



appendix 3

Outcomes of Consultation: Submissions
from the Public

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3.6 Risks and benefits

Background

Under relevant matters, item (c) of the Warrant seeks information about:

the risks of, and the benefits to be derived from, the use or avoidance of genetic modification, genetically modified organisms and products in New Zealand, including —

- (i) the groups of persons who are likely to be advantaged by each of those benefits; and
- (ii) the groups of persons who are likely to be disadvantaged by each of those risks

Outline of this section

This section of the report focuses on public submitters' perceptions of risks and benefits as a consequence of use and avoidance of genetic modification. Some of the information presented duplicates that presented earlier in coverage of submitters' views about strategic options for genetic modification use, in the light of their views about the ethical, cultural, environmental, social, and economic risks and benefits of genetic modification (see "Strategic outcomes, issues and options").

This section summarises public submitters' views about the risks and benefits of genetic modification in three sections. They include:

- a general overview of submitters' views about risks and/or benefits
- risks and benefits associated with the use of genetic modification and who will bear the risks and gain the benefits
- risks and benefits associated with the avoidance of genetic modification and who will bear the risk and gain the benefits.

General overview

As Table 3.11 shows the vast majority of public submitters were opposed to genetic modification in New Zealand, most of these expressing strong opposition. Their general view was that the risks that genetic modification posed were particularly great because impacts, if they could be predicted, were likely to be irreversible and spread randomly from point of impact. Therefore, given current understanding and assessment mechanisms, the risks associated with genetic modification could not be accurately assessed.

Table 3.11 Public submitters’ general stance on genetic modification (n = 10,861)

Stance on genetic modification	Number	%
Strongly against	7036	64.8
Tends to be against	2963	27.3
Neither for or against	659	6.1
Tends to be for	132	1.2
Strongly for	72	0.7

Risks and benefits of use of genetic modification

Some public submitters, including those expressing an overall opposition to genetic modification, acknowledged benefits from genetic modification use in particular areas, usually health but also the environment and, to a lesser degree, the economy and food production. However, for most public submitters, the risks were too great, or insufficiently understood, to justify applying genetic modification technologies, regardless of the claimed benefits. In rare cases, public submitters considered the risks small enough, the technologies safe enough, or the benefits great enough, to justify the use of genetic modification. However, overall, they were more likely to identify benefits from genetic modification avoidance and risks from genetic modification use. The benefits and risks identified are described for the three most commonly mentioned sectors: health, the environment and the economy.

Benefits

As Table 3.12 shows, 1045 public submitters did acknowledge some potential benefit from genetic modification use, particularly in the health area. However, most of those indicating some acceptance of its use for health reasons also stressed

Table 3.12 Acceptable applications of genetic modification (n = 1045)

Acceptable applications	Number	%
For laboratory, contained research	604	57.8
Medical uses – non-defined	447	42.8
Medical uses – specified	178	17.0
Increased food production	77	7.4
Increased food quality	60	5.7
For environmental protection	38	3.6
Strictly controlled testing	13	1.2
Limited to non-viable genetic modified material	8	0.8
Creates technology, data or products	8	0.8
Outside New Zealand	4	0.4
Animal use	4	0.4
Forestry or plants	3	0.3
Limited to non-heritable genetic modification	1	0.1
Other	12	1.1
The "Other" category includes the following acceptable GM applications:		
<ul style="list-style-type: none">• limited field trials for medical research only• when GM involves same kind of species• when distribution of costs and benefits are equitable• when modifications are reversible• to improve food safety• to improve biosecurity		

Multiple response

that such use had to be laboratory based and contained. Only very small percentages wrote about benefits of genetic modification for food quality and productivity, and environmental protection. Amongst these, however, were some who expressed frustration at the level of public misinformation about the uses of genetic modification. This frustration was exemplified by one submitter who was:

tired of GE being the root of all evil. I feel our 'informed' choices are extremely misinformed ... GE is not just about frog genes in potatoes and a monopolised seed supply. With public encouragement, it could be about third world countries being able to support themselves ...

Public submitters who acknowledged potential health benefits (see Table 3.12) from genetic modification wrote about targeted treatments generally, cures for specific diseases, the eradication of inheritable disorders, use of gene therapy, the development and use of nutraceuticals, lowering of health care costs, improved food quality and safety and increased food productivity. Submitters were also concerned about the capture of any benefits from genetic modification by multinationals. There was a general belief that only a few (almost always multinationals) will benefit from genetic modification and many (namely the general public) will suffer the costs. Other notable concerns included the ethical and spiritual implications of genetic modification, the irreversible nature of genetic modification application, the eroding of consumer choice and adverse economic impacts. The adverse economic impacts related to organic farming in particular, but also the opportunities New Zealand would forgo (for instance, taking advantage of niche markets based on our “clean, green image”) if we take the genetic modification road.

