

Book review

Methods of Risk Assessment of Transgenic Plants. IV. Biodiversity and Biotechnology

Klaus Amman, Yolande Jacot, Richard Braun (Eds.), Birkhäuser, P.O. Box 133, Basel, Switzerland, 2003, ISBN 3-7643-6657-5, 196 pp., Hardcover, € 68

This book is purported to be about biodiversity and biotechnology. Unfortunately many chapters only pay a minor lip service to biodiversity, and in some chapters, not even that. Many chapter authors do not even discuss how the issues they do describe affect (positively or negatively) biodiversity. Thus, a chance to fill a niche usually full of clichés and unsubstantiated claims with hard information has only partially been fulfilled. Still, the chapters are very good to excellent in discussing what the authors actually chose to discuss.

In an opening chapter, the editors explain the needs and loss of biodiversity in a manner that should be convincing to individuals jaded by rhetoric on the subject, and they make the point how “paradoxically (biotechnology) is likely to contribute to conserving (biodiversity) by reducing appropriation of biodiversity rich land for agricultural purposes”. They make the point that biotechnology has much to offer the resource poor farmer to increase sustainable yields without encroaching on other areas.

Krattinger does well at “widening the perspectives on biodiversity”, distancing himself from the self-proclaimed environmentalists’ claims that biotechnology is a threat to biodiversity, and presents conceptual and factual evidence of how biotechnology can promote and preserve biodiversity. He considers the Convention on Biological Diversity (CBD), which intended to protect bioprospecting in a manner to support biodiversity, as a hindrance rather than a solution, preferring a “Linux software” type open source solution where all can contribute and gain. He believes that the 1992 Rio definition of the precautionary principle “lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental damage” as including biotechnology to contribute in doing so. In dealing with acceptance of biotechnology, he aptly reminds us of the inconsistency in the acceptance of biotechnology for producing medicinals for the first world, yet un-acceptance for its use to overcome malnutrition, the major medical problem in the developing world.

Beringer’s chapter on horizontal gene transfer is of necessity short, as while such gene flow is well documented

in prokaryotes, “true horizontal transfer” (the author’s term) among plants has only been documented on an evolutionary time scale. Thus, he describes cases of gene movement between related species, a type of gene transfer that he calls “not true” (and this reviewer termed “diagonal”). Unfortunately, he does not document the plethora of field evidence where there is good evidence that there has been no horizontal gene transfer from bacteria to plants despite exceedingly strong selection pressure on plants living in an environment where closely associated bacteria contain lifesaving genes, yet the genes have not moved in to degrade herbicides in thousands of plant species on multiple millions of hectares over decades.

Amman and Jacot, in a chapter on vertical (mainly diagonal) gene transfer contend that evolutionarily desirable traits are mainly found in the wild. Prior to genetic engineering such gene transfer has been to, not from crops. They present evidence that it is unlikely for transgenes to introgress more rapidly than innate genes, except where conventional insecticides, conventionally appearing in pollen, poison insects. They have adapted a local based coding system for the likelihood of gene flow between transgenic and indigenous plants to the pan-European level. The coding system classifies where cross-pollination has never occurred, where it can only occur where embryos are artificially kept alive versus gradations of how/where it may occur in the field, as modulated by biological impediments. Unfortunately they fail to consider that within the last group, if introgression can occur, it will and the gradations only define the time it will take. They do not discuss transgenic containment strategies to delay that time, nor the fact that when it first happens, gene flow could be quick within the recipient species. Additionally, they (nor anyone else in this volume) do not discuss transgenic mitigation strategies that could quench spread, once a gene has introgressed.

Herren, while loudly disclaiming an anti-biotechnology bias, proclaims that because biotechnology is industry based, it is unlikely to provide solutions to developing-world problems, while other technologies are under addressed. This view does not accept that there are problems in the developing world that despite huge investments, over scores of decades, conventional technologies have not been able to cost-effectively solve to the farmers’ satisfaction. Many of these issues are now being addressed with considerable success by the public sector (often using genes donated by the private sector). It is unfortunate that such a great personage

continues to emote this political/economic bias, instead of using these technologies for the good of his clientele. He presumes that integrated pest management can be a stand-alone technology.

DeGreef discusses the socio-economics of technology transfers with the backdrop of the two top threats to biodiversity: habitat loss and introduction of exotic species, i.e. expanding agriculture. Producing more on less land can be enhanced by biotechnology, the fruits of which must reach the farmer, a true socio-economic constraint in the developing world.

