Seed Science Research (2004) **14**, 395–397 DOI: 10.1079/SSR2004190

BOOK REVIEW

SEED CONSERVATION: TURNING SCIENCE INTO PRACTICE

R.D. Smith, J.B. Dickie, S.H. Linington, H.W. Pritchard and R.J. Probert (Editors). xxiv + 1023 pp.

Royal Botanic Gardens, Kew, UK. 2003. ISBN 1–84246–052–8, £59.95, US$107.90

The field of seed conservation is, literally, of vital importance to humanity, given the size and impact of the human population on biological diversity. At 1023 pages, *Seed conservation: Turning science into practice* is a massive work, a *tour de force* that has set the standard in the field for many years to come. Superficially, this volume can be viewed as the proceedings of the inaugural workshop hosted in 2001 by the Millennium Seed Bank at Wakehurst Place, the Royal Botanic Gardens, Kew. But it is very much more than that.

At one level, it reflects the distilled knowledge and insight developed during 30+ years of seed conservation activities at Wakehurst Place. At another, and by calling on the professional experience of over 100 contributors, from almost 50 organizations in over 20 different countries distributed across six continents, the editors have artfully woven a remarkably broad-based tapestry depicting the science and practice of seed conservation.

The book is organized into three substantive sections, sandwiched between short introductory and concluding sections. The three sections, Planning and Collecting, Processing and Testing, and Storage and Utilisation, are described on the back cover as comprising a set of reviews, research papers and case studies. This rather pedestrian description does not do justice to a more subtle organization. This is not merely a grab bag of chapters organized after the fact from among an array of speakers that responded to a call for papers. Rather, the chapters, by and large, represent elements of a larger picture strategically solicited by the editors both to tell their own story, and also to contribute their part to a larger composition. The editors weave a rich tapestry, with the foundational science, strategic or policy issues forming a strong warp, which is bound together by a richly detailed weft of chapters emphasizing more pragmatic treatments, practical guidelines, special cases and case studies. It is not surprising that there are competing views on many issues within seed conservation, and, at least for those with which I am most familiar (the science and practice of long-term seed storage), the various views are given a fair hearing.

The sheer magnitude of this volume – 56 chapters – does not make it practical to address each individually, so I will finish this review with some boilerplate, and a few vignettes to characterize the whole.

Its very appearance provides a useful metaphor for its contents. What may appear initially to be a standard paperback, is really a quality book constructed of sewn signatures of good paper and covered with a substantial limp cloth binding. It has stood up well to several months of rough handling while dragging it around with me during the time it took to read it. The chapters are, in general, well written, and the book is well edited. With so many chapters and contributing authors from all across the world, it is not surprising that writing styles vary among chapters, and (remarkably) few chapters are not of the calibre of the vast majority. Nevertheless, the editors have done an excellent job overall, giving the volume a consistent graphical look throughout, similar to other books by Kew, and have crafted a coherent whole that is greater than the sum of its parts. I found very few typographical errors, and none that appeared to make the authors' meaning unclear. Because so much ground is covered, a glossary would have been welcome, and I would have liked the families to have been consistently indicated for the many genera mentioned. The type, although easy to read, is a bit small. With approximately 45 lines of text per page, the amount of information contained is extraordinary. While expensive in absolute terms (US$107.90; £59.95), the per page price of less than US$0.11 (£0.06) is reasonable, even modest, by contemporary standards.

The volume begins with a ten-page introduction, (available on the World Wide Web at http://www.rbgkew.org.uk.msbp/inform/index.html),

which serves as an abstract or executive summary of the volume as a whole. In the first chapter, Cheyne describes how 'The Millennium Seed Bank Project [MSBP] has been developed within the framework for international conservation collaborations agreed by the signatories to the Convention on Biological Diversity (CBD)' (p. 5). It would be easy to get the mistaken impression from this chapter that the MSBP is collaborative in nature because it felt compelled to be so in light of international agreements. This would be unfortunate, because the Millennium Seed Bank, while new, is the most recent incarnation of seed conservation efforts that have been conducted at Wakehurst Place for some three decades. Indeed, the editors have, between them, over 125 years of combined seed conservation experience at Wakehurst Place. They appear from early on to have viewed their work and facilities as a global conservation resource, and have long worked in a collaborative manner, providing training, expert advice and seed storage facilities to the world. Indeed, our correspondence files here at the Berry Botanic Garden show clearly that in 1983, Simon Linington was instrumental in educating the first curator of our seed bank in what it took to operate in accordance with international standards. He provided not only extensive advice, but also graciously sent several volumes of supporting literature. This enabled us to begin on the right foot, and make the most of the limited resources available to us at the time. So, too, when the MSBP Wellcome Trust building, which houses the seed bank, was being designed, the editors conceived of, and were able to get included, more than a dozen mini 'apartments' for use by short- to medium-term collaborators from around the world. This, combined with the fact that fully one-third of the delegates to the workshop on which this volume is based were collaborators from around the world, illustrates the depth of the commitment shown by RBG Kew and Wakehurst Place to sharing their knowledge, expertise and facilities for the benefit of humanity. Much of the value of this volume, and the enormous global conservation resource it represents, flows from a generosity of spirit the five editors have shown throughout their long careers.

