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Book reviews

Hillel, D. (ed.) *Encyclopedia of Soils in the Environment (Volumes 1–4)*. Elsevier, Oxford, UK, and St Louis, MO, USA, 2005. xxxiv + 2119 pp. (in four volumes). Eur 995 (£710, US$1095), hardback. ISBN 0-12-348530-4. Available from Elsevier, Customer Service Department, Linacre House, Jordan Hill, Oxford OX2 8DP, UK, for purchase in Europe, the Middle East and Africa, and at 11830 Westline Industrial Drive, St Louis, MO 63146, USA, for purchase in North America.

This encyclopaedia follows hard on the heels of, and will provide strong competition to, the one edited by Lal (2002), which was reviewed in volume 54, pages 633–634. This new one comprises four hardbound volumes each of a size that is easy to handle (200 mm × 275 mm and 30 mm thick). The topics are in alphabetical order, and the letter range of each volume is given on its spine. The editorial team consisted of Daniel Hillel, as editor-in-chief, six editors, and an advisory board of 18, the international flavour of which counteracts the predominance of the USA among the editors.

The organization of an encyclopaedia should enable readers to find information rapidly, and in this set of volumes it has been well thought out; the encyclopaedia is 'user friendly' in this respect. For instance, where one might expect a topic alphabetically, reference is made to where it is in both the text and table of contents; an example is 'WATER EROSION *see* EROSION: Water-Induced'. In addition, at the ends of many articles there are '*See also*' sections of related topics, e.g. **'Erosion:** Irrigation-Induced; Wind-Induced'. Some authors did this admirably, giving the impression that the encyclopaedia is not only a compilation of separate topics, but also a coherent treatise with a strong theme as indicated by the general title. The whole would have been better still if more articles had been treated in this way, together with more cross-referencing between topics.

Each volume has the same 34 introductory pages, which include a brief guide of how to use the encyclopaedia and the full set of contents. The page numbering is not continuous; each volume starts with page 1 after the introductory pages. Only volume 4 contains the index, which is long (83 pages) and comprehensive. In it each topic is referenced by the volume number followed by the page number(s); for example, 'Biodiversity **1:136–141** *see also* Fauna'. Within this entry there are others arranged in a hierarchy, e.g. 'distribution 1:138–139', and within this category is 'biogeography 1:138–139'.

The encyclopaedia comprises 267 articles that embrace all the main aspects of soil science, together with others that link our subject to environmental management, food production, biodiversity, climate change and so on. There are 377 contributors: pedologists, biologists, ecologists, geologists, hydrologists, climatologists, geographers, etc. Some 60% of them are from the USA, and this made me wonder whether that reflects the strength of soil science there or the preference of the editors for their own countrymen. Many of the contributors are authorities in their particular fields of soil science and acknowledged internationally. Nevertheless, I should like to have seen examples from a wider range of countries than is the case.

The articles range considerably in length: from three to 18 pages, which has allowed authors to go into depth where necessary. Each article is well organized and generally well written in clear and concise prose, I presume under strong editorial guidance. Most articles provide overviews of the cores of the topics, some in more detail than others, but generally they are starting points for further reading. As an example I single out Fractals; the subject is difficult, and the article gives both a sound general description and depth to certain aspects of fractals. Most articles are well balanced and place their topics in a broader context, especially in relation to soil productivity, management and sustainability. They are generally well illustrated with line diagrams, photographs and photomicrographs, and supported by tabular material. Some of the photographs are repeated in colour in the centres of the volumes. It is a pity that there are not more colour plates, in particular of soil profiles and thin sections. The photomicrographs are generally of good quality and fascinating. Some authors have included lists of technical nomenclature in their articles, but there seems to be no consistent basis for their doing so. Some explain the abbreviations and symbols they use, as in the contribution on Pesticides, whereas others provide glossaries of terms, as in the article on Cultivation and Tillage. It is a pity that more did not do so or that key terms were not defined in the Introduction. Another inconsistency is that some articles have summaries, some have conclusions, and some have neither. In the absence of an abstract, a summary at the end of an article would help readers who wish to get a simple view of a topic to judge whether to penetrate further. There are lists of further reading at the ends of the articles, and these lists include up-to-date literature.

