appendix 3

Outcomes of Consultation: Submissions from the Public

Contents

Introduction to Appendix 3

This volume is one of the appendix volumes to the report of the Royal Commission on Genetic Modification to the New Zealand Government on its investigations into the strategic options and desirable changes to regulatory mechanisms to enable New Zealand to address genetic modification, genetically modified organisms, and products.

There are three appendix volumes covering the New Zealand context, the Commission's consultative processes and the outcomes of that consultation:

- Appendix 1 outlines the New Zealand context for the inquiry and records the major aspects of the processes of the Commission.
- Appendix 2 summarises and analyses submissions from Interested Persons.
- Appendix 3 summarises and analyses submissions from the Public.

This appendix volume (Appendix 3) covers written and oral public submissions arising from the Commission's consultation process. These submissions were received through Scoping Meetings, Public Meetings, Public Submissions, the Maori Consultation programme, a Youth Forum and a Public Opinion Survey. This appendix also includes glossaries (technical terms, Maori terms and abbreviations) and an index.

Quotations, abbreviations and macrons

This volume includes direct quotations from submissions. Many quotations are sentence fragments. Minor changes have been made to direct quotations for the sake of readability and consistency. Thus:

- *realize*, *e.g.*, *1990's*, *GMO's* have been changed to *realise*, *eg*, *1990s*, *GMOs* respectively, in line with the report style
- abbreviation of *NZ* in quoted material has been replaced by *New Zealand* and *biotech* by *biotechnology*, but other abbreviations (such as *GE*, *GMO*, *IP*) have been retained
- punctuation has sometimes been altered so that an initial capital is replaced by a lower-case letter when the direct quotation functions as a sentence fragment in the text, rather than a complete sentence
- ellipses (…), normally indicating the omission of words or sentences within the quotation, are used at the opening or closing of the quotation only if it is relevant to signal a continuing argument or theme.

No changes to quotations affect the meaning intended by the submitter.

The format for quotations depends on their extent or context in the report structure. Two formats have been used:

- Short quotations, including sentence fragments, are incorporated in normal paragraphs and are indicated by quotation marks.
- Longer quotations, usually passages of several sentences or paragraphs, are presented as an indented paragraph or paragraphs below a colon. They are in a smaller type size and indented on the left. These quotations do not use quotation marks.

The choice of format is determined by the context and does not indicate that one quotation is considered more important than any other.

In referring to organisations and Interested Persons, this volume uses the title in full at first mention in each subsection of the report and thereafter uses any designated abbreviated form or acronym. This procedure is repeated for each subsection. For example, in any subsection, *Malaghan Institute of Medical Research* will subsequently be referred to as *Malaghan Institute*, and *Environmental Risk Management Authority (ERMA)* will be followed by *ERMA*. The choices for abbreviated forms of Interested Persons are listed in Appendix 2, Table 1. Other abbreviations and acronyms are recorded in the Glossaries section of this volume.

The printed version of the report of the Commission adopts the common modern usage of macrons over long vowels in Maori terms. A glossary of Maori terms is included in this volume.

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1. Scoping Meetings: summary of outcomes

Introduction

To scope the questions for subsequent submissions to the Commission, the Commission conducted a series of public meetings in Wellington on 7–9 August 2000 and offered an online participation mechanism. The nature of this consultative process, which was open to any person, is outlined in Appendix 1 of the report (see "Processes of the Commission: Scoping Meetings: the process"). Written contributions by mail and email were also received.

This section describes the findings of the scoping process in terms of the issues and ideas expressed and the outcomes of the scoping process.

Issues and ideas expressed

The scoping process began with sets of general questions, and then allowed participants to formulate their own range of specific questions. These questions offered guidance on the full range of issues that the Commission should consider during the course of its deliberations.

Scoping was a preliminary phase of the Commission's activities. Hence the responses from participants were assessed for content; in particular, looking for hitherto unrecognised issues. They were not assigned any statistical weighting nor were they for use in deliberations. However, a degree of quantitative assessment occurred in that it was sometimes evident that responses revealed clusters of issues as major concerns.

The issues and ideas expressed through the scoping process are outlined below in terms of the type of response:

- issues generating most response, such as human health, environment and ethical issues
- issues crossing several topic areas, such as evidence and uncertainty, long-term effects, acceptable risk levels, and objectivity and quality of information
- issues specific to topic areas

- questions seeking information because of a lack of clear, reliable information
- largely rhetorical questions, often about conflicting views regarded as probably irreconcilable
- suggestions on topic emphasis.

The examples given illustrate how participants in the scoping process formulated the range of issues of genetic modification that should be considered by the Commission.

Issues generating most response

The scoping process revealed high levels of public interest in issues of human health, environment and ethics. Within the crops and food topic, human health and environment were significant issues. For the topic of uses of genetic modification in medicine, human health and ethical issues were at the fore. New Zealand's international legal obligations also generated numerous responses.

Participants in the scoping process for crops and food expressed their concerns over risk assessment and the adequacy of testing procedures for food safety, especially testing for long-term effects of genetic modification. They identified a need for ongoing and objective research on genetic modification. On environmental issues, participants formulated a wide range of questions about the effect of genetically modified crops on soil, biodiversity and biosecurity, and the risks of horizontal gene transfer.

Assessment of risk was again a major concern when participants considered the scope of medical issues of genetic modification technology. Contributors acknowledged the potential benefits of genetic modification in providing safer and/or more effective medicine but also expressed concerns about the possibility of unanticipated side effects, allergic reactions or long-term adverse effects. They stated the need for objective research and public education on medical applications of the technology.

On ethical issues associated with medical uses, contributors to the scoping process particularised numerous concerns. These covered a wide range of issues, such as: equality of access to medical benefits, rights of patient choice, animal welfare, allocation of health care resources and control of genetic information.

Participants also responded strongly to issues arising from international legal obligations. They identified New Zealand's policies on genetic modification as relevant to its international agreements (such as the World Trade Organization's Agreement on the Application of Sanitary and Phytosanitary Measures and the supplementary agreement to the Convention on Biological Diversity known as the Cartagena Protocol on Biosafety), bilateral agreements with Australia (such as

Australia and New Zealand Closer Economic Relations Trade Agreement (ANZCERTA)), and the regulatory regimes of blocs of nations such as the European Union.

One of the major concerns was intellectual property law relating to the patenting of genetic information (as a general ethical debate and as an issue of proprietorship, including rights to indigenous genetic material). Participants questioned whether New Zealand could have its own intellectual property law distinct from that of its trading partners. They were concerned by the conflict between access to information for research needs and the confidentiality demanded by commerce and they asked whether the commercialisation of genetic modification technology should be regulated.

Issues crossing several topic areas

Some issues formulated during the scoping process were applicable over a range of topic areas. They included evidence and levels of uncertainty on aspects of genetic modification, testing methods, long-term effects, acceptable risk levels, ownership rights to knowledge, and the objectivity and quality of information. These were the issues on which participants appeared to want high-level action to provide appropriate assessment, monitoring, information and education.

As an example of these wide-ranging general issues, questions of objectivity and quality of information crossed several major topic areas. In crops and food, for example, participants identified issues relating to: authenticity of facts on food safety; accuracy and completeness of food labelling; checks on the origin of products; and the need for independent monitoring of laboratory work and field trials.

Similarly, in the topic area of medical applications, the scoping process identified issues of the accuracy of labelling, of the need for integrity in provision of information on genetic modification, and of patient choice depending on the completeness of information on medicines derived from genetic modification technology.

On the subject of intellectual property, participants identified a need for public education about patent issues. In responses to the subject of liability, they suggested that provision of full information to end users of the technology would remove any liability of retailers for the products of genetic modification.

Issues specific to topic areas

Other issues developed by participants in the scoping process were specific to the main topic area. For example, in the area of crops, food and environment, there was a specific issue on the marine environment, namely, whether it would be

regarded as a special case, given the difficulty of its management. Another involved the dangers of monoculture. On the topic of medical uses of genetic modification, participants stated concerns over the ethics and risks of xenotransplants.

Questions seeking information

Some of the issues developed through the scoping process were direct questions that sought information. They illustrated the complexity and extent of the subject of genetic modification. Among such questions were:

- What is the definition of a genetically modified product?
- What are the differences between genetically modified and non-genetically modified crops and technologies?
- When does a food become a medicine (eg vitamins)?
- What are the current controls on food safety?
- What are the Treaty of Waitangi obligations to Maori ethical rights?
- What are the specific Maori issues relating to intellectual property protection?

