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Book reviews

Integrated Pest Management – Ideals and Realities in Developing Countries, by S. MORSE & W. BUHLER. ix + 171 pp. Boulder, USA: Lynne Rienner Publishers Inc. (1997). £31.95 (hardback).
ISBN 1 55587 685 4.

The literature on IPM is now vast, so one may wonder what there is new to merit yet another book? This book *is* different, in that it is not a practical guide to implementing IPM in any particular crop or cropping system, but an analysis of exactly what the term means, how it has evolved and where and why it has been effective.

The authors claim that hitherto the approach has been to adapt IPM to farmers' circumstances rather than to ask whether IPM is really what farmers want or are able to achieve. It outlines some of the classic IPM successes, mainly from North America, and contrasts them with results obtained in developing countries, concluding that it may be effective in the context of large-scale industrial farming but is unsuitable for resource-poor farmers operating on a relatively small scale. To some protagonists of IPM, this may seem a contrary view, so the book is well worth reading to appreciate this different slant.

The text is interspersed with quotes from journals, reports, funding agencies, and many past and present IPM 'gurus', illustrating a multitude of facets to the subject. It should be in the library of any group seriously involved with modern, environmentally-benign crop protection.

TREVOR LEWIS

Seed Biology and the Yield of Grain Crops, by D. B. EGLI. ix + 178 pp. Wallingford: CAB International (1998). £35.00 or $65.00 (hardback).
ISBN 0 85199 241 2.

The author of this book aims to 'develop a mechanistic understanding of the production of seed yield by grain crops'. He gives a very brief outline of the history of crop physiology in Chapter 1, in which we are told that 'historically, going back to growth analysis concepts, more emphasis was placed on understanding the processes involved in the production of dry matter and less effort was devoted to understanding the processes regulating the partitioning of assimilate to the seed and the accumulation of dry matter by the seed'. Egli's research on the soybean crop has contributed to rectifying this deficiency, and much of it is used to illustrate his arguments. I am not familiar with the soybean literature, and I found his work on regulation of seed-fill duration in Chapter 3 especially interesting – it deserves to be seen by the wider audience likely to read the book. He also uses examples from other major seed crops throughout the book. The book has very clear illustrations, and is systematically structured.

One omission which was very noticeable in the first few pages, giving the history of crop physiology, was the lack of mention of the more recent advance from classical growth analysis to interception of solar radiation as an approach to understanding dry matter production. This is perhaps understandable given the emphasis of the book on assimilate partitioning, but was nevertheless very obvious.

A curious feature of the book is the virtually complete absence of the concept of thermal time, which has been so useful in explaining and modelling variation in development and has become incorporated into standard agronomic procedures in some crops. Much of the book is concerned with duration of processes connected with the seed, and these are ideally suited to analysis by thermal time. For example, on p. 119, Fischer's photothermal quotient is described in a discussion of determination of seed number per unit area. This quotient is, in essence, intercepted radiation per degree day. No mention is made of this, although to be fair, Fischer never interpreted the photothermal quotient in terms of thermal time in his original paper. This is also one of the few weak points in the book, since the author argues against the validity of the approach represented by the photothermal quotient purely by speculation without any data or models to illustrate his case.

Yield components are a useful vehicle for teaching crop physiology to agricultural students, although they are not popular as an aid to understanding by researchers. This book attempts to revive the use of yield components as a concept to understand yield formation. I am not sure if it will succeed in changing the direction of research into the physiology of yield in the same way as growth analysis or light interception concepts have, but it will certainly be useful in teaching crop physiology.

PETER KETTLEWELL

Theoretical Ecosystem Ecology: Understanding Element Cycles, by G. I. Agren & E. Bosatta. xvi+234 pp. Cambridge: Cambridge University Press (1996). £37.50 or $52.95 (hardback), £17.95 or $29.95 (paperback).
ISBN 0 521 58022 6 (hardback) 0 521 64651 0 (paperback).

I suspect that I am not alone in skipping the introduction to most textbooks. Usually I skim the introduction in the bookshop then, if I like what I see, I buy the book and never read the first chapter again. Don't do that with this book.

The Introduction is paramount and really does set the scene for what is to follow. There are some gems of scientific philosophy and insight here that should not be missed. The authors are very careful to define their space and time. They are dismissive of the rush into computer models without first defining and understanding the basic concepts. One particular comment remains with me, 'the goal of science is understanding rather than prediction'. If nothing else, find a copy of this book in a library and read the first sixteen pages.

The remainder of the book develops a mathematical model of ecosystem ecology in terms of differential equations relating the state of the system with a description of the system dynamics (operator). The mathematics used is not trivial and I can't believe that this book will have a wide appeal. The authors try hard to reconcile the physics and mathematics with the ecology but, like many before them, they will find the span of their bridge just not quite big enough to cross the gulf. The aim is laudable; however, the mathematical background required to begin this book will be beyond most practising scientists dealing with plants and soils. Those researchers who persevere, however, will reap great rewards.