Some repetition in an encyclopaedia is inevitable. Much could have been avoided in this one with better cross-referencing, however. For example, Darcy's law is cited in so many articles that it became tedious, yet it has its own section to which authors could have referred. It must be difficult to obtain a balance in a project of this size, but it did not take me long to discover an overemphasis on soil hydrology; this probably explains my irritation over the repetition

of Darcy's law. Soil hydrology is important because so many soil processes depend on water movement through or on the soil and there remain many unsolved problems, but it occupies too much space here. By contrast, despite their growing importance in soil science and site-specific management, electromagnetic induction (EMI) scans have been omitted. Furthermore, the section on nutrient management makes no mention directly to precision agriculture or site-specific management. There has been enormous progress in these fields in the past 10 years, yet the approach adopted in the encyclopaedia seems archaic.

Somewhat surprising and scarcely relevant are the biographies of soil scientists, some well known, some not. The list is by no means comprehensive and omits many of great worth, in particular Dokuchaev, though the section on Classification systems includes two articles on the Russian ones, the second of which gives some history on Dokuchaev's period. Notably the general topic has no section on any of the other European classification systems, which is a baffling omission given the rich history of soil science in Europe. And why include such an article as 'Women in soil science (USA)'?; as a European woman I found it too narrow to be of worth.

In a review of this nature one cannot include any specific detail; there is much more I could have written. Despite my criticisms above, this is a splendid set of books and a credit to the editors, the editorial board and the authors themselves. The overall standard is high, and the encyclopaedia has achieved what it set out to do – to link soil with the environment. Articles on climate change, greenhouse gas emissions, desertification, environmental monitoring, salinity, pollution, catchment management, to name but a few, broaden the context of our subject and show it as a key to our understanding of the environment.

The encyclopaedia is expensive, and its cost is likely to deter most individual scientists from buying it. However, consultancies, government agencies and research institutes with interests in the environment should have it for their staff, and it should find place in all university libraries where students can access it. It is also timely in view of the growing need for up-to-date information about the soil, in particular for policy makers who have to set out the means for attaining a sustainable world.

An online version of the encyclopaedia is available at: http://info.sciencedirect.com/reference_works, access to which is by subscription to ScienceDirect. I strongly recommend that the publishers sell the encyclopaedia on CD in addition – that way it could be much cheaper and be affordable by individual scientists, it would be less bulky to store, and it would be searchable for the information one actually needs and avoid one's thumbing through a book or its index.

M. A. OLIVER

Reference

Lal, R. (ed.) 2002. *Encyclopedia of Soil Science*. Marcel Dekker, New York.

Kimble, J.M. (ed.) *Cryosols: Permafrost-affected Soils*. Springer-Verlag, Berlin, 2004. xviii + 726 pp. £115.50 (Eur 149.95), hardback. ISBN 3-540-20751-1.

Land areas of the world at high latitudes and high altitudes that are affected by permafrost have been studied by geomorphologists and engineers for many decades, and relict permafrost features, such as ice-wedge casts and cryoturbation structures, have long been used to infer past periods of cold climate in sequences of Quaternary sediments. However, the soils of current permafrost regions, Cryosols in the World Reference Base for Soil Resources or Gelisols in the US Soil Taxonomy, have been studied systematically only since the late 1980s, when the International Permafrost Association and the International Soil Science Society (now the IUSS) formed a Cryosol Working Group led by Charles Tarnocai (of Canada) and Sergey Goryachkin (of Russia). This book summarizes the results achieved by members of the Working Group and their associates, and is the first significant text dedicated to the soils of cold regions. The absence of any discussion relating to relict features inherited from Pleistocene permafrost might be a little disappointing for many European soil scientists, but it results naturally from the way Cryosols are defined.