These questions confirmed the desire (expressed elsewhere by participants) for clear and unbiased explanations of the technology. People also sought information on genetic modification in relation to the special social and legal frameworks of New Zealand.

Rhetorical questions

Contributors to the scoping consultation also posed rhetorical questions, usually where there were conflicting viewpoints that they regarded as probably irreconcilable or matters that they considered as probably unanswerable. Often these views related to cultural and spiritual issues and people's rights.

Examples included:

- How does one balance Maori spiritual dimensions with Pakeha frameworks?
- How can the decision-making process accommodate the divergence of views of public against private, an individual against society, a minority culture against a majority culture?
- Who should choose someone else's genetic destiny?

Suggestions on topic emphasis and process

Various participants in the scoping process (particularly those who provided written comment by mail, email or online entries) made recommendations that went further than the formulation of specific issues at the workshop sessions. For example, they suggested changes in priorities to the blocks of subject matter. One

such suggestion was to increase the relative importance of ethical issues and break it down into subcategories of animal rights and welfare, human rights and ethics, and environmental ethics.

Outcomes of the scoping process

The scoping process provided the Commission with new information. It confirmed public interest in the issues of genetic modification and prompted planning for additional consultation initiatives. Participants in the scoping process provided the Commission with greater particularisation of the issues to be considered at Formal Hearings of Interested Persons and other forms of consultation.

Extent of national interest in genetic modification

The Scoping Meetings and online participation were among the earliest mechanisms for interaction between the Commission and the New Zealand people. The process revealed the extent of national interest in the subject of genetic modification and the proceedings of the Commission. This indication of the extent of public interest, unrelated to the clarification of issues at the heart of the scoping process, was nevertheless important. It confirmed the necessity for the Commission's commitment to facilitating dialogue with the people of New Zealand.

Review of consultation initiatives

As a result of these early indications from the Scoping Meetings of the depth of public concern, the Commission continued to review and expand its consultative options throughout August–September 2000. The schedule of Public Meetings and the Maori Consultation programme were reviewed and expanded. The Youth Forum was added to the mechanisms for consultation (see Appendix 1, "Processes of the Commission: Youth Forum: the process" and this volume, "Youth Forum: summary of outcomes).

The issues identified at the Scoping Meetings were used in the wider public consultation process of the Public Meetings.

Particularisation of issues

The Scoping Meetings, online participation and written contributions created a useful information resource on the issues to be considered by the Commission throughout the remainder of its deliberations. Clustering of responses provided an indication of which topic areas were related and which were particularly contentious issues. These blocks of subject matter and clusters of responses assisted the Commission in scheduling the Formal Hearings of Interested Persons so that

those with similar interests might be heard during consecutive sessions of the Hearings.

The scoping process provided an informative introduction to the role of the Commission in investigating the issues of genetic modification and receiving representations upon them. It reinforced the Commission's emphasis on consulting all New Zealanders on this subject.

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2. Public Meetings: summary of outcomes

As part of the Commission's public consultation programme, a series of Public Meetings was held in 15 cities or regional towns throughout the country during September, October and November 2000. These meetings provided an opportunity for the Commission to hear the views of the public in an informal setting. The Public Meetings were additional to Formal Hearings, Hui and written submissions, and a public opinion survey.

The purpose of the meetings was to allow the Commission access to the views and opinions on genetic modification of a wide cross-section of New Zealanders.

Each meeting had two parts, which were conducted by independent bilingual (English and Maori) facilitators. The first part involved a welcome followed by a workshop on issues and questions surrounding genetic modification. A series of questions was developed to facilitate discussion. The questions were intended neither to be definitive nor to indicate any particular viewpoint. The second part included workshop participants reporting back to the Commissioners on the issues identified during the workshop, and directing questions and comments directly to the Commissioners, thereby allowing for public comment on any issues not included in the workshops. This process is described in more detail in Appendix 1, "Processes of the Commission" ("Public Meetings: the process").

The process was developed to give each person present an opportunity to express themselves, and to facilitate discussion rather than adversarial positions. The key themes to emerge are presented below. The questions used in the meetings were posted on the Commission's website ("Public Meetings Questions" document), so are presented here in a shortened form. The summary of all questions relating to a topic is listed first, followed by representative responses from across the country indicative of some of the major points raised, relevant to any question of that group. This is because responses often addressed general issues rather than being directed towards a particular question. Full summaries of the workshop part of the public meetings were placed on the Commission's website.

The Commissioners reviewed the workshop cards, and tapes of the report back sessions were included in the initial review of material. The findings below summarise the workshop cards. A wide range of views was expressed in the responses to all questions. Responses were grouped under commonly recurring

themes which generally reflected the questions posed. Exceptions to this included the raising of animal rights issues and legislation.

Respondents' use of "GM" (genetic modification), "GMOs" (genetically modified organisms) and "GE" (genetic engineering) is retained in the summary of responses. Names of organisations whose abbreviated form has been retained in the summary of responses are listed in the glossaries at the end of this volume. The responses have been lightly edited for grammar and style consistency but are otherwise presented as a series of quotations.

Participants primarily expressed an opposition to the general release of genetically modified organisms and to any genetically modified products in the food chain. Other issues commonly raised included ethical, cultural and spiritual matters, economic concerns, agricultural and crop issues, and research, environmental and medical issues. These major concerns were felt consistently throughout the country. One exception was Hamilton, where issues surrounding research were raised more than in other centres.

Human health issues

Questions

What are the health issues associated with the use or avoidance of genetically modified:

- foods (production and consumption)?
- crops (production and consumption)?
- pharmaceuticals (production and consumption)?
- medical procedures?
- nutraceuticals?

Responses

Most of the discussion involved perceived negative health effects of genetic modification. The major areas of discussion included that high levels of uncertainty surround uses of genetic modification in food, that presently unknown allergies may develop, that transgenics are generally not favoured, that New Zealand could be the victim of an experiment, that personal choice will be reduced and that testing is not adequate. There was a lack of trust in those wanting to develop genetically modified food. Some participants highlighted that genetic modification may offer cures for diseases and should be permitted for this reason.

> Much is unknown about GM/GE and how it changes biological processes. Contamination from GE crops is unpredictable. Transgenic uses must be banned.

GE food has not been tested on human beings, therefore it is wrong.

What about the effects of exposure to proteins never previously present in foods?

Transnational industries can not be said to have good health as an objective.

Why are we funding GE when the world trend is towards organics?

Long-term negative effects of GM are unknown and may include allergies and viruses crossing species.

Consumer choice/Labelling issues

Questions

What rights do individuals have regarding their use or avoidance of genetically modified:

- food?
- crops?
- pharmaceuticals?
- medical procedures?

What are the issues associated with labelling genetically modified products, such as:

- the adequacy of an existing or new labelling regime?
- measuring and determining GM content?
- the containment of GM products?

Responses

Points commonly raised included consumers' rights to choose what they are eating, the level of possible contamination of non-genetically modified food with genetically modified food, the importance of food labelling to those with allergies and that New Zealand should convert to organic agriculture.

It is important to label GM medicines clearly.

Consumer sovereignty and personal right to choose what one ingests is an important human right. With that, I think it is important to label foods with any genetically engineered organism, whether whole or processed.

These GE foods have not been tested — we are the test sample. ANZFA does not test these foods but takes the word of the companies that are pushing them. We do not believe this protects consumers.

When a consumer chooses to buy organic food it is a very great concern that these will eventually be contaminated by the GE crops grown nearby! With cross-pollination occurring, how can we be sure seeds saved from organically grown plants are true to type?

It takes away our choice.

There will not be labelling of foods in restaurants/cafes, so how do we know what we are eating?

There is inadequacy of GE food labelling by ANZFA and difficulty in avoiding GE food. Consumers may purchase, for example, GE soy cooking oil, as it will not be labelled as genetically engineered.

The monopolisation of the food industry by a small number of corporations leads to less consumer choice and an uneven power balance, including control of prices and safety issues. We support local industry and not the globalisation of the food industry.

The myth that New Zealand is 'clean and green' we want to be real. Why not go organic New Zealand 100 percent organic?

Yes, let's label GM foods but, at the same time, let's ensure we label foods for other issues, such as: "soil erosion techniques (cultivation) used in the growing of this crop"; "diesel oil burnt, to grow this crop".

After six years of GE products on the market, with no damage/health risks being identified, what is the problem?

Cultural and spiritual issues

Questions

What are the cultural, spiritual and religious issues for Maori associated with the use or avoidance of genetically modified:

- food (production and consumption)?
- crops (production and consumption)?
- pharmaceuticals (production and consumption)?
- medical procedures?

