Clean, Green and Genetically Modified?

GMOs and the Future of New Zealand

Daniel Pollak
Ian Axford Fellow in Public Policy

December 3, 2003

The Ian Axford Fellowship in Public Policy

We acknowledge and thank the following corporate and government sponsors that support the programme:

- Air New Zealand
- ERMA New Zealand
- Fonterra
- LEK Consulting
- The Department of Internal Affairs
- The Department of Labour
- The Department of the Prime Minister and Cabinet
- The Ministry for the Environment
- The Ministry of Agriculture and Forestry
- The Ministry of Economic Development
- The Ministry of Education
- The Ministry of Foreign Affairs and Trade
- The Ministry of Health
- The Ministry of Justice
- The Ministry of Research, Science and Technology
- The Ministry of Social Development
- The National Bank
- The Office of the Commissioner of Police
- The State Services Commission
- The Treasury
- Transpower New Zealand Ltd

The Ian Axford Fellowships were named in honour of Sir Ian Axford, a New Zealand astrophysicist and space scientist.

Since his education in New Zealand, England and later at Cornell University and the University of California, Sir Ian has been closely involved in the planning of several space missions, notably the Voyager probes to the outer planets. Since 1974, Sir Ian has been director of the Max Planck Institute of Aeronomy in Germany. He is the recipient of many notable science awards and was named "New Zealander of the Year" for 1995.

In the world of space science, Sir Ian has emerged as one of the great thinkers and communicators, and a highly respected and influential administrator. Currently, he is working to create the first mission to interstellar space with the Voyager spacecraft.

The Ian Axford Fellowships in Public Policy have three goals:

- To reinforce United States/New Zealand links by enabling fellows of high intellectual ability and leadership potential to gain experience and build contacts in each other's countries.

- To increase fellows' ability to bring about changes and improvements in their fields of expertise by the cross-fertilisation of ideas and experience.

- To build a network of policy experts on both sides of the Pacific that will facilitate international policy exchange and collaboration beyond the fellowship experience.

Fellows are based at a host institution and carefully partnered with a leading specialist who will act as a mentor. In addition, fellows spend a substantial part of their time in contact with relevant organisations outside their host institutions, to gain practical experience in their fields.

The fellowships are awarded to professionals active in the business, public or non-profit sectors. The United States and New Zealand selection committees look for fellows who show potential as leaders and opinion formers in their chosen fields. Fellows are selected also for their ability to put the experience and professional expertise gained from their fellowship into effective use.

Acknowledgements

First of all, the usual disclaimer – none of the individuals acknowledged here share any responsibility for the opinions expressed in, or accuracy of, this report.

I would like to thank the Government of New Zealand, the Commonwealth Fund and Fulbright New Zealand for funding and administering the Ian Axford Fellowship in Public Policy. I am grateful to my employer, the California State Library, for allowing me to disappear for several months. The New Zealand Ministry of Agriculture and Forestry (MAF) must also be singled out for supporting the Axford Fellowship and for acting as my host in New Zealand.

Paul Reynolds, MAF Director of Policy, and Helen Anderson, Acting Chief Executive of the Ministry of Research, Science and Technology, served as my research advisors. I also am grateful to Kay Hewitt for important help in my research on the Royal Commission. There are many others at MAF Policy who helped me significantly, most notably Peter Kettle, Graeme King, and Moira Jones.

Thanks are also due to Jennifer Gill, Executive Director of Fulbright New Zealand, and all the Fulbright New Zealand programme staff. I am also extremely grateful to the other Axford Fellows for their collegiality and, well, fellowship: Carlton Eley, Jennifer Gootman, Marek Gootman (honorary Axford Fellow), and John Smith.

In my research I was assisted by the librarians in the MAF Information Bureau, as well as by Steven DeBry of the California Research Bureau and Melissa Ellison, research librarian at the United States Embassy. Jenny Rouse provided valuable help in editing the report.

I also want to thank Dean Misczynski, Sy Schwartz and Bill Craven for their support of my aspiration to become an Axford Fellow.

Finally, thanks to Lara Miyazaki and to my family for long-distance moral support.

Daniel Pollak

Executive Summary

In 2000, the Government of New Zealand appointed an independent Royal Commission on Genetic Modification to preside over an ambitious 15-month inquiry into genetic modification (GM). The Royal Commission heard testimony from hundreds of interest groups and experts, as well as the views of thousands of members of the general public.

The Government embraced the Royal Commission's recommendation that New Zealand "keep its options open," neither rejecting genetically modified organisms (GMOs) nor neglecting to manage their risks appropriately. While this might sound like a prudent middle course, it has proven to be very controversial because many had hoped the Royal Commission would put the brakes on the use of GMOs in food or the environment.

According to some, allowing the release of GMOs into the environment will be a precipitous blunder that will subject New Zealand to unwarranted environmental, health, economic, and other risks. Others say it is necessary in order to keep New Zealand internationally competitive in agriculture and other biology-based industries, and also to encourage the continued growth of its scientific and technological capacities.

In this report I assess the strengths and limitations of the Royal Commission on Genetic Modification and its effectiveness as a public participation process. I also review the policies that are being developed to manage releases of GMOs, particularly with respect to environmental risk assessment and crop co-existence.

The Royal Commission's work supports a number of observations and conclusions about public participation. Among other things, it demonstrated the usefulness of having several mutually enforcing streams of public consultation, and of making efforts to overcome cultural, temporal and geographic barriers to foster wide participation.

The Royal Commission's conclusions departed significantly from the anti-GM views held by the majority of the general public. What, then, was accomplished by consulting the public? The Royal Commission process helped to stimulate a debate that likely enhanced public understanding. Although many disagree with the current direction of policy, the Royal Commission's report clearly helped the Government to shape policies that acknowledge and reflect many areas of public concern.

The Royal Commission proved very useful politically to the Government in terms of channelling a highly charged political debate into a neutral forum. The Government's ability to carry out controversial policy changes has been greatly strengthened by the fact that an independent panel conducted such an inclusive, in-depth public debate beforehand. The credibility of the Commission's conclusions was enhanced by the fact that opponents of GM had a say in its establishment, and that the process ran without any Government interference.

There are many difficult challenges as New Zealand develops new policies and rules to regulate and manage environmental releases of GMOs. The Environmental Risk Management Authority (ERMA) must perform environmental risk and cost-benefit assessments that take into account diverse factors, ranging from the physical and ecological effects to economic and cultural considerations. Many of these factors are difficult to quantify or compare, and there are unanswered questions about the methods and criteria that will be used.

ERMA is under conflicting pressures – for example, to make its risk assessments broader, yet avoid being too risk-averse. If ERMA does not adopt clear guidelines, it may be accused of being arbitrary or lax in its oversight. On the other hand, if it tries to resolve too many questions in advance, the process may become too rule-bound and inflexible.

Another challenge to managing environmental risks is the co-ordination between ERMA, the decision-making body, and the Ministry for Agriculture and Forestry (MAF), the enforcement agency. Recent reviews have noted problems in co-ordination of crisis response and enforcement of monitoring requirements. There is a need to clarify areas of authority and lines of accountability between these two agencies.

Another challenging area of regulation will be managing co-existence between GM and non-GM agricultural production systems. Organic farmers and much of the public want to enforce a zero-tolerance policy with respect to the mixing of GM and non-GM products and crops. Yet in some cases some low levels of mixing or cross-pollination may be unavoidable.

There are economic reasons to worry about co-existence. Organic certification standards do not tolerate the use or presence of GM contamination. Many export markets are resistant to GM products, and there are concerns about possible impacts on New Zealand's overseas brand image should GMOs be used.

It remains an open question who will pay the costs of measures to enforce separation between GM and non-GM crops. Strict controls will be particularly important when the GM crop in question has not been approved for human consumption – for example, some GM crops may be used to manufacture pharmaceutical compounds.

GM contamination of seed imports is likely to occur, raising questions about the interface between two laws – the Biosecurity Act and the Hazardous Substances and New Organisms (HSNO) Act. The legal status of GM plants accidentally imported and grown falls into a legal grey area. Legal changes may be needed to harmonise the two laws.

New Zealand is providing a good deal of public funding for research into the effects of GMOs, which could help to address some of the many uncertainties raised by GMOs. A continuous dialogue will be needed between those making funding decisions, the scientists, and regulatory agencies to ensure that the research agenda meshes with the questions faced by the policy and regulatory systems.

From a scientific point of view, the risks posed by GMOs are often not very different from the risks posed by other kinds of new organisms. However, GMOs currently demand a great deal of attention due to high public interest, raising the question about how these issues should be balanced against other priorities.

The first application for release of a GMO will offer an interesting test of the new regulatory system. The Royal Commission concluded that the first release of a GMO would be too momentous a decision to be decided by the regulatory system, and should be a high-level political judgement made by the Minister for the Environment. It does not appear likely that the Government will follow this recommendation.

CONTENTS

I. Introduction

Citizens and governments all over the world hear conflicting claims about genetically modified organisms (GMOs). GMO opponents say the technology has unpredictable and potentially dangerous consequences, such as creating foods that may be unsafe to eat, or causing irreversible harm to the environment. They say that the use of GMOs undermines sustainable agriculture, and many claim that the use of GMOs is inherently unethical or immoral. Meanwhile, proponents argue that GM technology can produce myriad benefits. They point to successes in using GM to create new medicines, and say that GMOs can bring us better foods and improved nutrition, remedy environmental problems, and promote sustainable agriculture.

During the last few years, New Zealand has engaged in an intensive, soul-searching debate over such questions. During 2000-2001, New Zealand appointed an independent Royal Commission on Genetic Modification to preside over one of the most ambitious, wide-ranging public debates on such questions ever attempted anywhere. The Royal Commission heard testimony from hundreds of interest groups and experts, as well as the views of thousands of members of the general public.

The Royal Commission's recommendation was for New Zealand to "keep its options open," neither rejecting GMOs nor neglecting to manage their risks appropriately. While this might sound like a prudent middle course, it has proven to be very controversial because many had hoped the Royal Commission would put the brakes on the use of GMOs in food or the environment.

So far, New Zealand has never allowed the intentional release of GMOs into the environment. Although there were widespread calls for a blanket ban on environmental release, the case-by-case approach, which the Government is now putting into effect, clears the way for the eventual release of some GMO at some point down the line.

According to some, ending the current moratorium on applications to release GMOs is a precipitous blunder that will subject New Zealand to unwarranted environmental, health, economic, and other risks. Advocates of ending the moratorium say it is necessary in order to keep New Zealand internationally competitive in agriculture and other biology-based industries, and also to encourage the continued growth of its scientific and technological capacities.

It may be many years or even decades before events will prove which of these two conflicting visions was closer to the truth. But in attempting to chart a course, New Zealand has undergone a policy development process that makes it a valuable case study.

WHAT THIS REPORT IS ABOUT

This study focuses on the policies New Zealand is developing to manage the risks of releasing GMOs into the environment, both in terms of protecting the environment and promoting the co-existence of GM and non-GM agriculture.[*]

[*] The risks of environmental release are only part of the policy debate – this report will not be able to fully address other important aspects such as medical ethics, animal welfare, and the safety of consuming GM foods.

In addition to looking at New Zealand's evolving policies on environmental release and co-existence, I will look at the process of the Royal Commission – how it carried out its public consultation and inquiry, what it accomplished, and what were its strengths and limitations.

This report is based on a review of published reports, laws, regulations, and government documents, combined with several dozen personal interviews conducted over the period July-November 2003. Interviewees included government officials and others, such as representatives of organic and conventional farming, environmental organisations, private industry, the news media, and Māori. This report reflects the opinions of the author, not the New Zealand Government or any other organisation.

What Are GMOs?

By the 1950s, scientists had determined that biological inheritance was governed by the structure of deoxyribonucleic acid (DNA). DNA consists of long, thread-like molecules found in all living cells. By the 1960s, the structure of DNA was known, and scientists had unlocked the genetic code. The constituent molecules in the DNA strands form discrete, meaningful sequences known as genes. A gene is like a set of instructions for the molecular machinery of the living cell. The primary function of these instructions is to tell the cell how to assemble proteins from their building blocks, amino acids. The proteins then go to work as structural elements of cells and tissues, or as enzymes controlling further biochemical processes.

In the 1970s, scientists began learning how to cut and splice DNA, and introduce genes from one organism into another, even if the organisms belong to completely different species. Such alterations become part of the genetic code of the modified organism, and can be inherited when it reproduces. In this way, new organisms can be created with novel traits that could not readily be achieved through older techniques such as selective crossbreeding.

The term "recombinant DNA" is often used to describe the combination of genetic material from two different sources. This can happen naturally through sexual reproduction, or in the laboratory through genetic engineering. When novel organisms are created by genetic engineering, they are sometimes called "transgenic" organisms or "genetically modified organisms" (GMOs).

THE GLOBAL GM CLASH

The controversies over GM in New Zealand can be broadly viewed as a local eruption of a conflict that is occurring around the globe. The clash is between two trends: the growth of GM as a commercial force, and the reaction against it. On the one hand, scientists in the private and public sectors are finding commercial and practical applications for GM, and governments are embracing it as a potential economic development engine. On the other hand, consumer and environmental activists are leading an anti-GM reaction that has broad popular support among citizens nervous about the new technology and distrustful of scientific and regulatory institutions.

Genetic engineering helped create an important new medical industry in the United States in the late 1970s. Agricultural applications of genetic engineering were successfully commercialised in the 1990s, further raising expectations for biotechnology's growth. Expectations grew that the 21st century might be the "biotechnology century," in the way that information technology shaped the late 20th century. Governments around the world began investing in genetic research and development and providing incentives for the growth of their biotechnology sectors.*

* A note on terminology: I will be using the terms "genetic modification" and "genetic engineering" as synonymous, although in reality there are ways to genetically modify an organism without genetic engineering. Also, although some writers use the term "biotechnology" as if it were synonymous with genetic engineering. I will attempt to follow the practice in New Zealand of treating genetic engineering as just one type of biotechnology.

However, the use of genetic engineering to produce new agricultural crops initiated a reaction against GM food and the release of GMOs into the environment. The reaction has taken many forms, including:

- *protests* against genetic engineering and food products with GM ingredients, including demonstrations, boycotts, and in some cases, destruction of GM crops
- *laws and regulations* in some countries requiring special labels for GM food, and imposing restrictions or moratoria on new GM crops
- *consumer rejection* of GM food products by many consumers in important markets such as Europe and Japan
- *food producers and marketers* such as McDonalds and Gerber pledging to keep GM ingredients out of their products
- *scientific research* reflecting increasing interest and resources devoted to the alleged effects of GMOs on human health and the environment
- *pro-GM counter-lobbying* by the life science industry and biotechnology researchers calling attention to GM's benefits and the dangers of over-regulation.

Europe has been a centre of anti-GM activism, consumer rejection and government regulation, but the anti-GM movement has expressed itself all over the world.

THE NEW ZEALAND CONTEXT

The GM clash was bound to surface in New Zealand. Several factors unique to New Zealand have shaped the issues here.

High Hopes for New Zealand Biotechnology

New Zealand has been one of the countries taking a keen interest in expanding its biotechnology sector. This is not so much due to the sector's current size or direct economic impact – biotechnology currently employs about 3900 New Zealanders out of a workforce of 1.9 million.[1] Yet the Government considers biotechnology a key industry for maintaining and improving New Zealand's standard of living.

New Zealand 's relative income declined over much of the post-war period, with real per capita income falling from among the highest in the world in the 1950s, to 20th (out of 29) in the OECD by 1999.[2] The Government's economic strategy, known as the Growth and Innovation Framework, identifies biotechnology as one of the three top priority sectors that "have both the potential to grow in their own right and, because of their horizontal nature, positively improve productivity across the economy." The other priority industries are information and communication technology, and creative industries.[3] The hope is that the growth of biotechnology will not only diversify New Zealand's economy, but that the technological innovations it generates will strengthen New Zealand's key biology-based economic sectors – agriculture, horticulture, pastoral farming, forestry, and so forth.

A Biology-Based Economy

Biotechnology sounds like a natural fit for New Zealand. The country has a population that has long been well educated and technologically innovative. Throughout its history its economy has been based in biological productivity. The original Polynesian settlers lived off the native flora and fauna and grew imported crops such as the kumara (sweet potato). The first European settlers were sealers and whalers. Today, New Zealand agriculture is renowned for its efficiency, productivity, and high quality. As a country with very few trade barriers, New Zealand agriculture is also highly sensitive to export market trends.

Products of New Zealand's farms, forests, and pastures produce a great deal of its wealth (14% of GDP and 55% of exports).

New Zealand Economic Statistics

Total population (2003)	4 million[1]
Gross Domestic Production (2003)	$113.5 billion NZ[1]
Food, Agriculture, Forestry: % Contribution to GDP (2001)	
Agriculture	6%
Forestry and Logging	1%
Food and Beverage Manufacturing	5%
Wood and Paper Products Manufacturing	2%
Total	14%[2]
Biology-Based Exports as % of All Exports (2002)	
Dairy	22%
Meat	14%
Forestry	10%
Fish and Seafood	4%
Fruits, Nuts, Vegetables	5%
Total	55%[3]

Sources:
(1) Statistics New Zealand http://www.stats.govt.nz/;
(2) Chapman, Nicky, *Bateman Facts New Zealand*, (Auckland: Bateman Ltd, 2002);
(3) Statistics New Zealand, "Agriculture in New Zealand,"
http://www.stats.govt.nz/domino/external/web/prod_serv.nsf/htmldocs/Agriculture+in+New+Zealand

It is unusual for an economy so heavily based on export of commodities to support a first-world standard of living. Since GM could represent a revolutionary change in agricultural practices world wide, the stakes are high as New Zealand determines how to handle this technology.

If there are strong reasons for New Zealand to embrace the commercialisation of biotechnology, New Zealand has also provided fertile soil for the growth of an anti-GM movement.

Biological Invaders

New Zealand is a country that is wary of introducing new organisms. New Zealand benefits from its geographic isolation that keeps out many agricultural pests and diseases, and enforces strict biosecurity laws (as many visitors from abroad can attest after being heavily fined for trying to carry fruits or other contraband through customs).

Having evolved in isolation, New Zealand's many unique species of flora and fauna are highly vulnerable to invasive pests. The desire to protect the native ecosystems, already a deeply held value, has no doubt grown as ecotourism assumes an ever-larger role in New Zealand's economy.

While introduced species are the basis of the country's wealth, they have also been a scourge. The first settlers brought rats and dogs that helped to devastate native wildlife. Today, New Zealand struggles to control a host of exotics. Just a few examples are the Australian possum, which spreads bovine tuberculosis and devours native plants; the varroa mite, which afflicts bees; the painted apple moth, which attacks plantation forests; and weeds such as broom, gorse and thistle.

It is not surprising that New Zealand society is ambivalent about GMOs – they present all of the opportunities and risks of introduced species, but with the added uncertainties and fears that accompany a new technology.

Clean, Green and Free Trading

Other factors in New Zealand's political culture also contribute to a divisive GM debate. In the 1980s, New Zealand radically transformed the economy, sweeping aside a host of government interventions, and dramatically reducing trade barriers and subsidies. The belief that New Zealand is, and should remain, a free-trading nation with minimal government intervention in the economy still holds great sway.

At the same time, however, New Zealand prides itself on being a "clean, green", environmentally progressive country. The Green Party is a minority political party but its ideals have broad appeal. In the 1970s, New Zealand decided (after a Royal Commission of Inquiry on the subject) to renounce nuclear energy. In the 1980s, New Zealand defied the United States by declaring itself a nuclear-free zone and banning port visits by United States navy vessels. The comparisons environmental activists make between genetic engineering and nuclear energy have special resonance in New Zealand.

II. New Zealand Grapples With Genetic Modification

All of the above indicates how GMOs can be portrayed as both an opportunity and a threat for New Zealand's economy and its values. In this context, the period 1999-2000 proved to be a watershed, with a number of incidents raising the intensity of debate and discussion:

- *Human genes in sheep and cattle*. New Zealand regulators approved field tests by a British company of transgenic sheep genetically engineered to produce a cystic fibrosis drug in their milk. At the same time, New Zealand researchers applied for permission to test dairy cows genetically engineered to produce a therapeutic protein for multiple sclerosis. Some Māori leaders and others expressed concern about the ethics of putting human genes into animals.[4]
- *"Frankenstein" fish*. In April 1999 New Zealanders read newspaper headlines about an alleged cover-up of deformed "Frankenstein fish." The Green Party had released documents suggesting that a company testing GM salmon had attempted to hide the emergence of deformities such as lumps on the heads of the experimental fish.[5]
- *Canola foul-up*. ERMA revealed that during a 1996-1997 contained trial of GM canola, holes had been found in the netting that was supposed to prevent the spread of pollen, raising the possibility that pollen could have escaped into the environment.[6]
- *Destruction of GM crops*. In March 1999, an activist Green faction calling itself "Wild Greens" destroyed a test plot of GM potatoes being grown by a government research institute.[7]
- *Withdrawal of cholera vaccine*. In 2000, ERMA announced that a recently-approved oral cholera vaccine would be withdrawn because it contained live GMOs but had not been through the ERMA approval process.[8]

Such episodes fuelled calls for New Zealand to put a hold on GMO releases and assess the health, environmental, and ethical questions. Alliance Party MP Phillida Bunkle declared that "We are moving deeper and deeper into genetic engineering…Today's approval for human genetic coding to be put into animals may be a bridge too far."[9] Green Party Co-Leader Jeanette Fitzsimons said, "With genetic engineering we are at the same stage we were last century when releasing rabbits and possums around New Zealand. As is the case now, government agencies hoped the result would be beneficial, but didn't really know."[10]

In the 1999 elections, Greens and others strongly criticised the ruling National Party for not doing enough about these concerns. The election led to a change in government. Labour formed a coalition with the left-of-centre Alliance Party, bolstered by an agreement for support on supply and confidence votes with the Greens.

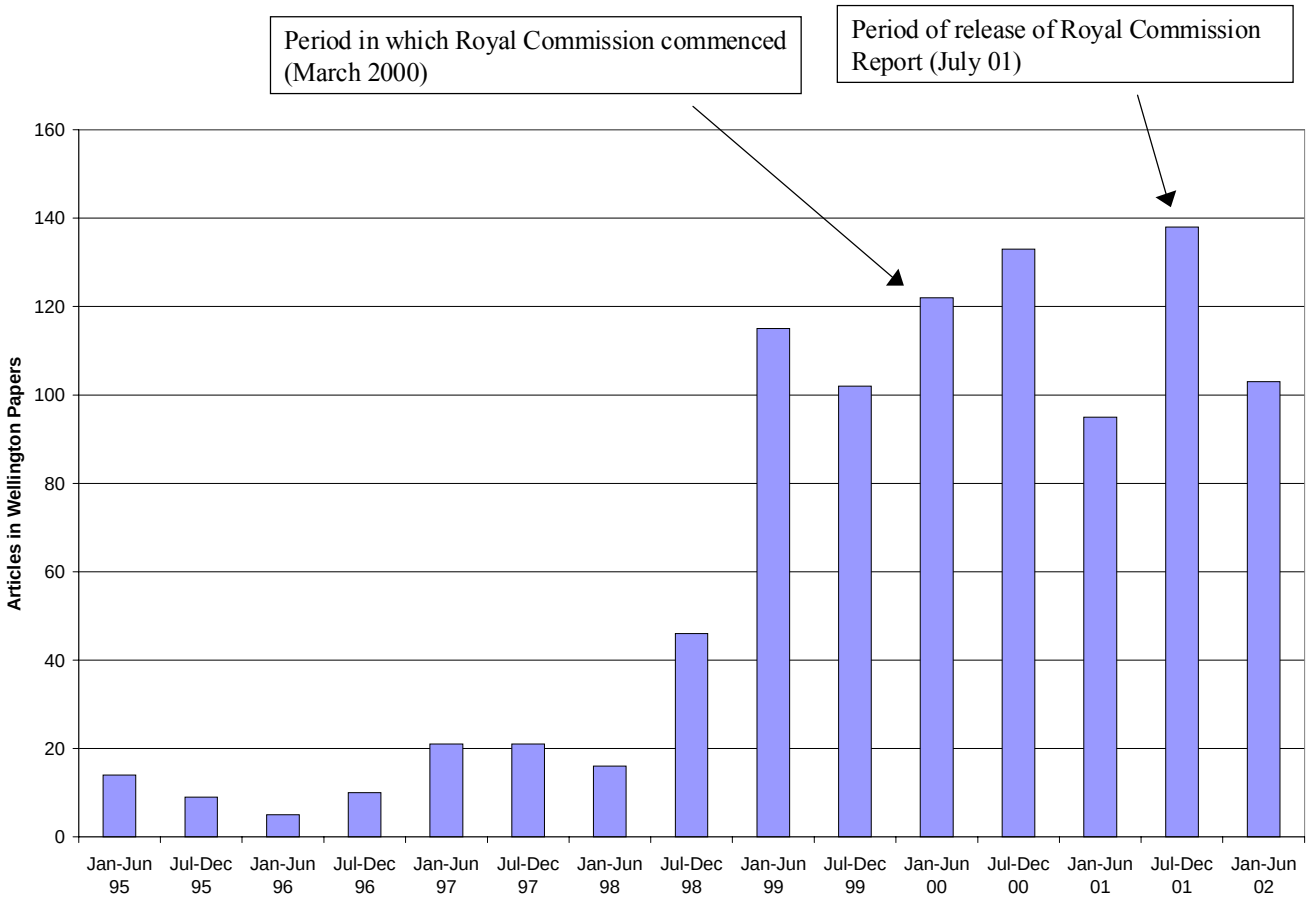
Throughout this period the Greens kept up steady pressure for a commission of inquiry into GM issues,[11] drawing comparisons with the inquiry into nuclear energy in the 1970s.[12] They made it clear that this would be one of the key items they sought in exchange for their support of the Labour-Alliance coalition government.[13]

The Green and Alliance parties, supported by Greenpeace, also called on the Government to impose a moratorium on GMO field trials.[14*] The Labour Party, the dominant member in the coalition, opposed the idea of a moratorium, saying it would interfere with scientific research. However, Labour indicated it would support creating a commission of inquiry.[15]

In December 1999, the new Government announced that a Royal Commission on Genetic Modification ("the Royal Commission" or "the Commission") would be established. Government, industry, and research organisations reached agreement that there would be a *voluntary* moratorium on applications for release and field tests of GMOs during the inquiry. The announcement was widely greeted across the political spectrum as a sound proposal to help New Zealand to grapple with these controversial issues.

