

Book Review

Genetically Modified Crops and Agricultural Development

Matin Qaim

Palgrave Macmillan US, 2016. ISBN 978-1-137-40571-5, 206 pages

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Farmers have been growing GM crops for 20 years and planted 180 million hectares to GM crops in 2015. Qaim provides a thorough and unbiased review of the accumulated research on the risks, benefits, and policy issues surrounding the use of GM crops in developing countries. The book will be valuable for anyone looking for a readable and credible source that summarizes a vast and complex literature on the impact and policy implications of GM crops.

Genetically Modified Crops and Agricultural Development reviews the economic, social, environmental, and political issues related to the use of genetically modified (GM) crops in developing countries. The review examines the realized contribution and future potential of GM crops to address three core agricultural development goals—increased food supply, improved rural livelihoods, and more sustainable agricultural production. The stated objective of the book is to “contribute to a more rational discourse about GM crops by providing science-based information on various aspects of public concerns.” It is clear that the author is perplexed by the persistent gulf between his belief in GM crops’ potential to contribute to the core development goals and the modest

impact that they have had in developing countries during the first two decades of their commercial use. The core obstacle to the expansion of GM crop technology is identified as “limited public acceptance.” Qaim observes that “Unfortunately, the available evidence has hardly entered the public debate. The prejudices and arguments used against GM technology are still the same as 20 years ago” (p. 10). The strategy pursued in the book is to provide a comprehensive and accessible summary of the available evidence to spur rational discourse on GM crop technology. The book is organized into eight chapters that provide the scientific, agricultural, cultural, and economic context that frame the “complex public debate.”

The second chapter of the book places the scientific evolution of GM crops within the historical context of the contribution of plant breeding to satisfying the need to feed a growing world population. In very broad strokes, the emergence of the science of plant hybridization and molecular plant breeding tools are described. The role of the development of high-yielding varieties (HYVs) and the Consultative Group on International Agricultural Research (CGIAR) in the Green

Revolution is also summarized, along with the growth of the private sector seed industry. This is a very compact chapter that serves to link past scientific and institutional breakthroughs in crop improvement to the continuing challenge of satisfying global food demand. The chapter effectively sounds the alarm that past success is no guarantee of future progress against this fundamental mandate.

Chapter 3 provides a very accessible explanation of applied biotechnology science and its potential to release global food availability constraints. The chapter builds nicely on the previous chapter's discussion of conventional approaches to crop improvement, while also introducing the potential health and environmental risks of GM crops. Qaim states his sources and conclusions in very clear terms: "GM crops are not per se more risky than conventional plant breeding technologies," (49) and "The available evidence clearly shows that the ecological problems related to the cultivation of GM crops fail to differ in any fundamental way from those associated with conventional crops or agricultural production in general" (55). He also identifies one of the core regulatory debates concerning GM crops—GM crops are regulated based on the scientific process used to generate them while all other agricultural technologies are regulated based on their performance.

The impact of GM crops that have already been grown by farmers and the potential impact of crops that are under development are discussed in Chapter 4 and Chapter 5. Chapter 4 summarizes the data on GM crop uptake and the empirical evidence of past impacts, a literature to which Qaim has made substantial contributions over the past 20 years. The data comparing GM crop and conventional crop varieties with regard to pesticide use, yields and farm profit are summarized in a format that is accessible to non-economists. The assessment separates findings according to event (herbicide tolerance and insect resistance)

as well summarizing the results of modelling studies that estimate the global impacts. The studies cited provide abundant evidence of environmental benefits and economic gains that are widely shared among farmers, the industry, and consumers.