Turner provides a post-modernist contention that bioethics is passé, giving examples from 'situation bioethics' and not from approaches using the rigorous tools of a bioethics philosopher. She propounds that one must consider popular culture, meaning (in all her examples) anti-science European culture as nurtured by science fiction movies. The possibilities that there may be popular cultures that are not swayed by such considerations, where most people either accept biotechnology (North America) or are hungry (the developing world) is missing.

Nickson calls for precise use of language in risk assessment, presenting a glossary of terms. Unfortunately, he does not proscribe loaded, racist terms of the Nazi era that one hears too often, which must be eschewed; "gene pollution, genetic contamination, genetic purity", nor does he correct his own company's continuous incorrect use of "development" (for evolution) or "tolerance" (for resistance). Although the chapter is on communication, there is nothing about communicating biodiversity issues other than these partially touched linguistic issues.

Biber-Klemm deals with trying to provide solutions in the clash between protecting "traditional knowledge" and intellectual property law. Traditional knowledge including landraces (whose use is declining) is basically in the "public domain", and usually not "novel", precluding patenting. She describes how the Convention on Biological Diversity was meant to protect biodiversity, in part by providing an economic incentive (and protection) to bioprospecting, in contrast to Krattinger's view that it is an impediment (discussed above). A dialog between them would have been useful. Conversely, a chapter by Girsberger contrasts the law covering intellectual property and how it conflicts with attempts to protect traditional knowledge.

In yet another chapter on the Cartagena protocol on biosafety of the CBD, Nobs et al. placed an emphasis on the legalistic (not scientific) aspects of biosafety, especially of export-import of commodity agricultural products, and liability (from undefined) undo effects. They did not discuss the possible effects on biodiversity of the common occurrence of seeds falling from trucks journeying from port to factory, let alone solutions such as irradiation sterilized commodity shipments.

Gray et al. explore the effect of transgene flow to wild species from the "viewpoint of conservation genetics", a task

that they explain is difficult with the few crops related to wild species, as they have been exchanging genes since domestication. Imported alien (non-transgenic) relations have already endangered indigenous wild relations. Thus, they note the difficulty in predicting what a single transgene may do to a wild population.

Johnson begins from a premise that intensive agriculture is the main cause of habitat destruction (while not mentioning that developing world subsistence agriculture is arguably more so). He maintains that more effective herbicides are the cause for lack of plant biodiversity. He notes that the problem is less in the US, where intensively farmed land occupies a smaller proportion of area, but does not extrapolate this to Europe by suggesting that poorly-productive land should be brought back to the wild as it has in the US. He thoughtfully discusses other measures to increase biodiversity, while maintaining agriculture. He renders the most balanced discussion I have seen to date on the pros and cons of herbicide-resistant transgenic crops vis a vis biodiversity. Still, there are areas where he may be non-critical in not noting that due to plasticity it is seed output that is important, and not plant number when a herbicide is used. He points out that genes conferring unfit traits would not last in the wild if introgressed, but warns about flow of genes to weeds that will increase their competitive ability. Unfortunately, his suggestion that transformation of crops related to weeds should not be allowed is counter-productive to agriculture: weeds most related to crops are the hardest to control, e.g. feral red rice in rice. There, only transgenics, duly transformed with containment and mitigator genes, would be most useful.

den Nijs lucidly describes the great utility of molecular tools for studying biodiversity. He then goes on to discuss the effects of agriculture and transgenics on wild species, discussing cases where there may be an effect on biodiversity and extinction. The cases where he foresees "extinction" are con-specific wild or feral forms of crops: wild rice, cotton and alfalfa (lucerne), which have been exchanging genes for millennia.

Heywood details the societal and scientific issues involved in developing and implementing conservation strategies, especially the disdain shown by the conservation biology community to deal with agrobiodiversity conservation, snobbishly preferring the pristine and wild. Much is said for "in situ" conservation of landraces, "on the farm" with little on strategies to make this viable for the farmer—including the use of biotechnology to enhance landraces. Still, the futility of "freezing the genetic landscape is discussed", as farmers manage rather than conserve landraces.

The book ends with a short conclusion section of a transcribed discussion among the participants.

The book is an excellent source of information, especially for one interested in the biodiversity of scientific, political, social, economic, and philosophical approaches conflicting with each other in the biodiversity debate. At times they seem un-reconcilable due to an inflexibility of the partici-

pants and where they “come from” intellectually and politically, but that is exactly what dynamic biodiversity is about. For an excellent one-person disparate discussion of the potential impacts of transgenics on biodiversity, it is advised to see the excellent monograph written by the senior editor of this book, at <http://www.botanischergarten.ch/Biotech-Biodiv/Report-Biodiv-Biotech12.pdf>.

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