The debate and recommendations of the Royal Commission unfolded during a time of high public interest in, and awareness of, GM. The rising public interest can be charted in terms of media coverage. The graph below records the number of articles in the two major Wellington daily newspapers which mentioned genetic modification.

Newspaper Coverage of Genetic Modification[†]



[*] In New Zealand, the term "field trials" refers to an experiment, possibly conducted out-of-doors, but strictly contained to avoid spread of the organism.

[†] I used the Lexis-Nexis database to count articles in the two Wellington dailies, the *Dominion* and the *Evening-Post*. The two papers merged in early July 2002, so the chart could not be continued past the end of June 2002. The search terms used were genetic engineering, genetic modification, GM, GE, GM, GMO, and variants.

GENETIC MODIFICATION IN NEW ZEALAND – KEY DATES

1996 – Hazardous Substances and New Organisms (HSNO) Act.

July 29, 1998 – HSNO Act rules on new organisms go into effect. Prior to this, GMOs were assessed by the Interim Assessment Group, a body with no statutory authority, enforcing a voluntary regime.

Throughout 1999 – various incidents heighten the debate about GMOs, including malformed GM fish, experiments with transgenic sheep and cattle, revelations of problems in past canola field trials, and destruction of experimental GM crops by protesters.

December 1999 – Labour-Alliance coalition forms new Government. In Speech From the Throne, Government commits to holding a Royal Commission of Inquiry. The Government also commits to having a moratorium on the commercial planting of GM crops during the Inquiry.

March 2000 – Process of establishing the Royal Commission on Genetic Modification begins. Two months later, Royal Commission holds its first meeting, and background papers are commissioned on a number of topics.

June 14, 2000 – Start of voluntary moratorium, which runs until October 2001.

July 27, 2001 – Royal Commission on Genetic Modification reports to the Governor-General.

July-November 2001 – Government releases its response to the Royal Commission's report.

February 2002 – Government releases "Growing an Innovative New Zealand" (a.k.a. the Growth and Innovation Framework, or GIF), which identifies biotechnology as a high-priority sector for economic development.

May 21, 2002 – Legislation passed establishing statutory moratorium on GMO releases, to run until October 29, 2003.

July 2002 – Elections lead to Labour-led Government in co-operation with United Future.

April 2003 – Eight Cabinet policy papers released. They contain government recommendations regarding policies and legislation to implement the Royal Commission's recommendations. Also, MAF releases papers on co-existence.

April 29, 2003 – New Organisms and Other Matters Bill 2003 introduced to amend HSNO.

May 2003 – Release of New Zealand Biotechnology Strategy and the Biotechnology Task Force Report ("Growing the Biotechnology Sector in New Zealand: A Framework for Action").

October 29, 2003 – Moratorium on applications for GMO releases expires.

October 30, 2003 – New Organisms and Other Matters Bill enacted amending HSNO to allow conditional releases.

RELEVANT LAWS AND INSTITUTIONS

Before discussing the Royal Commission on Genetic Modification, it is worthwhile to briefly summarise the relevant laws and institutions that existed at the time it was created.

Prior to 1996, there was no law in New Zealand specifically dealing with the release of GMOs into the environment. In 1988, the Minister for the Environment had set up a body called the Interim Assessment Group (IAG), which reviewed proposals to field test or release GMOs. The IAG had no statutory basis. Its review was mandatory for government-funded research and voluntary for privately-funded research.[16]

The Hazardous Substances and New Organisms Act of 1996 (HSNO) established a regulatory regime for new organisms, including GMOs, to be administered by a new agency, the Environmental Risk Management Authority (ERMA). HSNO's rules on new organisms went into effect in 1998. Under HSNO, applications to develop or test a new organism in containment, or to release it into the environment, are reviewed by ERMA staff and decided upon by the Authority, a six- to eight-member quasi-judicial board whose members are appointed by the Minister for the Environment.

HSNO governs intentional release of GMOs and other new organisms. However, a different piece of legislation applies to preventing the *unintentional* introduction of new organisms, the Biosecurity Act of 1993. This is the law governing the exclusion and control of pests and other unwanted organisms (and is the source of New Zealand's strict border controls). As amended in 1997, the Biosecurity Act prohibits a biosecurity inspector from allowing various categories of organism into the country, including "new organisms" as defined under HSNO. The primary enforcement agency for the Biosecurity Act is the Ministry of Agriculture and Forestry (MAF).

Although ERMA has jurisdiction over applications to intentionally release a GMO, it lacks the operational capacity to enforce its decisions under HSNO, so enforcement is handled by MAF under the provisions of a Memorandum of Understanding between MAF and ERMA.[17]

ENTER THE ROYAL COMMISSION

The process of establishing a Royal Commission on Genetic Modification began in March 2000. The Commission was formally announced in April, along with an announcement of the voluntary moratorium on applications for release or field testing of GMOs, which was to terminate when the Commission completed its work.

The Members of the Royal Commission on Genetic Modification

The Royal Commission on Genetic Modification consisted of four members – a scientist, a clergyman, a physician, and a retired judge. None had any background in the GM debate. Other than the chair's experience as a judge, none had prior connection to government. The members were:

Sir Thomas Eichelbaum, Former Chief Justice of New Zealand (Chair)

Right Reverend Richard Randerson, Bishop of the Anglican Church and Dean of Holy Trinity Cathedral in Auckland

Dr Jean Fleming, Senior Lecturer in Anatomy and Structural Biology at the University of Otago School of Medical Sciences; researcher on molecular reproduction and endocrinology

Dr Jacqueline Sherburd Te Makahi Allan, General practitioner in South Auckland.

This panel brought together diverse backgrounds. It is customary to appoint a former High Court justice to head such an inquiry. Sir Thomas Eichelbaum had served as counsel in a number of prior commissions of inquiry. Bishop Randerson had scholarly and professional experience dealing with topics such as the Treaty of Waitangi and social and economic justice. Dr Allan's background included not only medicine but also her Māori heritage and her professional work on Māori community health.

The Warrant of the Royal Commission on Genetic Modification

The Terms of Reference, budget, and other details of the Royal Commission on Genetic Modification were developed by a working party led by the Ministry for the Environment MFE), and including officials from several other government departments.[*] The Terms of Reference were the subject of extensive negotiations between the Green and Labour parties.

The Warrant required the Commission to report on the following two items:

"(1) the strategic options available to enable New Zealand to address, now and in the future, genetic modification, genetically modified organisms, and products; and

(2) any changes considered desirable to the current legislative, regulatory, policy, or institutional arrangements for addressing, in New Zealand, genetic modification, genetically modified organisms, and products."[18]

The Terms of Reference required the Royal Commission to perform the following tasks:

- "Consult with the public in a way that allows people to express clearly their views;"
- "Adopt procedures that will encourage people to express their views";
- "Consult and engage with Māori in a manner that specifically provides for their needs";
- "Use relevant expertise, including consultancy and secretarial services, and to conduct, where appropriate, your own research".[19]

[*] These were the Department of the Prime Minister and Cabinet; the Ministry of Research, Science and Technology; the Ministry of Health; the Treasury; the Department of Conservation; the Ministry of Fisheries; Te Puni Kokiri (the Ministry of Māori Development); the Environmental Risk Management Authority; the Ministry of Foreign Affairs and Trade; the State Services Commission; the Ministry of Agriculture and Forestry; and the Department of Internal Affairs.

In addition, the Terms of Reference listed a broad array of specific topics which it authorised the Commission to explore, as follows:[20]

- uses of GMOs in New Zealand
- scientific evidence and uncertainty about present and future uses
- risks and benefits from using or avoiding use of GMOs
- international legal obligations
- liability issues
- intellectual property issues
- Treaty of Waitangi issues
- global developments that may influence the use of GM in New Zealand
- human health and safety interests
- environmental and economic matters
- ethical, cultural, and social issues.

Public Consultation Process of the Royal Commission on Genetic Modification

I will summarise this process briefly here, and return to it in more detail later in this report (see p. 26). The Royal Commission employed several different processes, some running in parallel, to study the issues and consult the public, interested persons, and Māori, as mandated by its Terms of Reference:

1) *Scoping meetings*. These were held with the general public to scope out the range of issues and develop ideas about how the consultation processes should unfold.

2) *Formal hearings*. These were intended to gather the views of directly interested parties – primarily stakeholder organisations such as advocacy groups and parties with an economic interest in the issues.

3) *Public meetings.* Meetings were held throughout New Zealand to enable the Commission to hear the views of ordinary New Zealanders.

4) *Public submissions.* The Commission received more than 10,000 written submissions from the general public.

5) *Māori consultation programme*. The Commission organised workshops and hui (formal meetings held according to Māori protocols) throughout New Zealand, culminating in a national hui.

6) *Youth forum*. The Commission heard the views of New Zealand youth in a special forum for 100 winners of a national essay contest.

7) *Public opinion survey*. The Commission contracted with a marketing and social research firm to conduct a telephone survey of the opinions of a representative cross-section of the New Zealand public.

Viewpoints Expressed During the Royal Commission Process

Clearly, the Royal Commission received a huge amount of information. Few would dispute that the Commission took an extraordinarily detailed snapshot of the nation's viewpoints and perceptions of GM. What did the Commission find out?

It is an over-simplification of the debate to divide it into anti- and pro-GM camps. Yet this is a useful simplification. What I term the "anti-GM" side of the debate was not necessarily against all uses of GM. But those occupying this position shared a tendency to stress the dangers of GM over the benefits, particularly the dangers of environmental release and use in food. Similarly, what I call the "pro-GM" camp were those who tended to stress potential benefits of GMOs and to argue that with proper care the risks of releasing GMOs could be managed at acceptable levels.

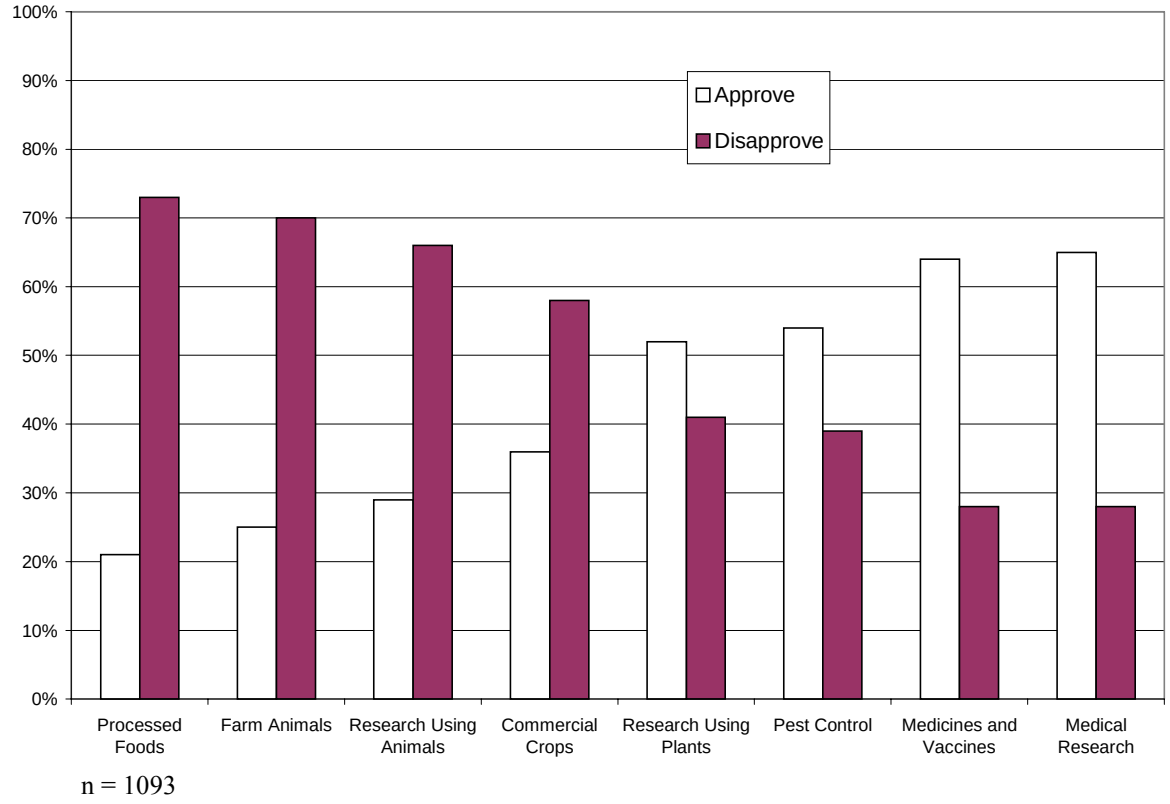
One immediately apparent fact was that the submissions from the general public were overwhelmingly opposed to GM. By the Commission's own count, 92% were opposed to GM, and 64.8% could be categorised as "strongly against".[21] The top four concerns of submitters from the general public were environmental risks, uncertainty about risks, public health safety, and food safety.[22]

Many submissions from the general public called for a total ban on GM. Among the minority who noted some benefits of GM, most favoured contained use in the laboratory, primarily for medical uses; there was little support expressed for GM in food, plants or animals. Some also allowed the desirability of exceptions for uses that provided clear environmental benefits. Those who addressed economic issues usually saw New Zealand's economic future as lying in organic and GM-free production, with 71.1% of these saying they believed New Zealand would gain substantial competitive advantage from avoiding GM and developing its organic sectors.[23]

The Royal Commission decided early on that the public submission process might provide a biased sampling of public opinion. Accordingly, it commissioned a public opinion telephone survey in an effort to gain a more statistically representative cross-section. The results still showed a public tending to oppose GM, but less dramatically so than was represented in the public submissions. A clear majority disapproved of the use of GM in animal research and in processed foods, but majorities favoured medical applications and even plant research.

Public Approval and Disapproval of GM Uses (Spring 2001)

(Public Opinion Survey for the Royal Commission on Genetic Modification)[24]



Yet another angle on public views was provided by submissions from Interested Persons. Interested Persons are those who have an interest in the outcomes of an inquiry that is distinct from the interest of the general public. Their submissions, presented in the formal hearings, revealed the basic divisions among stakeholder groups.

Environmental groups tended to be opposed to the use of GM in food and in the environment. The scientific researchers and institutions working on GM tended to acknowledge that the technology should be regulated, but argued that it could provide many benefits, and should not be over-regulated.

Farmers and food industry representatives tended to take a similar line to these scientists. However, organic farmers tended to align with environmentalists. This is not surprising, given that organic certification rules prohibit organic farmers from using GM, and organic farmers perceive GM as a threat to their livelihood and to the principles of sustainability upon which the organic movement is based.

Such generalisations are inevitably an over-simplification. While those speaking on behalf of conventional agriculture tended to be more pro-GM, and those speaking on behalf of alternative or organic agricultural practices tended to be more anti-GM, there were notable exceptions on both sides.

Like the general public, Māori who spoke at hui were predominantly anti-GM. The declaration from the national hui that represented the culmination of the Māori consultation programme called on New Zealand to become "an independent, nuclear- and GE-free nation".[25] The hui brought forward various aspects that were of particular concern to Māori:

- The mixing of genes between humans and other species was "roundly condemned at every hui."[26]
- Māori frequently voiced concerns about the Government proceeding on GM policy and research without proper consultation of Māori and recognition of rights conferred by the Treaty of Waitangi.
- Concerns were expressed about the impacts on native flora and fauna of importance to Māori culture, and issues about using genetic resources for private gain.
- Māori wanted to see an independent authority that carefully monitored and controlled all research and development on GM. However, some noted the benefits of the technology and the Māori tradition of readily adapting to new technologies.
- All the hui aired criticisms about a perceived lack of information and time for Māori to make informed decisions and submissions.

Policy Issues Considered by the Royal Commission

The issues considered by the Royal Commission are too numerous to be adequately treated in this report. They are more fully described in the Commission's own report. However, it is necessary to describe the issues before discussing what the Royal Commission recommended and the policy changes that resulted from those recommendations.

Environmental and Health Issues

Critics of GM emphasised the potential risks from GMOs. They expressed the view that the technology is unpredictable – that scientists don't really know what the results of the genetic changes will be on the characteristics of the modified organisms. This in turn leads, they argued, to uncertainty about whether these organisms could harm the environment, human health, or the safety of foods. To many, GM is a dangerous tampering with the evolutionary process itself – a giant experiment in which our ecosystems are the laboratories and citizens and consumers are guinea pigs.

Examples of the types of dangers feared included that:

- GMOs organisms will interbreed with wild organisms with adverse consequences, such as the creation of "superweeds" resistant to herbicides
- GMOs will have unexpected, harmful interactions with native flora and fauna, and that they will be impossible to eradicate once established
- gene constructs commonly used in GMOs, such as antibiotic resistance genes, will spread to other kinds of organisms with harmful effects on human health*

* Antibiotic resistance genes are often used in genetic engineering as "markers" – the antibiotic resistance trait helps scientists to determine in the laboratory whether the intended genetic transformation has been successful. The process by which such genes might find their way from one type of organism to another in the absence of sexual reproduction has been termed "horizontal gene transfer."

- GM foods might contain unintended substances that will harm the health of consumers.

Alongside concerns about the safety of GMOs there was often mistrust of institutions. As the Commission put it, "There was a significant level of doubt as to whether genetically modified products were anything more than a cynical manipulation of the consumer for corporate profit."[27] Similar concerns were raised about scientists – given that much scientific research is corporate funded or can be commercialised for profit, could the statements of mainstream scientists be trusted? And were regulators and the Government not themselves subject to pressure from corporate interests? Those worried about GMOs sometimes pointed to past examples (such as the use of DDT) in which scientists assured the public that something was safe, only to be proven wrong years later.

Cultural, Ethical and Spiritual Issues

A great many people hold convictions that genetic engineering can transgress ethical, spiritual, or cultural norms. Many with deep-seated environmental convictions believe that human beings should not tamper with the fundamental building blocks of life. Combining genes from widely disparate species is often viewed as ethically questionable, especially if one of the species in question is human.

Some of these convictions have roots in religion or in tradition (as with the convictions that are held by many Māori). Others are rooted in general principles of fairness and human rights. For instance, the belief that individuals should be able to make an informed choice as to whether or not to consume or otherwise be exposed to GM products is often cited as a fundamental right.

There is no sharp dividing line between value-based concerns and the environmental and health-based concerns raised earlier. A person who believes that GM could permanently damage the environment would likely oppose GM on both pragmatic and ethical grounds.

Economic and Strategic Issues

The Royal Commission posed the question, "Will genetic modification technology enhance or damage New Zealand's economic and strategic prospects?"

As noted earlier, New Zealand's economy is based in biological products, so a technology that promises a revolution in biotechnology holds obvious enticements. If New Zealand embraced GM, it could heighten productivity, reduce production costs, and create new products. It could provide new solutions for problems such as agricultural pests and diseases, and reduce dependence on toxic chemicals used for pest and weed control. Even if New Zealand did not pursue these benefits, there is nothing to stop its international competitors from doing so. At the same time, proponents of GM see biotechnology as an important avenue allowing New Zealand to diversify and solidify its position as one of the world's elite knowledge-based economies.

Opponents of GM tended to challenge every one of the above assumptions . They see many of the promises of GM as false promises. And they see the benefits of foregoing GM as outweighing the benefits of embracing it. They pointed to the fact that in many markets, most notably Europe, consumers do not want to consume GM food. They noted the growth of markets for organic products, and the premium such products fetch. New Zealand, they

argued, is in a prime position to declare itself "GM free" and reap the benefits of the worldwide consumer reaction against GM.

Research and Scientific Capacity

The Royal Commission considered research on GM in the context of many of the risks and benefits discussed above. In addition, it heard from researchers who felt that rules on research were too restrictive – that the time and cost of complying with regulations governing research were too burdensome, inhibiting innovation and potentially beneficial applications.

Many supporters of GM believed that overly restrictive rules would, over time, undermine New Zealand's science base. Recruiting and retaining scientists would become more difficult, and key research would be carried out in other countries. The diminution of New Zealand's research capacity would, they believed, ultimately harm its international competitiveness. As an economy dependent on biology-based products, New Zealand could not afford to lag in this area of science.

Crop Co-Existence

The Commission received many submissions about the benefits of using GMOs outside of the laboratory setting, such as improved crops, fruits, and vegetables; GMOs that could deal with troublesome pests such as the Australian possum or help clean up the environment; and improved trees for forestry.

One of the most important policy issues that arose was the question of compatibility between GMOs and other production systems. First of all, there was the question of whether New Zealand should keep its environment and food production systems entirely GM-free as an economic strategy, an enhancement of New Zealand's "clean, green image" in export markets. Any release of GMOs into the environment could presumably undermine this strategy.

In addition, questions were raised about specific ways in which GMOs could harm other forms of production. Most notably, organic certification rules prohibit the use of GMOs. If GM crops accidentally pollinated organic crops, or GM ingredients inadvertently were mixed with organic ingredients, the organic products would no longer be certifiable as organic. Further, it was argued, the mere perception that this was a possibility could reduce the demand for New Zealand's organic products.

Food Issues

The Royal Commission considered issues such as whether GM foods are safe, whether the health effects have been sufficiently researched and monitored, and whether the existing regulatory system was satisfactory. It also considered questions relating to whether consumers were being given enough information (e.g. through food labels) to make informed choices.

Medicine

Given the undisputed benefits that GM has yielded in medicine, medical benefits provided potent examples for proponents of GM. Such uses may raise issues of product safety, accidental release of live GMOs, and consumer choice, as well as questions about the ethics

of certain kinds of genetic manipulation. However, most of those involved acknowledged that these concerns were outweighed by the benefits of treating life-threatening and debilitating illness.

Intellectual Property

The patenting of genetic sequences and related technologies raised a variety of issues. There were concerns about the control of too many key discoveries being consolidated in the hands of large overseas corporations. There were concerns also about the fundamental ethics of allowing patenting and ownership of genes.

Māori raised questions about the exploitation for private gain of biological resources that are considered part of their cultural inheritance, especially since connnectedness to the natural world is a central aspect of Māori spirituality and cultural identity. In addition, the 1840 Treaty of Waitangi confers to Māori rights of possession over lands and natural resources (although the precise nature of these rights remains a hotly disputed topic).

Liability Issues

The central question regarding liability was, if something goes wrong with GM, who is responsible for cleaning up the mess and compensating those harmed? Should this be addressed through changes in law, and/or through some insurance scheme?

THE ROYAL COMMISSION ISSUES ITS REPORT

Altogether, the work of the Royal Commission cost $4.9 million dollars and took 15 months.[*] After the conclusion of the public consultation process, the Commission spent several months deliberating and drafting a four-volume report that was released in July 2001.

Two phrases were key organising principles of the report: “preserving opportunities” and “managing risks.” The Royal Commission concluded that GM was essentially neutral, a technological tool that could be used for good or for ill. A blanket ban on its use could limit opportunities to reap its benefits. Therefore, each proposed use should be weighed by regulators, who would consider its risks and benefits, and whether with appropriate management the benefits outweighed the risks. The existing regulatory system needed some changes, but was capable of performing a case-by-case assessment without a fundamental overhaul. “Our major conclusion is that New Zealand should keep its options open. It would be unwise to turn our back on the potential advantages on offer, but we should proceed carefully, minimising and managing risks.”[28]

The Specific Recommendations of the Royal Commission

The Royal Commission issued 49 separate recommendations, which are listed in the Appendix to this report. Key recommendations are as follows:[†]

[*] The total cost was widely reported at $6.2 million. However, according to the Department of Internal Affairs, $1.3 million was not used and was returned to the Government.