What are the cultural, spiritual and religious issues for non-Maori associated with the use or avoidance of genetically modified:

- food (production and consumption)?
- crops (production and consumption)?
- pharmaceuticals (production and consumption)?
- medical procedures?

How and should spiritual, religious and ethical concerns be weighted against societal/economic benefits?

Responses

Responses generally showed concern with sovereignty over cultural and intellectual property, the possibility of 'genetic discrimination', human rights and freedom of choice.

> We are Maori and we should have the right to know what GE is all about. We need honest answers.
>
> The Treaty of Waitangi promises to protect our cultural and intellectual property. It is currently all being sold. We need to know that our properties are guaranteed to our Maori iwi and this nation.
>
> Under the partnership of the Treaty of Waitangi, both Maori and Pakeha should have the right of veto over important decisions like GM. Partnership means taking both views into account.
>
> GE is against the principles stated in the Treaty of Waitangi under Taonga, and the genealogy of Maori Whakapapa. To allow GE is to break the Treaty.
>
> Animals and plants have a right to be themselves just as humans have. Humans have an absolute right to freedom of choice — to know what they are eating.

Environmental issues

Questions

What are the environmental risks and benefits associated with the use of genetically modified:

- crops?
- foods?
- biological pest controls?
- herbicides/pesticides?
- pharmaceuticals?
- medical procedures?

Responses

The prime points raised in discussion were that general release of genetically modified organisms into the environment should not be permitted because of uncertainty about the effects, as well as concerns about the integrity of soil biota, that research should be permitted only in containment, that genetic modification technology is irreversible, that nature knows best and that it may be prudent to wait until further research is carried out.

> We are only stewards of this land. We do not have the right to change what nature intended. It has taken millions of years for the planet to evolve. Are the unspoken

generations yet to be born going to thank us, or curse us, for GE? A referendum is needed.

MAF is at present showing a huge lack of control over the entry of insects into our country. How can it monitor GE trials safely? I want the right to grow organic food for me and my family with no cross-pollination of GE.

We were of the view that the Commission must accept that the precautionary principle should be adhered to. The table was unanimous in this thinking.

Remember previous scientific mistakes — Mururoa Atoll, Agent Orange etc. There was scientific assurance but it still went wrong.

A tree creates 600,000 chemicals to control its environment naturally. Man can only synthesise 25,000. We cannot beat nature; nature knows best.

Our existence as human beings is possible through our coexistence with animals, vegetation and plant life. To tamper with and put genes of foreign entities (and viruses) into beings is unnatural and will lead to further foreign viruses developing.

GE pharmaceuticals and pesticide-resistant GM crops result in water pollution.

With respect to the question of burden of proof, the onus should be on promoters to prove it safe, rather than on consumers to prove it unsafe.

GE plants can be used for absorbing heavy metals as part of toxic waste reduction, ie, as bioremediation vehicles.

The strategic approach would be to wait. We can always introduce it if it is proven safe.

Please consider and take a holistic approach to all things Maori, who live and breathe the natural world of New Zealand.

Economic issues

Questions

What are the economic risks and benefits (regional, national and international) associated with the use of genetically modified:

- crops?
- foods?
- pharmaceuticals?
- pest controls?
- nutraceuticals?
- medical procedures?

Who should fund research into genetic modification technology?

Responses

Participants commonly raised such issues as that the risks of genetic modification in the environment and human body cannot be predicted, that testing for genetic modification content will not be expensive, that if New Zealand produces more organic food it will have an advantage over the rest of the world, that it is becoming difficult to obtain genetic modification-free ingredients and that there is large international demand for genetic modification-free food. There was also concern over who would bear the risks of the new technology and the dangers of cross-pollination.

> As a primary producer and tourism destination, the New Zealand economy depends on ecology. The Commission does not include an ecologist and should emphasise this when reporting on the effects of GE to our ecology and our economy.
>
> The cost of having two separate systems — GE and organic — should be borne by those who change the status quo. The cost of separation of the two systems is a loss to the economy.
>
> GE crops are capital intensive; they require a scarce resource. Organic crops are labour intensive; they utilise an abundant resource.
>
> Paying for modified seeds will erode our balance of payments yet the GE products do not command premiums on the world markets. Organic foods can be produced with minimal import cost and already command a premium.

Future use issues

Questions

What are the potential future uses of genetic modification technology in:

- New Zealand agriculture?
- New Zealand horticulture?
- New Zealand's pharmaceutical industry?
- New Zealand's medical industry?
- New Zealand's scientific industry?
- New Zealand foods?

Responses

Responses generally reflected that the Commission's recommendations will have a significant effect on the future of New Zealand, that being genetic modification-free is an opportunity, that world demand for genetic modification-free food is high and that biodiversity will be threatened. Other views were also expressed,

such as that the new technology may offer as yet unforeseen opportunities and that it may be used to generate higher prices for exports.

> GE may turn out in 30 years to have been a big mistake. Five years of testing to date cannot establish 30-year effects (asbestos, smoking, thalidomide) and no GE release should occur before contained testing for 30 years has occurred.
>
> Within each generation there is the general assumption that we know it all, only to find out in the next generation that we didn't. GM is likely to be seen as one of those huge mistakes leaving behind and in front of it a path of destruction.
>
> As New Zealand did with the nuclear issue, so this is again a chance to be a forerunner in showing we don't have to go down a negative road. We could easily become the envy of the world — a place where real food grows. We do not need to be fooled by scientists. It must be exciting for them, but the negatives outweigh the positives.
>
> I want all field trials denied in New Zealand. Aotearoa will not be able to grow organically or have the potential to grow safe food if we allow genetically engineered trials to occur in New Zealand.
>
> I am a student of ecology. GE will disrupt the natural processes and balance of earth's natural systems. These include dangers of viruses crossing over between species, mutations, and cross-pollination.
>
> As a remote nation with the opportunity to grab the organic market worldwide, why would we even consider the possibility of GM?
>
> Recommend as a first step to promote a thorough, honest education for every household in New Zealand. An information package should be assembled by every interested group or section of the population and sent to everyone in the country. It could utilise a question-and-answer format and call for feedback.
>
> Be open but controlled in what R&D is taking place in New Zealand on GE.
>
> New Zealand must examine all the options, using real data (not emotions) to determine its direction. Perhaps we should hold off public release of GMOs to give time. We can't have either/or organic/GE.

Global development issues

Questions

What global developments might influence the way in which New Zealand utilises genetically modified:

- crops?
- foods?
- pharmaceuticals?

- nutraceuticals?
- medical techniques?

What are the international environment, economic (including trade), political and social implications for New Zealand should it choose to use genetically modified organisms and associated products?

What are the international environment, economic (including trade), political and social implications for New Zealand should it choose not to use genetically modified organisms and associated products?

Responses

The wide variety of views expressed included that global development should be holistic, that new therapeutic products should be researched, that caution is necessary, that a spiritual approach is important, and that genetic modification is not the answer to world hunger.

> There should be a compensation process for unpredictable outcomes, eg through use of a bond.
>
> There'd definitely be threats and pressure and probably sanctions etc from pro-GM interests and pro-GM countries — much more than when we took a nuclear-free stance — but there'd be huge acceptance by a rapidly growing demand for organic food etc.
>
> There is growing demand for therapeutic approaches that are non-toxic, holistic and contain no side-effects. New Zealand would be wise to research, develop and promote holistic alternatives and strong preventative approaches to health.

Ethical issues

Questions

Questions of risk and liability introduced a wider debate on ethical issues.

Who should take responsibility for the risk associated with utilising genetically modified organisms and associated products?

Who should take responsibility for the risk associated with not utilising genetically modified organisms and associated products?

Responses

Responses included concern over a common inheritance which should not be patented, that genetic modification technology is profit-driven, that there is a loss of independence and choice, that there is need for a balanced decision and that the benefits of genetic modification should be available to all.

> Patent rights being allowed on naturally occurring gene codes is a theft from the common inheritance.

The application of genetic engineering is ethically flawed since it presupposes that all organisms can be employed for the benefit and profit of only one species, namely Homo sapiens. Therefore, GE goes against the very evolutionary processes that have shaped our planet. Remember, these have not been exclusively for the benefit of man — all forms are interdependent. By employing GE we are abusing our power over other species. With power comes responsibility.

There are ethical issues of using animals and humans as guinea pigs. Risks include passing genes on to non-target organisms and contamination; GM crops colonising and altering heritage crops; reduction of biodiversity, by contamination or GE species out-competing our native flora and fauna. This threatens our ability to become an organic nation.