Permafrost covers about 25% of the earth's surface, and is especially widespread in Russia, where 65% of the land area is affected, and Canada, where almost 40% of the country has permafrost-affected soils. Following a brief historical introduction on research into the soils of cold regions in Alaska, Greenland, Antarctica, Eurasia and Canada, Section 2 of the book contains 13 chapters on the geography of Cryosols. These provide excellent detailed accounts of the distribution and classification of Cryosols in parts of the Arctic and Antarctic, Alaska, Canada, the Russian arctic archipelagos, northeastern Eurasia, north European Russia, western Siberia, far eastern Russia, Mongolia, China and central Siberia. The classification of Cryosols is also covered, though in a more general sense, in Section 5, which contains four excellent chapters describing systems recently introduced in Canada and Russia, the American Soil Taxonomy and the World Reference Base. Probably the most valuable aspect of the book is the various clear accounts of the extensive classical Russian research on Cryosols, very little of which has hitherto been available in English.

Section 3 on properties and processes of Cryosols is perhaps the most disappointing part, mainly because most of the chapters illustrate how little is definitely known about soil processes in very cold environments. However, recent research described in this section clearly shows that the earlier concept of complete pedological inactivity in such areas is completely wrong, even in the most arid parts of Antarctica. Most chemical, physical and microbiological processes occur in the seasonally thawed 'active' layer, but even within seasonally or permanently frozen layers slow changes can occur, especially where a winter snow cover insulates the soil from the lowest air

temperatures. The chapter by C.R. Burn on the thermal regime of Cryosols is of special significance in this context, providing the physical background explaining seasonal transfers of heat and liquid water that influence many processes. Blume *et al.* describe chemical and mineralogical changes resulting from weathering in Antarctic soils, including those resulting from rock weathering by lichens and microbial acidification, which is often enhanced under the penguin rookeries of Antarctica.

Ecological processes including microbial activity and organic matter dynamics are considered in Section 4. Whereas most of the soil in the arctic and boreal zones previously served as a sink for atmospheric carbon, some tundra soils have shown the opposite since the 1970s in becoming net emitters of C, probably because of the strong climatic warming that northern regions have experienced in recent decades. The seven chapters in this section are therefore important in assessing the positive feedback mechanism of global warming on atmospheric C and the effects of warming on soil microbial populations. Many Cryosols contain large stocks of carbon in the permafrost and subsurface active layer because of deep mixing by cryoturbation. These are currently important for respiration of C to the atmosphere during the winter, and in future may well contribute more significantly to atmospheric C with increased melting of permafrost and deepening of the active layer.

The final section of the book (Section 6) consists of four chapters concerned with the management and use of Cryosols. In northeast European Russia (the Vorkuta area, with a mean annual air temperature of $-6°C$), several thousand hectares of tundra soils have been successfully cultivated since the late 1950s for production of forage from native grass species and annually sown mixtures of peas and oats. A fascinating paper by Archegova *et al.* describes the changes in soil characteristics monitored over this period of agricultural use, including changes in hydrological and thermal regimes. Another important aspect of management, described by Eberling, is the control of acid mine drainage and disposal of tailings rich in heavy metals at Nanisivik Mine on Baffin Island in Arctic Canada.

John Kimble, Charles Tarnocai, Sergey Goryachkin and other members of the Cryosol Working Group are to be heartily congratulated for the production of this book. It is the first authoritative and wide-ranging account of soils that occupy very large areas of the world's polar regions and are likely to have increasing ecological and environmental significance in the future.

J. A. CATT

Lal, R. & Shukla, M.K. *Principles of Soil Physics*. Marcel Dekker, New York, 2004. x + 716 pp. US$95, hardback. ISBN 0-8247-5324-0.