The warp and weft relationship of chapters in constructing a larger whole can be found throughout the book, and I will outline just two to illustrate the pattern.

In section two – Processing and Testing – the chapter 'Seed viability under ambient conditions, and the importance of drying', by Probert, could easily be called a review, and it is, but it is also a primer. He begins with a solid scientific, conceptual foundation about the effects of ambient conditions (temperature and humidity) on the viability of mature, orthodox seeds. The chapter also includes a set of practical guidelines for immediate post-harvest handling and drying of seeds during seed collection missions, and a technical discussion of seeds in sealed containers. It ends with a practical discussion of seed drying, which includes factors that affect the rate of seed drying and advice on low-tech methods of seed drying, describing, for the first time, the use of charcoal as a low-cost desiccant.

The weft chapters that build on this chapter include a practical discussion of non-destructive measurement of seed moisture, a more theoretical treatment about assessing desiccation sensitivity that looks beyond the traditional distinction between orthodox, intermediate and recalcitrant seeds to underlying causes. This group is, in turn, followed by a chapter on understanding and handling desiccation-sensitive seeds. This suite of chapters concludes with a narrowly focused case study of *Warburgia salutaris* (*Canellaceae*), a highly used medicinal plant in southern Africa. It contains, perhaps, the most major point of disagreement I have with any chapter. It is based on a fascinating allometric analysis showing that larger fruits produce larger seeds, and the reasonable assumption that larger seeds generally have a higher probability of establishing seedlings than do small seeds. It is the conclusion that seeds from the largest fruits should be used for *in situ* and *ex situ* replanting schemes, with which I am uncomfortable. I think it is risky to apply artificial selection for any single trait (large fruits), without understanding what other, unintended, consequences might also arise. It is conceivable that large fruit and seed size could be related to lower concentrations of some chemical compound that produces the medicinal properties for which the plant is valued, and such a selective regime would reduce its potency over time.

Section three – Storage and Utilisation – could as easily been divided into two sections, one on storage and the other featuring a series of, for want of a better description, case studies. The first 12 chapters of this section comprise the storage component, three of which provide the structural warp, across which other chapters weave supplemental material. The final 10 chapters of this section are the case studies, which serve as a richly detailed weft, to illustrate how the full range of issues dealt with throughout the volume are put into practice within the context of many different situations, by organizations with very different missions and levels of available resources.

The three warp chapters dealing with storage are 'The design of seed banks' by Linington, 'Predicting seed longevity: the use and abuse of seed viability equations' by Pritchard and Dickie, and 'Optimising seed banking procedures' by Walters. These are complemented and supplemented by a variety of chapters. Some are very general in their scope, such as one by Buitink and Hoekstra, which seeks to

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understand and predict optimal storage conditions and longevity using a biophysical approach. Others have a narrower focus on such subjects as selecting seed containers for long-term storage, or the longevity of a single species under ultra-dry storage.

In summary, *Seed conservation: Turning science into practice* is a monumental testament to what a relatively few people at a world-class botanic garden can accomplish to benefit the many, when inspiration, creativity, long-term dedication and generosity of spirit are brought to bear in active, mutually respectful, collaboration with colleagues and conservationists globally.

Edward O. Guerrant Jr
Berry Botanic Garden
11505 SW Summerville Avenue
Portland, OR 97219, USA

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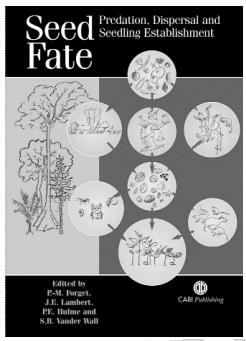

Seed Fate: Predation, Dispersal and Seedling Establishment

Edited by P M Forget, Museum of Natural History, Brunoy, France, J E Lambert, University of Wisconsin, USA, P E Hulme, Centre for Ecology and Hydrology, Banchory, UK and S B Vander Wall, University of Nevada, USA

December 2004 432 pages Hardback
0 85199 806 2 £75.00 (US$140.00)

Readership

Seed science, plant and animal ecology.