The GM debate does not acknowledge a spiritual belief that all beings are interconnected — it experiments in isolation. The scientific lack of awareness around interconnectedness is dangerous.

Modern science has a mind set that is largely incapable of recognising the idea that life is sacred. It is therefore ill equipped to check its own activities from an ethical perspective.

Will we be the generation that future generations point to in anger and pain for being responsible for creating — in the name of profit — the greatest and most far-reaching man-caused disaster ever in the history of this planet?

There is need for an ongoing ethics forum to take debate out of political, economic area.

Is it ethical to export GMO products from New Zealand if New Zealanders don't want GMO products for their own consumption?

Questioning the ethics of the technology itself, technology is not value free. It has its own agenda.

What effect will GM have on people who have taken an ethical decision to become vegetarian? How will they be able to avoid eating foods containing animal genes?

Other issues commonly addressed at workshops

Legislation

In general, participants called for more regulation, and for independent testing for the presence of genetically modified ingredients.

ERMA approvals are keeping on going, with at least three during the Commission hearings so far. What of future uses if our regulatory agencies are so permissive?

Food labelling should have thorough coverage with no exceptions. Consumer choice has to

be honoured. It was agreed by Australasian Health Ministers two years ago but there is still no action for the patient public.

Animal rights

Concern was expressed about animal suffering, the large numbers of animals used in experiments and pollution from "GE pharms".

Animals used for xenotransplantation would be kept in a sterile environment and would be unable to perform their basic natural behaviours. There are also dangers of new diseases infecting humans and other animal species through xenotransplantation.

There have been many problems with the GE of animals that have been modified so far. For example, unexpected results such as GE salmon with deformed heads, or negative results, such as pigs modified to be heavier having joint and cardio problems.

Why is there no inclusion of animal rights and welfare issues in the terms of reference?

The improvements in production of GE animals are unlimited, unlike the changes and improvements made through the process of natural selection.

There is a lack of understanding of DNA. There is not enough knowledge of animals' DNA to experiment with GM. GM takes a reductionist view of organisms. Genes function in a complex and unpredictable way. Genes cannot be taken in isolation. We can never predict the consequences of the GM of animals.

Pharming is completely unethical. Because of possible cross-species disease transference, animals are kept in sterile, lifeless conditions. These animals are completely denied basic freedoms.

Will transgenic meat be clearly labelled and publicised? Will this practice be permitted in New Zealand?

Intensive farming of genetically altered animals for research or farming practices also creates a risk of environmental and human damage from run-off from farms and factories. Who will be responsible for controlling this? Will this be reported when it happens?

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3.1 Introduction to the analysis of Public Submissions

The Commission was established by the Governor-General in May 2000, with the gazetting of a Warrant setting out its terms of reference. The Warrant (see Appendix 1, "Operational detail: Terms of reference") requires the Commissioners to report to Government on two matters:

(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

The terms of reference set out 14 headings under which the Commissioners may make inquiries and receive representations. These address advantages and disadvantages; benefits and risks; cultural and ethical considerations; legal obligations, here and internationally; responsibilities arising under the Treaty of Waitangi; and economic considerations.

The Warrant requires the Commissioners to consult with the people of New Zealand in a way that allows them to express their views clearly. The Commissioners' approach to that task has been guided by the basic requirements set out in the Commissions of Inquiry Act, the directions given in the Warrant and the resources and time available. However, the details of the process have been largely up to them to set. Opportunities for public input have included:

- initial *Scoping Meetings*, which were used to determine the key questions and specific issues that needed to be addressed (see Appendix 1, "Processes of the Commission: Scoping Meetings"; this volume, "Scoping Meetings: summary of outcomes")
- *written submissions from Interested Persons*, who are defined under Section 4A(1) of the Commissions of Inquiry Act as any person (which includes organisations) who "has an interest in the Inquiry apart from any interest in common with the public", and who were entitled to appear and be heard at the Inquiry (see Appendix 1, "Processes of the Commission: Formal Hearings"; Appendix 2, "Analysis of written submissions by Interested Persons")
- *written submissions from the public*, ie, from those who were not granted Interested Persons status but who were entitled to file submissions with the Commission in written form, and for whom any further participation was a matter for the discretion of the Commission (see Appendix 1, "Processes of the Commission: Public Submissions: the process"; this volume, this section: "Analysis of Public Submissions")
- *consultation with Maori*, whereby, in accordance with the Warrant's direction to the Commission to consult and engage with Maori in a manner that specifically provided for their needs, the Commission arranged national and regional Hui and a series of workshops, where Maori and some non-Maori presented their views (see Appendix 1, "Processes of the Commission: Maori Consultation: the process"; this volume, "Analysis of Maori Consultation")

- *Public Meetings*, held in 15 regional centres throughout New Zealand (see Appendix 1, "Processes of the Commission: Public Meetings: the process"; this volume, "Public Meetings: summary of outcomes").

The submission process

The Warrant required the Commission to seek the views of the public, including ethical, cultural, environmental and scientific perspectives, on the use of genetic modification, genetically modified organisms and products in New Zealand. The Commission called for submissions from the general public on the subject of genetic modification as it related to the Commission's terms of reference. The deadline for the receipt of public submissions was 1 December 2000.

The Commission provided guidelines for the written submission process. Those accorded Interested Persons status were provided with a standard template for submissions. This was designed to assist the Commission in addressing the items set out in the Warrant. The Commission provided some general formatting guidelines for public submissions. An alternative format with topic headings was also provided. The Commission informed submitters that submissions would be analysed on the basis of these topics and that it would be helpful to the Commission if submissions followed this general format.

While the Commission encouraged the use of certain forms of submission presentation, these were not prerequisites for acceptance. The Commission also indicated a preference for submissions in electronic form (either on disk, or by email) followed by hard copy in typed rather than handwritten form. The Commission strongly discouraged repeat or 'form' submissions based on a common template. Submitters were not required to conform to any of the formats and submissions in other written formats were also accepted.

The Commission indicated its intention to make submissions publicly accessible on its website but reserved the right to refrain from publishing all or any part of individual submissions. In cases where persons wished to submit confidential information, the Commission could limit the public availability of submitted material.

Analysis of Public Submissions

The analysis of public submissions by the Centre for Research, Evaluation and Social Assessment (CRESA) started in early December 2000, following the closing date for acceptance of submissions.

A template was designed for the quantitative analysis of information provided by public submitters. This template broadly reflected the matters itemised in the Warrant and was designed to be consistent with that used in the analysis of Interested Persons but with appropriate amendments to better incorporate the views of public submitters.

Each submission was analysed using this template and data for each submission was entered into a database and analysed using the Statistical Package for the Social Sciences (SPSS). This analysis identified patterns of opinion on specific matters set out in the Warrant, particularly:

- common views expressed amongst public submitters
- divergent views expressed
- matters that submitters considered unresolved.

Some qualitative analysis of the submissions was also carried out throughout the analysis process. Analysts systematically recorded other themes that were not incorporated into the template. Frequency counts of these other themes were recorded and incorporated into the SPSS database for inclusion into the quantitative analysis. Workshops, structured around Warrant items, were also held with the analysts during the latter part of the analysis process. In these, analysts provided further detail about the themes, based on their notebook recordings and collective discussion.

Analysts also identified submissions that contained quotes that could be incorporated into the final report. These quotes were selected because they expressed new ideas or commonly shared views in a particularly coherent, or typical, manner.

An important part of the analysis of public submissions involved a quality check to ensure that the submissions provided were legible, readable by analysts and met other analysis criteria[1].

[1] Matters that needed further attention with a minority of public submissions included: the need for translation, usually from Maori but also from Samoan and some European languages; poor legibility; incomplete submissions, sometimes because of fax transmission errors; lack of relevancy; difficulties in identifying submitters, given their use of pseudonyms; inclusion of other correspondence such as letters from submitters to the Royal Commission, for instance about the submissions process; duplications of submissions; multiple submission by the same submitters; multiple submitters using one identifying email address; evidence submitted with no guidance as to how the submitter would like that evidence to be interpreted. Seeking resolution to these problems continued throughout the analysis process. While some could be sorted out, problems around legibility and incomplete fax tranmissions could not. Also, the few submissions that were not relevant to the Warrant were included in this analysis in that submitter characteristics were noted. However, the content of these submissions was not relevant to the matters set out in the Warrant.