This book, a text for undergraduate and graduate scientists, contains 20 chapters arranged in five parts. Two introductory chapters, on the importance of soil physics and on basic concepts and definitions, are followed by six chapters on soil mechanics (221 pages) describing the fabric and structure of the soil and its stability, strength and rheological properties. Then follow eight chapters (260 pages) on soil water, one each on soil temperature and aeration, and one each on gravelly soils and soils with special problems. Throughout, the authors not only discuss the physical properties of soil (with 639 displayed equations) but also describe how these can be measured and provide many numerical exercises to illustrate and support the text. Their prose is generally clear but often infelicitous. The book is copiously illustrated: line diagrams are informative, but many graphs are qualitative and some photographs lack adequate contrast. There are 915 references, but my first test of them failed: for the slump test (page 127) the names of both authors (Williams & Cooke) are misspelt, and the citation is not referenced.

What of the quality of the material? First impressions were not promising. The authors often confuse mass and weight, they fail to discuss the exchange of energy and mass at the interface between soil and atmosphere, and they cite Fisher but ignore Penman in the chapter on evaporation. Further, they frequently describe, graph and tabulate matric potential as a positive quantity when it is in fact negative.

Closer reading led me to three main criticisms. First, the balance is uneven, many chapters giving the impression of having been written long ago and only cursorily updated. For example, much of the material on soil structure is old and, although Chapter 16 on solute transport is a fair summary of our knowledge (but CXTFIT is omitted), most of the references pre-date 1992. The antique flavour is enhanced by the almost invariable use of c.g.s. rather than SI units: discussions of soil water, using ergs, dynes and bars instead of newtons, joules and pascals, are decades out of date, as is the use of calories in thermal problems. Second, there is a lack of critical judgement in the selection, presentation and interpretation of the material. The text conveys much information but fails to distil *principles*. For example, there are extensive and useful lists of, *inter alia*, mechanisms of soil aggregation, indices of soil structure and methods of assessing its stability, equations for infiltration and for gas diffusion in soils, and 14 (!) ways of expressing soil water content. However, there are few critical discussions of the value of or the utility in choosing a given method, model or equation, or the particular circumstances in which it might be the 'best buy'. The lack of selectivity invades the appendices: soil scientists do not use nautical miles or parsecs as units nor H_2SO_4 solutions to provide atmospheres of constant humidity. The chapter on gravelly soils is, however, useful because this important topic is rarely addressed in textbooks. Finally, the quality of the quantitative material is execrable. I noted around 1000 errors without undue effort: Tables 11.3 and 18.1 are disgraceful. A well-defined nomenclature and the correct and consistent writing of symbols, equations and units are essential in science, and the authors fail to provide these. As an example, consider

section 2.1 in which 12 definitions of density, porosity and moisture content are developed in terms of the proportions of the solid, gaseous and liquid components of the soil. The subscripts for liquid and gas transmute unannounced to water and air, two forms of θ are used for water content, and the result is several confusing equations and two incorrect ones (Equations 2.5 and 2.13). Several equations are written with acronyms, not algebraically, and some are wrong (e.g. Equation 16.83 and on Figures 7.11, 10.4 and 10.6). The conventions for specifying units are frequently broken (the prefix for kilo is k, not K), and some units are unintelligible (see Example 17.2 on page 551) or ill chosen (solute leached in one month given in mg ha^{-1} on page 509). The arithmetic solutions to the problems are often hard to follow, and the answer to Example 20.1 is obviously wrong (salt accumulating at 450 t ha^{-1} annually).

The publication of this book will not enhance the reputations of the authors or the publisher. The latter must shoulder much of the blame because competent sub-editing and proofreading would have eliminated many errors. I cannot recommend the book either for teaching or for reference. Those wishing to study the physics of the soil would do much better with Hillel's (2004) *Introduction to Environmental Soil Physics*, the latest revamp of his tried and tested text, which gets both the soil science and the physics right and is also much cheaper at less than US$60 (£37.50; see below, editor).

D. A. ROSE

Reference

Hillel, D. 2004. *Introduction to Environmental Soil Physics*. Elsevier Academic Press, Amsterdam.