[†] Please note that, for the purposes of highlighting my own themes, this list is ordered and grouped differently than the Royal Commission’s own list of its recommendations.

1) Environmental Release of GMOs

Perhaps the most controversial recommendation of the Royal Commission was that HSNO should be amended to provide for a new category of environmental release – "conditional release." At the time, HSNO only allowed GMOs to be used in containment, or to be approved without restrictions for general release into the environment. In keeping with its overall conclusion that the risks of GMOs should be addressed on a case-by-case basis, the Commission recommended a new category under which GMOs could be released under restrictions or conditions that would be intended to avoid or reduce risks. This recommendation was controversial in part because it would make it more likely that GMO releases could eventually begin to be approved.

Another set of recommendations concerned the Ministerial "call-in powers" under which the Minister for the Environment can opt to assume responsibility for a decision on a release application in place of ERMA. Under HSNO, the Minister could decide on an application in place of ERMA where the Minister considered that the decision would have "significant economic, environmental, international, or health effects; or effects in an area in which the Authority lacks sufficient knowledge or expertise."[29]

The Commission recommended that HSNO be amended to include significant cultural, ethical and spiritual issues as grounds for the Minister's call-in powers. In addition, the Commission recommended that before the first approved release of a GM crop, the Minister should exercise the HSNO call-in powers to assess the likely overall economic and environmental impact on the "preserving opportunities" strategy.

2) Crop Co-Existence and Separation

The Commission recommended several measures intended to help ensure that GM crops could co-exist with other forms of production:

- *GMO-free districts*. Risk assessments under HSNO should allow for specified categories of GM crops to be excluded from districts where their presence would be a significant threat to an established non-GM crop.
- *Bt management*. Appropriate agencies should develop a strategy for the use of Bt crops.[*]
- *Horticultural labelling*. Appropriate agencies should develop a labelling regime to identify GM seed, nursery stock and propagative material at point of sale.
- *GM-free bees and honey*. MAF should develop a strategy to allow continued production of GM-free honey and other bee products, and to avoid cross-pollination by bees between GM and non-GM crops.
- *GM animals*. When GM animals are used to produce medicines or other non-food products, non-food animals should be used wherever possible.
- *Crop separation*. MAF should develop an industry code of practice to ensure effective separation distances between GM and non-GM crops; and identify how the costs of buffer zones should be borne.

[*] Bt is a natural pesticide produced by certain genetically engineered crops to make them pest resistant. Special restrictions on the use of such crops would be needed to prevent pests from evolving resistance to Bt, especially since Bt is a key tool used by organic farmers.

- *Dialogue and mediation*. MAF should develop formalised local networks to encourage dialogue and communication between farmers using different production methods, and provide for mediation where necessary.
- *Crop sterility*. One tool to prevent GM crops from cross-pollinating with non-GM crops could be to create GM crops that are sterile.

3) Ethics

The Commission made a number of recommendations that responded to ethical concerns about genetic manipulation. The most important recommendation was that the Government should establish a body known as "Toi te Taiao: The Bioethics Council." This would be an advisory body and a vehicle for open public consultation. A number of other recommendations had ethical or moral motivations, for example that the law should be amended to prevent the patenting of human beings and human reproductive processes.

4) Policy and Governance

The Commission recommended that the Government should establish a new office of the Parliamentary Commissioner on Biotechnology. Parliamentary Commissioners are semi-autonomous watchdog agencies, and this commissioner would be tasked with studying trends, conducting audits, and performing educational functions.[30]

The Commission also recommended that Government should develop a medium- and long-term biotechnology strategy for New Zealand.[31]

5) Māori Role

The special status and viewpoints of Māori were reflected in several of the recommendations. One was that the local-level biosafety committees that evaluate lower-risk research projects should each include at least one Māori member. Another recommendation was that HSNO be amended to provide that "effect is to be given" to the principles of the Treaty of Waitangi. The existing wording stated that "All persons exercising powers and functions under this Act shall *take into account* the principles of the Treaty of Waitangi" (emphasis added).

6) Call for Additional Research

The Royal Commission called for additional research in a number of controversial areas where it appeared that more information was needed. Specifically, it recommended the following research initiatives:

- *Environmental impacts*. ERMA should require research on environmental impacts on soil and ecosystems before approving release of GM crops.[32]
- *Organic and sustainable agriculture*. Public research funding should be allocated to ensure that organic and other sustainable agricultural systems are "adequately supported."[33]
- *Socio-economic and ethical impacts*. Public research funding portfolios should include research on the socio-economic and ethical impacts of the release of GMOs.[34]

- *GM forest trees*. In connection with any proposal to develop GM forest trees, an ecological assessment should be done to determine the effects on the soil and environmental ecology.[35]

7) GM Food: Health and Safety

The Commission concluded that the existing regulatory system was safe, but recommended additional measures to provide information to the public, including the development of a GE-free label for foods produced without GMOs.[36]

8) Streamlining Regulations on Laboratory Research

The Commission recommended various changes to consolidate and streamline the regulatory requirements for laboratory researchers, many of which were considered unnecessarily duplicative or burdensome, especially for low-risk experiment.[37] The Commission also recommended legal changes to better protect the confidentiality of sensitive commercial information provided by applicants seeking approval of GMOs.[38]

9) Liability

The Commission concluded that, at least for the time being, there should be no changes in the liability system.[39]

REACTIONS TO THE ROYAL COMMISSION'S REPORT

The conclusions of the Royal Commission were controversial. The organised groups most dissatisfied with the Royal Commission's report were the Green Party, environmental advocates such as GE-Free New Zealand in Food and Environment, organic farmers, and many Māori representatives. In contrast, praise for the Royal Commission's report tended to come from scientists at research institutions, the life science industries, representatives of conventional (non-organic) agriculture, and those representing industries such as the meat and dairy industries and grocery manufacturers (again, bearing in mind that these are broad generalisations).

The Royal Commission's report tried to acknowledge many of the fears that had been expressed about GMOs, and to address them. However, many of those fears would have been difficult to address with anything less than a continued moratorium on environmental releases.

The Green Party was shocked and angered by the Royal Commission's report. Greens Co-Leader Jeanette Fitzsimons said, "We were quite prepared not to get everything we were looking for. We were quite prepared to work in a spirit of compromise. But, really, this goes too far."[40]

Organic farming advocates were also surprised – "staggered," to use the word of one spokesman.[41] They argued that the report's recommendations on co-existence between GM and organic crops were unrealistic, and predicted large economic losses for their sector.[42]

GM in Parliament: The Numbers

New Zealand is currently governed by a coalition of the Labour and Progressive parties, with support from the Green and United Future parties on supply and confidence votes. The Government presently has considerable support in the 120-member Parliament for its overall approach on GM (lifting the moratorium and implementing the recommendations of the Royal Commission). Here is how the parties lined up in the GM debate as of October 2003, according to their public statements to date.

Supporting the Government's Approach

Labour Party

52 seats

National Party

27 seats

ACT New Zealand

9 seats

United Future

8 seats

Opposing the Government's Approach

Green Party

9 seats

Opposes environmental release of GMOs and their use in food.

New Zealand First

13 seats

Supports moratorium on GM releases that could impact upon food production, due to potential economic effects.

Progressive Party

2 seats

Wants to keep the moratorium until the technology is proven safe.

It soon became clear that the issue would jeopardise the accord between the Greens and Government. Labour's Prime Minister, Helen Clark, praised the report as thorough, measured, and balanced.[43] The Greens soon announced that they might withdraw support for the Labour-led coalition unless the Government instituted policies that would restrict GMOs to the laboratory and contained field trials, and not allow environmental release.[44] After a period of uncertainty about how the Government would respond, Labour declared that it would not be "held [to] ransom" on a single issue, and committed unequivocally to ending the moratorium and carrying out the recommendations of the Royal Commission.[45]

The Government formally responded to the Royal Commission's report on October 31, 2001, endorsing the strategy of "preserving opportunities." The Government introduced a new catch-phrase for its approach: "proceed with caution."

This dispute became a central issue in the national elections held the following year. The July 2002 election saw both Labour and the Greens lose ground. As a result of losing the support of the Greens, Labour struck a deal with the right-of-centre United Future party to ensure enough votes in Parliament to govern. The Greens and the Government now stood in clear opposition to one another on the GM issue.

III. Assessment of the Process of the Royal Commission

Some readers may be disappointed that I evaluate the *process* of the Royal Commission, but do not intend to pass judgement on the fundamental *correctness* of its "preserving opportunities" strategy and related recommendations. I will take it as a given that this is the direction New Zealand is moving in. In a later section (see p. 49) I will devote considerable attention to various difficult challenges involved in these implementing these policies.

The process of the Royal Commission provides some potentially useful precedents for the future. First of all, this Royal Commission broke new ground in New Zealand's tradition of Commissions of Inquiry. These inquiries usually have been more like forensic investigations (into a crime, accident, malfeasance, etc.). The Royal Commission on Genetic Modification's inquiry was, in contrast, built around fostering broad discussion and debate. It not only included the submissions of organised stakeholders, but also devoted equal effort to airing the views of the general public and of Māori.

The Royal Commission on Genetic Modification also provides a useful case study of public consultation in the making of public policy. That is a topic of broad interest throughout the world, not just in New Zealand. This Royal Commission was no doubt one of the most elaborate, ambitious consultation efforts ever conducted anywhere with respect to the GM debate. The example of the Royal Commission provides insights into some underlying questions. What are public and stakeholder consultation processes supposed to accomplish? What are the strengths and limitations of different methods of consultation?

LEGAL AND HISTORICAL CONTEXT OF COMMISSIONS OF INQUIRY

Commissions of inquiry are a longstanding feature of the Westminster style of government practised in Great Britain and other Commonwealth countries. The first royal commission was established by William the Conqueror, and looked into issues of land ownership and taxation. Its report, published in 1086, was known as the "Doomesday Book."[46*] Commissions of inquiry were introduced to New Zealand in 1867 and are currently governed by the 1908 Commissions of Inquiry Act.[47]

Under the Commissions of Inquiry Act, the purposes of a commission may include inquiry into the administration of the government, the working of any law, the necessity of any legislation, and other matters of public importance. Among the rationales for establishing a commission are to inquire into issues that are too complex, controversial, new, or provoking of public anxiety to be handled any other way.[48] As a result of their independence, inclusiveness, and broad powers, commissions of inquiry tend to have high visibility and their findings tend to have a good deal of credibility.

Not all of them deal with broad policy issues. More often than not they deal with very specific questions. Many of them have been what is sometimes termed "blame" inquiries – investigations into a specific incident, such as a plane crash or allegations of misconduct. One precedent for the Royal Commission on Genetic Modification is the 1976 Royal Commission on Nuclear Power Generation, which helped lead New Zealand down the nuclear-free path.

[*] Subsequent royal commissions have not shown the same flair for eye-grabbing titles.

Another broad inquiry, the Royal Commission on Social Policy, issued a massive report in 1988.

The government appoints a commission of inquiry and sets the conditions under which it operates. The "warrant" of a commission contains its "terms of reference," which define the subject matter and scope of the inquiry. The warrant may also include specific requirements dealing with the need to hold public meetings, publish discussion papers, or maintain confidentiality of sensitive information.[49]

A commission of inquiry is compelled to hear any person with an interest in the inquiry and those "interested persons" retain the same privileges and immunities as witnesses in a court of law, including access to counsel. An interested person is defined as any party or person who has an interest in the inquiry beyond that of the general public.[50]

Commissions of inquiry are sometimes described as being judicial or quasi-judicial proceedings. They have a number of features in common with courts – they have powers to compel witnesses and administer oaths, and enjoy a certain independence from the government. Like courts, they can be subject to judicial review on matters such as their fairness and their interpretation of their terms of reference.[51] However, given that they are appointed by the government and their conclusions are merely non-binding recommendations, they are more properly considered a tool of executive government than a component of the judicial system.[52]

WAS THE ROYAL COMMISSION SUCCESSFUL?

There are four goals by which we might assess the success or failure of a royal commission of inquiry:

1) *Influence on public policy.* Were its recommendations adopted?
2) *Political usefulness*. Was it useful politically for the government?
3) *Legitimacy*. Did it conduct its process in a way that upheld the law and was perceived as fair and credible?
4) *Public participation*. Did it foster a useful public debate that adequately consulted and involved the public?

By all of these criteria, the Royal Commission on Genetic Modification must be viewed as having been, for the most part, successful.

Influence on Policy

It is clear that the Royal Commission on Genetic Modification had a major influence on policy-making. Most of the Commission's recommendations have been adopted or endorsed by the Government.

Not all commissions of inquiry have been as successful in this regard. For example, the Royal Commission on Social Policy issued a five-volume, 4650-page report in 1988 after two years of work. The report had little impact. As one observer at the time noted, "the silence has been deafening."[53] One of the Government's own ministers reportedly joked he was using the report as a doorstop.[54]

The Royal Commission on Social Policy had a number of problems. The length of the report was daunting (although the Royal Commission on Genetic Modification's own report was not light reading either, at four volumes totalling over 1200 pages). Other factors of timing and content were probably more decisive. The social policy report turned out not to accord well with the Government's fiscal constraints, as well as its policy and political priorities.[55]

Assuming a royal commission operates with some real independence of judgement, there is always the possibility its recommendations may not be in step with what the government wants to hear or do. But this also highlights the importance of a commission of inquiry not taking too long to issue a report, or else it might become irrelevant.

Political Usefulness

Inseparable from the policy impact of a commission of inquiry is the question of its political usefulness. A royal commission can benefit the government by providing guidance or political cover on a controversial topic. At the same time, any government that appoints a royal commission is taking a risk. The commission's findings will likely attract a lot of attention and have a high degree of credibility as a thorough, impartial analysis – but there is no guarantee that these recommendations will mesh with the government's own agenda.

In this instance, the Royal Commission on Genetic Modification proved very useful politically. It helped to channel a highly contentious political debate into a non-political forum, and provided the Government with a way of making (and in some cases avoiding) difficult decisions in a way that could draw heavily on the credibility of the Royal Commission.

The Royal Commission on Genetic Modification provided a clear policy direction on an issue which had the potential to generate considerable political headaches. The recommended direction was consistent with the Government's broader economic priority of promoting biotechnology, but could not be accused of totally ignoring public fears about GM. No policy on GM could be uncontroversial, and many are unhappy with the Government's policy. But the extensive process of the Royal Commission, and its appearance of fairness and neutrality, has given the Government a strong prop to lean on in pushing its chosen approach. The Government often invokes the Royal Commission to assert that objections raised by critics have already been thoroughly aired and addressed.

Legitimacy of the Royal Commission

With regard to legitimacy, my conclusions must be considered tentative. I only interviewed a small subset of the thousands of participants in the process, mainly stakeholder representatives, government officials, scientific researchers, and members of the Commission itself. I supplemented this with published materials such as news media reports.

With regard to legitimacy, the Royal Commission on Genetic Modification is not without its critics. But in general the Commission seems to have been widely perceived as having conducted its process fairly, to have heard all the competing viewpoints, and to have conducted itself according to legal requirements.

The four Commission members were all prominent and respected citizens with diverse but relevant areas of expertise. None had any prior involvement in politics or any evident reason to be biased about GM issues. Any suspicions that the cards were being stacked to favour a pre-determined outcome would have been considerably lessened by the fact that the Green Party was closely involved in creating the Commission, and had input to its membership and its Terms of Reference.[56]

During the process, the Royal Commission and the Government both were scrupulous in avoiding any appearance that the Government was interfering with the Commission, or trying to influence its outcome. For example, the members of the Commission refused to meet with any elected officials except in the public forums of the Commission. The Commission's day-to-day operations were managed by a special secretariat that was independent of the Government.

The public consultation programme of the Commission is widely regarded as having been conducted in an even-handed manner that gave representatives of all points of view equal opportunity to make their case. I will discuss this perception of fairness (and its dissenters) in my evaluation of the public consultation programme (see p. 36).

After the Royal Commission issued its report, Wellington's *Evening Post* observed, "There are legitimate concerns but it is telling that four carefully selected commissioners with no apparent preconceptions have decided, after months of submissions and deliberation, to give genetic engineering a conditional green light. That is a conclusion that cannot be lightly dismissed."[57]

All of these factors now make the job of anti-GM advocates more difficult. For example, in rejecting a recent legal challenge against ERMA by an anti-GM group, the presiding justice wrote that the High Court was "not concerned with … the risks associated with genetic modification…Those perspectives must be developed elsewhere. The report of the Royal Commission on Genetic Modification published in 1991 *[sic]* followed a full consultation process which enabled such perspectives to be presented and considered."[58]

It should also be noted that there is no sign yet that the Royal Commission's work will be challenged on any points of law. It should be noted that this has not always been the case with past inquiries. For example, the 1994 Commission of Inquiry into Certain Matters Relating to Taxation (a.k.a. the "Winebox Inquiry") was invalidated by the High Court, which found several fundamental legal errors in its report.[59]

PUBLIC CONSULTATION AND PARTICIPATION

It is impossible to evaluate this Royal Commission without evaluating how it conducted its public consultation. While not without its flaws, the Royal Commission's process in many ways provides a case study of a thorough and well-managed public consultation process, albeit a public consultation that had limited aims. The lengths to which the Royal Commission went in its consultation are particularly impressive given the small size of New Zealand's population.

Criteria for Evaluating Public Participation

Public participation and consultation are widely used in many countries for everything from local planning to regulatory decision-making to the formulation of broad plans and policies. I define public participation to include all the formal procedures other than elections by which policy-makers ask the public for its views.

There are different schools of thought about what public participation is supposed to accomplish. One view is that its purpose is to give citizens more power to influence policy. As one early study put it, "There is a critical difference between going through the empty ritual of participation and having the real power needed to affect the outcome of the process." For some, public consultation processes that merely solicit the views of the public are a "sham"; true public participation only occurs when real power is shared with the citizen participants.[60] Processes that fall short of this ideal are sometimes dismissed as little more than a form of political control and pacification.[61]

I think there can be little doubt that, for those citizens who take part in public participation or consultation, this is one of their main goals: to actually influence policy. And to the extent the decision makers do not adopt the hoped-for positions, they will be disappointed.

However, I take a broader perspective, from which implementing the desires of citizens is just one of several possible benefits of public participation. I will follow Beierle et al.[62] in looking at "social goals" – outcomes that "lead to a well-functioning and responsive system of environmental policy and management." These are goals whose value is widely recognised, and presumably transcend the individual goals of stakeholders and participants in the process:

1) *Incorporating public values into decisions.*
2) *Improving the substantive quality of decisions*, by providing information, generating new policy alternatives and helping policy-makers to understand the preferences and goals of the public.
3) *Resolving conflict among competing interests.*
4) *Building trust in institutions.*
5) *Educating and informing the public.*

After describing the public consultation processes of the Royal Commission on Genetic Modification, I will comment on what it achieved, drawing on interviews from a variety of participants, primarily representatives of stakeholder groups (formally known as "Interested Persons"), as well as interviews with the members of the Royal Commission. Again, it should be stressed that I did not talk to enough individuals to form anything like a representative sample of all the participants in the consultation programme, so my conclusions about how participants viewed the process cannot be considered definitive.

I will look at the extent to which the Royal Commission achieved the above five "social goals" of public participation. I will also discuss how public participation influenced the substance of the Royal Commission's decisions, and some ways the Royal Commission's process might have been improved upon.

Overview of the Royal Commission's Process

Early on, the Commission commissioned a set of background papers from outside experts on various aspects of GM (including ethical aspects, economics, public perceptions, Māori aspects, and human health aspects). Setting a precedent that would continue throughout the process, the papers were placed on a public website.

The Commission then embarked on several different parallel processes to ascertain the views of the public.

1) Scoping Meetings and Other Preliminary Steps

In August 2000 the Commission held scoping meetings to begin a dialogue about the shape the public consultation processes should take. They also established a process for designating "Interested Persons" and taking written submissions.

The public scoping meetings were held in Wellington on August 7-9. Participants could attend personally or send written comments or e-mails. At the scoping meetings, participants were informed about the nature of the Commission and its inquiry, how to make submissions and how to apply for Interested Person status. Participants also made contributions on "key questions," such as "What are the health risks and benefits associated with GM foods?"[64]

Up to 200 people attended each of the three Wellington meetings.

2) Formal Hearings

These were set up to hear submissions from Interested Persons over a period of 13 weeks, from October 2000-February 2001. There were 265 applications for Interested Person status. Ultimately 117 persons and organisations were granted such status.[65] Interested Persons represented a wide range of interests: environmental organisations, food industry groups, conventional and organic farming organisations, scientific research institutes, biotechnology companies, and many others. Often these groups had experts from other countries make submissions on their behalf.

These hearings were held in a courtroom-like setting with stenographers and many of the formalities of the courtroom. The Commissioners posed questions to the Interested Persons themselves or through the Commission's counsel. To some extent the adversarial nature of the courtroom was also present, as Interested Persons or their representatives had the opportunity to cross-examine witnesses.

All of the hearings were public, and submissions from Interested Persons were placed on the Commission's website. Opportunities were also made for submitters to appear again for new evidence and rebuttal submissions.

Formal hearings were held in Wellington, Auckland, and Christchurch. The Commission heard from about 300 people, and the hearings produced 4656 pages of transcripts and almost two cubic metres of submissions and evidence.[66]

3) Public Meetings

These meetings were intended to allow the general public to air its views in a more informal setting than the formal hearings. These meetings included workshops in which key issues were discussed. During an "open floor" segment, often chaired by local government representatives, members of the public could pose questions to the Commission.

Public meetings were advertised in a variety of ways, including print media, radio, and street posters. The meetings ran from September through November 2000. There were 15 meetings in total. They were held in both populous and accessible areas and also some of the remoter regions. Each meeting ran for six hours, so that members of the public with varying work schedules could attend. The number of attendees at each meeting ranged from about 15 to 200.

4) Public Submissions

The Commission invited written submissions, and more than 10,000 were received by the closing date of December 1, 2000. Like the Interested Person submissions, public submissions were placed on the Commission website, and their contents were later summarised in a published analysis.[67]

5) Māori Consultation Programme

The Terms of Reference placed great emphasis on consulting Māori, giving this equal weight with consulting the general public. The first step was an initial hui in Rotorua on July 21 to begin planning the process. Ultimately the Māori programme consisted of 28 regional workshops and 10 regional hui throughout New Zealand from October 2000 through March 2001, culminating in a national hui at Ngāruawāhia in April. Workshops provided information about the process in preparation for the hui. The regional hui provided venues for submissions, and the national hui allowed representatives from different regions to meet and provide a composite view.

The meetings were publicised in Māori and English, through news releases, posters, and the efforts of local iwi. Most of the regional hui were held at marae (Māori meeting houses), and local marae protocol was observed. The regional hui were chaired by a member of the local community. All oral submissions were taped. Submitters presented in English or Māori. The latter were simultaneously translated for the Commission.[68]

6) Youth Forum

A one-day forum was held at Te Papa Museum of New Zealand in Wellington in March 2001. It was open to 100 young people aged 12-25, selected on the basis of an essay competition. The Commission paid for 20 young people to travel to Wellington to attend. Ninety-nine young people attended in all.[69]

7) Public Opinion Survey

The Royal Commission contracted with a marketing and social research firm to conduct a telephone survey on the opinions of a representative cross-section of the New Zealand public. The survey covered attitudes toward GM, as well as awareness and understanding of the

issues. The survey sample included 1153 New Zealanders. Māori were oversampled and given the opportunity to be interviewed by a Māori interviewer.[70]

The consultation programme ran from July 2000 to April 2001. The Commission then deliberated, formed its conclusions, and drafted its report, which was released three months later, in July.

Did the Royal Commission Achieve the "Social Goals" of Public Participation?

Arguably, all of the "social goals" of public participation were furthered, to at least some extent, by the process.

1) Incorporating public values into decisions

Clearly the Report of the Royal Commission incorporated a wide array of public values into its decisions, and included dozens of policy recommendations to address them. Many submitters were unhappy with the extent to which their values were incorporated, but their views were certainly heard, reported, and to some extent acted on.

Different aspects of the process contributed in different degrees and in different ways, as I will discuss in a later section.

2) Improving the substantive quality of decisions

This is a difficult question to answer, because we do not know what decisions the Government would have made in the absence of a Royal Commission. In addition, there is no consensus on whether the Government did the right thing in adopting the strategy recommended by the Royal Commission.

Nevertheless, it is hard to imagine that the Government could have developed such a detailed and comprehensive package of policies on GM without the work of the Commission. Given the general direction in which the Government chose to move, the public consultation was clearly beneficial – it provided a great deal of information about risks, benefits, varying public attitudes, and available alternatives for addressing these.

3) Resolving conflict among competing interests

It is not clear whether the Royal Commission process resolved conflicts. New Zealand is still gripped by a very contentious debate on the issues. The Royal Commission temporarily created a neutral forum. Arguably, in the words of one of the organisers of the process, "a lot of the heat went out of the debate."