Profile of Public Submissions

The vast majority of public submissions were from individuals (96.9%), with 2.1% from groups of individuals and less than 1% from organisations or groups. These organisations included:

- farming interests (organic, non-organic and fish)
- advocacy groups (anti-genetic modification, social, health and environmental)
- retailers and retail associations
- private companies (with and without genetic modification involvement)
- various social and political groups
- district councils.

Types of Public Submitter are shown in Table 3.1.

Also among the organisations making submissions to the Commission through the public submission process were certain government departments and agencies that either had not sought or were not granted Interested Person status. These organisations provided extensive information for the Commission to consider, mainly on matters of policy, processes, legislation and regulation relating to biotechnology issues. A brief summary of some of the relevant information is provided below as section 3.15, "Comment on policy, process and regulation provided through public submissions by public sector organisations". This material was reviewed separately and is not part of the analysis report of sections 3.1-3.14.

Table 3.1 Type of Public Submitter (n = 10,861)

Submitter type	Number	%
Individual	10,524	96.9
Multiple individuals	227	2.1
Organisation/group	93	0.9
Unclear	17	0.2

Further personal information about submitters was usually not provided and, therefore, could not be systematically recorded. However, some submitters provided information, for instance identifying as Maori, male, female, Jewish, vegetarian and so on. Reference has been made to the personal qualities of some groups of submitters as appropriate to illustrate the range of views expressed.

Most submissions came to the Commission in hard copy form although some arrived via email. Most were short: 89.7% were single-page submissions. Approximately half of the remaining submissions were two pages in length, with the majority of others between three and 10 pages long. Only 3% of submissions were presented in a form format. A number of submitters (perhaps a third) used the submission format suggested by Greenpeace and other groups. These forms included headings consistent with the matters laid out in the Warrant, focusing discussion on strategic options and submitter perceptions of risk and benefit. However, most used that format to structure their own views; only a minority also used the words suggested by those groups.

The report structure

This report summarises the views expressed in the 10,861 written submissions from the public. The structure of the report reflects the content of the Warrant, which requires the Commissioners to report on two principal matters, the first being the strategic options available to New Zealand to respond to genetic modification technologies. The other principal area addresses changes to the current legislative, regulatory, policy and institutional arrangements for addressing genetic modification. The Commission is also authorised to investigate a range of relevant matters. These matters, itemised in the Warrant, cover the use of genetic modification in New Zealand, liability, intellectual property, the Treaty of Waitangi, relevant global developments, opportunities from use or avoidance of genetic modification and main areas of public interest. Thus, the report includes sections on the following broad topic areas:

- strategic outcomes, issues and options
- statutory and regulatory system
- use of genetic modification, genetically modified organisms and products
- evidence and uncertainty
- risks and benefits
- international obligations
- liability

- intellectual property
- Treaty of Waitangi
- global developments
- opportunities from use or avoidance
- main areas of public interest.

The final section summarises the main themes presented in the submissions.

section 3.2 |

appendix 3

Outcomes of Consultation: Submissions from the Public

Section contents

3.2 Strategic outcomes, issues and options

Background

Information about strategic issues and outcomes is sought from Warrant items under "Relevant matters". Warrant items (k) and (m) request information on, respectively:

> the key strategic issues drawing on ethical, cultural, environmental, social, and economic risks and benefits arising from the use of genetic modification, genetically modified organisms, and products
>
> the range of strategic outcomes for the future application or avoidance of genetic modification, genetically modified organisms, and products in New Zealand

With reference to strategic options, the Warrant asks the Commission to receive representations upon, inquire into, investigate, and report upon:

> the strategic options available to enable New Zealand to address, now and in the future, genetic modification, genetically modified organisms, and products

Outline of this section

To present the views of public submitters, this section is divided into three parts:

- The first, addressing Warrant item (m), outlines the range of *strategic outcomes* public submitters identified as desirable for the main areas of public interest identified in the Warrant. These include human health (including biomedical, food safety and consumer choice); environmental matters (including biodiversity, biosecurity issues and the health of ecosystems); and economic matters (including research and innovation, business development, primary production and exports).
- The second addresses Warrant item (k) by describing the *strategic issues* raised by public submitters relating to the ethical, cultural, environmental, social, and economic risks and benefits arising from genetic modification. The issues they raised focused on acceptability, choice and risk assessment and management.

- The third part addresses Warrant item (1) by reporting public submitters' views about the *strategic options* available to enable New Zealand to respond to genetic modification, given their desired social, environmental and economic outcomes and the issues they raised about acceptability, choice and risk assessment and management.

Strategic outcomes

The vast majority (92%) of public submitters were opposed to genetic modification (this is discussed further below and demonstrated in Table 3.2). The sort of social, environmental and economic world that public submitters sought could be inferred from their comments about why they generally rejected genetic modification. This section of the report summarises these desired outcomes, which relate to avoidance rather than application of genetic modification, with reference to human health, social matters (both nationally and internationally), environmental matters and the economy. Where possible, the ways that public submitters defined health, social matters, the environment and the economy are also included. In general, submitters opposed genetic modification and, therefore, only rarely outlined strategic options that would include use of genetic modification.

Health outcomes

Public submitters focused on two dimensions of health: treatment and prevention. While they identified both these dimensions as important, they tended to place slightly more emphasis on prevention. Thus, they tended to focus on factors that they considered as having an effect on their health. These included the environment in which they, and their children, lived and the food they ate. A smaller proportion of public submitters also wrote about the diagnosis and treatment of disease and other health-related conditions.

If submitters specified the sorts of health outcomes they considered desirable, they most often referred to the following:

- being allergy free
- being disease free or being exposed to fewer diseases
- living in a healthy environment, often defined as a natural environment
- having healthy children
- ensuring the health of the next generation
- ensuring that the next generation has the same access to, and choices about, health

- survival of the human species and the ecosystem in which humans live
- equal opportunity to health both within New Zealand and between nations. This covered both access to health care and affordability of healthy options (eg access to genetic modification-free food). Many public submitters were also concerned about health within developing nations and their equitable access to health outcomes
- having spiritual wellbeing and cultural health.

Environment outcomes

Environmental quality was of great concern to submitters, who mostly wrote about the indigenous flora and fauna of New Zealand and the physical landscape. Some referred to the environment in more ecological terms, with a minority including humans as part of the wider ecosystem or ecosystems.

In general, public submitters expressed a positive, often idealised, view of the New Zealand environment. Many described the natural and physical environment as pristine and clean and green and described that purity as enhanced by New Zealand's nuclear-free stance. If public submitters doubted the pureness of the current New Zealand environment, they indicated the belief that, as one submitter wrote, "... it is still within our control to make this country a safe, clean, green Paradise!" Encapsulated in their concept of environmental virtue, was an assumption of New Zealand remaining genetic modification-free. Some people equated being genetic modification-free with embracing organic production while others argued that New Zealand could work towards fully organic production.

Social outcomes

The characteristics of public submitters' desired social environment could be inferred from their comments about the aspects that would be lost through the application of genetic modification. These characteristics included:

- equity, within New Zealand, between nations and between generations. The aspects of equity most commonly raised included equal access to resources, acceptance of diversity (including ethnicity, culture, religious belief, ethical belief) and lack of discrimination (particularly relating to physical differences such as disability). Often those discussing equity issues did not elaborate further than their demand for equity and fairness
- individual and national self-determination, achieved through individual choice, individual or collective control over, or consent about, some important matters, recognition of human rights, individual or collective

feelings of safety, individual and collective (group or national) pride and acceptance of difference

- stability. Public submitters' desire for stability in the social environment to some extent equated with the concept of equilibrium in ecosystems. They wrote about harmony and certainty
- democracy, described as public input into decision-making and consumer choice.

Economic outcomes

The part of the economy most commonly discussed by public submitters was food production, particularly primary production and food processing. To a lesser extent, they also referred to other industries such as forestry, tourism, and fishing (both for food and recreation and tourism). Only rarely did they refer to biotechnology, including research and production.

Public submitters often talked about the economy as a dichotomy between locally owned industry (generally perceived as small and good), and multinationals (generally seen as large and bad). One submitter's comments summed up views of many, by describing multinationals as "... self-seeking commercial interests posing as world benefactors [who] apply seductive or threatening pressures. We must close our eyes and ears to them." They also tended to characterise New Zealand products, particularly from primary production, as high-quality and clean and green. This image of New Zealand's purity was seen as an important competitive advantage for New Zealand businesses that submitters worried could be threatened by the adoption of genetic modification. In general, however, submitters indicated that economic considerations are still of less importance than human health, environmental quality and social equity.

