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From risk to uncertainty: Australia's environmental regulation of genetically modified crops

Fern Wickson
University of Wollongong

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From Risk to Uncertainty: Australia's Environmental Regulation of Genetically Modified Crops

A thesis submitted in fulfilment of the requirements for the
award of the degree

Doctor of Philosophy

from

University of Wollongong

by

Fern Wickson

BA/BSc, BA (Hons)

Biological Sciences / Science, Technology and Society
2006

ABSTRACT

In this thesis I present a critical appraisal of Australia's environmental regulation of genetically modified (GM) crops. I begin by suggesting that, although realist risk analysis currently dominates environmental decision-making on recombinant DNA technologies, the existence of contested values and widespread scientific uncertainty challenge the adequacy of this approach. What an appropriate approach to regulatory decision-making under these conditions would involve is then used as a guiding question to survey literature on risk and uncertainty from a range of social science disciplines. Through this survey, a theoretical framework is synthesised where the ends of a spectrum of stances taken towards environmental decision-making are contrastingly described as traditional 'science/risk' and emerging 'precaution/uncertainty' based approaches.

After describing the important components of precaution/uncertainty based approaches and suggesting that they represent a more appropriate way to orient environmental decision-making on GM crops, I then analyse Australia's regulatory framework in terms of where it can be positioned along the science/risk - precaution/uncertainty spectrum. Exploring the key distinguishing themes of the discourse of decision-making, the role awarded science, the avenues for public participation, the requirements for ongoing research and monitoring, and the range of policy options considered, I argue that Australia's environmental regulation of GM crops currently represents a predominantly science/risk based approach to decision-making.

With the process of 'objective' scientific risk assessment shown to be central in Australia's environmental regulation of GM crops, I then perform a detailed deconstruction of a case study risk assessment - the impact of Bt cotton on non-target organisms. Using criteria developed to explore the analytical themes of the reliability of cited scientific studies, how scientific information was used and the adequacy/appropriateness of the conclusions drawn, the thesis provides a detailed example of 'extended peer review'. This review challenges the objectivity of the risk assessment process, demonstrates the value of social science analyses of science for policy and offers a framework to help advance these forms of investigation.

Through this research, I critically appraise Australia's environmental regulation of GM crops, present recommendations for how it could be improved, and provide practical and theoretical frameworks to assist the development of robust processes for environmental decision-making.

CERTIFICATION

I, Fern Wickson, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Biological Sciences and Science, Technology and Society, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Fern Wickson

(Date)

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ABBREVIATIONS

ANZFA	Australia New Zealand Food Authority
APVMA	Australian Pesticides and Veterinary Medicines Authority
AQIS	Australian Quarantine and Inspection Service
COGENE	Committee on Genetic Experimentation
CRC	Cooperative Research Centre
CSCG	Commonwealth State Consultative Group on Gene Technology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DNA	Deoxyribonucleic acid
EPA	Environmental Protection Agency
ESD	Environmentally Sustainable Development
FSANZ	Food Standards Australia New Zealand
GM	Genetically Modified
GMAC	Genetic Manipulation Advisory Committee
GMO	Genetically Modified Organism
GTCCC	Gene technology Community Consultative Committee
GTEC	Gene Technology Ethics Committee
GTTAC	Gene Technology Technical Advisory Committee
IOGTR	Interim Office of the Gene Technology Regulator
ISAAA	International Service for the Acquisition of Agri-Biotech Applications
IUCN	The World Conservation Union
NAS	United States National Academy of Sciences
NICNAS	National Industrial Chemicals Notification and Assessment Scheme
NIH	National Institute of Health
NRA	National Registration Authority
OGTR	Office of the Gene Technology Regulator
RAF	Risk Analysis Framework
RARMP	Risk Assessment and Risk Management Plan
rDNA	Recombinant Deoxyribonucleic acid
TGA	Therapeutic Goods Administration
UK	United Kingdom
US	United States of America

PUBLICATIONS FROM THIS THESIS

Peer-Reviewed Articles

Wickson, F., Carew, A.L. and A.W. Russell (accepted, forthcoming in 2007)
“Transdisciplinary research: characteristics, quandaries and quality” *Futures*.

Wickson, Fern (2005) “Australia’s Environmental Regulation of Genetically Modified Organisms: risk and uncertainty, science and precaution” *Griffith Journal of the Environment* volume 1 (June). Online at
<http://www.griffith.edu.au/faculty/ens/gje/>

Wickson, Fern (2005) “Environmental Decision Making: Emerging Conceptualisations of Uncertainty and Precaution” *Rhizome* volume 1, issue 1, pg. 147-162.

Wickson, Fern (2004) “Australia’s Regulation of Genetically Modified Crops: Are We Risking Sustainability?” *Australian Journal of Emerging Technologies and Society* volume 2 (Autumn). Online at
http://www.swin.edu.au/sbs/ajets/journal/issue2/abstract_gmcrops.htm

Wickson, Fern (2004) “Understanding the Environmental Impact of Genetically Modified Crops through Multidisciplinary Research” *Environmental Sustainability through Multidisciplinary Research*, eds Mohammad J. Mowlaei, Andrew Rose and Julia Lamborn, Environmental Engineering Research Event, Australia, pg. 400-409.

Research Profiles

Wickson, Fern (2004) “PhD Student Working for Passion Not Profit” *Illawarra Mercury: Cutting Edge, focus on leading research and innovation* December 14th, pg. 39.

Wickson, Fern (2005) “Environmental Regulation of GM crops: a transdisciplinary study” *WiSENet Journal* volume 69 (July). Online at
<http://www.wisenet-australia.org/issue69/Environmental%20Regulation%20of%20GM%20Crops.htm>