Hillel, D. *Introduction to Environmental Soil Physics*. Elsevier Academic Press, Amsterdam, 2004. xvi + 494 pp. £37.50, hardback. ISBN 0-12-348655-6.

Daniel Hillel is well known for his contributions to soil physics. His texts, *Fundamentals of Soil Physics* and *Applications of Soil Physics*, were highly regarded, and in 1998 he combined the two into a single book, which he entitled *Environmental Soil Physics* (Hillel, 1998). Edward Youngs, in his complimentary review of that book in this Journal (volume 50, page 535), nevertheless thought that its bulk (771 pages) would mitigate against its use for study. The near pristine state of our library copy suggests to me that he was right. Now, however, the author has boiled that text down to this 494-page *Introduction*, described in the publisher's blurb as 'student-oriented'.

This abridged edition retains the same structure as its predecessor. It begins with a short essay on the soil as an essential component of our environment on which civilization as we know it depends. The soil sustains us; we ignore it or maltreat it at our peril. If it is to continue to meet the ever growing demands we make of it then we must cherish it, and that means we must understand its properties and behaviour. This then is the *raison d'être* for studying soil physics.

Thereafter the subject is divided into seven main parts which are further split into 21 chapters. The first five parts, entitled 'Basic relationships', 'The solid phase', 'The liquid phase', 'The gaseous phase' and 'Composite phenomena', comprehensively cover the basic principles with brief illustrations of their practical consequences. The last two parts, comprising 'The field water cycle' and 'Soil–plant–water relations', apply these principles in the field. In his earlier books Hillel included worked examples to test the reader's understanding, and many of those are reproduced in this one in brown boxes. Other boxes, in blue, contain asides into applications, history, everyday life and related pieces of science. Many of the figures are now in colour, which gives them immediate impact.

In cutting his earlier text the author has wielded his knife deftly, excising unnecessary peripheral fat and leaving us the meat. All the fundamentals are present, their treatment is penetrating and rigorous, the subject matter is arranged logically and coherently, the writing is exceptionally clear, and the illustrations, anecdotes and apparent asides are pertinent and add to the attraction of the narrative.

Is the publisher's description 'student-oriented' justified? Is this a text to be recommended for students? I have no hesitation is answering 'Yes' to both questions. Further, the publisher has kept faith with the author in marketing the book at a price any serious student, in the richer countries of the world at least, should be able to afford.

I have a criticism, however; the 'Environmental' in the title is fashionable but misleading. It is the same as Youngs pointed out in his review of the earlier book, which ought properly to have been entitled 'Agricultural Soil Physics'; the principal applications were to crop production, land drainage and irrigation. That book contained little on the wider role played by the soil in the environment, and this one seems no different. The author has missed an opportunity to incorporate the soil's function in natural regimes and to deal with such topical matters as the transport, absorption and emission of greenhouse gases.

Nevertheless, what we have is an attractive near comprehensive coverage of soil physics for both student and professional, informative, edifying and a joy to read. It is likely to be the definitive text on the subject for years to come. If soil physics is your subject then buy it.

R. WEBSTER

Reference

Hillel, D. 1998. *Environmental Soil Physics*. Academic Press, San Diego, CA.

Lehmann, J., Kern, D.C., Glaser, B. & Woods, W.I. (eds) *Amazonian Dark Earths: Origin, Properties, Management*. Kluwer Academic Publishers, Dordrecht, 2003. xix + 505 pp. Eur 135 (US$149, £86), hardback. ISBN 1-4020-1839-8.

Glaser, B. & Woods, W.I. (eds) *Amazonian Dark Earths: Explorations in Space and Time*. Springer-Verlag, Berlin, 2004. xiv + 216 pp. Eur 99.95 (SFr169, £77, US$139), hardback. ISBN 3-540-00754-7.