Public submitters' comments about the economy of the future and the economic outcomes New Zealand currently seeks, or should seek, reflected their widespread confidence in the future. Their views about the current state of the environment were similarly positive. A common view was that, with a genetic modification-free future, New Zealand would experience economic growth leading to national wealth and increased employment. As other countries adopted genetic modification they would necessarily be seen as "contaminated". New Zealand, because of its geographic isolation, would be the only producer able to guarantee a pure product and demand for New Zealand produce would be phenomenal. New Zealand's competitive advantage lay in the fact that " ... as an island country we have every opportunity to be fully organic which carries no risk and is better for farmers, will feed people and not kowtow to large corps". This economic growth would be

based on small-scale production, particularly food production using organic processes, through locally owned industries. Such economic activity would enable New Zealand to be more self-sufficient, thus freeing the country from dependence on multinationals, the United States and other outside influences perceived as having unwelcome control over New Zealand's environment and economy.

Only a very small number of public submitters felt that genetic modification could prove an actual benefit to New Zealand's future, and many of those felt resigned to it rather than enthusiastic. These submitters felt that it is "... better to be carving our own destiny than to be impotent when one is imposed on us". Knowing that genetic modification is here to stay, these submitters would prefer to see New Zealand at the forefront of the technology rather than left behind.

Strategic issues

Public submitters raised a number of strategic issues around the use of genetic modification with respect to human health and environmental, social and economic matters. These include issues around consumer or public choice, risk and risk management, and acceptability.

Issues of choice

Whatever the area under consideration, public submitters were concerned about choice. These concerns related to personal and national self-determination and sovereignty. For many submitters this was the key issue, arguing that "... the cornerstone of any advanced society is that of an individual's freedom to make choices ...". For instance, public submitters argued their right to have choice over the state of the environment in which they lived (that is, whether it remained genetic modification-free), whether they would consume genetically modified or genetic modification-free food or whether they would accept genetic modification-based medical treatments. Thus, they considered strict labelling requirements for food and medical products an imperative.

Public submitters were also concerned about the impact of some people's actions on the ability of others to have a choice. For instance, they argued that any release of genetically modified organisms would preclude others from having a choice to produce or consume locally produced organic food. Many of the concerns raised about genetic modification in food were expressed in these terms. Public submitters expressed a desire to have non-genetically modified food available, accessible and affordable and many felt that the introduction of genetic modification would necessarily impair their choice.

Closely linked to submitter notions of choice was the ethical issue of consent. A substantial number of submitters concerned about issues of personal choice also discussed their right to consent to genetic modification in their environment. These submitters feared that they would be subjected to "the genetic modification experiment" without their consent. This issue was most often discussed in relation to food, but also in relation to medical applications. Submitters expressed a desire to know details of their medical treatment or what they were eating with the right to "opt-out" of anything involving genetic modification. A number of submitters saw evidence of this right being eroded in the cases of genetically modified insulin and the lack of a stringent food labelling regime.

Issues of risk and risk management

For most public submitters, the risks associated with genetic modification were perceived as too difficult to identify and potentially too great to contemplate. Benefits claimed by scientists and companies involved in genetic modification were seen as too few, obtainable by other means, and benefiting too few people (mainly multinational corporations) to justify an "... experiment, the consequences of which are unpredictable, uncontainable, and potentially irreversible". Information about risks associated with genetic modification is poor. Therefore, submitters argued, the concept of risk management is inherently flawed, and they:

> ... would like to see the dubious science of 'risk management' explained and debated thoroughly by the public. Risk management assessments are constantly used as a justification for genetically engineered experimental and commercial cropping yet many of us find the reasoning and application of risk management bizarre, insane, incorrect and collusive with the interests of big business.

The majority of commentators argued that risk avoidance, through the rejection of genetic modification, was the only responsible way forward.

Public submitters perceived risk assessment as difficult because the contexts (for instance, ecosystems, human bodies) within which direct and indirect impacts potentially occur are complex. Therefore, the types of impacts, their location, timing and cumulative effect cannot be predicted with any certainty. Given these difficulties, some submitters questioned the ability of agencies responsible for assessing risk to assess that risk. In particular, submitters were concerned about the assessment of food and the capability of the American Food and Drug Administration (FDA) and the Australia New Zealand Food Authority (ANZFA) to assess food safety adequately.

Submitters expressed concern that regulatory agencies were too lax in their risk assessment techniques, accepting the safety studies produced by companies at face

value without conducting their own independent trials, and focusing too narrowly on the tests in question. Submitters were concerned that wider environmental impacts of genetic modification were being ignored, citing, for example, a study initially passed by the Environmental Risk Management Authority (ERMA) that later needed closer scrutiny when it was discovered that genetic modification waste products were being ejected without treatment into the sewer system. A few submitters likened the situation to the introduction of possum and ferrets into New Zealand without consideration of the wider impact on indigenous flora and fauna.

However, submitters also argued that, regardless of the difficulties of assessing risk, these agencies and others need to continue assessment processes and pursue approaches to improve their assessment techniques. The submitters' comments demonstrate a conundrum. On the one hand, they want a 100% guarantee that current or potential use of genetic modification technologies (eg, for health care and food production) are safe. But on the other hand, they believe that current assessment skills and techniques cannot provide certainty around safety and many do not trust the organisations concerned. Many submitters view company research as biased and regulatory agencies as compromised by links to industry, citing the "revolving door" as evidence of a biased system:

> Many of us like to think we are living in a democracy, not a dictatorship run by Multinational Corporations and large Food Manufacturing Companies, who manipulate governments and their appointed agencies including the FDA, ANZFA and ERMA. People with a long history of employment in these Multinational companies are too often found in these agencies and I do not believe that they are therefore capable of making unbiased decisions for the people's good.

Given this conundrum, public submitters recommended caution. A high number of submitters suggested applying a form of the precautionary principle emphasising safety, in which the onus is on the producer to guarantee safety, rather than on others to prove risk. "When in doubt, don't" is a submitter's quote that sums up this view, emphasising that genetic modification should not go ahead until and unless it is first proven safe.

Submitters outlined core principles required of any risk management approaches adopted. These included corporate responsibility and liability with regards to unintended consequences (the 'polluter pays' principle), the independence of risk assessment and risk management agencies, giving priority to considerations such as safety over profit and a strong regulatory framework.

Issues of acceptability

For the small proportion of public submitters who discussed the use of genetic modification to achieve particular outcomes, its acceptability depended on a range of factors, particularly the cultural, ethical, religious and/or value stance of themselves or identified groups. For instance, the use or manipulation of human genes would be unacceptable for Maori, given human beings' tapu status, as would the inclusion of pig genes in food for Jewish and Muslim people and the inclusion of any animal genes (including dairy products, eggs and so on) in food for vegans. One vegetarian submitter described her concern that:

> ... many vegetarians feel threatened by GM because genes taken from animals are being copied and used in vegetables. Despite the fact that scientists argue that the genes which are being used are only exact copies of animal genes, most vegetarians, including myself, would never consider this sort of reasoning to be acceptable.

Other factors also identified, but less frequently, as influencing the acceptability of genetic modification included:

- the nature of benefits gained, to people, the environment or the economy
- submitters' personal health status or that of close relatives or friends
- submitters' occupations or involvement in particular economic activities.

Given these factors, genetic modification technologies may be acceptable if they enhanced environmental quality, but unacceptable if there is risk of developing pests such as "super-weeds", increasing herbicide resistance or cross-species gene transfer. They may also be unacceptable if they interfered with, or undermined, the integrity of the environment. For many submitters, any interventions to the environment that altered its original state were perceived as unacceptable. They used terms like "as God intended" and "as Nature intended" to explain their valuing of the environment in its natural state. Often these submitters were concerned that "... human beings behave as if we are outside Nature instead of realising we are part of it." These submitters included people arguing from a generic ethical perspective, a Maori perspective, a Jewish perspective, vegetarian and vegan perspectives and an economic perspective (particularly as organic farmers).

Some submitters were very concerned with animal rights, writing that "... many people prefer to live in a world which is moving away from the cruel treatment of animals and will oppose genetic engineering ..." and refused to sanction any uses of genetic modification in which animals were exploited. This included the production of animals genetically modified for xenotransplantation, the production of human health treatments and vaccines, and the use of animals in research. These concerns

transcended the genetic modification debate, with these submitters being:

> ... opposed to GM in medicine where animals are used, eg where it involves the inhumane use of animals, eg 'spare parts' animals. I believe that animals should have no role in the treatment of human diseases.

These submitters were adamant that human beings do not have the right to tamper with the genetic make-up of other animals merely to improve their own condition.