I asked members of the Royal Commission whether they thought the process helped resolve conflicts or generate consensus in the public. Dr Allan thought the process helped create a consensus in favour of GM use in medicine and in contained settings such as the laboratory. Bishop Randerson thought the dialogue in the hearings created a more thoughtful and well-informed debate, but that "much of the public reporting and follow-on tended to be divisive and adversarial."

Dr Fleming expressed worry about the continuing acrimony, saying, "In my bad times, I think the Commission probably did a lot to divide the country, if you like, or to polarise the country." However, she said she tries to see the debate in a positive light, reminding herself, "It's just that New Zealanders are still concerned, but they want to know more, and the Commission helped a lot in allowing people to know more."

While it is not clear whether the level of conflict was reduced, the Royal Commission process seems to have played a role in the solidification of pro- and anti-GM coalitions. The Life Sciences Network, a lobbying umbrella for life science companies and research institutions, was established in 1999, but its influence and prominence rose greatly during the Royal Commission process. It played a key role in organising and co-ordinating the testimony of scientists and others making submissions in favour of GM, and also led the effort to cross-examine and challenge the witnesses who criticised GM. The Royal Commission process also led to heightened co-ordination among those opposed to GM, in particular solidifying links between organic farmers and environmentalists such as Greenpeace. It might be that the Royal Commission tended to *simplify* the GM debate, with coalitions co-ordinating to emphasise certain common themes.

More research would be useful in this area. It would be useful to try to track statements by pro- and anti-GM advocates over time to see if their positions evolved, and whether there is definite evidence that consensus grew as a result of the Royal Commission process. Unfortunately, the opportunity has been missed to repeat the public opinion survey immediately after the process was over to track shifts in public opinion that might be due to the Royal Commission process.[71]

4) Building trust in institutions

It is difficult to say what the effect has been on trust in institutions. It is perhaps too early to tell – the proof may be in whether or not New Zealanders ultimately accept the approach the Government is taking. However, it seems clear that trust could have been severely undermined if the Government had tried to take the course it did on GM without having initiated the Royal Commission inquiry first. The variety and complexity of the issues, and the strong feelings behind them, had to be explored in depth for the Government's approach to be credible.

5) Educating and informing the public

In terms of educating and informing the public, it is again only possible to speculate on the Royal Commission's achievement. The Commission sponsored a very comprehensive public debate, and its report, along with the website, have certainly provided a major resource that would not otherwise exist. As noted earlier, the subject of GM received extensive media coverage during the Commission's tenure.

It would have been very interesting had the Royal Commission's public opinion survey been conducted both before and after the Commission did its work, especially if the survey had focused more attention on public understanding in addition to public attitudes. In the future, an evaluation of the impacts of a commission of inquiry could be incorporated into the process. A survey repeated before, during, and after the process would provide potentially valuable information about the impacts of the process. This could be supplemented by work with focus groups.

How Public Consultation was Factored into the Decision Process

Different strands of the process contributed in different ways and to varying degrees to the final recommendations of the Commission.

One clear limitation of the process was that it was not designed to make citizens the partners in decisions. But this was fully consistent with the Terms of Reference, which called upon the Royal Commission to consult the public, Māori, and Interested Persons, but left it to the Commission to reach its own conclusions.

Public Meetings and Submissions

Public meetings and written submissions have a number of inherent limitations. They allow each participant only a short time to speak, with minimal opportunities for interaction with the decision-makers. Often the participants who choose to attend are not a representative sample of public opinion. Also, members of the general public are usually not as well informed as the professional opinion-leaders who testify on behalf of organised interest groups and commercial interests.

The public meetings and the more formal Interested Persons hearings seem to have fulfilled complementary roles. As Dr Fleming put it, the public meetings were useful to "get a flavour of the major issues that people were worried about, and it was the formal hearings where we could actually get the true evidence in a scientific way and debate it."

The meetings with the lay public had the effect of sensitising the Commission to which issues the public was concerned about, and to the intensity of that feeling. This in turn seems to have influenced the Commission in terms of reporting and acknowledging those concerns – even though the actual details of the recommendations were more likely to have emerged from the Interested Persons hearings and submissions.

As Dr Allan put it, the Commission took the sentiments expressed "very seriously" and they influenced the Commission to write its report "carefully in inclusive language." She adds, "The vehemence of expression at both the Māori and the public consultations bought home … some of the opinions out there," compared to what was being reported in more subdued written submissions, the media, and the more "polite" formal hearings. As a result, public and Māori concerns "got increased space and emphasis as a result … it was a subtle result, but on reflection it was very much a contributor to the final shape of the report."

Sir Thomas Eichelbaum said that the public meetings were the "opportunity for everyone and anyone to have their say." Bishop Randerson observed that the public meetings "to a large extent had the feel of a rally, a rally by the Greens – you know, we've got to rally here and really impress upon the Commission the dangers of genetic modification and make sure we keep New Zealand as a clean, green environment…That is not to say there weren't fresh insights that came out of them, but I feel they were more expressions of views and positions rather than presentation of fresh evidence."

The written submissions were similar in that they were predominantly, and often vehemently, anti-GM. The large numbers (over 10,000) reinforced the extent of anti-GM opinion among the general public. However, sheer force of numbers did not make anti-GM written submissions more influential than other submissions with regard to the Commission's

substantive deliberations. This was particularly true of submissions that looked like form letters. Three members of the Royal Commission mentioned to me that the numerous cookie-cutter anti-GM submissions added little to the process by which they drew their conclusions. As one put it, "the bulk of those seemed to be form letters that had been put out by Green organisations. Some of them had very succinct messages like 'stuff GE!'"

Public Opinion Survey

Although more than 90% of the speakers and submissions from the general public were anti-GM, the members of the Royal Commission believed that this was not a representative sample. The public opinion survey was important to them as a way of, as Dr Jacqueline Allan put it, "finding out what middle New Zealand thought." Like the public submissions, the survey showed the public to lean toward anti-GM views, but less dramatically so. And the survey quantified varying attitudes toward different kinds of GM. The survey seems to have been a very cost-effective tool. Because it was undertaken by a contractor, it did not compete much with the other parts of the process for the time and attention of the Commission members.

Interested Persons Hearings

According to my interviews with Commission members, the Commission viewed the formal hearings and submissions of Interested Persons as being crucial to actually shaping their substantive opinions and understanding of GM issues.

The formal hearings allowed more intensive exploration of the views expressed than had the public meetings. Interested Persons represented organised stakeholder groups, such as industry, farmers, the organic sector, research scientists, and environmental and consumer advocates. Many of the submitters were outside experts brought in by these groups, some from other countries. Interested Persons were allowed to have representatives cross-examine witnesses from other points of view, and the Commission posed questions to witnesses as well (usually through its legal counsel).

The formal hearings were sometimes rather adversarial in tone due to the clashing views and the use of cross-examination. Some Interested Persons, particularly from the anti-GM point of view, complained later about the process. Some felt anti-GM witnesses had been treated harshly by opposing counsel, who they said made personal attacks, or based their challenges on irrelevant issues or inaccurate statements. Of course, pro-GM advocates can also recite a litany of allegedly false statements made by their opponents.

However, the Commissioners themselves were not accused of displaying any bias or opinions about the speakers, and evidently took care to appear "poker faced" during testimony. One member of the Royal Commission I interviewed expressed disappointment that it was not possible for the Commissioners to ask more frequent and probing questions, saying they felt they had to restrain themselves so as to maintain an air of neutrality.

One of the aspects of the GM debate that is most challenging is the clash of opinions over complex scientific issues. All of the members of the Royal Commission singled out the Interested Persons hearings as being useful in allowing them to probe disagreements, look for areas of consensus, and form their own opinions about disputed assertions.

One area of consensus that seems to have become clear during the proceedings was that GM's opponents and supporters were not deeply divided as to the appropriateness of GMOs in laboratory research and medicine. While contained uses did raise some ethical concerns, the main faultline was between those who supported and those who opposed release of GMOs into the environment and their use in food.

One thing all members of the Royal Commission mentioned to me was that the process helped them to probe various anecdotes and examples that were circulated or put forward by anti-GM advocates. To take one example, in 1989 thousands were poisoned by a dietary supplement, tryptophan, that was produced using GM bacteria. This was often cited as illustrating the dangers of GM. In the Royal Commission's report, the discussion of the case did not draw a definite conclusion, but certainly displayed a scepticism about whether GM was to blame for the poisonings.[72]

In the interviews I conducted, all the members of the Royal Commission made a point of noting that their inquiry and report had, in their view, put to rest various anti-GM stories that were in wide circulation. Bishop Randerson, Dr Allan and Dr Fleming all readily recounted specific instances in which, in their view, the scientific testimony of witnesses put forward by the anti-GM side didn't hold up to scrutiny. As Bishop Randerson put it, it "became quite clear to me that there are a lot of global myths about GM that have wide circulation." Said Dr Fleming, "We put to bed a whole lot of myths." She felt that anti-GM advocates were unintentionally stretching or reinterpreting the evidence to make GM look bad. Recalling a particular scientific presentation about health risks of GM food, she said, "That was a very interesting day, the day that those scientists came and sat down, because I began to feel the inkling that there were a lot of scientists out there who were looking for the worst in the science, and actually they couldn't find it."

Māori Consultation

The Royal Commission realised that it was important, as Dr Fleming put it, to meet with Māori "on their own territory to gain their trust, make them feel they could say anything they liked …" The presence of Dr Allan on the Commission probably did a great deal to enhance the understanding of Māori protocols.

The Commission members told me they had learned a great deal from the Māori consultation. It is clear that the consultation with Māori shaped many of the recommendations of the Commission, and not only those that explicitly mention Māori issues or the Treaty. For example, the recommendation that GM researchers avoid using animals normally found in the food chain was to a large extent the result of Māori concerns.[73] Nevertheless, as I discuss in a later section (see p. 41), Māori expectations about the nature and impact of consultation are formed in a special historical and political context. The type of public consultation carried out by the Royal Commission is probably not sufficient by itself to satisfy those expectations.

Youth Forum

The Youth Forum staged a lively debate. Some members of the Commission were surprised because the views of youth did not always fall into the patterns that had grown familiar during the other public meetings. "It was so stunningly different from every other public hearing," said Dr Fleming. The youth participants had different priorities, being more focused on

biomedical ethics and modification of the human species, in contrast to the preoccupation of the general public with things like food safety.

While the youth forum provided another dimension to the Commission's report, none of the Commission members could point to a specific way in which it influenced their recommendations. One member stated bluntly that "It added no new arguments, no new evidence."

Individual Research

Some members of the Royal Commission found that the submissions and other material generated by the process were not enough, and tried to conduct some research on their own. For example, Dr Allan says she went to a "radical book store" and bought every anti-GM book she could find. Then she looked up all of the supporting scientific articles and reports those books cited, in an effort to get to the bottom of some of the controversies.

Making Up Minds and Reaching Consensus

As described above, the Commission members formed many of their opinions out of the clash of ideas and evidence in the formal hearings. No doubt some submissions made a particularly strong impression. For example, one member described a powerful presentation by the parents of children with rare genetic diseases. Two of the four Commission members specifically mentioned to me a presentation on crop gene flow that particularly impressed them. It dealt with techniques for differentiating the risks of cross-pollination from various kinds of crops, and seems to have contributed to the overall feeling of the Commission that issues such as co-existence could be managed on a case-by-case basis.

For the most part, however, the Commission members described the process of reaching conclusions as having been mainly the result of a gradual accumulation of evidence, rather than through sudden revelations. Asked about how the Commission resolved the conflicting views put to it, Sir Thomas Eichelbaum, the Chair, said, "As a lawyer and a judge, I have had 50 years' exposure to people giving different versions of the same events." He noted that, "We had a huge volume of evidence. In cases of that kind, where you're gathering information or hearing evidence over a period of many months, speaking as a judge, eventually your mind assimilates all that and comes to a conclusion, finds one case more convincing than the other. It's really a preponderance of the evidence."

The members of the Royal Commission were under instructions from their Chair not to discuss the issues at all until all of the evidence had been heard. The moment when they finally met to talk about what they had heard was a dramatic one. As Bishop Randerson recalled it,

> When all the submissions finished at the end of March 2001, we decided, let's just take some days off and spend a couple days together, just the four of us, without any staff, and think about what we've heard. Because Sir Thomas was very clear that we wouldn't discuss our views and opinions before we'd heard all the evidence. He said, 'That's not a judicial way of proceeding, to begin drawing conclusions before all the evidence is in.'

> So we had never, for the whole 12 months, discussed what conclusion we thought we were coming to. It was quite a moving moment in a way, now the four of us sat around in this country house with coffee and said, 'OK, what do we all think?' And it very quickly became apparent that we all agreed that a blanket solution wasn't going to be the way ahead, that the issue was too complex for there to be a blanket solution, either to ban GE completely or put all our eggs in the GE basket. So having reached that conclusion as a basic starter, it became a matter of unpacking all the evidence and deciding how we wanted to assemble it.

Dr Allan recalled the day in very similar terms, adding that she was "quite stunned" by the degree to which they were in agreement so quickly. Sir Thomas Eichelbaum concurred that they reached consensus quickly, but added that, "As always, the devil was in the detail, and how to frame conclusions on individual subjects." In the end, it would take them three months to hammer out the report.

Differing Perceptions of the Royal Commission's Fairness or Objectivity

The Commission seems to have been scrupulous about observing procedures that ensured that everyone had their say and that all points of view were aired and reported.

In my interviews with stakeholders, I heard some complaints, mainly from the anti-GM side, that the allotted time for testimony or cross-examination at the formal hearings was insufficient to do full justice to their views and evidence. However, I heard nothing to indicate that there was a systematic or pervasive bias that favoured one side over the other. In addition, some GM opponents complained of shortcomings in the public meetings and submission process – for example, that the submissions forms were too complicated or that the public meetings were held without sufficient advance advertising.[74] Overall, however, given the many thousands who spoke or provided submissions, and the fact that over 90% of them were anti-GM, it seems reasonable to conclude that anti-GM viewpoints were adequately expressed in the public meetings and public submissions.

With regard to fairness, the most common complaint I heard was that there were unfair disparities in resources. Many on the anti-GM side of the spectrum believe that GM advocates, with their ties to industry and large government-funded research institutions, had greater resources at their disposal for mounting their case. However, it appears that both sides were able to conduct aggressive lobbying campaigns – for example, both sides were able to bring quite a few expert witnesses from other countries before the Commission. Some anti-GM advocates also thought the hearing process had been too adversarial and that their witnesses had been unfairly maligned.

Criticisms of the Inherent Fairness of the Report

The most pointed criticisms of the Royal Commission have been reserved not for its process but its report. These critics feel that the report reveals a bias in the amount of space and emphasis it devotes to commenting critically on examples raised from the anti-GM side.[75] This feeling has some basis in reality. As mentioned earlier, the Commission members really did have as one of their goals in drafting the report the highlighting of sceptical questions about a number of anti-GM claims. However, this in itself does not necessarily mean they were biased. In the view of the Commission members, they were guided by the evidence.

In addition, however, the critics argue that the Royal Commission revealed its bias through flaws in its reasoning and handling of the evidence. One published critique went through several examples in detail, before concluding:

> The Royal Commission's report is clearly not the unbiased, balanced assessment it was meant to be. It systematically downplays and under-reports evidence suggesting hazards, even to the extent of excluding much of it, while it regularly relies on weak, unsubstantiated and sometimes false assertions from biotech proponents to counter and often override well-grounded concerns expressed by experts. Further, its procedures are so loose and careless that it not only incorporates many false statements by others but also contains many blatantly false assertions of its own. The report's favourable findings and recommendations about GE foods squarely rest upon these many falsehoods and could not have been issued if the facts had been fully and accurately presented.[76]

I will not attempt to weigh in on the merits of this argument. To do so would require a systematic evaluation of how the Commission handled all the claims and counter-claims aired in its report, which is beyond the scope of my research.

Another criticism is that the report's overall rhetoric employed a sort of "straw man" strategy. The Commission's report sets up a dichotomy between "a New Zealand free of all genetically modified material" and "unrestricted use of genetic modification." The report then concluded that "either of the extreme options would significantly restrict New Zealand's future choices."[77] Critics charge this employed a false dichotomy that misleadingly implies that the Royal Commission chose the middle ground, when in fact the middle ground contained other viable options.

This criticism has some validity. The Terms of Reference called upon the Royal Commission to report upon "the strategic options available to New Zealand to address, now and in the future, genetic modification, genetically modified organisms, and products."[78] The concluding analysis of its report would have been stronger if it had culminated in a comparison of more alternative strategies. It is highly unlikely the Government would have even considered a total ban on GM. And none of the advocates of GM were arguing for its unrestricted use without regulation.

A more persuasive analysis would have compared and contrasted more than one *plausible* alternative strategy, for example, a strategy to allow fully contained uses but have a moratorium on field releases. Another alternative would be to have a moratorium for use in food crops.

This represents more a shortcoming in how the report's conclusions were framed than a substantive failure to consider all the options. For example, if one wants to know why the Commission did not accept the idea of banning environmental releases, discussion of all the relevant issues is contained in the report, but it is dispersed throughout it.

It is worth noting that the Royal Commission may deserve some credit for moving the debate forward so that the positions of all-or-nothing were, by the end of the process, considered extreme. By the time the Royal Commission finished airing all the potential risks and benefits

of GM, it would have been more difficult for anyone in New Zealand to say they supported either unrestricted use or a total ban.

Conclusions Said to be Based on Incomplete Evidence

Critics have said that evidence that came to light *after* the Royal Commission finished its work runs counter to its conclusions, undermining the validity of those conclusions.[79]

This assertion is not completely without foundation. The Royal Commission's work is undeniably a snapshot – a snapshot of knowledge on GM at a particular time, and a snapshot of public opinion. This is an inevitable constraint on a commission of inquiry – it must complete its work in a limited amount of time. If it takes too long, it could become irrelevant.

It is especially true in an area like GM, a fast-changing field of science and technology. New information is constantly coming out – new scientific results, technological changes, economic and commercial developments, and changing policies and regulations around the world.

This is a reality that should be kept in mind when designing any commission of inquiry – if it deals with a fast-changing subject, especially a scientific one, its findings will inevitably be based on incomplete information and have a limited shelf-life.

However, the Royal Commission's report is in fact quite comprehensive and it is difficult to name any category of risk that it did not in fact consider. There have no doubt been further developments since. GM opponents can cite new research on gene flow or environmental effects of GMOs. However, these are incremental changes in the state of knowledge. It is doubtful that this information would have changed the Royal Commission's fundamental conclusions, since the Commission recommended that risks such as these be assessed on a case-by-case basis by regulators as they arose.

It should also be noted that while new information has arisen since the Commission concluded its work, the new information probably cuts in more than one direction. One of the Royal Commission members I interviewed, Dr Allan, agreed that the Commission's work had in some ways been overtaken by changing science. But her example was the development of new techniques that make genetic engineering more precise, reducing the likelihood that the genetic changes will have unanticipated consequences. This would tend to argue in favour of reduced rather than heightened caution about the technology.

"Corngate", Seed Contamination and the Royal Commission

The topic of seed contamination is perhaps the most noteworthy area in which more information emerged after the Royal Commission finished its work.

In November 2000, a company that imported ostensibly GM-free corn seed into New Zealand from the United States conducted a routine test and found traces of Bt corn.[*] Government officials were notified of the potential for GM contamination[†], and there followed a series of

[*] Bt corn is genetically modified to produce the Bt toxin that kills certain insect larvae and confers insect resistance on the plant.
[†] Supporters of GM prefer value-neutral terms such as "adventitious presence" or "inadvertent presence" to the somewhat loaded term "contamination." But in the interests of brevity and the lack of a verb form for "adventitious presence," I will continue to use "contamination" and "contaminate."

intensive internal discussions about what to do. Although the Government considered immediately notifying the public and ordering the suspect corn plants destroyed, it did not do so. It did, however, issue a rather muted public statement a month later about a possible incident of contamination and the adoption of new safeguards. That announcement attracted little public attention.[80]

Officials briefed the Royal Commission on the incident and the policy questions it presented, both in writing and in oral submissions, in February and March 2001. They told the Commission that GM seeds had been inadvertently imported and planted. The briefings noted that products containing this kind of GM corn were approved under food safety laws for human consumption in New Zealand, so posed negligible health risks. They stated that the environmental risks were also low, although there could have been cross-pollination with other corn crops.[81]

The officials also told the Commission that it was quite likely that such episodes would recur from time to time with certain kinds of seeds imported from countries that use GM crops. They informed the Royal Commission that the Government was initiating new measures to test sweet corn seed imports. Such tests would be very stringent by international standards, but would never be able to guarantee that imported corn seed would be 100% GM free.[82]

In its report, the Royal Commission briefly mentioned the issue, noting that, "some imported seeds may contain a small proportion of genetically modified contaminants … it is difficult to keep all genetically modified organisms out of the country."[83]

A year after the Royal Commission had issued its report, in the charged political atmosphere of a national election campaign, the corn seed contamination episode suddenly erupted as a major focus of public debate. In July 2002 a television programme carried an interview in which the Prime Minister was surprised with probing questions about the case. The broadcast coincided with publication of a book alleging that the Government had "covered up" key aspects of the corn seed contamination episode. The book also alleged that the Royal Commission had been "misled" about the episode a year earlier, "compromising the Royal Commission process."[84] The media dubbed the scandal "Corngate".

Do the facts show that the Royal Commission was undermined? I am not in a position to determine what the Government intended in its dealings with the Royal Commission. What information it conveyed to the Commission is a matter of public record. It appears that virtually every aspect of the seed contamination episode that would have had a bearing on the substantive policy issues was presented to the Commission.

One might argue that certain ramifications of the seed contamination problem were not brought out in these briefings. For example, the Royal Commission was told that the Government was planning a seed-testing regime that would allow seed shipments to have up to 0.5% inadvertent GM content. The following year, officials publicly acknowledged that this 0.5% threshold might clash with the HSNO's prohibitions on GMO releases. In addition, the official briefings to the Royal Commission were not always completely clear. For example, one of ERMA's witnesses told the Commission in successive sentences that the inadvertent planting of imported GM seeds was both "bound to arise from time to time" and yet "a worst case scenario".[85] Since then, events and official statements have made it clearer that such episodes are all but inevitable under existing procedures and circumstances.

However, it does not appear that the Royal Commission itself can be faulted for these shifts in the official line that have occurred after the Commission had published its report. At the same time, however, it is regrettable that a full public airing and debate of all the ramifications and questions raised by seed contamination did not occur until a year after the Commission had finished its work.

The fact that the Corngate episode created so much controversy and outcry in 2002 probably also indicates that the Government could have been more open and transparent in how it presented the seed contamination issues to the general public when these issues first arose. If the public had known at the end of 2000 everything it learned in 2002, it seems likely the questions about seed contamination would have been a greater focus of public debate and discussion during the Royal Commission process. However, this can not be attributed to any flaw in the Commission's own process.

Māori Concerns

Comments by some Māori representatives indicate dissatisfaction with government-sponsored consultation processes such as that of the Royal Commission on Genetic Modification. They assert that the Government asks for and listens to their views, but then too often dismisses those views:

> Thus even though there often seems to be a genuine respect for Māori difference, and a willingness to share in the richness of Māori tradition, it is usually framed in terms of "cultural sensitivity" … there is little recognition that the Māori world is anything other than a cultural object noted for its spirituality and its music. In this view, everything from our notions of political authority to an understanding of genetics is marginalised as "cultural" rather than scientific or intellectual.[87]

This relates to my earlier remarks about differing views on the goals of public consultation. The unique relationship between the Crown and Māori under the Treaty of Waitangi creates expectations that consultation will be part of a more collaborative decision making process that places greater weight on the substantive concerns of Maori.

Māori also have voiced reservations about other aspects of the Royal Commission process – for example, that the process happened too quickly, and that they lacked the necessary time and resources to reach their own conclusions about this difficult and highly technical subject. GM competes with a host of other issues for the attention of tribal representatives, from social welfare to natural resource management.

It is somewhat artificial to try to consider Māori consultation in this Royal Commission process in isolation. There have been other forums in which Māori are consulted on these issues, such as through ERMA hearings and consultations between Crown Research Institutes[*] and local iwi over specific research proposals.

Furthermore, the Government has been in an ongoing dialogue with Māori for generations on the questions fundamental to New Zealand's cultural and political identity – such as the meaning of the Treaty, the redress of historical grievances, and the degree to which Māori rights and differences should be granted official recognition. To some extent Māori concerns

[*] The nine Crown Research Institutes are government-owned enterprises that are required to operate as self-sustaining commercial organisations.

about the Royal Commission consultation process are really an instance of longstanding concerns about the way New Zealand is governed.