The strongly weathered ferrallitic soils on the old land surfaces and river terraces in humid tropical South America are notoriously infertile. In stark contrast there are in the Amazon basin patches of rich dark soil, known there as 'Terra preta de Índio' (Indian black earth) and now in the international literature as 'Amazonian Dark Earths'. These soils are highly productive.

The Amazonian Dark Earths were first described for science in the 1870s, since when they have intrigued pedologists, ecologists and archaeologists. How did such remarkably fertile soil come into being while surrounded by large tracts of much poorer soil in the same environment? What can the soil tell us about the prehistory of human occupation and land use in the region? Can we use our understanding of the nutrient dynamics of this soil to improve the surrounding land for agriculture?

Surveys in the last 15 years or so have revealed patches of Dark Earths widespread throughout the Amazon basin. At the same time archaeological research suggests that there were large civilizations in the region. Such civilizations must have been fed from a productive agriculture that is hard to imagine in that environment. The Dark Earths contain abundant debris from human occupation – bones of animals, potsherds, charcoal – and that provides the clue to their fertility; they are where people lived. But did the Amerindian people intentionally create the Dark Earths for their agriculture? If so, how precisely did they do it, and should we attempt something similar today? Or was the accumulation of nutrients and organic matter an incidental outcome of their occupation?

Reports of these surveys and investigations appeared in theses, books, journals, proceedings of conferences and occasional papers scattered over several disciplines and in at least four languages. It was time the results were brought together and for the investigators to pool their knowledge. Two symposia on the Amazonian Dark Earths were held in 2001, and these were followed in 2002 by the First International Workshop on the subject in Manaus and Santarém, Brazil. These two books contain versions of papers presented at that Workshop.

The first book, with the subtitle *Origin, Properties, Management*, contains 23 chapters, each by experienced authorities, arranged logically into four sections. The first section summarizes the history of research on the Dark Earths, and describes the region as the Europeans saw it in the 16th century and the social and cultural life and activities of the indigenous people. Maps and diagrams show where Dark Earths have been recognized together with a classification of them. The second section deals with the inherent properties of the Dark Earths, especially those that account for their fertility and potential for production, the quantity and nature of the organic matter in them, carbon sequestration and biodiversity. The third section is entitled 'Methods for characterization of Amazonian Dark Earths'. Most of the methods described are well established, but the archaeobotanical methods might not be so familiar to soil scientists. The last section records how the indigenous people currently manage the land around their homesteads and in their fields further away, the effect it has on the soil's fertility, and how such practice is likely to have led to the formation of the Dark Earths. It closes with a chapter on historical ecology.

The second, slimmer book, *Explorations in Time and Space*, begins with an introductory reprise of what the subject is all about and with pointers to the 14 chapters that follow. The next two chapters also repeat to some extent information in the first book. Chapter 4 breaks new ground with its 'Geographical method for Anthrosol characterization'. It is followed by a mixed bag of chapters on the 'arena negra' of Lake Charo in Peru (Chapter 5), the distribution of Dark Earths in relation to the migration of people in the upper Amazon (Chapter 6), organic matter in archaeological Black Earths and a contrasting Yellow Latosol in the Caxiuanã in Brazil (Chapter 7), and sequential fractionation of phosphorus in anthropogenic Amazonian Dark Earths (Chapter 8). The authors of Chapter 9 have attempted to estimate the rate at which the Dark Earths formed. They reckon that at the sites they studied roughly 100 years was long enough, but they are reluctant to generalize. Chapter 10 returns to the theme of the mode of formation in pre-European times, and is supplemented in Chapter 11 with chemical data. Chapter 12 describes how a particular people use differentially the space available to them so that some parts of that space accumulate nutrients. Chapter 13 asks the question 'Could research on anthropogenic Dark Earth soils be a solution for sustainable agricultural development in the Amazon?' Despite a plethora of words, or perhaps because of it, I could not see an answer; only more questions. The authors of Chapter 14 spell out the merits of 'slash and char', as distinct from 'slash and burn'. Apparently turning woody material into charcoal and spreading it on the land instead of burning it in the open when land is cleared for cultivation can increase yields of crops; though the near 9-fold increase in yield of sorghum claimed by the authors is hardly believable. They follow it with an account of their research on the microbial response to charcoal amendments to the soil.