Strategic options for genetic modification

Public submitters were overwhelmingly opposed to genetic modification in New Zealand (see Table 3.2). They viewed the introduction of genetic modification as inconsistent with, or threatening to, their environmental, social and economic aspirations. Their anxieties about genetic modification were compounded by their doubts about its acceptability to various groups, their scepticism about the possibility of risk assessment and risk management and their concerns about loss of choice.

The strategic options available to enable New Zealand to address genetic modification, as identified by public submitters, reflected their general anxiety about the technology. Most submitters (9,695 of the total 10,861) made some references to how New Zealand should respond to genetic modification. Nevertheless, as Table 3.3 shows, some of these submitters did make exceptions to an overall rejection of all genetic modification activities. These related to their acceptance of New Zealand's pursuit of certain health, environmental and social outcomes (discussed previously), the achievement of which could be aided by the application of genetic modification.

Table 3.3 shows that over half the submitters who commented on New Zealand's strategic options clearly rejected any application of genetic modification. A significant number of these expressed two opinions, preferring a complete rejection of genetic modification, but also recognising that they might not be able to halt it. Therefore, they demand, at the minimum, a strict labelling regime to allow them the choice to avoid genetically modified products. A further 26.4% indicated a strong objection to genetic modification, but wrote predominantly about food. It was not clear from their comments whether they accepted other applications or not. Only small proportions of submitters were generally accepting of genetic modification, always well less than 1% suggesting strategic options that allowed for any widespread application. When considering risk assessment and risk management options, public submitters were far more likely to suggest a precautionary approach and most unlikely to suggest genetic modification application in the absence of firm controls.

Table 3.2 Public submitters' general stance on genetic modification (n = 10,861)

Stance on genetic modification	Number	%
Strongly against	7035	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

Differences between public submitters were slight, with the vast majority indicating a preference for minimal genetic modification activity. However, there were some differences between organisations and individuals or groups of individuals. In particular, organisations were more likely to be accepting of application of genetic modification than individuals or groups of individuals, but also more likely to suggest the need for a strong regulatory framework. This is not surprising, however, as a regulatory framework would not be needed if genetic modification was rejected altogether — the preference of most submitters.

Some public submitters highlighted uses of genetic modification they would be willing to allow under certain conditions. The range of acceptable applications identified by public submitters is discussed below, under four headings:

- health-related options
- environment-related options
- social-related options
- economy-related options.

Health-related options

Most exceptions to a total ban on genetic modification related to the pursuit of health outcomes. Given their focus on both prevention and health treatment, the strategic options identified reflect public submitters' interest in maximising both prevention and treatment opportunities. When commenting on health prevention, submitters focused mainly on environmental quality and food production and

Table 3.3 Strategic options for genetic modification in New Zealand (n=9,695)

Strategic options orientation	Number	%
Generally accepting of GM		
Accept most GM uses but within a strongly controlled regulatory framework	42	0.4
GM use except for a limited and selected range of excluded activities	40	0.4
Embrace all aspects of GM	39	0.4
Accept most GM uses	25	0.3
Adopt GM because its use is an inevitable global phenomenon	22	0.2
Embrace all aspects of GM technology within minimalist regulatory framework	6	0.1
Generally reject GM		
No GM, no GMOs or GMPs permitted in New Zealand	5461	56.3
No GM for a specified use (often food-related), no comment on other uses	1546	15.9
No GM in food, no comment on other uses	1014	10.5
GM free except for a limited and selected range of uses	552	5.7
Risk assessment and risk management options		
Need strongly controlled regulatory framework (particularly for food labelling)	979	10.1
Continue moratorium (whether voluntary or compulsory) pending further research	777	8.0
Wait and see what happens overseas	404	4.2
No patenting of GM products	236	2.4
Case by case assessment balancing risk against benefit (taking cautious approach)	184	1.9
More consultation with the public	137	1.4
Need minimalist regulatory framework	6	0.1

Multiple response

processing. When commenting on health treatment, some submitters also commented on health research into treatments. The widespread demand for a ban on genetic modification of food and food products was usually argued on health grounds.

To achieve health outcomes through health treatments, submitters identified a range of exceptions to a total rejection of genetic modification. These ranged from general support for the use of genetic modification in health (in contained laboratory settings and with strong controls and risk management) and/or treatments to genetic modification technologies in the treatment of specific health problems, including multiple sclerosis, diabetes, arthritis, Attention Deficit Disorder, cancer, Huntingtons chorea and Parkinsons disease.

Submitters were more likely to support non-targeted genetic modification application for a range of health problems than targeted use for specific health problems. Examples of specifically defined exceptions to applications of genetic modification included:

- any intra-species uses (genetic modification within a species)
- any inter-species uses (genetic modification between species)
- any application to inheritable genes such as for Huntingtons chorea. A few submitters rejected such applications as undermining human diversity and denying the legitimacy of human imperfection.

Environment-related options

Exceptions to a total ban on genetic modification were also identified for the achievement of desired environmental outcomes. These environmental outcomes related to both environmental quality, for instance through pest control, and environmental enhancement, for instance through enhancing biodiversity and revegetation. Thus, for a very small number of submitters the application of genetic modification technologies may be acceptable for:

- eradicating pests such as possum, Old Man's Beard, gorse and rabbits
- treating pollution such as oil spills
- revegetation of indigenous species
- recovering extinct species or saving threatened species
- reducing the use of pesticides and insecticides.

Social-related options

A few submitters also identified exceptions to a total ban on genetic modification to achieve social outcomes. These social outcomes usually related to equity issues,

within New Zealand, between developed and developing nations, and between current and future generations. Thus, some submitters accepted the use of genetic modification to address particular equity issues such as a reduction in the costs of food. However, the vast majority of submitters who commented about equity issues in relation to food argued that the distribution of food was at the heart of problems around food supplies rather than the production of sufficient food. They were also distrustful of "miracle claims" surrounding genetically modified crops, highlighting studies in which promised benefits ('super yields' for genetically modified crops, and supposedly vitamin A-rich 'Golden Rice') failed to materialise.

There were some submitters who had few qualms about genetic modification in itself but were worried about the economic and ethical framework in which it is occurring. Their primary concern was that private, corporate interests are exercising complete control over new developments, developing genetically modified products in areas of highest profit while simultaneously restricting independent research into other benefits. This concern was best expressed by submitters who felt that "... the profit motive has no place in GM-research." For these submitters, the capitalist system and the market economy should have no place in such fundamental research. These submitters were happy to see more research and development of genetically modified products (usually in contained situations, but sometimes more widespread) if it was under strict public control and scientists were known to be working for the benefit of humanity.

Economy-related options

Public submitters were far less equivocal about the strategic use of genetic modification to achieve economic outcomes. Because most public submitters saw New Zealand's economic future in organic and genetic modification-free primary production, they were less likely to accept any use of genetic modification technologies. While some accepted some laboratory-based research, very few could see field trials or release as consistent with their preferred economic future. A great number of submitters saw genetic modification as having the potential to destroy the New Zealand economy, for instance through massive crop failures, evaporating global demand for genetically modified products, or over-reliance on foreign corporations.

Although many submitters argued that genetic modification would lead to worsening public health, some argued that the use of genetic modification in health treatments would have economic benefits, given a reduction in health costs. Some public submitters argued for a continuation of what they assumed to be closely controlled use of genetic modification in laboratory settings, to achieve

economic outcomes and to enable New Zealand's participation in the global biotechnology sector. In extremely rare instances, public submitters argued for minimally controlled use of genetic modification to achieve economic outcomes.

section 3.3 |

3.

appendix 3

Outcomes of Consultation: Submissions from the Public

Section contents

3.3 Statutory and regulatory system

Background

The Warrant contains two items that relate to the statutory and regulatory framework and processes that are currently in place in New Zealand, namely Warrant item (2) and, under "Relevant matters", item (n).

Warrant item (2) called for information and comment on:

> 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

and Warrant item (n) called for information and comment on:

> whether the statutory and regulatory processes controlling genetic modification, genetically modified organisms, and products in New Zealand are adequate to address the strategic outcomes that, in your opinion, are desirable, and whether any legislative, regulatory, policy or other changes are needed to enable New Zealand to achieve these outcomes

Both Warrant items invited submitters' comments on the current legislative, regulatory, policy and institutional arrangements. The first, item (2), invited comment on desirable changes and item (n) on their adequacy and, also, changes needed to achieve strategic outcomes (discussed in the previous section). Given the similarity of these Warrant items and the ways in which submitters raised issues around regulatory and legislative processes, their responses to these two Warrant items are combined into a single section of the report.