A small number of public submitters (38) discussed benefits to the environment from use of genetic modification. Benefits were identified as new pest control mechanisms, the eradication of possums, gorse and other pests, reduced use of insecticides and herbicides, and less intensive agriculture and, therefore, less stress on the environment.

Few submitters identified economic benefits from genetic modification use. Of the few that did, the benefits included increased choice of products, increased productivity, profitability, competitiveness in a range of sectors and increased scientific activity.

Risks

Public submitters were far more likely to identify risks as a consequence of genetic modification use. These ranged from general environmental, social and/or economic disaster to more specific negative impacts.

Submitters saw risks as highly likely and extremely dangerous given the relative infancy of this field of research. One submitter's fears, typical of others, were that "... the observed and potential risks of GE technology are so numerous that it is hard to believe they are being ignored. It is an inherently uncertain and unstable technology, and yet it is being implemented at a pace that assumes all the consequences are known." Submitters pointed to other technologies (principally nuclear power) as potentially devastating but still ultimately containable. In one example of a contrasting of those technologies with genetic modification, a submitter stated that "... our new technologies involve such fundamental and powerful levels of nature and are being applied over such short-term scales and on such a global level that even minute mistakes can become overwhelming problems overnight." Submitters argued that because it is alive, genetic pollution is self-replicating and cannot be cleaned up. This irreversibility, combined with the uncertainty around risk made submitters wary. One, for instance, stated that "... the analogy to the story of Pandora's Box is most appropriate — there will be no possible chance to reverse the process if unknown adverse effects become established in our lives."

Table 3.13 summarises submitters' views about unacceptable uses of genetic modification, given levels of risk and characteristics of use that are ethically or otherwise unpalatable. Most often, use was unacceptable given risks to food quality and supply and to the environment.

Environmental risks identified by submitters, other than general environmental disaster, included:

- general destabilisation of natural ecosystems
- the unpredictable and, therefore, uncontrollable and irreversible nature of impacts including
- cross-pollination of genetically modified crops with other flora including commercial organic and non-organic crops, indigenous flora and other non-commercial plants
- cross-species gene transfer, contamination of indigenous fauna
- consequent loss of Maori traditional foods
- loss of biodiversity and biosecurity
- loss of environmental integrity, with consequent degradation of its cultural and spiritual value to particular groups (eg, interference with whakapapa)
- threat to indigenous ownership/knowledge of fauna and flora posed by potential multinational control of genetic information
- increased use of pesticides.

Table 3.13 Non-acceptable characteristics of genetic modification applications (n = 3130)

Non-acceptable characteristics	Number	%
Food production	2130	68.1
Release of viable organisms in the environment (ie food or non food crops)	1479	47.3
Transfer of genetic material between 'unlike' species	491	15.7
Introduction of inheritable genetic changes in humans	365	11.7
Privatisation of genetic material	131	4.2
Transfer of human genetic material into plants or animals	128	4.1
Experimenting on animals	77	2.5
Non-insurability against risks	49	1.6
Production of genetically modified animals for bio-factories	17	0.5
Human uses	9	0.3
Plant research and development	7	0.2
Medicines or medical research	5	0.2
Commercially driven	5	0.2
Terminator technology	4	0.1
General undefined research	3	0.1
Other	6	0.2
The "Other" category included the following non-acceptable applications:		
<ul style="list-style-type: none">possum controlmilitary usesuse of antibiotic resistance markers/ viral resistance genesnatural medicine componentsbioremediation techniques/biosensorsartificial sweetenerssubstitution of tropical cash cropsrelease of non-viable organisms		

Multiple response

Submitters were very concerned that any negative environmental impact would be unstoppable. “Through evolution and natural selection over millions of years”, one argued “organisms have developed finely balanced relationships between themselves and the physical environment. Once we have ‘genetic pollution’ this will persist as long as there is life on earth.” Even nuclear waste, it was pointed out, becomes harmless after tens of thousands of years. Negative effects of genetic modification can never be recalled.

Public submitters addressing genetically modified crops pointed to the hazard of crop pests becoming immune to natural toxins produced by genetically modified plants. This would necessitate the development of ever more dangerous pesticides, causing greater environmental harm. This would also impact on the organic farmers who rely on natural pesticides on their farms. If pest insects become immune to these toxins organic farmers would not be able to use this integral approach to pest management in the production of their crops.