The Workshop succeeded in its aims of bringing a great deal of information from disparate fields of research to a wide international audience. The editors can take credit for assembling these two books from the proceedings to provide a fairly

comprehensive view of current knowledge, understanding, methods of research, and prospects for land management. Yet despite the organizers' desire to coordinate the information, the two books scarcely relate to one another; neither mentions the other specifically. The first seems to have been planned to cover the subject; the second looks as though it contains the leftovers, even though they are no less interesting or worthy. Further, there is a lot of repetition, not only between the two books but also between contributions within the books; and some of the facts and almost self-evident truths are repeated *ad nauseam*. What is now needed is for someone to boil down these reviews, research papers and reports of case studies into a single coherent monograph. This might be a task for the group calling itself the 'Terra Preta Nova' which was set up at the Workshop. Until we have that, those of you wishing to learn of this fascinating subject can at least dip into these two collected works.

R. WEBSTER

Morgan, R.P.C. *Soil Erosion and Conservation*, 3rd edition. Blackwell Publishing, Oxford, 2005. x + 304 pp. £29.95, paperback. ISBN 1-4051-1781-8.

This third edition of Morgan's text follows the same structure as the previous edition (Morgan, 1995), which I reviewed and commended in this Journal (volume 50, page 175).

The opening chapter sets the scene; it summarizes the extent of erosion world-wide, the amounts of soil being lost, and the social and economic consequences. The next five chapters describe the processes and mechanics of erosion. They deal with the factors that influence erosion and how an understanding of them combined with survey data can lead to assessments of hazard. The factors and processes interact in complex ways, and relating erosion to them is far from easy. Chapter 5 tells readers how to measure erosion, in the field on small plots and from whole catchments, and in the laboratory. It stresses the importance of standard sizes and shapes of plots and standard items of equipment so that results from different situations can be compared sensibly. Chapter 6 is devoted to mathematical modelling of erosion and to the calibration of what are almost inevitably empirical models against measurements in the proper circumstances.

The second half of the book is about conservation. Chapters 7–10 are headed respectively 'Strategies for erosion control', 'Crop and vegetation management', 'Soil management' and 'Mechanical methods for erosion control'. They tell readers what to do to prevent or at least reduce erosion and what can be done to restore land that has been damaged by erosion. They contain much of practical value. But in Chapter 11 Morgan argues that technology is not enough; farmers and graziers are unlikely to do all they should if left on their own, either because they lack the financial resources or resilience or because their self-interest outweighs the interests of others. So in this chapter, entitled 'Implementation', he puts soil conservation in a wider social context. It is in everyone's interest to conserve our soil and prevent damage to the environment in general; and it is for communities and their politicians, both local and national, to understand their roles as stewards and to take responsibility, even to the stage of passing and enforcing legislation. The ideas were there in the 2nd edition, but here they are strengthened.

The new edition also recognizes major advances in research during the last 10 years, in particular on the movement of soil over the land by tillage, the use of tracers to measure erosion, the validation models and the uncertainties of their predictions, and terrain analysis for assessing the risk of erosion.

An innovation in this edition is a set of boxes; each chapter ends with a box. Some of the boxes contain recipes for action, some summarize especially important matter, some illustrate the subjects with case work, and some appear to be no more than continuations of the text that has gone before. They seem to be there largely because boxes have become fashionable in students' texts. Further, the background is so dark that I have difficulty reading the contents.

The above are minor blemishes on an otherwise admirable text built on the author's 35 years of research and teaching. The book is intended for both undergraduates and postgraduates studying soil erosion and conservation as parts of courses in agriculture, engineering and various branches of geography and environmental science. It is likely also to remain a valuable companion for them as they move into professional roles as conservation officers, civil and agricultural engineers, and environmental consultants the world over. If you fall into any of these classes then buy it; and even if you already have the second edition buy this new one to bring yourself up to date. I strongly recommend it.