Key Features

- Covers seed fate in a variety of contrasting continents, biomes and habitats
- Discusses all types of animal-seed interactions including predation and dispersal
- Examines the impact of a variety of animal taxa on seed fate

Main Description

This book presents current knowledge of seed fate in both natural and human-disturbed landscapes, from various regions of the world. Habitats considered range from mountain and arid deserts in the temperate zone, to savanna and lowland rainforests in tropical regions of the world. Particular attention is paid to plant diversity conservation when seed removal is affected by factors such as hunting, habitat fragmentation or intensive logging. Contributors include leading scientists involved in research on seed ecology and on animal-plant relationships from the perspective of both primary and secondary seed dispersal, and predation.

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Email: orders@cabi.org

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7th Floor,
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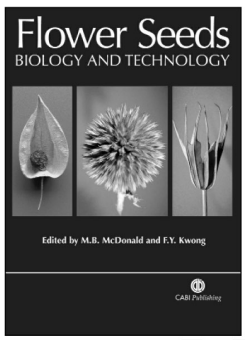

Flower Seeds: Biology and Technology

Edited by M B McDonald, Department of Horticulture and Crop Science, Ohio State University, USA and F Y Kwong, PanAmerican Seed Company, West Chicago, USA

December 2004 400 pages Hardback
0 85199 906 9 £95.00 (US$175.00)

Readership

Seed biology and technology, and ornamental horticulture.

Key Features

- The first book to consider this important topic
- Successfully brings together the leading authorities on specific topics
- Provides an essential reference tool for all those interested in flower seeds
- Well illustrated with colour plates, black and white photos and line diagrams

Main Description

The floral industry represents a significant proportion of agricultural income in several developed countries, particularly the USA, the Netherlands and Japan. Hitherto the sheer diversity of flower seeds, in their form, function and biology, has hindered the production of a comprehensive treatment of the topic. This book provides a unique and much-needed resource of information on the biology and technology of flower seeds. It presents in-depth information on the history and evolution of the ornamental and wild flower seed industries followed by recommendations for successful breed and production programs. A comprehensive coverage of the biology of flower seeds is considered as well as appropriate technologies associated with germination, vigor and viability testing. In this volume, the first of its kind, international authorities from academia and industry have been brought together to provide a comprehensive reference resource for both practitioners and students of seed science and technology and of ornamental horticulture.

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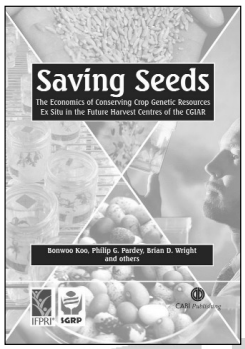

Saving Seeds: The Economics of Conserving Crop Genetic Resources Ex Situ in the Future Harvest Centres of CGIAR

by B Koo, International Food Policy Research Institute, (IFPRI), Washington D C, USA, P G Pardey, University of Minnesota, USA, B D Wright, University of California, Berkeley, USA, and others.

October 2004 232 pages Hardback
0 85199 859 3 £49.95 (US$90.00)

Readership

Plant breeding and genetics, conservation, biodiversity and agricultural economics.

Key Features

- The authors are internationally recognized experts in their field
- Presents original research findings on a topical subject
- Provides a comprehensive overview of genebanks from an economic perspective

Main Description

The conservation of genetic resources is vital to the maintenance of biodiversity and to the world's ability to feed its growing population. There are now more than a thousand genebanks worldwide involved in the ex situ (meaning "away from the source") storage of particular classes of crops. Since the 1970s, the eleven genebanks maintained by the centres of the Consultative Group on International Agricultural Research (CGIAR) have become pivotal to the global conservation effort. However, key policy and management issues – usually with economic dimensions – have largely been overlooked.

This provided the impetus for a series of detailed economic studies, led by IFPRI, in collaboration with five CGIAR centres: CIAT (based in Colombia), CIMMYT (Mexico), ICARDA (Syria), ICRISAT (India) and IRRI (Philippines). This book reports these studies and discusses their wider implications.

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