Chapter 5 provides a summary of GM crops that are in advanced stage of development or in early stages of adoption. This is the most comprehensive compilation of this GM crop pipeline information that I have seen recently. More than 50 traits in 23 crop species are identified as being under development, with the type of institution involved in the research about evenly divided between the public sector and the private sector. The chapter identifies the technologies, but only briefly discusses the institutional pathway to uptake by developing country farmers. The chapter is very brief in its treatment of prospects for the uptake of the array of potential new GM crops, with little mention of structural, cultural, or financial obstacles. This seems to be a missed opportunity to bring together the past experience summarized in Chapter 4 with the promise of the long list of GM crops in the pipeline. Pipeline lists such as this have appeared at regular intervals in the past, yet one of the mysteries surrounding the current biotechnology era is why the range of GM crops to have delivered large impacts has been so narrow and so static. All of the most successful GM crops were introduced nearly 20 years ago.

The key policy issues of biosafety regulation, GM food labelling requirements, coexistence, trade, intellectual property, and industry concentration are dealt with in Chapter 6. These complex issues are given concise descriptive overviews, with particular attention given to the issues of overregulation of GM crops and the threat posed by industry concentration. The analytics behind the current structures for regulating and delivering GM crop technologies are not treated in any detail. In Chapter 7, Qaim probes the "complex public

debate” around GM crops, opening with the statement that “Public attitudes toward GM crops are predominantly negative” (135). The chapter discusses the major claims that have been made of detrimental health and environmental effects of GM crops, identifying the sources of those claims, and tracing their consequences on the public discourse. The role, motives, and tactics of non-governmental organizations (NGOs) in developing narratives that have generated the negative public attitude are traced in the chapter. Qaim judges the narratives developed by NGOs from false science and unsubstantiated rumors to be the most decisive factor influencing public opinion. The areas where there are scientific consensus are also identified, including the conclusion that GM crops are not inherently more risky than conventionally-bred crops, and that given the large economic and environmental benefits that have been generated by GM crop adoption, there is no scientific justification for banning GM crop technology.

The final chapter attempts to reconcile the evidence of large and widely-shared economic and environmental benefits with the continued social and political resistance to GM crop technology. Qaim states his conviction that “Not using and further developing these technologies would be irresponsible” (178) so it is clear that his hope is that acceptance will emerge as the public becomes more aware of the evidence on the benefits of existing GM crops, the potential of technologies currently being developed, and the accumulating years without verified health or environmental harm. The concluding hope is that governments will undertake reform to rectify the “major stumbling block” posed by the overregulation of GM crops.

Genetically Modified Crops and Agricultural Development accomplishes the difficult task of providing a comprehensive interpretive summary of a vast literature in a fast-moving field. A further strength of the book is its accessibility to non-economists, making it a

valuable tool for regulators, policymakers, and teachers who need a credible and up-to-date reference. Key parts of economic theories and methods that have been used in the academic literature are presented, but can be skipped over by readers who lack the background without losing the main threads of Qaim’s arguments. The central plea of the book—that GM crops are overregulated relative to their risk and potential reward—comes through clearly and convincingly. Only time will tell whether the abundant evidence presented in the book will be sufficient to achieve the author’s objective of generating a more rational discourse about GM crops.

I would have liked to see a deeper discussion of the institutions involved in the delivery of GM crop technology. As written, the discussion takes place in something of an institutional vacuum. Why has the public sector played such a small role in GM crop delivery to date? What financial, structural, and political changes would need to occur for those promising pipeline technologies to move into developing country farmers’ hands? The concluding chapter points out that “institutional adjustments may be required”, but concrete suggestions are lacking and the roles of the international community, national governments, and the private sector are not identified.

Further Readings

- Barrows, G., S. Sexton, and D. Zilberman. 2014. “Agricultural Biotechnology: The Promise and Prospects of Genetically Modified Crops.” *Journal of Economic Perspectives* 28 (1): 99–120.
- Harmon, A. 2014. “A Lonely Quest for Facts on Genetically Modified Crops.” *The New York Times*, January 5.
- Walker, T.S., and J. Alwang, eds. 2015. *Crop Improvement, Adoption and Impact of Improved Varieties in Food Crops in Sub-Saharan Africa*. Oxfordshire, UK; Boston, MA, USA: CABInternational.