Global Crop Resources

Gene Banks and the World's Food. DONALD L. PLUCKNETT, NIGEL J. H. SMITH, J. T. WILLIAMS, and N. MURTHI ANISHETTY. Princeton University Press, Princeton, NJ, 1987. xvi, 248 pp., illus. $35.

Gene Banks and the World's Food could not have been published at a more appropriate time. Interest in genetic resources, no longer solely the domain of the scientist, is at an all-time high. Today an informed public speaks knowingly of species extinction, the loss of wild relatives of important economic plants, and the implications of such loss for the ability to meet future food needs of a growing population. Moreover, a debate has developed over germplasm ownership and its dissemination outside its area of natural distribution. Historically, germplasm has been freely exchanged between nations and scientists. Today there are those who would curb the exchange and would make germplasm available to those outside the source country only at a price if at all. The developed world, through its multinational seed companies, is accused of exploiting gene resources of the developing world without regard to questions of value or ownership. Thus germplasm issues have become politicized and have moved beyond the scientific institutions and onto the agendas of national governments and international organizations such as the Food and Agriculture Organization of the United Nations.

Those who are concerned about the destruction of the rain forests of the Amazon basin or of the savannahs of east Africa will find nothing in this book that treats those serious problems of species extinction. The book deals exclusively with crop plants and their wild and weedy progenitors. It is to these cultivated plants of economic importance that most of the world's gene banks devote their resources and attention.

The book is an excellent presentation of the rationale for gene banks, their mode of operation, and the economic justification for their existence. Many additional related subjects are also covered, including seed production, genetic diversity and vulnerability, breeders' rights, plant exploration, and biotechnology. The authors are well qualified to deal with these subjects. Each has years of experience in germplasm conservation and utilization. Recognizing a growing interest in germplasm conservation among laypersons, they have wisely chosen as an audience "interested citizens, policy makers, researchers in the agricultural and environmental sciences, as well as social scientists." By limiting the use of technical language, they have succeeded in telling their story in a way that should appeal to such an audience.

Those who are unfamiliar with the history of plant exploration will find chapter 3, "Plant collectors and gene banks," of considerable interest. Although medicinal and pleasure gardens were established before the time of Christ, it was not until the 16th century that plant exploration became a serious business. During those early years botanical gardens played a major role in collecting, propagating, and disseminating new, exotic plants. The countries of Europe established numerous botanical gardens in their colonies, particularly in the tropics and subtropics. One of the main functions of these gardens was to collect, adapt, and move to the mother country new plants of potential economic value. The circuitous route by which Blue Mountain coffee reached Jamaica offers a typical example of the role of botanical gardens in these activities. The progenitor of Blue Mountain coffee originated in Java. From there it was sent to the Amsterdam Botanic Garden in 1706. The Dutch sent progeny to Dutch Guiana (Surinam) and to Louis XIV in France. This stock was grown and multiplied at the Jardin des Plantes, from which it was sent to the French colony on Martinique in 1720. Sometime thereafter it reached Jamaica, where it provided the original stock from which was developed the Blue Mountain variety, a variety thought by some to be among the world's best coffee.

Though botanical gardens were the early propagators and distributors of newly discovered plants, it was explorers, often living and traveling under most arduous conditions, who collected new plants. The book gives brief accounts of several of the more famous plant hunters, including Frank Meyer, David Fairchild, Wilson Popenoe, and Nikolai Vavilov.

Those unfamiliar with plant breeding will find chapter 8 especially informative. Here is portrayed in graphic form the ancestry of IR36, a rice variety developed by the International Rice Research Institute in the Philippines. The nontechnical reader probably will not be able to understand the breeding procedures employed, but the complex genealogy of IR36 will be clear to all. As the authors indicate, the methodology utilized in developing IR36 is applicable to many other crops. This example therefore provides an insight into the methods employed generally in modern plant breeding.

Chapter 6, "Genes in the bank," should be of considerable interest to those engaged in genetic resources activities of any kind. The chapter includes in tabular form much information on the number of gene bank acces-

"Field gene bank for several species of *Tripsacum*, wild relatives of maize used in breeding for resistance to diseases, insect pests, and resilient stems. Tlaltizapan substation of the International Maize and Wheat Improvement Center, Mexico, June 1985." [From *Gene Banks and the World's Food*]

Potato varieties. *Top*, wild species being screened for pest and disease resistance at the Huancayo, Peru, substation of the International Potato Center, 1982. *Bottom*, several varieties for sale in Huancayo, June 1982. [From *Gene Banks and the World's Food*]

sions of the world's most important food crops. Data are provided by country and institution on the number of accessions of cereals, pulse crops, root and tuber crops, and industrial crops in various gene banks around the world, information that was previously available only in scattered publications.

If there is a weakness in the book it is a tendency to overemphasize the use that is currently being made of unimproved plant accessions in plant breeding and to underemphasize the importance of full documentation and evaluation of materials in the world's gene banks. Although gene bank accessions are an important source of germplasm in plant breeding, the most widely used germplasm consists of elite lines, commercial varieties, and improved populations. Because only a very small part of the material in gene banks has been evaluated, most breeders go to the banks as a last resort and usually only for genes coding for disease resistance. Evaluation is thus the most urgent need faced by most of the world's gene banks.

Notwithstanding this minor criticism *Gene Banks and the World's Food* is a superb book. It has much to offer all students of plant genetic resources as well as the interested layperson. The book's scholarly, balanced treatment of the controversial "International Undertaking" is a welcome counterweight to the biased, misleading statements that have appeared in the literature on this subject.

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Mechanisms of Mobility

Insect Flight. Dispersal and Migration. W. DANTHANARAYANA, Ed. Springer-Verlag, New York, 1986. x, 289 pp., illus. $69. Proceedings in Life Sciences. Based on a symposium, Hamburg, F.R.G., Aug. 1984.

This book covers a wide range of topics related to insect flight, from its evolution to orientation and physiology. Some chapters are useful primarily as bibliographic sources. Others also summarize research to date or highlight particular problems. The introductory chapter by the editor, Danthanarayana, summarizes the contents of the book concisely and clearly. A chapter by Dingle on the evolution and genetics of insect migration succinctly outlines the present state of research and indicates where future research might best be directed. This topic is dicussed with reference to a particular organism, the African armyworm, *Spodoptera exempta*, by Gatehouse, whose analysis indicates that population fluctuations may be significantly modulated by genetic variation in dispersal tendency. A short, well-argued chapter by Edwards describes the importance of arthropod fallout as a mechanism for recolonizing areas (in this instance the area around Mount St. Helens) and, for some arthropod populations, as providing the only source of nutrients. There are few studies bearing on this problem despite its importance in large-scale dispersal of arthropods, and Edwards's study provides valuable data. Similarly short, but well written and clear, is the chapter by Dixon and Howard on the trade-offs between dispersal and fecundity in aphids; such trade-offs are of significance for general evolutionary theory since they illustrate the principle that pathways of evolution may be constrained by physiology. Chapters by Riley and Reynolds, Danthanarayana and Dashper, Mikkola, Gibo, and Farrow taken as a group demonstrate that mechanisms of orientation in migration are at least as complex in insects