Ensuring that Māori do not become too disaffected about policy on GM will likely remain a high priority for Government. The last few decades have seen a political resurgence of Māori influence in step with their growing numbers (which totalled 14% of the population in the 2001 census).[88]

However, it should be noted that the Royal Commission did get several aspects of Māori consultation right. One Commission member had deep ties to the Māori community, and others had knowledge of Treaty issues. The Commission was careful to make accommodations for testimony and participation in the Māori language, and broke new ground by holding meetings of a commission of inquiry in the marae setting. Māori have criticised the Government for acting as if one or a few government-chosen representatives can speak for all Māori. There are diverse Māori tribes, each intimately tied to a geographic place, and they all speak for themselves. The Royal Commission's holding of many regional hui acknowledged that reality.

Other Strengths and Limitations of the Royal Commission Process

A widely-recommended best practice is to hold public participation early, before decisions are made, rather than merely seek to ratify plans that already have been made.[89] The Royal Commission holds up well here as well, having occurred at a time when all parties agreed a comprehensive review of policies on the subject was necessary.

The literature on public participation calls for the need to use multiple, mutually reinforcing tools to maximise the benefits of public participation.[90] The Royal Commission did so with its many approaches: a survey, public meetings, written submissions, formal hearings, hui, and youth forum.

This Royal Commission departed significantly from historical precedent in holding such an inclusive participation process. Past commissions of inquiry have heard testimony only in the formal courtroom setting. This Royal Commission held public meetings in many locations around the country, in community centres and Māori marae (meeting halls), making it easier for all New Zealanders to participate if they wanted to. The public meetings were six hours long, to accommodate a variety of work schedules, and were advertised in a variety of ways. It is likely that this emphasis on outreach and inclusiveness enhanced the credibility of the Commission's work.

The Commission was also admirably open to using technology and technical expertise. It used video conferencing to assist interest groups in presenting experts from abroad. It used a website to disseminate information and submissions. The Commission employed an automated clipping service that forwarded news articles about the process to the members via e-mail. It crafted the format of submissions so that they could be analysed with the aid of computers in preparation for the final report.

Lack of Institutional Memory

The work of the Commission was hampered initially by a lack of institutional memory regarding how such inquiries have been established and conducted in the past. The last broad-

based policy inquiry providing a precedent was the Royal Commission on Social Policy, conducted over a decade earlier.

This may explain why initially the amount of money allocated was too small. In addition, Commission members and staff did not realise at the start how much time and effort their responsibilities were going to take. A few months after the Commission began, the evident complexity and difficulty of the task became apparent. The Commission hired an executive to run the process and free the Commission members for their primary duties of hearing evidence and deliberating on the issues.

The learning process resulted in some early fumbles and miscues. For example, by the time it was realised that the Commission needed a courtroom, none was available. A brand-new courtroom had to be constructed from scratch.

Some of the institutional memory necessary in the future has since been documented in a report by the Department of Internal Affairs.[91] However, given the innovations used in this inquiry, it seems likely there is a good deal of additional experience that could be documented about the logistical details of setting up and running the various streams of the consultation process.

Pace of the Inquiry

Māori qualms about the pace of the inquiry reflect wider problems having to do with time constraints. Other participants I spoke to felt they did not get enough time when they testified, but this is not surprising given the thousands of people who attended the events. A commission of inquiry has to avoid taking too long to complete its work if it is not to lose relevance to the political process.

Some members of the Royal Commission told me in interviews that the experience of being on the Commission was a highlight of their professional lives to date. They found the process fascinating and were impressed with the passionate concern for the well-being of New Zealand that was manifested by participants. Nevertheless, carrying out a process like this was very hard work for the Commission. The many long meetings, demanding hours, mountains of information, and the weight of their responsibilities took a toll on some. One Commission member suffered stress-related health problems. Another experienced familial strains, and said, half-jokingly, “It was good for the country but I wouldn’t wish it on my worst enemy.”

IV. The Government Response to the Royal Commission

In the remainder of this report I will consider in more detail the policies and rules that are being put into place to carry out the recommendations of the Royal Commission. I will discuss some of the challenging questions that are likely to arise, and make some suggestions as to how they could be addressed.

I will begin, however, by establishing the policy context – the actions of the Government that have occurred in the aftermath of the Royal Commission's report.

THE GOVERNMENT EMBRACES THE COMMISSION'S RECOMMENDATIONS

The Government endorsed the general approach of the Royal Commission and most of its dozens of specific recommendations, setting to work immediately on implementing many of them. The Minister for the Environment, in charge of co-ordinating the Government response, recommended a "constraint period" of up to two years be legislated. This would take the place of the voluntary moratorium on applications to ERMA for environmental release of GMOs that existed during the Royal Commission process.

This statutory moratorium would be set to expire automatically. It would provide time "for a period while the work, analysis and research identified as necessary by the Commission is underway."[92] It would also be politically useful – a national election was going to occur in 2002, and this would postpone until after the election the controversies that would likely erupt the first time ERMA received a conditional release application.

While the Government accepted most of the Royal Commission's recommendations, it did reject some of them. There were four major recommendations that were explicitly rejected early on:

1) *Ministerial call-in*. The Government rejected the recommendation that the ministerial "call-in" power should be exercised before the first application for release of a GM crop. This would require the Minister for the Environment to assess the overall effects of the first release on the overall strategy of "preserving opportunities."

2) *Parliamentary Commissioner on Biotechnology*. The Government also rejected the Royal Commission's call for the creation of a Parliamentary Commissioner on Biotechnology, stating that it its functions could be carried out in other ways and that the legal criteria for establishing such an office did not exist.

3) *Treaty of Waitangi*. The Royal Commission recommended that "section 8 of the HSNO Act be amended to provide that effect is to be given to the principles of the Treaty of Waitangi" (HSNO only called for decision-makers to "take into account" these principles). The Government did not accept this recommendation, but agreed that HSNO should be amended in some way to more appropriately reflect the Treaty relationship with Māori.

4) *GM-free bees*. The Government deemed "impracticable" a recommendation that MAF develop a strategy to allow continued production of GM-free honey and other bee products and avoid cross-pollination between GM and non-GM crops.

The Government endorsed the idea that MAF should develop an industry code of practice for separating GM and non-GM crops. However, it concluded that the development of such a code of practice would be deferred to the future, after the moratorium had been lifted.

The Government concluded that a number of steps should be taken or initiated prior to the lifting of the moratorium:

- *Amending HSNO and regulations* to meet the concerns raised by the Commission.
- *Research.* Commencing or continuing research to address socio-economic, ethical, environmental and agricultural issues which were identified by the Royal Commission as needing additional work.
- *ERMA review*. Initiating an independent review of the functioning of the Environmental Risk Management Authority (ERMA).
- *Other policy work*. Undertaking other work on issues identified by the Commission such as conditional release and crop co-existence, the biotechnology strategy, and liability issues.
- *Establishing a Bioethics Council*.

In terms of the overall "preserving opportunities" strategy, these initiatives were intended to ready New Zealand for a case-by-case approach to managing the risks and benefits of GMOs.

GOVERNMENT ACTIONS DURING THE MORATORIUM PERIOD

At the time of writing this report, the moratorium has just been lifted. In this section I will describe the results of the Government's efforts during the moratorium, as it endeavoured to solidify the foundations of its "proceed with caution" strategy.

Amendments to HSNO

In October 2003, Parliament enacted legislation amending HSNO. The amendments enacted into law many of the recommendations of the Commission. The following were the key changes made to HSNO:[93]

1) *Streamlined low-risk approvals.* Changes were made to ease the regulatory burden on scientific researchers working on GMOs in containment. For example, the law now allows a single approval of a variety of genetic modifications on a project basis, rather than requiring a separate process for each organism and transformation involved.

2) *Streamlined procedures for assessment and approval of animal or human medicines* that are or contain low risk new organisms, including approvals to deal with emergency situations.

3) *Extended grounds on which the Minister may call in applications* to include significant cultural, ethical, and spiritual effects.

4) *Creation of the new category of "conditional release."* The new category will allow ERMA to approve the release of new organisms with conditions imposed to protect the environment and crop co-existence.

5) *Specification of one agency (the Ministry of Agriculture and Forestry) to be responsible for all enforcement* of HSNO's provisions regarding new organisms.

6) *Changes to better incorporate Māori viewpoints.* The amendments created a new advisory board to work with ERMA on Māori issues, and made provisions for allowing expertise in Māori issues to serve as a basis for appointment to the Authority.

7) *Liability.* The amendments provided penalties and civil liability for breaches of HSNO.

Research on GM Issues

In responding to the Royal Commission, the Government provided an additional $2.5 million per year to improve understanding of the socio-economic, ethical and environmental impacts of GM and other emerging biotechnologies. In September 2003, the Foundation for Research, Science and Technology reported that it had established 20 research contracts totalling $6.7 million per year for research in these and related areas. In addition, over $3 million per year was being spent on projects "specifically targeting organic approaches."[94] This government-funded research is carried out primarily by universities and the quasi-public Crown Research Institutes, as well as private businesses and other researchers.

Independent Review of ERMA

Following the 2002 election, the Green Party and the Government reached an agreement to initiate an independent review of ERMA and its capability to robustly implement HSNO with respect to new organisms. The review panel released its report in March 2003.

While saying that ERMA was doing well in many areas, the report highlighted a number of problems in its rules, procedures and institutional culture. A total of 49 recommendations were made to improve ERMA's ability to meet its mandate.

Economic Studies on the Effects of GM Release

One frequently raised objection to using GMOs in New Zealand was that it would harm New Zealand's brand image (the "clean, green image") in export markets due to consumer reluctance to buy GM food products. The Government commissioned a study of the effects of GM use on New Zealand's international brand image and the consequences for the economy.[95]

Policy Development on Crop Co-Existence

After the Royal Commission, MAF conducted a public consultation process of its own about co-existence. Around the same time, the Government directed MAF to take a number of steps to address various co-existence questions and begin developing policies on them. Many of

[*] The nine Crown Research Institutes are government-owned enterprises that are required to operate as self-sustaining commercial organisations.

these initiatives were still underway at the time the moratorium ended.[96] I will describe these initiatives in more detail later (see p. 56).

Biotechnology Strategy

The Government's Biotechnology Taskforce issued a Biotechnology Strategy in May 2003. The Biotechnology Strategy focused to a great extent on activities the Government could support to encourage the commercial growth of the biotechnology sector, as a facilitator, a funder of research, and so forth. It highlighted the need for a rigorous regulatory system, balanced against ensuring that regulations did not stifle innovation. The Strategy also discussed efforts to engage the wider community in order to foster dialogue and public trust.[97]

Establishment of a Bioethics Council

In accord with the recommendations of the Royal Commission, the Government created a new body called Toi te Taiao: the Bioethics Council. Its stated goal is, "To enhance New Zealand's understanding of the cultural, ethical and spiritual aspects of biotechnology and ensure that the use of biotechnology has regard for the values held by New Zealanders".

The Bioethics Council reports to the Minister for the Environment. The Council established working groups that prepared legislative submissions regarding proposed amendments to HSNO, as well as on legislation concerning human assisted reproduction. The Council soon launched projects on the use of human genes in other organisms, and Māori responses to biotechnologies.

Re-Examining Māori Involvement in ERMA Decisions

The Government carried out consultations with Māori after the Royal Commission reported, and also appointed an advisory Māori Reference Group. These confirmed that many Māori felt their opinions were not taken seriously enough or considered early enough in the decision-making process on new organisms. Some, although not all, of their recommendations have been addressed in recent amendments to HSNO.

One of the amendments establishes a committee to be called Nga Kaihautu Tikanga Taiao. The function of the committee will be to provide advice and assistance to ERMA on matters of policy and process from the Māori perspective.

Another amendment explicitly allows knowledge and experience of the Treaty and tikanga Māori (Māori beliefs) to be considered as qualifications for appointment to the decision-making Authority. The law requires that the Authority contain a balanced mix of knowledge and experience in matters likely to come before it.

CORNGATE AND OTHER "CONTAMINATION" SCARES

A summary of the post-Royal Commission period would not be complete without mention of some episodes of "contamination" of crops and food by GM seeds or GM material. These

[*] Supporters of GM prefer value-neutral terms such as "adventitious presence" or "inadvertent presence" to the somewhat loaded term "contamination." But in the interests of brevity and the lack of a verb form for "adventitious presence," I will stick with "contamination" and "contaminate."

episodes raised difficult questions about managing GMOs, in particular highlighting the challenges of keeping GM and non-GM food production systems separate.

The GM sweet corn incident that gave rise to Corngate has already been mentioned. Several similar contamination episodes followed. Some concerned not only imported seed crops but also processed foods *exported* from New Zealand. In July 2003, a food company in Japan tested a pizza topping mix imported from New Zealand and got positive results for GM corn. The ostensibly GM-free corn, which was grown in New Zealand, may have been contaminated with Bt corn.[98]

Anti-GM advocates pointed to these episodes as proof that crop co-existence is not possible – that GM crops will inevitably contaminate non-GM crops. And they have claimed that this will in turn affect New Zealand's access to export markets – that countries sensitive to GM, such as Japan, will be less inclined to buy New Zealand products if more forceful steps are not taken to keep GM out of New Zealand. Meanwhile, regulators began trying to devise new policies to deal with these types of occurrence, as I will discuss in more detail later (see p. 59).

V. GMO Releases: Policy and Regulatory Issues

The Government and supporters of its GM policies want GMO releases to be dealt with under routine procedures handled by regulators. Their opponents want GMOs to be kept out of the environment and food production systems altogether. The end of the moratorium has therefore assumed great importance in the political debate, since it marks the transition from debating GMO releases to actually restarting the regulatory machinery.

The Government, for its part, has staunchly insisted on lifting the moratorium in the face of considerable pressure. Although there are indications that extending the moratorium could have had popular support,[*] doing so would have muddied the clarity of Government's stance that the regulatory system should take over. And it would have probably injected new life into a high-profile political debate over GM that Labour would probably rather see subsiding into a more muted discussion of the pros and cons of this or that regulatory proposal.

WHAT MIGHT HAPPEN NOW THAT THE MORATORIUM IS LIFTED?

As the end of the moratorium approached, the Government tried to downplay its significance, correctly pointing out that it would not unleash a flood of GMOs on New Zealand's environment. Rather, it just marked the beginning of the period when GMO releases could begin to be considered by ERMA.

According to an ERMA survey, only one application for conditional release is likely to be submitted during the period from the lifting of the moratorium through June 2004: a pre-commercial application to conduct farm-scale tests of Bt potatoes. In addition, ERMA's survey turned up an unsubstantiated, "very speculative" rumour that a company might be applying for conditional, commercial release of a GM plant.[101]

It only takes a single controversial application to raise a political storm, and over time, a number of applications may trickle in to ERMA. Early approvals could encourage more applicants. Given that GM research in New Zealand has been ongoing for several years, during which time such applications were not allowed, there may in fact be a certain amount of pent-up demand for ERMA approvals.

What kinds of GMO application are likely candidates in the longer term? According to MAF, the GM potatoes mentioned above could soon be joined by pre-commercial trials of GM herbicide-tolerant onions.[102]

The table below lists crop species grown over sizeable areas in New Zealand for which GM varieties are either available commercially from other countries or are being developed for research purposes in New Zealand. While there is no reason to think that these GM crops are *likely* to be grown here, they could at least be counted among the possible candidates.

[*] An August 2003 public opinion poll commissioned by the *New Zealand Herald* (and widely cited by GM opponents) found that 68.6% of New Zealanders preferred to extend the moratorium.

Some New Zealand Crops That Have GM Counterparts[103]

Forage crops	**Forestry**
Perennial ryegrass	Radiata pine
White clover	Spruce
Forage brassicas (turnip, swede)	Eucalyptus
Grain and arable crops	**Fruit**
Maize	Apple
Canola	Kiwifruit
	Tamarillo
Flowers	**Vegetables**
Cyclamen	Potato
Lisianthus	Onion
Orchid	Vegetable brassicas
Pelargonium	Pea
Petunia	Leek
Sandersonia	Garlic
Rose	
Carnation	

Source: Malone, 2002.

It does not appear that New Zealand farmers are planning to grow any of the existing GM crops commercially in the near future, for several reasons. One is that the most common commercial GM varieties are not that useful in New Zealand – for example, the pests that Bt corn is resistant to do not exist in New Zealand. Herbicide-tolerant forms of soy or cotton are not very useful in a country that grows little of either crop.

A decisive factor against GM crops in New Zealand at the moment is that New Zealand farmers and food exporters do no believe there is currently much market demand for them. GM crops such as herbicide-tolerant onions would be useful to farmers if consumer attitudes in foreign markets were to change, but that day will probably be years from now, if it comes at all.

However, GM food crops are only one potential use among many that could become commercially viable in New Zealand in the future:

- GMOs for environmental purposes, such as pest control – which could greatly reduce New Zealand's reliance on toxic chemicals to control pests such as the possum.
- GM forage crops to improve farm productivity (without the market risks involved in trying to sell animal products that are themselves GM).
- So-called "pharming," in which GM animals such as sheep or cows are used to make therapeutic proteins for medicine.
- Veterinary applications such as animal vaccines.
- GM pine trees for producing wood and pulp.
- Genetic research and modification of the bacteria in the rumen of cattle to enhance livestock health or productivity.

Many observers predict that if GM food crops are to gain wider public acceptance, there must be a "second generation" of modified crops with tangible benefits to consumers. Currently most GM crops are intended to make production easier for the farmer.

THE RULES ON GMO RELEASES

As noted earlier, New Zealand is very careful about what organisms it allows into the country. There are two primary laws governing this. The Biosecurity Act is intended to prevent the inadvertent introduction of unwanted organisms. It is the law responsible for border inspections of imported goods and travellers. It is also the Act under which the Government tries to eradicate pests.

The intentional release of organisms (or their importation for release) is governed by HSNO. Under HSNO, ERMA must approve the importation, development, testing or release of any new organism. Under HSNO, a "new organism" includes a GM organism not previously approved for release.[104*]

As recently amended, HSNO now allows four categories of release approval:

1) *Development or importation in containment*: Organisms held in laboratories or other secure locations specifically designed to prevent escape.

2) *Field testing in containment*. A field test involves keeping the organism in conditions similar to those of the environment into which it would be released. However, field tests are contained to assure that the organism, and any heritable material, can be recovered after a field trial.

3) *Importation for release or release from containment (full release)*. Such organisms can be released with no controls, time limits, or subsequent approvals required, and can be used by anyone, anywhere.

4) *Conditional release*. The new category created in response to the Royal Commission is less restrictive than field testing in containment but more restrictive than full release. ERMA will be able to set conditions or restrictions on the applicant in order to mitigate or manage any risks that would be created by a full, unrestricted release.

Requirements to Approve a Release

HSNO sets out the requirements for an application to be approved by ERMA. The applicant must identify the organism and describe how it is going to be used. The applicant must also describe "all the possible adverse effects of the organism on the environment" as well as "the affinities of the organism with other organisms in New Zealand."[105] The application cannot be approved unless there is sufficient information available to assess the adverse effects.[106] An application for conditional release must describe the controls that the applicant proposes to use with the organism.[107]

[*] GMOs are just one type of organism governed by HSNO. The definition of "new organism" includes any organism not present in New Zealand when the new organisms law came into effect in 1998. In addition there are "risk species" that have not been approved for release and are considered new organisms; as well as "prohibited organisms" that cannot be approved for release at all. Furthermore, pest species that have been eradicated from New Zealand are also regulated by HSNO as new organisms.

In addition, ERMA must consider the ability of the organism to "establish an undesirable self-sustaining population" and "the ease with which the organism could be eradicated" if it did so.[108]

The process of reaching a final decision has two basic stages. First, if the proposed release fails mandatory minimum standards, it must be rejected. If it passes the minimum standards, then there is a cost-benefit assessment.

The minimum standards for approving the release of a new organism are fairly strict. ERMA is required to decline the application if the new organism is likely to cause any of the following kinds of effects at a "significant" level:[109]

- displacement of any native species within its natural habitat
- deterioration of natural habitats
- adverse effects on human health and safety
- adverse effects to New Zealand's inherent genetic diversity
- organisms that cause disease, are parasitic, or become a vector for human, animal, or plant disease (unless that is the expressed purpose of that importation or release).

The second step, if the minimum standards are met, is to compare the expected costs and benefits of the release, taking into account the proposed risk-management measures. In order to approve the release, ERMA must find that the "positive effects of the organism outweigh the adverse effects of the organism."[110]

Conditional Release Requirements

When it comes to applications for conditional release, ERMA must consider all of the above in light of the controls that the applicant proposes will be used on the organism, their likely effectiveness, and the ease with which the organism could be recovered or eradicated if it formed a self-sustaining population.[111]

HSNO contains a non-exhaustive list of possible conditions on a release approval, including:[112]

- controlling the extent and purposes for which organisms can be used
- monitoring, auditing, reporting, and record-keeping
- requirements to ensure co-existence with non-GM crops, such as separation distances
- contingency plans to manage incidents
- limits on dissemination or the length of time the organism or its genetic material will be in the environment
- mandatory levels of training or knowledge, or limits on the numbers of users who may hold an approval
- specifying the duration of the approval or of a control before requiring review by the Authority, and the nature of that review.

Amount of Information Required

ERMA's rules specify that the extent of the information required for an evaluation should be "relevant and appropriate to the scale and significance of the risks, costs and benefits associated with the substance or organism."[113] ERMA may require an applicant to supply more information if there is insufficient information to assess the risks and benefits.[114]

Precautionary Approach

In evaluating applications, ERMA is supposed to apply a "precautionary approach." As the Act states, "all persons exercising functions, powers, and duties under this Act … shall take into account the need for caution in managing adverse effects where there is scientific and technical uncertainty about those effects."[115]

Public Notice

If ERMA determines there is likely to be a significant public interest in the application, it may notify the public that it will receive public submissions.[116]

CHALLENGES AND ISSUES IN REGULATING GMO RELEASES

The new rules and policies assign ERMA the important and difficult task of balancing the risks and opportunities for New Zealand in approval decisions regarding the release of GMOs. MAF, as the enforcement agency, must work closely with ERMA to craft the conditions that will be imposed and to ensure that they are carried out effectively.

Challenges for ERMA Risk Assessment

Risks of New Organisms are Disparate and Difficult to Measure

The variety of environmental effects ERMA must consider is large, going well beyond the range of physical and natural phenomena that science is best prepared to measure and predict. Under HSNO, "environment" is defined to include "people and communities," natural and physical resources, "amenity values," and "social, economic, aesthetic, and cultural conditions."[117]

HSNO also requires that all decisions take into account, among other things, the sustainability of flora and fauna, the intrinsic value of ecosystems, public health, and economic and related costs and benefits from the use of new organisms. Furthermore, decisions must take into account the relationship of Māori people and their culture and traditions with respect to their ancestral lands, sacred places ("waahi tapu"), valued flora and fauna, and other "taonga" (which translates roughly as "treasures"). Decisions must take into account the principles of the Treaty of Waitangi.[118]

In addition, all persons exercising powers and duties under HSNO must "recognise and provide for" "the maintenance and enhancement of the capacity of people and communities to provide for their own economic, social, and cultural wellbeing and for the reasonably foreseeable needs of future generations."[119]

This is a very broad array of factors for a risk management agency to deal with. It will be hard to know where to draw the boundaries on a risk assessment. ERMA's rules allow it to scale the extent of its analysis to the level of risk, which could help it to avoid getting bogged down. It is also authorised to take into account past precedent, rather than treating each successive decision as a brand-new case. One possibility that might be considered is that ERMA could perform a more abbreviated risk assessment when a proposed use or modification does not differ greatly from something approved in the past.

In trying to acknowledge precedent, however, ERMA's credibility will require that it not appear to be rubber-stamping applications. Given that there is still so much controversy about the magnitude of risks associated with GM, this will always be a delicate balance.

It cannot be over-emphasised how important early, proactive risk identification will be. ERMA will need to work closely with applicants starting very early in the development of GMOs, to ensure that necessary research is begun long before the time an application for release is being readied.

The Difficulties of Comparing Costs to Benefits

Weighing the expected costs against benefits sounds like a mathematical calculation, but it is really more likely to be an ambiguous and complicated decision involving uncertainty and a variety of implicit and explicit assumptions. The complexity of ecological and economic systems makes prediction difficult. And the different kinds of effect cannot be directly compared – there is no simple way to determine whether a given environmental effect outweighs a given economic effect.*

Furthermore, ERMA decisions must reflect a variety of potential social and cultural factors that are not necessarily concerned with outcomes at all. There could be opposition from certain groups to GM in principle, regardless of the specific biological, physical, or economic effects the GMOs might have. It is not clear how to integrate such concerns into a risk-management framework.

Since not all relevant factors can be quantified or directly measured against one another, ERMA will need to employ other means of categorising and ranking risks. A simple decision rule such as, "Are total expected costs greater than total expected benefits?" will often not be applicable.

