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BOOK REVIEW: Sakiko Fukuda-Parr, ed., *The Gene Revolution: GM Crops and Unequal Development*. London: Earthscan, 2007, xxx + 248 pp., $42.50 paperback, ISBN 978-1-84407-409-9.

The motivation for *The Gene Revolution* is the contention that policy debates regarding biotechnology, particularly in developing countries, have not been correctly framed. A concern behind the book's rationale is that too much of the discussion over the spread of GM crops has been conducted by either extreme proponents or extreme opponents of the technology. This volume instead seeks a middle ground. Its objective is to examine how innovations in institutions and policies can make biotechnology work for developing countries.

The book is divided into three parts. The first part, which serves as an introduction to the issues, consists of five chapters. Part II contains case studies on five developing nations' experiences with GM crops: Argentina, Brazil, China, India, and South Africa. The final part has two chapters comparing and analyzing the experiences of the countries considered in Part II. The chapters are authored by the editor and fourteen other contributors. A strength is that these individuals come from a wide array of backgrounds and specialties.

The first two chapters are by Fukuda-Parr. Chapter 1 begins with a brief background on GM crops. From there, it moves on to discuss objectives for developing countries in advancing technological innovation. Importantly for the focus of the book, these objectives go beyond the standard issues of poverty and hunger to include GDP growth, improving health and environmental sustainability, and global competitiveness. Chapter 2 moves into the key elements of the book: how institutional changes and alternative institutional models affect the spread of GM crops and lead to different experiences with them in different countries.

The remaining three chapters of Part I consider the differing experiences of the U.S., Europe, and West and Central Africa. Chapter 3, by Traxler, covers the U.S. This brief chapter discusses the leading role of the U.S. in agricultural biotechnology, its regulatory structure and seed markets. The strength of the chapter is in the tables, which contain useful data for understanding these issues. Europe and its turn against GM crops is the focus of Chapter 4 by Tiberghien. While this topic would be worthy of a book of its own, the chapter provides a good summary of how European policy has evolved, including such issues as labeling rules, the de facto moratorium on GM approvals, the effects that anti-GM activists were able to have on the debate, and acceptance of the precautionary principle. Nwalozie, Sereme, Roy-Macauley and Alhassan move the discussion away from developed countries and into West and Central Africa. For this region, which has seen little in the way of the gene revolution, they consider the potential of biotechnology to help meet

national priorities. The chapter effectively covers the institutional, resource, and delivery challenges of the area and points to areas were GM crops could provide important benefits.

The examples from Part I are useful preparation for the five case studies of developing countries' experiences with GM crops in Part II. Each respective chapter examines which crops have been successful and why, institutional and regulatory changes and actions, research and development (R&D), intellectual property rights (IPR), the seed industry, and economic and social impacts. Many of these countries face similar problems in developing biotechnology, such as a lack of qualified researchers, funds, and resources, and in dealing with often large trade in illegal seeds. Although the authors raise several concerns, the chapters as a whole present a positive experience with and future for GM crops. At the same time, each country has had unique experiences, issues, and challenges that make discussion of the individual cases worthwhile.

In Chapter 6, Chudnovsky investigates the case of Argentina. Roundup Ready soybeans have been greatly successful in the country and make for an interesting evaluation. The case for their rapid adoption is made in the framework of the country's economic liberalization, well established seed industry, and regulatory decisions. Benefits from adoption appear to have gone largely to farmers, and the nation's stakeholders appear quite favorable towards biotechnology.

Brazil's challenges from the spread of GM crops are detailed in Chapter 7 by Silveira and Borges. Roundup Ready soybeans are again the major crop on which the Brazilian debate has focused. Adding to the controversy, farmers in the nation have been using GM soybeans from Argentina for several years without recognition by the government. The authors believe that Brazil could be successful in GM crop creation with additional funding, given their infrastructure and training.

The Chapter 8 case study of China by Huang, Hu, Rozelle, and Pray shows an experience much different from those of Argentina and Brazil. Bt cotton is the primary GM crop and motivates much of the discussion. The authors show how China has developed a public sector model for biotechnology research much different from the U.S. corporate model. The Chinese research effort is detailed both in terms of successes and remaining challenges. Next to the U.S., China is shown to be the most focused on the future benefits of agricultural biotechnology.

Chapter 9 on India by Ramaswami and Pray is focused more on the role of GM crops in reducing poverty than some of the other case studies. How successful the gene revolution can be in this regard, however, is still a question. The same issues faced by other countries, such as regulation development and IPR and funding, leave much to be determined in the future. The farmers' interest in GM crops, especially for Bt cotton, is once again apparent despite institutional issues. This demand suggests that there are benefits many stakeholders have already identified.

Gouse's chapter on South Africa completes Part II. He covers farmers' experiences with GM crops, including subsistence farmers, and the country's R&D efforts. Bt cotton is again the dominant GM success in the country. While the institutions appear to be developing in the country, the main hurdle of creating a commercial

product remains. While the issues are by now familiar from the preceding chapters, the experiences of South Africa reinforce the challenges inherent in the gene revolution.

In the final part, Fukuda-Parr provides two chapters that pull together and summarize the material from Part II. Chapter 11 in particular does an excellent job addressing the various issues raised in earlier chapters. It stresses the key areas for institutional change (i.e., new R&D systems, IPR with enforcement, and regulations for seed markets and biosafety) and details and compares the different institutional approaches. A useful (but quickly dated) table of GM approvals in various countries is also included. The last chapter ties back in with the first, taking a hard look at the role of government policy. The book ends with a call to change the debate on GM crops and the gene revolution.

As with all books, there are some areas that could have been improved. One daunting aspect for many readers might be the extensive use of acronyms and abbreviations. Although a five-page list is included in the front matter, readers who need to consult the list to refresh their memories or familiarize themselves with the terms and organizations will have to interrupt their flow of reading. Another issue is the redundancy across many of the chapters. This redundancy is expected in a volume of contributed chapters, but each chapter would have benefitted from more new material. On a related note, serious opponents of GM crops and their use in developing countries will likely believe that their concerns have been largely ignored. Arguments presented against using GM crops in developing countries are scarce and not given much credence. However, the discussions in the book appear to be based on cited empirical evidence rather than the bias that undercuts some other efforts to address this topic.

Who will be most interested in this book? Although Fukuda-Parr does not specifically state an intended audience, several groups should be interested. The most obvious would be policy makers and analysts, in both government and private organizations. The background and case studies should prove useful for judging responses to different institutional arrangements and future planning. Academic researchers might find the book useful because it raises issues that deserve further study. Given its relatively small size, the book is a great starting point, leaving much to explore. In the classroom, some case details and tables and figures in the text would make nice examples, and some instructors might consider certain sections for supplemental readings. In total, this book is a useful addition to the literature on GM crops and developing countries. More books attempting to take a middle ground approach should follow its lead.

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