A wide range of health risks was identified by public submitters concerned about the application of genetic modification in New Zealand. These included:

- allergies to genetically modified food and to an environment contaminated by genetic modification
- poorer health for the next generation, given genetic modification-related ill health
- poorer health for the economically disadvantaged (in New Zealand and elsewhere) who may be able to afford only genetically modified food. Other options will be too expensive
- severe and generalised health deterioration from loss of food sources and genetic modification-contaminated environment
- viral diseases and other infections from horizontal gene transfer to humans
- death from genetically modified medicines (eg Insulin)
- inappropriate use of genetic modification-diagnostic testing in workplace and for insurance
- non-insurability of health effects
- loss of choice in health care as genetically modified medicine become more ubiquitous and alternatives, such as homoeopathy, are genetic modification-corrupted
- unknown risks from nutraceuticals (eg ‘Golden Rice’).

Another health issue identified by many submitters was the likelihood of increasing the incidence of antibiotic resistance in human through the consumption of

genetically modified food. These submitters pointed out that scientists use an “antibiotic resistance marker gene” to determine whether or not the genetic modification successfully occurred. They cited scientists who believed that these antibiotic resistance genes could transfer over to humans when genetically modified food is consumed, rendering many antibiotic treatments in hospitals ineffective. A related concern was that viral vectors (notably *Escherichia coli*) used to transmit genetic material were themselves dangerous, being capable of transferring to human beings through the genetically modified food they eat.

Economic risks from the use of genetic modification identified by public submitters included:

- loss of organic and non-genetically modified produce markets (with consequent employment declines), given environmental contamination
- loss of agricultural and forestry markets generally, given unreliable productivity as a result of genetic modification-contamination
- generalised economic costs to the New Zealand economy as benefits are captured by multinationals
- decline in tourism with the loss of our clean, green image
- loss of Maori commercial fisheries (quotas wiped out by genetic modification-contamination of fisheries).

Risks and benefits of avoidance of genetic modification

In general, when public submitters identified benefits from genetic modification, they associated them with genetic modification avoidance in New Zealand. However, in some cases they identified benefits and opportunities from genetic modification use. These are also discussed later in the report (see “Opportunities from use or avoidance”).

Benefits

One set of benefits identified by submitters was, they stressed, contingent upon maintaining the integrity of the natural environment. For them, an environment in its natural state (that is, without any release of genetically modified organisms) would be healthier and safer for its inhabitants. In addition, it would enhance the spiritual and psychological health of a range of groups including Maori, specific religious groups, identified ethnic minorities and others, such as vegetarians, who live according to particular sets of beliefs.

Often, public submitters argued that remaining genetic modification-free would open the way for New Zealand to develop a profitable organic production sector and take advantage of the growing international demand for organic produce. The potential benefits to the New Zealand economy would include foreign exchange earnings, employment growth (including those in production and research), potential savings from reduced production costs and regional economic development. Other economic benefits would include tourism growth and opportunities to develop new business, for instance based around seed banks and the preservation of biodiversity.

Most of the health benefits from avoidance of genetic modification identified by public submitters related to the advantages of living in a genetic modification-free environment, eating genetic modification-free food (often confused with organic food) and having access to a quality environment and organic food denied other countries. Many submitters suggested that the absence of genetic modification in New Zealand would lead to people living healthy life styles with a sense of sovereignty over themselves, wholesomeness, personal integrity and cultural and/or ethical safety. Some of those arguing that a rejection of genetic modification would pave the way for New Zealand to establish itself as a viable organic producer also suggested that the country would profit from an increased interest in studying and using organic/natural ways for alleviating disease and illness.

Risks

It was very unusual for public submitters to identify risks to anything as a consequence of genetic modification avoidance. This is not a surprising result given the overwhelming objection to the technology by public submitters. The few risks identified included rampaging pests, increased use of chemicals and overuse of land, as a result of increased production. Health risks from avoidance of genetic modification identified by public submitters cluster around potential benefits forgone:

- missing out on genetic modification-treatments
- loss of researchers and knowledge, given ‘brain drain’, with consequent loss of health treatment advances
- opportunity costs to New Zealanders of rejecting genetically modified foods if they prove healthier
- denying people cures for inheritable conditions.

Economic risks resulting from genetic modification avoidance, identified by a small number of submitters, included:

- loss of markets if genetic modification production proves competitive

- economic sanctions by United States, European Union and other trading partners if New Zealand avoids genetic modification
- loss of scientific capability if genetic modification research is constrained either because New Zealand scientists will not be able to participate fully in the new technological revolution or they leave to pursue their science elsewhere
- loss of agricultural productivity compared with competitors
- loss of investment in science and genetic modification production.