The book develops theories for the soil and the plants as separate parts (II and III) of the book. In both cases, the mathematical models are built up from simple models with severe assumptions. Gradually the assumptions are relaxed to give more flexibility and realism. These transitions are carried out with care and detailed examinations of the mathematics so that the reader is encouraged to understand the theoretical mechanisms. The two parts are combined in the final part of the book to describe the interactions between the soil and plant growth, thus providing a mathematical description of an ecosystem.

The book does an extremely good job; the examples and exercises are purposeful and clear and the journey from fundamentals to ecosystem models well mapped out. But don't expect an easy ride!

I shall now read the book again, but at a leisurely pace. I am looking forward to it.

KEITH GREGSON

The Living Fields: Our Agricultural Heritage, by J. R. Harlan. 271 pp. Cambridge: Cambridge University Press (1998). £11.95 or $19.95 (paperback).
ISBN 0 521 64992 7.

Despite mostly unthinking assumptions, is not the truth that we regard scientists as technicians? And is not our sponsorship of them, almost invariably, money spent to buy solutions to the problems of how to make more money? In a knee jerk reaction, one might suppose that the scientists themselves could rush to deny what, nonetheless, does seem increasingly obvious. As unfolding, disconcerting science leaves one century for the next, is there even half a hope that scientists might be philosophers, ethicists or even romantics – in the more exact use of that term? The outlook seems unpromising.

It comes as something of a surprise to find that someone from inside science has stepped so far out of line that he appears to regard it as a cultural enterprise. He is, can you believe it, prepared to take seriously folklore, scripture, Darwinism, archaeology, other people's opinions and experimental science in his tapestry of ideas.

For those whose aim, with each meticulously planned experiment, is to advance science by about one millimetre, what are they to make of someone for whom the sweeping generalization is not so much occasional as habitual? I do not know, but I would like the opportunity to make the introductions and then stand back to watch the mutual incomprehension.

Jack Harlan has a long and distinguished record in crop science and has handed on his enthusiasm to many of his students. One needs to know this in order to appreciate the book. It is not a substitute for the hard science but an adjunct to it. Even with this proviso, one can still imagine those seminars at which solemn students earnestly reproduce Harlan's more provocative ideas as if they were gospel.

Before students are introduced to this book they should have come to grips with, for example, Purseglove's volumes on tropical crops (curiously not mentioned in the bibliography) and Harlan's earlier papers.

There are, though, misgivings. One appreciates Harlan's intention to stimulate, to interest and to challenge, but this reviewer, at least, is uneasy with the opening chapter. These pieces of literature, arcane and drawn in to prove a point – should not *they*, too, be subject to critical scholarship? And if, uncritically, they are retailed to students without the necessary background to appreciate them, are we not conveying the wrong kind of message? Perhaps such a view will be dismissed as 'spoilsport' and the book will go on to enlist many new enthusiasts.

The book closes with a wish for a more peaceful world and if, from that scientist, the whole 271 pages

were a valediction, I imagine we can allow him that. Harlan's approach raises the question of how scientists, while doing their science, still participate meaningfully in the wider culture of which they are a part. We need some answers.

G. P. CHAPMAN

Managing Soil Fertility for Intensive Vegetable Production Systems in Asia, ed. R. A. MORRIS, xxvii + 346 pp. Tainan, Taiwan: The Asian Vegetable Research and Development Center (1997). $15.00 (developed countries) or $12.00 (developing countries) (paperback).
ISBN 92 9058 112 3.

Vegetables, with their high content of minerals and vitamins, are essential for a healthy diet, yet production in South and Southeast Asia averages only 28 kg/person/year, well below the recommended intake of 73 kg/person/year. Removals of the major nutrients in vegetables are usually three to five times greater than cereals at typical yield levels so that sustained production almost always requires inputs of fertilizers or manures. Demand for vegetables in the region is increasing faster than supply and prices are inevitably rising with adverse consequences for the poor. This international conference, held in Taiwan in November 1996, sought to determine the nutrient requirements of tropical and sub-tropical systems of vegetable production and to prioritize the research that ought to be done to minimize the adverse effects of increased fertilizer usage.

The participants, and the papers presented, came predominantly from within the region, although it is noteworthy that Europeans dominated the final group of papers on nutrient uptake models and decision support systems. The book contains two introductory papers and 22 more specific papers organized in four sections: vegetable crop nutrient requirements, nutrient balances for representative systems, use of inorganic fertilizers and organic wastes, and methods to model and monitor N applied to vegetable production systems. The largest section is that on nutrient balances (nine papers) and six of the papers focus on the common system of vegetables following cereals, typically lowland rice.

Several common themes emerge. Nutrient applications often exceed removals and P and K accumulate to reach concentrations at which there is no response to fertilizer. In contrast, response to fertilizer N is widespread, although up to 75% of the fertilizer applied is not recovered in either the crop or the soil and leaching is widespread. It appears that most farmers pay little heed to the residual value of inorganic fertilizers, organic wastes or crop residues and, in his paper, Morris seeks to find some rational explanation for this behaviour. The wasteful use of N, with its subsequent adverse effects on water quality, are mentioned by many authors but until N availability from multiple sources can be co-ordinated with plant demand for N, scope for reducing leaching and achieving economic production is limited. These proceedings indicate that, if environmental and production goals are to be met, there is a need for research that is geared to both management issues and a better predictive and decision-making capability.