ERMA's rules encourage the use of alternative methods for handling disparate costs and benefits. Where costs and benefits cannot be expressed in common units, the rules recommend techniques such as "identification of dominant risks (being risks that may have a deciding influence) and ranking of risks in order of significance."[120] The ERMA rules specify some useful factors for helping to weigh risks, such as the degree to which risks are voluntary, will persist over time, are subject to uncontrollable spread, and the extent to which their management is well understood.[121]

Strict rules could make the process needlessly cumbersome or make it harder to respond to the specific needs that arise. But in the absence of established procedures, there will be ample

* Economists do have tools for putting dollar values on environmental effects, but there is no general consensus as to what methods are best in what situations, or whether the results are valid.

opportunities for debate and controversy about the specific ways in which ERMA carries out its task, especially if its methods vary greatly on a case-by-case basis.

Questions of Scope

Comparing costs to benefits raises many fundamental questions about the scope of the analysis. One question concerns cumulative impacts. A case-by-case regulatory framework may fail by "missing the forest for the trees." A succession of impacts may be insignificant when considered individually, but in the long run add up to something significant when considered together and in combination with similar impacts. The question arises in respect of benefits as well as harms. As the recent independent ERMA review noted, "ERMA's case by case risk assessment process appears ill suited to evaluating the way in which each advancing application is adding to the probability of a useful end result …"[122]

In addition, HSNO and the associated rules do not provide clear guidance on what is sometimes termed the "accounting stance". When we talk about benefits and costs, whose benefits and costs are we talking about? – benefits and costs to individual actors, to a region, or to New Zealand as a whole?

Precise definitions are necessary to avoid double-counting – for example, counting the same economic benefit twice, once as profits to a corporation and again as tax revenues to the government. One must decide how to count transactions that are a zero-sum transfer from one party to another. We might say they cancel each other out. Or, we might want to count them if they have an impact an how equitable the distribution of wealth is.

Issues also arise with respect to tracing out indirect and long-run impacts. One persistent issue in cost-benefit analysis is discounting. It is standard practice to discount economic impacts that occur in the future compared to impacts that occur sooner. If the impacts can be quantified, a numerical discount rate may be applied to calculate the expected present value of costs and benefits. The problem with this is that it tends to place very little value on the interests of future generations. Yet the welfare of future generations is precisely what many New Zealanders are most concerned about.

Criticisms of ERMA – Between a Rock and a Hard Place

The point of all of the above is not that it is impossible for ERMA to do its risk assessments, but that risk assessments inevitably involve choices about methodology that have advantages and disadvantages, and that will leave room for criticism or debate.

The difficult position ERMA is in is illustrated by the independent review of ERMA recently conducted. The review was very mixed, providing ammunition for both ERMA's critics and defenders.[123] The review criticised ERMA for weighing science inputs more heavily in risk and benefit assessments than other, less tangible considerations. At the same time, it criticised ERMA for being too rule bound and risk averse.

ERMA's job will probably always be a balancing of conflicting needs that will never leave everyone entirely satisfied. For example, if ERMA gives greater emphasis to non-scientific risks (such as economic and cultural factors), this is unlikely to help satisfy the stakeholders who already believe ERMA's regulatory process is too risk averse and burdensome.

The technical details of how ERMA actually does the risk assessment are important, a fact that is not always sufficiently appreciated. For example, the Bioethics Council has said that HSNO should require ERMA to take more account of ethical issues, but that "the actual translation of the legislation into the methodology and operations of ERMA is a matter for the Authority to determine."[124] It is easy enough to admonish ERMA to take various intangibles into account. But the devil is in the details, and the details of this "translation" will determine whether such admonitions have any useful effect.

CHALLENGES IN MANAGING CO-EXISTENCE

What is Co-Existence?

In keeping with the Royal Commission's recommendations, MAF has defined co-existence as "a state where different primary production systems, including non-GM systems such as organic production and conventional agriculture, and GM systems, are each contributing in their own way to the overall benefit of New Zealand while ensuring that their operations are managed so that they affect each other as little as possible."[125]

Managing direct effects mostly involves preventing or minimising the physical transfer of genetic material between GM and non-GM production systems.[126] But to the extent GMOs might impact upon the environment, they might have indirect effects on other crops as well. Some questions in this regard have been: Could GMOs produce new kinds of weeds or pathogens? Will they give rise to new forms of pesticide resistance, or have harmful effects on beneficial fauna such as insects or micro-organisms?

Crop co-existence is not uniquely a GM issue – it arises in other contexts too. Organic producers wanting to avoid pesticides must contend with spray drift from neighbouring fields, while conventional farmers may worry about pests from organic farms. Another example is the production of high-purity seeds, where farmers take steps to avoid unwanted cross-pollination.[127]

However, the concerns about co-existence with respect to GM are in some respects unique. Consumers do appear to differentiate between GM and non-GM products. The group of producers most worried about co-existence is organic farmers. Organic rules have "zero tolerance" for GM – any presence of GMOs, even accidentally, renders the production process non-organic. And it seems very probable that organic consumers prefer their products to be non-GM, and would be less willing to pay the price premium typical for organic products if they were not GM-free. Many, perhaps most, organic farmers think that co-existence with GM is not possible at all – "You can't control nature. As anyone with a garden knows, everything spreads in nature, it's part of nature's own biodiversity plan," as one organic advocate put it.

To put New Zealand's organic sector into perspective in economic terms, total organic exports for 2001/2002 were estimated at $70 million.[128] This would represent about 0.4% of the total annual agricultural exports of $16.3 billion in 2001.[129] The organic sector has grown a great deal in the past decade, and the industry believes there is potential for a good deal of further growth.

Another group with a direct economic stake is the beekeeping industry. According to MAF, bee products worth about $21 million are exported from New Zealand annually. The greatest

economic value of beekeeping is probably the service the bees provide as pollinators – a contribution estimated at $3.1 billion in 1992.[130]

Another area of potential economic impact involves New Zealand's national brand image. Some assert that consumers around the world favour New Zealand products in part because New Zealand is perceived to be GM-free.

In the period between the report of the Royal Commission and the end of the moratorium, the GM debate seemed to focus increasingly on such economic arguments. Episodes such as Corngate and the Japanese pizza topping scare highlighted questions about whether GM releases would impact upon New Zealand's overseas brand image. Some major food industry voices spoke out in favour of extending the moratorium – such as Heinz Wattie's, New Zealand's biggest producer of canned and frozen vegetables; Zespri, the marketer of New Zealand's kiwifruit; and fruit and vegetable exporter Enza Foods.[131]

MAF Initiatives on Co-Existence

The Government has directed MAF to take a number of steps to develop policies on co-existence. These initiatives are still underway at this time.

1) *Report on industry code of practice*. The Government directed MAF to report back by October 31, 2004 on the need for, and issues surrounding, developing a generic industry code of practice for achieving effective co-existence in primary production.

2) *GIS register of GM plantings*. MAF and other officials are to investigate the use of a Geographic Information Systems (GIS) register for GM plants to enable beekeepers to site their beehives away from unwanted nectar or pollen sources.

3) *Bt resistance management*. ERMA, MAF and MFE are to continue monitoring developments in managing potential Bt pesticide resistance.

4) *Propagative material labelling*. MAF and other officials are to develop a code of practice for labelling GM propagative nursery material (such as root stock) at the point of sale, and report back by October 31, 2004 about whether it should be voluntary or mandatory. Such labelling would allow commercial growers and home gardeners to choose whether to grow GE fruits, vegetables and flowers.

There are a number of questions that are likely to arise as MAF and the affected industries work on these issues.

Crop Co-Existence

One way to prevent GM plants from pollinating other plants is to engineer them to be sterile. However, this technique has proven controversial, as some view it as a way for corporations to control the production of seeds. Other approaches include harvesting plants before they flower, or using buffer zones. Such buffer requirements would work best if designed based on specific knowledge about the ability of different types of pollen to travel.

Preventing unwanted cross-pollination will require good information about the reproductive biology of any GM species that is to be grown in the open, such as when it flowers and how

its pollen disperses. Regulators will also need to know whether any sexually compatible crops and wild plants might be in the vicinity. This could prove challenging when it comes to wild species and weeds.

It seems likely that unwanted cross-pollination could be brought to a very low level. However, this level of purity will not satisfy organic producers or consumers who expect zero tolerance to be enforced.

Zero tolerance may be a necessity if GM researchers use plants such as corn as "bioreactors"* to produce pharmaceutical proteins. Containment measures for such applications will have to be especially strict, because these products are not intended for human consumption. In contrast, prior GM contamination scares have involved GM plant species such as Bt corn that are intended for food and are already widely consumed in many countries.

The management of co-existence does not end when the crop is harvested. In many cases crops are treated as a commodity, and the harvest from different farms is mixed together in the shipping, processing, and distribution of crops and food products. Maintaining co-existence is particularly difficult for bulk commodities such as corn (as Corngate illustrated). It will be easier for specialty crops such as fruits that are already packaged and sold under a brand label based on who grew them and where.

GM Animal Co-Existence

With animals, the task is simplified because it is easier to contain cows, for example, than pollen grains. If fences are not enough, they can also be monitored, and even electronically tagged for identification if necessary.[132]

Rules should be carefully developed and enforced to ensure that the meat, milk or other products from GM animals do not inadvertently enter the food supply. The Royal Commission recommended that, wherever possible, non-food animals, or animals less likely to find their way into the food chain, be used as bioreactors rather than animals that are a common source of food. This seems a sound suggestion.

While GM food contamination may be easier to avoid with animals than with plants, other adverse consequences may be more severe. For one thing, the GM applications considered most likely for animals involve the production of pharmaceuticals and other non-food products. Furthermore, a wide variety of studies have confirmed that the public has a stronger negative reaction to GM of animals than of plants, on moral and ethical grounds. The deadly results of past food crises involving animals, such as mad cow disease, have further sensitised the public to the safety of animal products. All in all, a contamination episode involving animals is more likely to have a strong political fallout and undermine the credibility of the regulatory system.

* A bioreactor is the name given to a manufacturing process that uses a biological process to manufacture a process. The bioreactor could be an organism or a culture of living cells (for example a fermentation process using transgenic bacteria).

Who Pays the Costs of Co-Existence?

Co-existence will not come without costs. Buffer zones will require land that could be put to other purposes. Devising and carrying out procedures to keep products separate in their handling and processing may also have costs. There will be regulatory costs as well to enforce and monitor co-existence requirements. Who should pay for all of this?

If zero tolerance is the goal, co-existence may become prohibitively expensive in some cases. Given the long distances pollen could travel by wind or insect, there seems to be a consensus emerging that zero contamination may be unattainable in a co-existence system for some crops.[133] As one MAF analyst said to me, "In biology there is no such thing as zero."

If we view GM as a sort of environmental pollution, we might conclude that the developers or growers of GM crops should be forced to bear the costs, and that if the costs of zero tolerance are too high, we should forego the GM crops altogether. However, GM proponents would likely view their crops as essentially benign. They tend to argue that if organic farmers want to assure that their crops are 100% GM free, they should be entitled to take the necessary steps, but shouldn't expect others to pay for it.

The case for defining GM escape as a form of environmental pollution (a negative externality, in the jargon of economics) may be stronger in some cases than in others. GM pharmaceutical crops clearly do not belong in the food supply, which suggests that those who grow them should pay for any necessary containment measures. The case is less clear with GM food crops. The seriousness of contamination problems will in part be influenced by whether the GM crop in question has been approved for human consumption and commercial-scale release or not.

Bees and Bee Products

One of the trickier aspects of co-existence is protecting the interests of beekeepers and the bee products industry. New Zealand beekeepers are concerned that their bees will pick up GM pollen, reducing the keepers' ability to sell organic honey or pollen. They are also concerned that they may be held liable for contamination by organic farmers whose fields are contaminated with GM pollen carried by their bees.

MAF has been working on the Royal Commission's recommendation of a geographic database of GM plantings to help beekeepers avoid GM contamination. One difficulty is that GM growers are not likely to want to publicly disclose their precise location, especially given the hostility of much of the public toward GM and past occurrences where GM crops were vandalised. Many beekeepers are sceptical that the scheme will work. As one of them put it, "New Zealand is too small for beekeepers to be able to move away from GM crops".

The Legacy of Corngate: Challenges Raised by Seed Contamination

While HSNO deals with applications to intentionally release GMOs, one of the main ways GMOs may get into New Zealand's environment is through accidental or inadvertent importation. The Corngate affair drew particular attention to the possibility that GM seeds might be mixed into shipments of otherwise-GM-free seeds intended for planting in New

Zealand. This raises a number of policy and regulatory questions that relate to the feasibility of maintaining crop co-existence.

In the incident that gave rise to Corngate, the shipment consisted of 5.6 tonnes of seed. By the time the evidence of GM presence was detected, 178 hectares of corn had been planted in New Zealand.[134] Initial test results suggested 0.5% of the seeds might be GM. This would be considered a low level by usual standards of seed purity. However, given the quantities involved, it would mean that thousands of GM corn plants were already being grown in the open environment.

Problems Inherent in Testing Seeds

A key issue raised was how well we can test seed shipments for GM presence. Can we detect very low levels of contamination reliably? All parties in the dispute would agree that there are limits to testing. A sensitive test is quite likely to accurately detect a high level of contamination, but if the detected contamination level is very small, it is harder to be confident about the results. To take a completely hypothetical example, if a batch of seed were contaminated, with five out of 100 of the seeds being GM, our test might be 99.9% likely to correctly signal the presence of the GM contamination. However, if only one seed in a thousand were GM, the same test might be only 90% likely to correctly detect the contamination. There would be some "false negatives" – cases where GM seeds were present but we failed to detect them. In addition, our test would inevitably sometimes also err on the side of caution, branding a shipment as containing GM seeds when in fact it did not (so-called "false positives").

At some point during the Corngate episode, government officials concluded that shipments of corn from the United States were bound to have low levels of GMO contamination from time to time. Furthermore, it is impossible to ever achieve 100% certainty that there is no contamination, short of testing (which means destroying) every seed in a shipment. Therefore, it was reasoned, it would be necessary to accept thresholds of acceptable contamination. The Government announced a 0.5% threshold of tolerance for GM corn.

A threshold of 0.5% may sound low, but, viewed in a certain light, it is quite liberal. This threshold would mean that the Government would accept up to 5000 GM corn seeds for every million non-GM corn seeds imported (the Corngate shipment reportedly contained 40 million seeds).[136] Many thousands of GM plants could be planted and harvested in the open environment without violating the rule.

To put this in perspective, under New Zealand law a research scientist wanting to grow even a few Bt corn plants outdoors in a field trial would have to apply to ERMA and go through a rigorous and costly review process. Among other steps, the application process would probably involve a public hearing and many hundreds of public submissions. For the application to be approved, the scientist would probably have to provide ERMA with a plan to assure that all of the corn plants would be kept in a controlled containment area, that all heritable material would be removed at the end of the trial, that the plants would be carefully monitored throughout, with steps taken to ensure that absolutely no pollen from them would be released into the air. These rules are strictly enforced.[137] In a recent case, a scientist who

[*] Bt corn is genetically modified to produce the Bt toxin that kills certain insect larvae and confers insect resistance to the plant.

carelessly removed a small amount of GM plant material from a containment facility became the subject of newspaper headlines and an ERMA investigation, and lost his job as a result.[138]

Subsequent to Corngate, the Government changed tack and announced that it would in fact enforce a policy of zero tolerance of seed contamination; there would be no acceptable threshold level. However, it appears that the statistical limitations of testing mean that some GM seeds will still slip through from time to time. A recent analysis by MAF concluded that it was not possible to confidently detect contamination below the 0.1% level (one seed in a thousand).[139]

HSNO and the Biosecurity Act – A Legal Grey Area

A 0.1% detection level could still allow thousands of GM plants to be grown in New Zealand even though they had not been approved for release. This highlights a tricky discontinuity in New Zealand's regulatory system. If the GM seeds were being imported *intentionally*, they would fall under HSNO and clearly would be illegal. However, since their presence was unintended, the matter arguably should be handled under the Biosecurity Act. But the status of such GM seeds or plants under the Biosecurity Act is unclear, particularly once they are inside the country.

The Biosecurity Act prohibits border inspectors from giving a "biosecurity clearance" allowing the importation of new organisms (the definition of which includes GMOs). In a case like the Corngate shipment, it is clear that if the border inspectors had been aware of the presence of GM seeds, they should have stopped the shipment. However, the seeds had been declared to be GM free.

Once such seeds find their way into the country, it is unclear exactly what action is legally required. The Biosecurity Act establishes a register of "unwanted organisms," which are considered pest species and are the targets of various efforts to control, manage, and/or eradicate them. A GMO such as Bt corn could conceivably be declared an unwanted organism, but so far this action has never been taken.

Efforts to Address Seed Contamination

New Zealand's authorities have been developing import control policies to try to prevent such inadvertent GM importations. In August 2001, after the discovery of the GM contamination that would give rise to Corngate, the Government introduced a requirement to test all consignments of sweet corn seeds imported into New Zealand for the presence of GM seeds.[140] Since then, MAF has developed additional testing protocols for rapeseed (canola), maize and soybeans as well.[141] In addition, MAF may investigate seed consignments where there is suspected presence of GM seeds (for example, MAF stopped a consignment of cotton seeds from Australia because much Australian cotton is GM and the importer lacked assurances that the seeds were GM free). [142]

MAF is likely to extend testing requirements to additional types of seeds. Where no testing requirements yet exist, importers of seeds that might be contaminated (because they come from a source country that grows GM varieties of that seed) are in some cases required to provide assurance that the shipment does not contain GM seeds. MAF has raised the possibility that importers might be required to produce a paper trail showing their efforts to keep GM and non-GM seeds separate.[143]

How Far Should New Zealand Go to Keep Out GM Seeds?

Is New Zealand doing enough to keep out GM seeds? Is it doing too much? The answer depends on one's perspective. Compared to other countries, New Zealand is already strict – it is one of the first countries to systematically impose GM screening on imported seeds.[144]

From another perspective, however, the gap between the results produced by HSNO and by the Biosecurity Act remains a rather glaring anomaly. For instance, even under a sensitive testing regime that could detect contamination down to the 0.1% level, we could probably expect many, perhaps thousands, of GM corn seeds to be imported and planted in New Zealand every year.*

Given that it is illegal under HSNO to intentionally plant even one of these GM seeds, it seems difficult to avoid the conclusion that either the Biosecurity Act is too lax or the HSNO regime is too strict. In terms of outcomes, the environmental release of a GM corn plant should presumably be a matter of equal concern whether it is planted intentionally or not.

One way to bridge the gap between HSNO and the Biosecurity Act might be to apply a rigorous risk assessment and cost-benefit analysis to GM releases via seed imports. This would seem to be a logical approach given the Government's commitment to the "proceed with caution," case-by-case regulatory strategy.

Clearly New Zealand could cut down on the number of "inadvertent" GM releases by, for example, banning imports of corn seed from the United States. MAF has deemed banning seeds from countries that grow GM varieties as infeasible due to New Zealand's reliance on imported seeds and the costs this would impose.[145] This is perhaps true, but it is hard to see why this conclusion should not be evaluated in as transparent and rigorous a manner as is mandated by HSNO for "intentional" releases. It should be possible for Bt corn to pass muster under some sort of environmental risk assessment.

A strong *prima facie* case can be made that contamination episodes like the one behind Corngate actually pose negligible health and environmental risks. In the United States, millions of hectares of Bt corn have been grown, harvested, and eaten annually for several years. There are no obvious signs that this has caused any particular environmental or health problems so far.

Opponents of GM would likely dispute this claim. And they would add that this argument ignores economic effects – what of the harm to New Zealand's exports and clean, green image? (Remember the Japanese pizza topping scare).

It is hard to think of a reason why such claims and counter-claims should not be evaluated in a manner analogous to that used for "intentional release." The distinction between unintended and intended presence does not, in any case, seem particularly relevant to the question of whether a risk assessment is appropriate, especially when the "unintended" presence is

* According to one published MAF estimate, there are 6,000 seeds per kg of sweet corn. MAF estimated that during the period August 2001-May 2002, 56,338 kg of sweet corn seed were imported. If MAF had been enforcing a rule rejecting every shipment with 0.1% or greater contamination, it still would have been possible for several hundred thousand GM seeds to get through. For instance, if every shipment had a 0.05% level of contamination, 169,014 GM seeds would be imported. While this may not be a realistic estimate of what would have actually happened, we are still dealing with tens of thousands of seeds even if it is out by a factor of 10. Sources: "Investigation into Genetically Modified Sweet Corn," Minister for Agriculture and Minister for Biosecurity, PPM/NZ-MIN/Briefings, Brief No: 03/73, 1 August 2003 (number of seeds per kg); David Wansbrough, "Border Control for Genetically Modified (GM) Seeds," MAF Discussion Paper No. 31, May 2002, 4 (amount of sweet corn seed imported).

predictable. It is a little like arguing against a risk assessment for the pollutants emitted by automobiles on the grounds that the pollutants are an unintended side effect of automobile use.

The assessment could be "case-by-case" in a broad sense, considering categories of seed according to their country of origin and the nature of the GM seeds that would likely be mixed with them.

This approach could contribute to resolving the ambiguous legal status of at least some of the GMOs that slip into the country unnoticed in seed shipments. The outcome of such a risk assessment might be some form of limited amnesty for some of these fugitive plants. The conclusion of such an assessment could be a sort of "conditional approval" for inadvertent releases. The condition might be that the seeds are inadvertently present in shipments that have been certified GM free according to enforceable identity preservation standards. This would obviate the need to test (and perhaps reject) shipments of seed that have low levels of contamination. At the same time, crops that pass this scrutiny perhaps could be subject to less strict regulation should a law-abiding scientist wish to grow them for a field trial.

On the other hand, if a rigorous assessment confirmed the fears of the anti-GM advocates, it might make sense to ban certain kinds of seed shipment altogether, despite the costs that this would incur in terms of trying to find alternate seed sources. Perhaps, to take a completely hypothetical example, New Zealand should ban imports of canola seed from Canada, but take a more flexible approach to squash seeds from California.

Such an approach would probably require some changes to both HSNO and the Biosecurity Act.

Brand Image Contamination and the Need for Economic Analysis

The question of co-existence takes its broadest form as the question of what using GMOs will do to the demand for New Zealand's products overseas. The argument is often made that New Zealand enjoys a clean, green image – an image of high environmental standards combined with high standards of purity and safety in its food products. Again, the parallel between GM and nuclear energy arises – one of the purported sources of New Zealand's clean, green image is its anti-nuclear stance.

GM opponents say that the clean, green image will be tainted by the release of GMOs (to say nothing of the effect if that release leads to unforeseen damage, uncontrollable spread, and so forth). On the other hand, they argue, New Zealand can enhance its clean, green image by remaining a GMO-free island in a world in which GMO use is spreading to every corner. In the future, they say, New Zealand may be one of the few places buyers can turn to for GM-free products, giving New Zealand a competitive advantage.

This argument cannot be lightly dismissed. There is ample evidence that a great many consumers around the world do prefer to avoid GM products if they can. Other countries, in Europe and elsewhere, are imposing labelling requirements and other rules that could make GM products more costly and harder to sell. For such reasons, at present there are probably very few farmers and food producers in New Zealand who are yet willing to begin trying to sell GM crops or food products containing GMOs.

Investigating the Brand Image Effects

This topic has been addressed by a study commissioned by the New Zealand Government.[146] The study drew on opinion surveys about consumer reaction to different scenarios of GM use in New Zealand. Mathematical modelling estimated the effects of these consumer attitudes on New Zealand's economy. The study was based on hypothetical uses of GMOs in medicine, pest control or in growing forage crops for grazing animals.

The study predicted that under a favourable scenario, releasing the GMOs could lead to modest gains in GDP of 2.5% over a 10-year period, while under an unfavourable scenario, GDP could shrink by 2.4%. The effects on particular sectors of the economy, particularly the meat and dairy sectors, would be much more pronounced, with the returns in these sectors swinging up or down by 8-9% depending on the scenario.

The study also looked at scenarios in which New Zealand refrained from using GMOs in an effort to cash in on a GM-free clean, green image. The risk in this strategy would be that other countries might adopt GM technologies that would make them more productive while New Zealand lagged behind. According to the economic models, this strategy held the potential for great gains or great losses. If things worked out well, over 10 years New Zealand's GDP might increase by 7.5%, or decline by 6.4% if things worked out badly.

There were a number of sources of uncertainty in the results. One was that it is difficult to predict consumer behaviour based on survey responses. Another major uncertainty concerns the degree to which the GMOs would actually achieve the ends they were introduced for, such as increasing agricultural productivity, and how this in turn would affect market prices. Different assumptions about the behaviour of other countries (such as their trade policies and whether they adopted the same technologies) also would affect the results.

Another point to consider is that such studies may only look at relatively few scenarios. In the economic modelling exercise just described, none of the GMOs analysed were food crops for human consumption. It is quite likely the results of such an exercise could differ if different GMOs were studied.