R. WEBSTER

Reference

Morgan, R.P.C. 1995. *Soil Erosion and Conservation*, 2nd edition. Longman, Harlow.

Fullen, M.A. & Catt, J.A. *Soil Management: Problems and Solutions*. Arnold, London, 2004. xviii + 269 pp. £19.99, paperback. ISBN 0-340-807113.

This book reviews the problems, challenges and potential solutions facing soil management today. Six of the 10 chapters cover various forms of soil degradation: erosion, desertification, pollution, acidification, adverse trends in soil structure, and loss and management of organic matter. Others are on soil survey, soil water management, and soils and climatic change, with a concluding review of prospects for the 21st century.

Surprisingly, nutrient depletion is not discussed, although the Foreword mentions it as a leading problem.

The material is well structured and the writing is clear. The detail given is considerable and authoritative, notably in the treatment of water management. The role of soil in absorption and transmission of pollutants is another strong section.

The regional coverage is ill-defined and unbalanced (curiously, countries do not appear in the index). Well over half of the book is about British soils, there is new material on conservation in China (including straw–clay checkerboards, presumably shown in the cover photograph), but outside of the desertification chapter, there is little on the tropics and on soils of other continents. Apart from the soil map of the world, none of FAO's numerous publications, highly relevant to degradation, water management, carbon sequestration, etc., is cited.

After a time one becomes aware of a strange feature. Soil management has the primary purpose of growing crops, and is carried out mainly by farmers; yet wheat, barley, maize and rice appear only infrequently, and farmers scarcely get a look in. It is as if 'soil managers' were hovering about, tackling degradation but not engaged in agricultural production.

The account of soil survey, classification and land evaluation is so perfunctory that it would have been better omitted. The authors suggest that a value for acceptable erosion of 2 t ha^{-1} $year^{-1}$ might be too large, yet in some parts of the world, to aim at anything less than 10 t ha^{-1} $year^{-1}$ is unrealistic. Irrigation is treated almost entirely with respect to England, without reference to the world's arid zones. The importance of maintaining organic matter is rightly stressed, but the outline of ways to do so omits agroforestry.

The book is explicitly intended for undergraduates, but in this respect it has a serious drawback: the absence of any critical attitude, any suggestion that a research finding may be defective. This makes the text so dull. Summaries of the state of knowledge are useful, but students need to have their interest aroused by being told what is not known, and what might be plain wrong. To say that the choice between the FAO and US systems of soil classification is 'largely a case of personal preference' is hardly an incisive basis for a seminar; though the authors' view is hinted at in the one joke in the book: a soil visited in China was identified (correctly) in the US Taxonomy as a Yermipetrosaligypsicsolonchak!

Many of the same issues are covered, but in a more readable manner, in two books by Alan Wild (1993, 2003), namely *Soils and Environment* and *Soils, Land and Food*, the latter reviewed in this Journal (volume 55, page 201). The present book should be available for consultation in libraries, but I fear that few students will get past any chosen 10 pages before adjourning to the bar.

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References

Wild, A. 1993. *Soils and Environment*. Cambridge University Press, Cambridge.

Wild, A. 2003. *Soils, Land and Food*. Cambridge University Press, Cambridge.

The UK economy shrank more than estimated in the first quarter of this year, recording the largest fall since 1979 as coronavirus led consumer spending to almost a standstill in March.Â Output in the UK dropped 2.2 per cent in the first quarter compared to the previous three months. The UK economy shrank more than estimated in the first quarter of this year, recording the largest fall since 1979 as coronavirus led consumer spending to almost a standstill in March. Output in the UK dropped 2.2 per cent in the first quarter compared to the previous three months, according to revised data from the Office for National Statistics (ONS). This is a sharper contraction than the first estimate of 2 per cent.