PETER GREGORY

Precision Agriculture in the 21st Century: Geospatial and Information Technologies in Crop Management, eds COMMITTEE ON ASSESSING CROP YIELD. xii + 149 pp. Washington, DC: National Academy Press (1997). £32.95 (hardback).
ISBN 0 309 05893 7.

This book is a collection of deliberations from a US committee set up to explore the potential for developing, co-ordinating and using information-handling tools for research, on-farm applications, and formulation of agricultural policies that will arise from precision agriculture. This is not a 'how to use precision agriculture at the farm-level' book. It takes a wider view looking at the implications that precision agriculture will have on farmers, researchers and society at large, inevitably with a US bias.

The book is organized in four main chapters. Chapter One covers the dimensions of precision agriculture and defines precision agriculture and the technologies and data requirements that are needed for the technology to be effective. The second chapter is entitled 'A new way to practice agriculture' and examines how precision agriculture may impact on farming methods and how agricultural research can use this technology. The third chapter addresses the adoption of precision agriculture, reviewing the literature on farmer adoption, the speed of uptake and the costs involved. This chapter also reviews the implications for rural employment, the environment and the food industry. The final chapter takes a broader look at the implications of this new technology with reference to public policy: who owns the data that the technology generates and requires and what is the role of the state in terms of research and development. To its credit, the book is interspersed with case study examples or likely scenarios that help to break up the somewhat endless literature review. It is well sign-posted, providing the reader with the useful option of dipping into a section at a time.

This is an extensive review of the literature and current debates relating to precision agriculture. The book has a wealth of references and authors and appears to be the condensed version of a vast review undertaken by the Committee. However, the lack of

flow of the book detracts from its vast content. The chapters do not necessarily follow on from each other and it is clear that, as with many multi-authored books, a common style of writing does not exist. If the reader wishes to obtain a definitive collection of review material on precision agriculture relating to potential impacts at the farm level, beyond the farm-gate, and the role of the state, then this book will be ideal.

PAUL WILSON

Humic Substances: Structures, Properties and Uses, eds G. DAVIES & E. A. GHABBOUR. xii + 260 pp. Cambridge: The Royal Society of Chemistry (1998). £59.50 (hardback).
ISBN 0 85404 704 2.

Humic substances are ubiquitous and plentiful organic constituents of soils and waters. Agriculturally, they are important because they influence soil structure and water retention, act as nutrient stores, and bind pesticides and metals. The maintenance of humic matter in soil is thus a key aspect of sustainable agriculture. The results of research into these materials are therefore of high relevance to Agricultural Science, as well as to Environmental Science. The present volume is a collection of research papers presented at a meeting held in Boston Massachusetts in March 1998.

The opening chapter is a review by a well-known member of the humic substances research community, M. H. B. Hayes. This covers a lot of ground, from basic concepts to the promise of new techniques. It is an excellent general introduction to the complex and, it has to be said, confusing world of the humus. An interesting point is that humic substances may be less refractory than has been previously supposed, their recalcitrance being reliant on chemical and physical protection rather than on inherent non-reactivity. Another, first advanced by R. L. Wershaw and colleagues in the mid-1980s, is that these materials may have lower molecular weights than suggested by earlier studies, with growing evidence that humic matter exists as aggregates of relatively small monomer units. It is strange that after so much research into humic substances the issue of molecular weight continues to be unresolved – I hope (and believe) I am right in saying that this reflects the complexity of the materials rather than the competence of the researchers.

A number of the remaining 18 chapters are concerned with the application of a particular analytical technique – usually highly advanced and sophisticated – to characterize humic matter. Examples include ^{13}C NMR, desorption mass spectrometry, capillary electrophoresis, fluorescence decay and size exclusion chromatography. The range of methods is impressive, and much information can be obtained. However, it is disappointing that there is no overarching theory of humic substances to be tested by the new knowledge. Chapters which particularly interested me were those by R. L. Wershaw and colleagues on the application of spectroscopic techniques (NMR and FTIR) to follow degradation pathways of leaves, the application of computational chemistry to humic adsorption by clay minerals (L. G. Akim and colleagues), and the work reported by B. Xing on competitive adsorption of hydrophobic organic compounds by humic substances.

Most of the papers in this book are accounts of specialized research, and will be of interest mainly to other workers in the field. There are three exceptions. The review chapter by Hayes has already been mentioned. C. E. Clapp and coworkers report that humic substances have positive effects on turfgrass growth, which is good news for golfers. The final chapter, outlining the scientific and commercial activities of the main sponsors of the meeting, is half research paper and half advertisement. It is an interesting account of the production of methane and humic substances from coal, and the claimed environmental and agricultural benefits.

E. TIPPING