It also seems likely that very different results could be produced by different economists using a range of defensible methods and assumptions. For instance, the idea that GM use would have a generalised effect on New Zealand's overseas brand image has been called into question by a subsequent study by a different team of New Zealand researchers. Based on interviews with European market "gatekeepers" – supermarket buyers, food importers and distributors – they concluded that negative consumer sentiment about a given GM crop was unlikely to transfer to a negative perception of all food from that country (although it would likely harm the appeal of organic versions of the same crop).[147]

These examples illustrate a number of things. One is that there is still much uncertainty surrounding this issue. Another is that deep, complex questions are not answered by a single study, and may not even be clearly answered by many studies. Uncertainty persists, and time may be the only provider of absolute certainty. However, it is clear that this preliminary research raises important questions that New Zealand should explore further.

INSTITUTIONAL ISSUES AT ERMA AND MAF

In the regulation and management of both environmental risk and co-existence, ERMA and MAF will need to co-ordinate smoothly, working together to ensure that conditions and restrictions on releases are effective and are enforced.

Questions About ERMA's Readiness

The independent review of ERMA was mixed. Supporters of the Government's GM policies tended to characterise the review as providing a qualified endorsement of ERMA, while critics said it portrayed a dysfunctional agency that would be unable to regulate GMO releases adequately. A wide variety of problems was noted, including low staff morale and high turnover, perceptions that staff were biased in favour of applicants, and weak oversight of the department's management by the decision-making Authority.

The Government has pledged to implement many of the called-for reforms concerning management structure, internal policies, and relationships with other agencies, stakeholders, Māori and the public. It will take time to see how effective the reforms are. As one newspaper editorial observed, "The watchdog [the review suggested] is one-eyed and unreliable, a mutt wagged by the tail. We are now assured that the system has been changed and the watchdog is clear-eyed, tough, sabre-toothed and fearless. The only proof of this will be time and experience."[148]

Challenges to Monitoring and Enforcement

The independent review of ERMA observed that, "Monitoring and co-ordinating compliance with the Act and Authority decisions has been patchy … The emphasis of Agency effort in new organism work is so strongly oriented to processing applications that the recurrence of monitoring mishaps cannot be ruled out."[149]

Monitoring often is neglected in environmental regulatory systems. It is not easy to ensure that well-intentioned conditions and restrictions placed on an approval are carried out and are effective, especially when monitoring must continue for many years.

Particularly in areas where science is changing and there are uncertainties about the effectiveness of proposed control measures, the monitoring system should build in the capacity to periodically re-evaluate the effectiveness of the management measures. That way, if agreed-upon goals are not being met, changes can be made. The term "adaptive management" is sometimes used to describe this approach to monitoring.[*]

[*] Theoretically, adaptive management involves setting up a monitoring regime that will provide rigorous, controlled scientific testing of the efficacy of different management approaches. While desirable, it is difficult to find cases where environmental managers have really achieved it in practice. Even the less rigorous goal of periodically re-evaluating and adjusting management measures takes considerable planning.

Problems of Co-ordination Between MAF and ERMA

The review of ERMA noted that ERMA and MAF "have different organisational personalities and ways of doing things." For example, the report observed that dialogue was needed between ERMA and MAF on the selection of controls for GM releases and the frequency of monitoring.[150] "There are tensions between staff in ERMA and their counterparts in MAF over the efficacy of some controls and the regularity of monitoring imposed." MAF reportedly placed more emphasis on the cost-effectiveness of controls, while ERMA's approach was more risk averse.[151]

Another independent review focused on the handling of a 2002 GM seed contamination crisis. The review praised the initial response to the crisis as "expeditious and well managed overall."[152] However, as the two agencies tried to follow through on this good start, there were undue delays and confusion. The division of responsibility between them created ambiguity about lines of accountability.

ERMA has taken the lead on seed contamination investigations, even though it is a quasi-judicial authority that the review called "ill-suited for directly handling operational matters, more especially in a crisis."[153] The report also asserted that there was little guidance as to what should happen if, for example, MAF and ERMA disagreed about enforcement.

What are Other Countries Doing?

Another useful measure would be for New Zealand to begin systematically building up knowledge about international regulatory practices for evaluating applications for GMO releases. For example, one of ERMA's challenges will be to develop ways of using a body of precedent from past risk assessments and decisions to guide future decisions. Other countries, such as the United States, have been doing this for several years already.

Resource Constraints at the Regulatory Agencies

GMOs are just one type of new organism, but are currently receiving a huge amount of public attention. This phenomenon can distort the priorities of regulatory agencies.

Because GM remains such a politically sensitive topic, any incident involving GMOs almost automatically pushes its way to the top of the agenda. The seed contamination episodes are one example. As the independent review of one of these episodes noted, "Responding to incidents like this diverts people from their normal duties. Other work does not get done; this could have downstream consequences for both MAF and ERMA New Zealand, for example in maintaining New Zealand's biosecurity."[154] If GMO use in New Zealand increases, and it continues to remain a top-priority area, the regulatory agencies may require more resources to deal with it, unless other priorities are adjusted.

HANDLING SCIENTIFIC UNCERTAINTY AND PRECAUTION

Scientific uncertainty has always been central to the GMO debate, and handling uncertainty will be a challenge in regulating GMO releases.

Will More Research Resolve These Issues?

As noted earlier, the Government is funding research on various scientific questions relating to GMOs. However, we should not set our hopes too high. It should be acknowledged that such research, while useful, will neither readily nor completely resolve all of the fundamental controversies and uncertainties about GMOs. Embedded in the GMO debate are numerous separate claims and counter-claims, representing many scientific hypotheses that will take many years and many different kinds of research to test.

To take one example, Britain's "farm-scale trials" of GM crops recently received worldwide attention. This was one of the most ambitious agronomic ecological experiments ever attempted, involving over 200 different fields growing GM canola, beet and maize over several years.[155]

The results were widely misreported as having demonstrated that GM crops reduce biodiversity. In fact, the results were mixed, and were in any event addressing a different and much more limited question. The fact that the plants in the experiment had been genetically modified was more or less incidental to the observed biodiversity effects, which were due to the use of differing regimes for applying herbicides. The results will, however, make a useful contribution to the debate over whether GM farming systems are more environmentally friendly than others. Questions will no doubt arise about the study's applicability beyond the environmental conditions in Britain where the trials occurred, leading to further research elsewhere.

The point of this example is that it is unrealistic to expect even several years of research to decisively resolve the fundamental disagreements between pro- and anti-GM advocates. All the research being carried out world wide will not accomplish this, let alone the limited amounts New Zealand is going to fund. Scientific knowledge accumulates in bits and pieces, through research in the field and laboratory as well as the accumulation of years of experience – time is the ultimate test of most hypotheses. Meanwhile, the number and variety of different kinds of GMO is likely to grow, raising new questions.

Furthermore, the scientific issues raised by GMOs vary a great deal depending on which organism is at issue. Until it becomes clearer which GMOs might be released in New Zealand, it will be difficult to anticipate and answer the scientific questions they will raise.

Some argue that the moratorium should be extended, while more research is completed in the meantime, in order to resolve questions about the effects of GMOs. It should be kept in mind, however, that in the nearer term (years rather than decades) it is likely that, while we will know more than we know now, there will still be uncertainty.

Linking Science to Policy

Given the fact that New Zealand has limited resources for carrying out such research, it should seek to direct its research funding in ways that will maximise the benefits for addressing New Zealand's most pressing needs.

However, research priorities are set by numerous actors – individual scientists, research institutes, private companies, and universities. The questions that interest them do not always coincide with the questions regulators and policy-makers want answers to. Nor do regulators and policy-makers always fully understand the capabilities and limitations of scientific research. This means that a continuing dialogue is always needed between funders, researchers, and the regulatory agencies.

Public research dollars are channelled through the Foundation for Research, Science and Technology (FRST). FRST attempts to assess individual projects according to how they fit into broader strategic goals, including the needs of the government departments ("end users"). FRST recently sponsored a symposium to provide an overview of the current state of research and provide an opportunity for scientists, regulators, and the public to discuss the research that was being done.[156]

Guidance and co-ordination will be needed to ensure that the work of researchers and the needs of policy-makers and regulators mesh. For example, research on the social implications of GM is now getting underway. It is being carried out by several disparate institutions and researchers, with as yet only informal communication and co-ordination between their projects.

It might be useful for ERMA, MAF and other actors to work individually or collectively on taking stock of the overall research interests of regulators and the ways researchers might contribute to meeting them. Staff at ERMA have noted the desirability of carrying out their own systematic research needs assessment, but have not yet had the resources to carry it out given all the competing priorities.

It should be stressed that a good deal of research has been done or initiated that should prove valuable to future regulatory decision making. I will list just a few examples.

- *Gene flow assessments*. New Zealand's Landcare Research is carrying out a systematic analysis of crop gene flow – what crops are grown or could be grown in New Zealand, their ability to disperse pollen or seeds, their potential to outcross with species in the wild, the role of factors such as pollinators and climate, and so forth. This framework and database could prove invaluable for assessments of environmental impacts and crop co-existence.
- *Effects on native fauna*. Researchers at HortResearch are studying the effects of pest-resistant GM plants on nontarget insects, such as the predators that feed on the targeted insects.
- *Economic impacts*. As discussed above, New Zealand researchers have been trying in various ways to assess the economic effects of GM on New Zealand's international brand image, exports, and economy.

THE FIRST RELEASE: A POLITICAL DECISION OR A REGULATORY ONE?

The Royal Commission on Genetic Modification was no doubt politically useful in shifting a highly charged debate into a neutral forum. The Royal Commission's recommendation of a case-by-case regulatory approach has provided a way to continue deflecting much of the political debate – political leaders need not answer arguments about the safety or wisdom of particular uses of GM, replying instead that the case-by-case regulatory system will handle them.

However, the Royal Commission recommended that the Minister for the Environment should exercise the call-in powers under HSNO to evaluate the effects of the first release of a GM crop, "in order to assess the likely overall economic and environmental impact on the preserving opportunities strategy." The Commission said this was because "the first release would be very much a watershed decision. At that point we would no longer be a genetic modification-free nation in terms of crops."[157]

The Government did not accept this recommendation. There is still the theoretical possibility the decision will be "called in," but the Government has said that "the Commission's proposed use of the Ministerial call-in provision is not the appropriate mechanism to implement a 'proceed with caution' approach."[158]

The public perception that the first release of a GMO could be a watershed has some basis in reality. The brand image issue, for example, may not fit well into the case-by-case regulatory framework. The central issue is not just the precise GMO that is involved, or how it will be managed. It involves the crossing of a threshold to GM-producer status. This is a broad strategic decision and it is not clear that ERMA is positioned at the right level to make it.[*]

To exercise the call-in power certainly would have the potential to add new fuel to the political debate over GM, something which the Government appears to wish to avoid. However, it is important to keep in mind that the Royal Commission's endorsement of a case-by-case regulatory approach did not encompass this particular decision.

KEEPING EVERYBODY HAPPY

The title of this section is somewhat facetious, as it will be well-nigh impossible to keep everybody happy in handling the divisive issues raised by GMOs. It is very likely these policies and the agencies that carry them out will come under pressure from several directions.

Pressure Not to Over-Regulate

One of the major priorities of recent reforms has been to streamline the regulatory system and make compliance less costly. There is a widespread sense that it is so restrictive it inhibits even laboratory research that would be fairly routine in other countries. As one scientist said to me, "compliance costs are out of all proportion to risks." Improving this situation is a long-term priority in the Biotechnology Strategy, so the pressure to avoid and reduce over-regulation will surely continue.

[*] Some argue that the threshold has already been crossed because of seed contamination. This may be technically true, but quite possibly irrelevant in terms of market perceptions, which may take greater note of intentional releases.

Pressure Not to Under-Regulate

Criticism of ERMA from the anti-GM perspective is likely to be a popular activity for many years to come. ERMA will never be able to produce airtight analyses of all the questions in considering applications for GMO release. There will always be openings for criticism. That is not to dismiss such criticism out of hand. It is merely to point out that the only thing likely to end this debate is a significant shift in public attitudes about GM.

If, 10 or more years hence, GMOs are in wide use around the world, and no significant environmental or health harms have been observed, it is not hard to imagine that public interest in its risks could fade, especially if GMOs have in that time produced more tangible benefits for ordinary people (and not just farmers and companies). Unless and until that happens, ERMA and biotechnologists will fall under often-uncomfortable scrutiny. GM foes have promised to turn out in force at ERMA hearings. Activists will continue to mount protests. GM researchers will probably continue to worry about the security of their experiments, given past episodes where experimental GMOs were stolen or damaged.

Legal Challenges

Another possible arena of conflict is the court system. There have already been a couple of legal challenges to ERMA approvals of GMOs. Both of these cases involved challenges to approvals for using GM cows to produce proteins for medical research.

In one case, the plaintiff, Mothers Against Genetic Engineering (MAdGE), claimed among other things that the Minister for the Environment had acted unlawfully in failing to exercise the ministerial call-in power that allows the Minister to decide applications in place of the Authority. The judge did sympathise with at least one of MAdGE's claims, criticising the "informal" process by which MFE evaluates GM applications and advises the Minister on them. The judge said a clear protocol was needed to ensure accountability.[159] However, the judge ruled against all of MAdGE's legal claims, and ordered it to pay costs.[160]

The other challenge, *Bleakley v. Environmental Risk Management Authority*, was more successful. This case challenged the adequacy of ERMA's analysis for a field trial of cows altered with a gene to produce a therapeutic protein for use in multiple sclerosis research. Bleakley, an anti-GM activist, succeeded in temporarily overturning ERMA's ruling.[161]

However, in both cases, the judges largely deferred to the regulatory decision-makers regarding the substance and merits of their decisions. The Bleakley decision went against ERMA only on procedural matters that could be readily rectified by re-writing the ERMA ruling to document more thoroughly how its conclusions were related to its rules.[162]

In general, the system of judicial review in New Zealand defers to the regulators on matters of substance and restricts itself to points of law and process. It is unlikely a decision will ever be turned down on the grounds that it is not a good enough decision, or that it lacks sufficient evidential basis or logical soundness. ERMA's decisions will likely be upheld unless it has made procedural or legal mistakes. The threat of such lawsuits could, however, encourage ERMA to apply its procedures cautiously. The costs, delays, and publicity associated with litigation could also have the effect of discouraging potentially controversial research or release applications.

Another arena in which the GMO regulatory regime may be challenged is at the local government level. Already the cities of Napier and Nelson have declared themselves GE-free cities, and the idea has been proposed in other localities as well. While some have called this a symbolic act, Green Party Co-Leader Jeanette Fitzsimons suggested that GE-free cities might enforce a ban on GMOs through their local land use plans.[163] If this were to occur, it could set the stage for some interesting legal clashes should a local government prohibit a GMO release that has been approved by ERMA.

The Desirability of Transparency and Openness

If GMO decisions are ever to become a routine regulatory matter rather than a noisy political spectacle, it will be desirable for government to operate with a high degree of transparency. This means documenting decisions according to clear criteria – that way, it is easier for the public to be reassured that decisions are not unduly subject to commercial or political pressure or the whims of regulators. It also means a steady flow of information in both directions between decision-makers and the public.

New Zealand's processes have for the most part been laudably transparent. The Royal Commission gave a chance for every conceivable viewpoint to be aired and considered in an apolitical setting. Government decisions have been extensively documented, and the Government routinely consults the public both in developing policy and in ERMA's regulatory approval process.

The events which gave rise to Corngate marked a notable lapse in these norms. For example, the rushed decision to announce a tolerance threshold for GM seed contamination was made without due allowance for exploring alternatives and determining what was politically acceptable. That decision was soon reversed.

Corngate took on added significance because it came to the public's attention in the highly charged atmosphere of a political campaign. Last year, Green Party Co-Leader Jeanette Fitzsimons announced that a parliamentary select committee that she chaired would be conducting an inquiry into the case. She noted that during the height of the controversy in 2002, "the climate was probably too heated for a serious, rational look at the facts".[164]

For its own part, the Government seems to have realised that scandal is to a certain extent the product of surprise, and has diligently provided regular public updates on subsequent contamination episodes.

VI. Conclusions

PUBLIC CONSULTATION

1) The Royal Commission on Genetic Modification illustrated the benefits of having more than one stream of consultation. It may be advisable to have both a very open public forum where anyone can participate, as well as a more formal process where decision-makers and stakeholders engage the policy issues in depth. The stakeholders are well informed and more likely to propose policy alternatives, and the decision-makers can probe their differing viewpoints to try to probe the roots of disagreements and search for areas of consensus. Meetings in which the general public testifies may be essential for gauging the depth and intensity of public opinions and sentiments, and for identifying issues of concern that will need to be addressed by the policy process.

2) Public meetings may provide a biased sampling of public opinion, and it is useful to supplement them with a professionally designed and administered public opinion survey.

3) The tools used by the Royal Commission were appropriate to the mandate of its Terms of Reference. However, if the goal is to give citizens or certain groups more power over the content of policy decisions, other tools may be necessary that produce collaborative decision-making.

4) The Royal Commission made good use of technology. This included a website for posting transcripts, submissions, and other documents generated by the process, and video conferencing to help stakeholders to bring in expert witnesses from other countries.

5) If an ambitious programme to consult and engage the public is planned, it may be worthwhile to invest in systematically evaluating its effects as well. For example, opinion surveys and focus groups could be employed as an evaluation tool to learn more about how the process fared in terms of educating the public, influencing opinion, or building consensus.

6) In addition, if a public participation process attempts to break new ground procedurally, it may be worthwhile to document and preserve institutional memory to benefit those who might try to build on its example in the future.

7) The Royal Commission provided a good example of some practices to make meetings inclusive, such as holding them in diverse locations, accommodating a wide variety of work schedules, and where necessary taking steps to transcend language and cultural barriers.

8) The duration of a public consultation process is constrained by resources and the need to remain relevant. This means that it will provide only a snapshot of public views, and the conclusions drawn from it could be challenged in the face of new information that comes out later. This will be particularly true when the subject involves a fast-changing area of science.

REGULATION AND POLICY

Risk Assessment

1) ERMA has a challenging task in fitting a wide variety of disparate issues into its risk assessments: physical, biological, economic, social, and cultural. There are quite a few methodological issues involved in evaluating these impacts, and in performing a cost-benefit analysis. ERMA will need to strike a balance between developing clearly-defined procedures and maintaining flexibility to deal with each case on its merits.

2) The lack of universally agreed methods for doing environmental risk assessment, particularly given all the intangible values involved, means that ERMA's approach will be open to dispute, particularly if it addresses these questions in different ways in different instances. Yet if it tries to clarify its standards and procedures, it runs some risk of being accused of becoming overly rigid and rule bound.

3) ERMA is under demands to avoid being too risk averse, but also under demands to take more intangible considerations beyond science into account. These tend to pull in opposite directions, so it will be hard for ERMA to satisfy everyone.

Crop Co-Existence

1) Zero-tolerance of GM contamination is difficult to achieve – perhaps, in some situations, impossible. Seed shipments from countries that use GM will likely have GM seeds mixed into ostensibly non-GM seeds. It may be unfeasible to completely prevent some GM crops from cross-pollinating with non-GM crops.

2) Maintaining separation of GM and non-GM crops and products will impose costs, and require decisions about who pays.

3) The case for zero tolerance is stronger when the GM crop in question is not approved for human consumption, such as pharmaceutical crops. And the case is stronger that the user or developer of these GMOs should pay the costs of achieving zero tolerance.

4) Co-existence is probably going to be easier to achieve with animals than with plants. However, the demands for zero tolerance and the negative fallout from contamination incidents could be greater if GM animals are involved.

5) There remains a legal grey zone between HSNO and the Biosecurity Act about the legal status of GMOs introduced to New Zealand inadvertently through seed imports. There is also a striking disconnection between the strict HSNO approach, which tolerates no unintended releases of GMOs, and the Biosecurity Act, which may tolerate the importation and growing of thousands of unapproved GM plants every year.

6) With respect to seed contamination, there are different levels of risk and benefit associated with different types of seed from different sources. It might be desirable to find a way to apply a risk assessment approach to seed imports, restricting or loosening the rules depending on the nature of the GM crop. This might require legislative changes to HSNO or the Biosecurity Act.

Scientific Uncertainty and Research

1) Public funding of research into the economic, social, environmental, and other effects of GMOs can provide useful information to help decision-makers deal with the many unknowns and uncertainties. However, a few years of research are not going to definitively resolve many of the fundamental ongoing disputes about GM.

2) In New Zealand's publicly funded research on GM effects, the information needs of regulators and policy-makers should be considered one of the top priorities. Keeping scientific research agendas aligned with the needs of the policy and regulatory systems will require ongoing attention.

Co-ordination of ERMA and MAF Regulatory Efforts

1) Regulating releases of GMOs will require close co-operation and co-ordination between ERMA and MAF. There remain many problems to be worked out, such as defining lines of accountability and authority.

2) Monitoring of compliance with, and effectiveness of, control measures will be a challenging area. Given that knowledge about management of GMOs is a rapidly evolving subject, monitoring plans will need to have built-in adaptability to respond to new information and changing circumstances over long periods of time.

3) In the current climate of heightened public interest, incidents and issues involving GMOs frequently assume a very high priority for the regulatory agencies. If the demands on the regulatory system from GM issues continue to grow, there is a danger this could lead to other priorities being neglected.

First Release of a GMO

The Royal Commission concluded that the first release of a GMO was of such broad significance that it should be a high-level political decision rather than a routine regulatory decision. There are arguments in favour of this view. For example, the continuing debate over protecting New Zealand's international "brand image" is a broad strategic issue rather than one of how to manage a particular GMO.

Balancing a Variety of Pressures

1) Dealing with GMOs will continue to be controversial, and as long as that is the case there will be many trade-offs and balances to manage. New Zealand will have to try to avoid both over-regulating GMOs and under-regulating them. Conflict over how to manage this balance will to some extent be channelled into a regulatory approval process, with its orderly procedures for consulting the public and making decisions. However, the basis and methods used in such decisions will leave room for much debate.

2) The judicial system will likely be the stage for some of these conflicts. ERMA decisions may be challenged in the courts. There may be legal clashes between the national regulatory bodies and local governments that take a different view of GMOs.

3) Maintaining a high level of transparency and openness in decisions about GM will expose the Government to criticism, but also help to avoid outcries such as that which accompanied the Corngate episode. Such transparency may help keep the lines of dialogue open between Government, users of GM technology, and the critics of GM.

GLOSSARY

The Authority	The decision-making board of the Environmental Risk Management Authority
Bt, Bt corn	Bt stands for "Bacillus thuringiensis." This is a naturally occurring soil bacterium that produces a protein toxic to some insect larvae (but not to humans). Many GM crops, such as Bt corn, incorporate this gene so that the modified plant will have the protective Bt insecticide in its tissues.
ERMA	The Environmental Risk Management Authority
FRST	Foundation for Research, Science and Technology
GE	Genetic engineering; genetically engineered
GM	Genetic modification, genetically modified
GMO	Genetically modified organism
HSNO	Hazardous Substances and New Organisms Act of 1996
hui	Conference or meeting hosted by Māori, and following traditional Māori protocols
iwi	Tribe or people (Māori)
MAF	New Zealand Ministry of Agriculture and Forestry
MFE	New Zealand Ministry for the Environment
Treaty of Waitangi ("The Treaty")	Treaty signed in 1840 between the British Crown and Māori leaders concerning sovereignty, possession of land and resources, and citizenship rights.

Appendix

Recommendations of the Royal Commission on Genetic Modification

"Chapter 6: Research

Recommendation 6.1: that applications to develop genetically modified organisms in PC1 and PC2 containment be assessed by the Institutional Biological Safety Committees (IBSCs) on a project rather than organism basis.

Recommendation 6.2 : that all approval forms, standards and regulations relating to the development of genetically modified organisms in containment be reviewed and updated.

Recommendation 6.3: that a separate, simplified form be developed for low-risk (Categories A and B) applications to IBSCs.

Recommendation 6.4: that the Hazardous Substances and New Organisms Act 1996 (HSNO) be amended to allow for the efficient importation of low-risk genetically modified organisms, through delegation of the approval process to the IBSCs.

Recommendation 6.5: that approvals to develop or import genetically modified organisms be deemed to cover their holding and breeding.

Recommendation 6.6: that HSNO be amended to clarify that research involving genetic modification of human cell lines or tissue cultures is covered by the Act.

Recommendation 6.7: that approval for development of genetically modified animal cell lines be delegated to the IBSCs.

Recommendation 6.8: that HSNO be amended to provide for a further level of approval called conditional release.

Recommendation 6.9: that HSNO be amended to cover procedures used in mammalian cloning, such as nuclear transfer or cell fusion.

Recommendation 6.10: that IBSCs include at least one Māori member, appointed on the nomination of the hapu or iwi with manawhenua in the locality affected by an application.

Recommendation 6.11: that the funders of research portfolios be resourced to include the costs of compliance with HSNO.

Recommendation 6.12: that the Environmental Risk Management Authority (ERMA) require research on environmental impacts on soil and ecosystems before release of genetically modified crops is approved.

