussion' are well thought-through summaries of the problems and assessments of the technical requirements for *Redesigning Rice Photosynthesis*, including the question of safety of genetically modified plants.

This sensible book should be widely read: it provides diligent readers with an excellent summary of current thinking applied to the whole problem of crop production, improvement, especially of photosynthesis, and genetic modification. It will serve researchers, more advanced students and teachers, and should be required reading for breeders, physiologists, biochemists and molecular biologists, and particularly those organizing and funding the science, to show how 'joined-up' thinking and long-term application of effort are required to tackle the problem. Quick-fix genetic modification of photosynthesis is unlikely, in my view, to achieve the desired yield increase within the 50 or so years required by the growing population, but it is essential to pursue the concepts and technology together with more conventional methods. The contributors and editors have given these problems a thorough airing and are to be congratulated.

D. W. LAWLOR

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Integrated Plant Nutrient Management in Sub-Saharan Africa: From Concept to Practice, edited by B. VANLAUWE, J. DIELS, N. SANGINGA & R. MERCKX. 384 pp. Wallingford: CAB International (2001). £55.00 or US$100.00 (hardback).
ISBN 085199 576 4.

This book contains a compilation of papers presented at the International Symposium on Balanced

Nutrient Management Systems held in Cotonou, Benin in October 2000. There are over 50 contributors to the 24 chapters who, together, represent a wide range of individual expertise and international affiliations. It is to the editors' credit that there is a reasonable consistency in standard throughout the book. After two introductory papers (which interestingly include none of the editors as authors), the book is divided into five technical sections and a set of final recommendations. In brief, the sections cover research strategies to account for biophysical and socio-economic variability, soil processes determining nutrient dynamics, interactions between organic and mineral nutrient sources, improved utilization of phosphorus and decisions support systems to improve resource use at the farm level. These five themes were identified from previous research as 'specific issues leading to or preventing the development of more sustainable farming methods'. As a source of useful and novel information on soil nutrient management, this text is a valuable resource and covers a subject and geographical area for which modern texts are in short supply. Interested readers will find that the book includes a wealth of technical information and research strategies that can be applied both in sub-Saharan Africa and beyond. In this respect, the book will be useful both to the specialist researcher and to the policy planner and the first part of the title is an accurate description of what will be found within. However, this reviewer at least, could not appreciate the second part of the title. For this, a much clearer theoretical and historical perspective would have been needed to establish a conceptual framework for what follows. Similarly, clearer signposting of why the five technical sections were chosen and how they link with the introductory concepts would have been useful to illustrate how the concepts can be applied in practice.

S. N. AZAM-ALI

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Environmental effects of Transgenic Plants: The Scope and Adequacy of Regulation, National Research Council Committee on Environmental Impacts Associated with Commercialization of Transgenic Plants. 320 pp. National Academy Press (2002). $49.95.
ISBN 0 309 09263 3.

If you are even remotely interested in the environmental effects of genetically modified plants, you should read this book. If your work is in this area of research, you should buy it.

This book is the report of a working group established to review the scientific basis for the oversight of transgenic crops by the United States Department of Agriculture. The result is an exceptionally clear statement of the state of the science. The book opens with an executive summary that, essentially, strings together the main findings and recommendations. This is helpful even if you wish to read the book fully, as it gives a clear statement of where the book is going.

The main chapters then follow. Substantial sections deal with the intricacies of USDA regulation processes; the main sections that interested me were the more general ones that reviewed the underpinning science. It begins with a review of ecological, genetic and social factors affecting environmental assessment. I was really impressed. The substantive issues were covered clearly within a few pages, with a confidence and (yes) flair that was most impressive, ranging across issues such as landscape ecology and the Green Revolution, before homing on to the process of modification. References are given, of course, but without any attempt to cover *all* the major references, simply enough to underpin the text without spoiling the flow.

The next main section concerns the thinking behind the US regulation. First the concepts of risk assessment are discussed, and then the potential hazards arising from GM crops are reviewed. The highlight here is Box 2.1, a wonderfully lucid and concise (4 pages) account of the Bt maize and Monarch butterfly saga, bringing it up to date with the major field investigation reported in 2001 by Sears *et al.* However, it also looks at the equally interesting issue of comparability between risks associated with GM crops and varieties developed using non-GM methods.

The following sections deal with procedures and case studies from the US regulation, interesting, but not always directly relevant to other countries, before reviewing post commercialization monitoring, and closing with a 'future' chapter. The recommendations and comments are brought together within the summary and clearly highlighted throughout.

I do not agree with every word written here, but the writing is of such high quality that it's easy to identify disagreements. For example, on models of risk assessment, the authors distinguish between whole organism and a model where the organism is the ordinary bit with the extra GM bit considered separately. It does not identify models of risk assessment based on ecological processes. There will certainly be a need for future editions of this book, ideally one that takes the process to a more international focus. But for now, I cannot recommend it highly enough.

L. FIRBANK