Recommendation 6.13: that public research funding be allocated to ensure organic and other sustainable agricultural systems are adequately supported.

Recommendation 6.14: that public research funding portfolios be resourced to include research on the socio-economic and ethical impacts of the release of genetically modified organisms.

Chapter 7: Crops and other field uses

Recommendation 7.1: that, prior to the release of any Bt-modified crops, the appropriate agencies develop a strategy for the use of the Bt toxin in sprays and genetically modified plants, taking into account:

- the concept of refugia
- limitations on total planted area
- home gardener use.

Recommendation 7.2: that the appropriate agencies develop a labelling regime to identify genetically modified seed, nursery stock and propagative material at point of sale.

Recommendation 7.3: that the Ministry of Agriculture and Forestry (MAF) develop a strategy to allow continued production of genetic modification-free honey and other bee products, and to avoid cross-pollination by bees between genetically modified and modification-free crops, that takes into account both geographical factors (in terms of crop separation strategies)and differences in crop flowering times.

Recommendation 7.4: that, in connection with any proposal to develop genetically modified forest trees, an ecological assessment be required to determine the effects of the modification on the soil and environmental ecology, including effects on soil microorganisms, weediness, insect and animal life, and biodiversity.

Recommendation 7.5: that, wherever possible, non-food animals, or animals less likely to find their way into the food chain, be used as bioreactors rather than animals that are a common source of food.

Recommendation 7.6: that, wherever possible, synthetic genes or mammalian homologues of human genes be used in transgenic animals to avoid the use of genes derived directly from humans.

Recommendation 7.7: that MAF develop an industry code of practice to ensure effective separation distances between genetically modified and unmodified crops (including those grown for seed production), such a code:

- to be established on a crop-by-crop basis
- to take into account
  - existing separation distances for seed certification in New Zealand
  - developments in international certification standards for organic farming
  - emerging strategies for coexistence between genetically modified and unmodified crops in other countries
- to identify how the costs of establishment and maintenance of buffer zones are to be borne.

Chapter 8: Food

Recommendation 8.1: that the Food Administration Authority monitor research studies on stock feed and act on any that indicate a need for stock feed to be assessed in relation to human health.

Recommendation 8.2: that Government facilitate the development of a voluntary label indicating a food has not been genetically modified, contains no genetically modified ingredients and has not been manufactured using a process involving genetic modification.

Recommendation 8.3: that, as a matter of priority, the Food Administration Authority disseminate information on the labelling regime for genetically modified foods and consumer rights in relation to foods made available for consumption at restaurants and take-away bars.

Recommendation 8.4: that the Food Administration Authority produce and distribute consumer information on the use of gene technology in the production of food.

Chapter 9: Medicine

Recommendation 9.1: that all gene therapy, whether in the public or the private sectors, require formal medical ethical oversight.

Recommendation 9.2: that Toi te Taiao: the Bioethics Council develop ethical guidelines for xenotransplantation involving genetic modification technology.

Recommendation 9.3: that products be clearly defined in legislation as medicines, pharmaco foods, functional foods or dietary supplements.

Recommendation 9.4: that imported medicines and pharmaco foods that include live genetically modified organisms be approved for use by Medsafe without a requirement for additional approval from ERMA.

Recommendation 9.5: that, in respect of applications for approval as Animal Remedies of genetically modified organisms or products manufactured by processes using genetic modification techniques, the specified information which the Director-General of Agriculture and Forestry requires to be contained in applications under the Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM) include full information on the efficacy and the form of the genetic modification used in manufacture; and that such information be included as one of the categories of relevant risks and benefits under section 19 of the Act.

Recommendation 9.6: that, as protocols identify useful therapeutics for serious disease control, approvals through ERMA and Medsafe be sought in advance for the importation of live genetically modified organisms in the form of vaccines.

Chapter 10: Intellectual property

Recommendation 10.1: that the New Zealand Plant Variety Rights Act 1987 be amended to introduce the concept of essential derivation.

Recommendation 10.2: that the Patents Act 1953 be amended by adding a specific exclusion of the patentability of human beings and the biological processes for their generation, in line with section 18 of the Patents Act 1990 (Commonwealth).

Recommendation 10.3: that a Maori Consultative Committee be established by the Intellectual Property Office of New Zealand to develop procedures for assessing applications, and to facilitate consultation with the Maori community where appropriate.

Recommendation 10.4: that New Zealand be proactive in pursuing cultural and intellectual property rights for indigenous peoples internationally.

Recommendation 10.5: that New Zealand pursue the amendment of the World Trade Organization Agreement on Trade-Related Aspects of Intellectual Property Rights and associated conventions to include a reference to the avoidance of cultural offence as a specific ground for exclusion or reservation.

Recommendation 10.6: that all parties concerned work to resolve the WAI 262 and WAI 740 claims currently before the Waitangi Tribunal as soon as possible.

Recommendation 10.7: that HSNO and ACVM be amended to give appropriate protection to all commercially sensitive or confidential supporting information provided with applications for approval.

Chapter 11: Te Tiriti o Waitangi

Recommendation 11.1: that section 8 of HSNO be amended to provide that effect is to be given to the principles of the Treaty of Waitangi.

Chapter 12: Liability issues

Recommendation 12.1: that Toi te Taiao: the Bioethics Council, in association with the Human Rights Commission, address the issue of genetic discrimination.

Recommendation 12.2: that for the time being there be no change in the liability system.

Chapter 13: Major conclusion

Recommendation 13.1: that the methodology for implementing HSNO section 6(e) be made more specific to:

- include an assessment of the economic impact the release of any genetically modified crop or organism would have on the proposed national strategy of preserving opportunities in genetically modified and unmodified agricultural systems

- allow for specified categories of genetically modified crops to be excluded from districts where their presence would be a significant threat to an established non-genetically modified crop use.

Recommendation 13.2: that before the controlled or open release of the first genetically modified crop, the Minister exercise the call-in powers available under HSNO section 68 in order to assess the likely overall economic and environmental impact on the preserving opportunities strategy.

Recommendation 13.3: that MAF develop formalised local networks to encourage constructive dialogue and communication between farmers using different production methods, and to provide for mediation where necessary.

Recommendation 13.4: that sterility technologies be one tool in the strategy to preserve opportunities, especially in the case of those genetically modified crops most likely to cross-pollinate with non-genetically modified crops in the New Zealand context (eg, brassicas, ryegrass, ornamentals).

Chapter 14: The Biotechnology Century

Recommendation 14.1: that HSNO section 68 be extended to include significant cultural, ethical and spiritual issues as grounds for the Minister's call-in powers.

Recommendation 14.2: that Government establish Toi te Taiao: the Bioethics Council to:

- act as an advisory body on ethical, social and cultural matters in the use of biotechnology in New Zealand
- assess and provide guidelines on biotechnological issues involving significant social, ethical and cultural dimensions
- provide an open and transparent consultation process to enable public participation in the Council's activities.

Recommendation 14.3: that Government establish the office of Parliamentary Commissioner on Biotechnology to undertake futurewatch, audit and educational functions with regard to the development and use of biotechnology in New Zealand.

Recommendation 14.4: that the Ministry of Research, Science and Technology develop on a consultative basis a medium- and long-term biotechnology strategy for New Zealand."

REFERENCES

1 Ernst & Young, *Review of New Zealand's Biotechnology Sector Summary Report, March 2003,* http://www.biospherenz.com/download/review-nz-biotech-sector.pdf.

2 Office of the Prime Minister, *Growing an Innovative New Zealand*, February 2002, http://www.executive.govt.nz/minister/clark/innovate/innovative.pdf, 13.

3 ibid., 7.

4 "Genetics Row Sure to be Election Issue?" *The Press*, 24 March 1999.

5 Frances, Martin "Papers Reveal Frankenstein Fish Cover-up," *The Evening Post*, 6 April 1999, 3.

6 "Genetically Modified Crop May Be Already Spreading," *New Zealand Herald*, 12 April 1999.

7 Samson, Alan "Greens Say They May Strike at Crops Again," *The Dominion*, 12 March 1999, 1.

8 "GM Cholera Vaccine Withdrawn" (news release), Environmental Risk Management Authority, 14 June 2000, http://www.ermanz.govt.nz/news-events/archives/media-releases/2000/mr-20000614.asp.

9 "Genetics Row Sure to be Election Issue?" *The Press*, 24 March 1999.

10 New Zealand Press Association, "Fears Raised Over GM Crops, 11 April, 1999.

11 "Green Party Wants Royal Commission," *Southland Times*, 14 April 1999, 20.

12 Espiner, Guyon, "Greens Outline GE Probe Terms," *Evening Post*, 14 December 1999, 2.

13 "Greens and Labour Off to 'Good Start,'" *The Dominion*, 9 December 1999, 2.

14 "Genetically Modified Crop May Be Already Spreading," *New Zealand Herald*, 12 April 1999.

15 "Labour Stops Alliance Bill in its Tracks," *The Dominion*, 19 May 1999, 2.

16 Royal Commission on Genetic Modification, *Report of the Royal Commission on Genetic Modification*, "Report and Recommendations," 2001, http://www.gmcommission.govt.nz/, 105.

17 ERMA, "Background Comment on Biosecurity Issues," 13 November 2000, http://www.ermanz.govt.nz/news-events/archives/media-releases/2000/mr-20001113.asp

18 Royal Commission on Genetic Modification, op. cit., Appendix 1, "Context and Process," 158.

19 ibid., 160.

20 ibid., 157-159.

21 op. cit, Appendix 3, "Outcomes of Consultation: Submissions from the Public," 39.

22 loc. cit.

23 ibid., 39-42, 69, 96.

24 ibid., 184.

25 ibid., 153.

26 ibid., 53.

27 op.cit., 63.

28 ibid., 2.

29 Hazardous Substances and New Organisms Act of 1996 (HSNO), Pt 5, Sec 68.

30 Royal Commission on Genetic Modification, op. cit., recommendation 14.3.

31 ibid., recommendation 14.4.

32 ibid., recommendation, 6.12.

33 ibid., recommendation 6.13.

34 ibid., recommendation 6.14.

35 ibid., recommendation 7.4.

36 ibid., recommendations 8.2, 8.1, 8.3, 8.4.

37 ibid., 6.1, 6.2, 6.3, 6.4, 6.5, 6.7.

38 ibid., recommendation 10.7.

39 ibid., recommendation 12.2.

40 Young, Audrey and Francesca Mold, "Greens' Fury at GE Nod," *New Zealand Herald,* 31 July 2001.

41 Larkin, Naomi, "We'll Rip Crops From Fields, Say Organic Farmers," *New Zealand Herald*, 1 August 2001.

42 MacLeod, Scott "Delight and Anger at GE report," *New Zealand Herald*, 31 July 2001.

43 MacLeod, loc. cit.

44 Langdon, Christine, "Greens Threaten Govt Over GM," *The Dominion*, 19 October 2001.

45 Stevenson, Philippa, "Unclear Signals on GM Trials Alarm Business and Science," *New Zealand Herald*, 1 October 2001;
Langdon, Christine, "Government 'Will Not Be Stood Over' Greens Told," *The Dominion*, 20 October 2001.

[46] Auckland District Law Society, "Commissions of Inquiry and Politics – A Recipe for Erosion of Public Confidence and Trust," 11 November 1999, 4.

[47] Fitzgerald, Roger, *Setting Up and Running Commissions of Inquiry: Guidelines for Officials*, Commissioners and Commission Staff, Department of Internal Affairs, 7 February 2001.

[48] ibid., 9-10.

[49] loc. cit.

[50] ibid., 19.

[51] ibid., 10, 18, 20.

[52] Auckland District Law Society, op. cit., 7.

[53] Upton, Simon, "Royal Commission Volumes Out of Step With The Times," *National Business Review*, 16 June 1986, 11.

[54] Goulter, John, "Shelving Our Social Conscience," *New Zealandia*, November 1989, 27.

[55] loc. cit.

[56] "Greens, Govt To Sign Protocol," *Evening Post*, 2 April 2000, 2;
"Greens Give Govt Their Wishlist for GE Inquiry," *Radio New Zealand Newswire*, 31 January 2000;
"Greens Expect To Sign Pact With Coalition Next Month," *The Dominion*, 15 April 2000, 2.

[57] "GM Commission Plays It Down The Middle," *Evening Post*, 31 July 2001.

[58] Potter, J, High Court of New Zealand, Judgement in *Mothers Against Genetic Engineering Incorporated v. The Minister for the Environment*, 7 July 2003, 4.

[59] Auckland District Law Society, op. cit., 1-2, 5.

[60] Arnstein, Sherry R., "A Ladder of Citizen Participation," *AIP Journal*, July 1969, 216-219.

[61] Checkoway, Barry, "The Politics of Public Hearings," *Journal of Applied Behavioral Science*, 17(4), 1981, 574.

[62] Long , Rebecca J. and Thomas C. Beierle, "The Federal Advisory Committee Act and Public Participation in Environmental Policy," Washington, D.C.: Resources for the Future, Discussion Paper 99-17, January 1999, 31;
Beierle, Thomas C. and Jerry Cayford, *Democracy in Practice: Public Participation in Environmental Decisions*, Washington, D.C.: Resources for the Future, 2002, 6.

[64] Royal Commission on Genetic Modification, op. cit., Appendix 1, "Context and Process," 110-112.

[65] ibid., 117.

[66] ibid., 121, 126.

[67] ibid., 140-141.

[68] ibid., 145-148.

[69] ibid., 149.

[70] ibid., 154-155.

[71] I think I owe this observation to Dr Jean Fleming of the Royal Commission, who raised the idea during our interview.

[72] Royal Commission on Genetic Modification, op. cit., 43.

[73] Interview with Dr Jean Fleming, 23 September 2003.

[74] "Commission gets letter of complaint," *The Dominion*, 1 December 2000.

[75] Wills, Peter R., "New GE Legislation: Corrupted at its Foundations" (press release), Physicians and Scientists for Responsible Genetics, 15 October 2003, http://www.scoop.co.nz/mason/archive/scoop/stories/4e/a3/200310152244.715cbd83.html;
Druker, Steven M., "Commission Fails Its Mission," Alliance for Bio-Integrity, http://www.gefree.org.nz/sdruker.htm.

[76] Druker, op. cit.

[77] Royal Commission on Genetic Modification, op. cit., 332-333.

[78] ibid., Appendix 1, "Context and Process," 158.

[79] Wills, Peter R., "Genetic Engineering: Policy and Science Since the Royal Commission: Insoluble Problems," Physicians and Scientists for Responsible Genetics (NZ), i.

[80] Hager, Nicky , *Seeds of Distrust: The Story of a GE Cover-Up*, Nelson: Craig Potton Publishing, 2002, 91-98.

[81] Transcript of submissions of Dr Oliver Sutherland, Deputy Chair, Environmental Risk Management Authority, and Bas Walker, Chief Executive, Environmental Risk Management Authority, to Royal Commission on Genetic Modification, 1 March 2001, www.gmcommission.govt.nz/inquiry/01MARSM.pdf;

Ministry of Agriculture and Forestry, "Possible Contamination of Imported Seed With Genetically Modified Material," 15 February 2001, presented to Royal Commission on Genetic Modification, 28 February 2001, http://www.maf.govt.nz/biosecurity/imports/plants/papers/gm-seeds/.

82 Transcript of submissions of Dr Sutherland and Bas Walker to Royal Commission on Genetic Modification; Ministry of Agriculture and Forestry, "Possible Contamination of Imported Seed With Genetically Modified Material."

83 Royal Commission on Genetic Modification, op. cit.,148.

84 Hager, op. cit., 113-118.

85 Transcript of submission of Dr Sutherland to Royal Commission on Genetic Modification, 4423.

86 *Report of the Royal Commission on Genetic M*odification, 148.

87 Jackson, Moana. "An Exquisite Politeness: The Royal Commission on Genetic Modification and the Redefining of the Treaty of Waitangi,," August 2001, Peace Movement Aotearoa, http://www.converge.org.nz/pma/redefi.htm.

88 Chapman, Nicky, *Bateman Facts New Zealand*, Auckland: Bateman, 2002, 113.

89 See: Checkoway, op. cit., 571;
Chess, Caron and Kristen Purcell, "Public Participation and the Environment: Do We Know What Works?" *Science and Technology*, 33(16), 1999.

90 Chess and Purcell, op. cit., 2691.

91 Fitzgerald, op. cit.

92 Ministry for the Environment, "Royal Commission on Genetic Modification: Government Response," http://www.mfe.govt.nz/issues/organisms/commission/cabinet-paper1.pdf.

93 Hazardous Substances and New Organisms Amendment Bill, as reported from the Committee of the Whole House, effective October 30, 2003.

94 Smart, John,"Welcome to the Symposium on Impacts of Emerging Biotechnologies," (presentation handout), symposium held in Wellington, 5-6 September 2003.

95 Business and Economic Research Limited (BERL), et. al., *Economic Risks and Opportunities from the Release of Genetically Modified Organisms in New Zealand*, Report to Ministries for the Environment and the Treasury, Ministry for the Environment, April 2003.

96 Cabinet Policy Committee, Minute of Decision, "Government Response to the Royal Commission on Genetic Modification: Report on Managing the Effects of GM Organisms and Co-existence in Primary Production: Paper 2: Practicalities of Specific Issues," POL Min (03) 8/7, 9 April 2003.

97 New Zealand Biotechnology Taskforce, *New Zealand Biotechnology Strategy*, Ministry of Research, Science and Technology, May 2003.

98 Espiner, Colin, "New GE Fears As Corn Seized," *The Press*, 5 July 2003, 1;
Taylor, Kevin "Suspect Seed Planted In Extra 94 Fields," *New Zealand Herald*, 8 August 2003.

99 Nicky Hager*, Seeds of Distrust: The Story of a GE Cover-Up*, (Nelson, NZ: Craig Potton Publishing, 2002).

100 Colin Espiner, "New GE fears as corn seized," *The Press*, 5 July 2003, 1; Kevin Taylor, "Suspect seed planted in extra 94 fields," *New Zealand Herald*, 8 August 2003.

101 Burley, Ngaire, "Looking Forward: Prospective Releases of GMOs Under the HSNO Act: A Synopsis and Interpretation of a Market Survey," ERMA New Zealand, August 8, 2003;
Collins, Simon, "Chemicals Losing Out to Genetics," *New Zealand Herald*, 20 April 2003.

102 Office of the Minister of Agriculture, "Government Response to the Royal Commission on Genetic Modification: Report on Managing the Effects of GM Organisms and Coexistence in Primary Production – Paper 1: Overview," 17 April 2003, 9.

103 Malone, Louise A., "Literature Review on Genetically Modified Plants and Bee Products," MAF Technical Paper No: 2002/05, Table 2, June 2002, http://www.maf.govt.nz/mafnet/rural-nz/research-and-development/biotechnology/literature-review-gm-plants-and-bee-products/

104 Hazardous Substances and New Organisms Act 1996, Part 1, Section 2A.

105 ibid., Part 5, Section 34.

106 ibid., Part 5, Section 38.

107 ibid., Part 5, Section 38A.

108 ibid., Part 5, Section 37.

109 ibid., Part 5, Section 36.

110 ibid., Part 5, Section 38.

111 ibid., Part 5, Section 38C.

112 ibid., Part 5, Section 38D.

113 ERMA New Zealand, "Annotated Methodology for the Consideration of Applications for Hazardous Substances and New Organisms Under the HSNO Act of 1996," August 1998, 12.

114 Hazardous Substances and New Organisms Act 1996, Part 5, Section 52.
115 ibid., Part 2, Section 7.
116 ibid., Part 5, Section 53.
117 ibid., Part 1, Section 2.
118 ibid., Part 2, Sections 6, 8.
119 ibid., Part 2, Section 5.
120 ERMA New Zealand, op. cit., 27.
121 ibid., 21.
122 Nakhies, Graeme, Margaret Loutit and Sissel Rogne, *A Review of the Capability of the Environmental Risk Management Authority (ERMA) Relating to the Risk Management of New Organisms*, prepared for the Minister for the Environment, March 2003, 58.
123 ibid.
124 Bioethics Council, "Submission to the Education and Science Select Committee on the New Organisms and Other Matters Bill," June 2003, http://www.bioethics.org.nz/publications/noom-bill-submission-exec-sum.html.
125 Office of the Minister of Agriculture, "Government Response to the Royal Commission on Genetic Modification: Report on Managing the Effects of GM Organisms and Coexistence in Primary Production – Paper 1: Overview," 17 April 2003, 2.
126 ibid.
127 ibid., 2.
128 Martech Consulting Group, "A Real Value for New Zealand: A Strategy to Unlock the Value in Organic Systems," Ministry of Agriculture and Forestry, 6 March 2003, http://www.maf.govt.nz/mafnet/rural-nz/sustainable-resource-use/organic-production/organic-strategy/organic-strategy.pdf, 2.
129 Ministry of Agriculture and Forestry, "Situation and Outlook for New Zealand Agriculture and Forestry (SONZAF)", December 2002, 31.
130 Office of the Minister of Agriculture, "Government Response to the Royal Commission on Genetic Modification: Report on Managing the Effects of GM Organisms and Coexistence in Primary Production – Paper 2: Practicalities of Specific Issues," 5.
131 Collins, Simon, "Export Giants Go Slow on GM," *The New Zealand Herald*, 26 August, 2003, A1.
132 Office of the Minister of Agriculture, "Government Response to the Royal Commission on Genetic Modification: Report on Managing the Effects of GM Organisms and Coexistence in Primary Production – Paper 1: Overview," 9.
133 See: Lancashire, John, "External Review of Submissions to MAF on How 'Conditional Release' May Assist in Achieving Coexistence of GM and Non-GM Crops", Ministry of Agriculture and Forestry, 11 May 2003, http://www.maf.govt.nz/mafnet/rural-nz/research-and-development/biotechnology/gm-coexistence-decision/external-review.htm.
134 Hager, op. cit., 14, 21-23.
135 ibid., 14, 21-23.
136 ibid., 21-22.
137 This incongruity is discussed in Hager, ibid., 61-67.
138 Collins, Simon, "Scientist Resigns Over GM Rules Breach," *New Zealand Herald*, 10 July 2003.
139 Wansbrough, David, "Border Control for Genetically Modified (GM) Seeds," MAF Discussion Paper No. 31, May 2002, 1.
140 ibid., 3.
141 Ministry of Agriculture and Forestry, "Protocol for Testing Imports of *Glycine Max* Seed for Sowing for the Presence of Genetically Modified Seed," 22 September 2002;
Ministry of Agriculture and Forestry, "Protocol for Testing Imports of *Brassica Napus* var. *Oleifera* Seed for Sowing for the Presence of Genetically Modified Seed," 1 October 2002.
142 Wansbrough, op. cit., 4.
143 ibid., 5.
144 ibid., 1.
145 Ministry of Agriculture and Forestry, "National Economic Impact of an Imported Seed Ban," December 2000, reprinted in Hager, op. cit., 135-138;
Wansbrough, op. cit., 4.
146 Business and Economic Research Limited (BERL), et. al., *Economic Risks and Opportunities from the Release of Genetically Modified Organisms in New Zealand*, Report to Ministries for the Environment and the Treasury, Ministry for the Environment, April 2003.

147 Knight, John, David Holdsworth and Damien Mather, *Trust and Country Image: Perceptions of European Food Distributors Regarding Factors That Could Enhance or Damage New Zealand's Image – Including GMOs*, Dunedin: Otago School of Business, University of Otago, September 2003.

148 "House Training a GM Watchdog", (editorial), *Sunday Star Times*, 14 September 2003, 8.

149 Nakhies, Loutit and Rogne, op. cit., 50.

150 ibid., 9, 11.

151 ibid., 50.

152 ibid., 16.

153 ibid., 9.

154 ibid., 16.

155 Walgate, Robert, "Mixed Results in GM Crop Trial," *The Scientist*, 16 October 2003, http://www.biomedcentral.com/news/20031016/08.

156 "Foundations for Success: Symposium on Impacts of Emerging Biotechnologies" conference, Wellington, September 5-6, 2003.

157 Royal Commission on Genetic Modification, op. cit., 338.

158 Office of the Minister for the Environment, "Royal Commission on Genetic Modification: Government Response."

159 Potter, J, op. cit., 49.

160 Mothers Against Genetic Engineering, "Background to MAdGE's Case," (press release), http://www.madge.net.nz/news/prel/courtcase.asp;
"Mothers Against Genetic Engineering Ordered to Pay Court Costs," Radio New Zealand Newswire, 22 September 2003.

161 The successful challenge was *Bleakley v. Environmental Risk Management Authority*, 3 NZLR 213, 2001.

162 *Bleakley v. Environmental Risk Management Authority*, 215.

163 "GE Decision Draws Flak," *The Nelson Mail*, April 6, 2001;
"Napier GM-Free," *Waikato Times*, 21 September 2001, 9.

164 "Committee to probe GE scare," *The Press*, 18 October 2002, 7.