The few public submitters who commented on legislation and regulations tended to make general comments about the adequacy or inadequacy of current regulatory and legislative processes rather than link suggested changes to the strategic outcomes they identified as desirable. Thus, their comments generally related to how they perceived the current processes as operating and how they might be improved.

Outline of this section

This section of the report presents submitters' views about:

- the adequacy of the current legislative and regulatory system
- problems with the legislative and regulatory framework
- suggested improvements.

Adequacy of current statutory and regulatory system

As Table 3.4 shows, only 113 public submitters made any comment about the overall adequacy of the current legislative and regulatory framework, and most of their comments were of a general nature. When specific comments were made they were almost always with regard to food, referring to either labelling requirements or production controls. To some extent, their less specific comments may have reflected their general lack of familiarity with, or detailed knowledge of, current legislation and regulations and the decision-making processes. The most significant features of the current legislative and regulatory framework are the Hazardous Substances and New Organisms (HSNO) Act, which is the principal legislation affecting the use of genetic modification in New Zealand, and the Environmental Risk Management Authority (ERMA).

Table 3.4 Adequacy of current statutory framework and regulatory process (n = 113)

Adequacy of current framework/process	Number	%
Inadequate – complete renewal required	61	54.0
Needs major improvement to be made adequate	29	25.7
Adequate – no improvement required	10	8.8
Needs minor improvement to be made adequate	7	6.2
Adequate but could be improved	6	5.3

It needs to be noted that many submitters may not have felt a need to address the current legislative and regulatory framework as they were recommending a total ban on genetic modification, precluding the need for more detailed comment. Submitters were more likely to comment on general issues such as the perceived lack of attention given to ethical and cultural issues; the lack of independence of individuals and organisations responsible for administering regulations and approving applications; and the lack of guiding principles to inform these processes and ensure better decision-making.

Problems with current system

Some 292 public submitters commented on perceived problems with the current statutory framework and regulatory process. Few public submissions contained specific references to the current legislation (rarely was the HSNO Act referred to and submitters were more likely to refer to ANZFA than ERMA). Their greatest concerns related to insufficient regulation of genetic modification activity and little recognition of public views, including ethical, spiritual and cultural considerations. See Table 3.5. Some also expressed concern about lack of clarity around definitions used. Other than in submissions presented by Maori interests, Treaty of Waitangi and other Maori-related concerns were seldom raised.

In general, public submitters made no comment about characteristics of the legislation, such as its prescriptive rather than principles or outcomes basis and the absence of discretionary powers. Similarly, they made no comment about compliance costs and impacts on research investment. In fact, they were more likely to suggest that current legislation and low compliance costs enable or promote research rather than limit it.

Public submitters addressing the current regulatory framework were intent on freeing ERMA and ANZFA from what they saw as excessive levels of corporate control. They expressed a desire for regulatory bodies and decisions to be totally transparent and above suspicion. Most of these submitters felt that ANZFA and ERMA were currently biased towards corporations, and politicians overseeing the process could not be trusted to work on behalf of the general public instead of big business. The example most frequently cited was that of a recent court case in the United States in which it was shown that the FDA declared genetically modified foods to be safe against the recommendation of many of its own scientists. This perceived bias in the regulatory system was also felt to be rife in the political system as well, with politicians more concerned about big business than public safety. Given this lack of trust, a number of submitters felt that "... a referendum is

essential if our present leaders still proclaim themselves to be governing for the good of all the people of New Zealand."

Public submitters also raised issues around consistency with respect to the legislative frameworks of New Zealand and its international trading and other partners. They typically expressed a view that any inconsistency with international partners could be a virtue. They thought that New Zealand should take an independent stance, as with the case of nuclear power. Such independence, they argued, could give New Zealand moral, ethical and economic advantage.

Table 3.5 Problems with current statutory framework and regulatory process (n = 292)

Problems with framework/process	Number	%
Under-regulates GM	154	52.7
Potential to allow patenting of genetic material	76	26.0
Too little recognition of those opposed	39	13.4
GM inappropriate for ethical/spiritual/cultural reasons	34	11.6
Over-regulates GM	10	3.4
Fails to protect information and intellectual property	8	2.7
Barrier to GM research investment	5	1.7
Too high transaction costs for applicants	5	1.7
Includes irrelevant social/economic and ethical criteria	1	0.3
Inconsistent with international agreements	1	0.3
Inconsistent with trading partners	1	0.3
Other	6	2.1

Multiple response

Other identified problems with the regulatory process (but mentioned only once or twice) included:

- too much secrecy in the application process
- overly low transactions costs for applicants
- limits on consumer choice
- unnecessary bureaucracy
- no viable risk assessment strategy
- need for the debate on genetic modification to be separated into research, medical uses and field releases.

Suggested improvements

The public submitters who commented on legislative improvements (4259 in total) tended to focus on what the legislation should do. Few commented on what needed to be changed to make it more effective. This lack of specificity probably reflected the majority's lack of familiarity with the legislation. One of the strongest messages given by public submitters who commented on legislative improvements was their desire for the legislation to bar all genetic modification, genetically modified food or specific genetic modification uses (57.9%). Most of these wanted all genetic modification activities barred. The next strongest message, as Table 3.6 shows, was for more stringent food labelling requirements (46.3% of those who commented).

Most submitters demanding a stricter food-labelling regime were insistent that it be comprehensive, detailing any use of genetic modification anywhere in the production of that food. Many expressed dissatisfaction with the labelling regime proposed by ANZFA, one individual, for instance, writing that "... the new labelling laws announced by ANZFA (an organisation who has no non-industry consumer representation) have favoured the Biotech Industry and Grocery Manufacturers over the concerns and fears of the people who have to eat the food." Public submitters wondered why New Zealand has delayed the implementation of a labelling regime when other countries have had one in place for years.

Many submitters who preferred a total ban on genetically modified products also expressed resignation that they could not keep genetic modification out of New Zealand. They, therefore, insisted that, at the very least, a comprehensive labelling regime must be installed.

The improvements to decision-making processes around genetic modification suggested by public submitters were usually of a generic nature. Only 109

Table 3.6 Improvements to legislation (n = 4259)

Improvements to legislation	Number	%
Bar all GM or GM food/crops or specific uses	2469	57.9
More stringent labelling, particularly for GM food	1974	46.3
Increase prescription of procedures (fines, penalties and enforcement)	467	11.0
New organisational/institutional mechanisms required	192	4.5
Expand to include social, economic, and ethical considerations	153	3.6
Clarify principles, concepts and definitions	52	1.2
Improved protection of information and intellectual property	31	0.7
Allow greater procedural discretion	21	0.5
Provide appeal and review mechanisms, institutions and processes	21	0.5
Ban specific aspects of GM	19	0.4
Define liability	10	0.2
Increase consistency with key trading partners	7	0.2
Increase compatibility with international obligations	2	0.0
Other	94	2.2

The "Other" category included suggested improvements to HSNO Act and other legislation:

- amending to increase restrictions
- amending to decrease restrictions
- repealing the new organism sections
- retrospective application (re. Application A363 – Monsanto) after amendments
- introducing strictest labelling requirements, covering any amount of genetic modification
- removing any requirement for GM-labelling
- withdrawing from ANZFA and replacing it with a New Zealand body
- reviewing ANZFA assessment methods
- gaining independence from international organisations and free trade agreements
- repealing the Plant Variety Rights Act
- amending the Biosecurity Act to exclude GM-biotechnology
- following the EU stance on genetic modification.

Multiple response

submitters commented on ERMA. However, most of these argued for more attention to social and ethical considerations and increased independence. See Table 3.7 for details of suggested improvements to ERMA, Table 3.8 for improvements to decision-making processes.

For 310 submitters commenting on processes in general, their comments seemed to be directed at ideal types rather than responding to known shortcomings of current arrangements. The suggested establishment of an independent body was a case in point. A small number of submitters suggested the setting up of an independent, trustworthy organisation (defined as free from profit motive) that would monitor, assess, and audit genetic modification experiments, trials and genetically modified products to ensure their ethical, environmental and health safety. However, there were also specific suggestions for changes to, or extensions of, current legislation. For instance, in suggesting changes to the legislation to ban specific aspects of genetic modification, submitters variously identified terminator technology, antibiotic resistance marker genes, viable genetically modified organisms, genetic modification of animals, patenting, experiments, commercial uses and military uses as requiring total bans. Others suggested embedding liability clauses in legislation to:

- provide protection for non-genetic modification producers
- establish an indemnity scheme for health risks
- establish central (rather than regional) government responsibility for impacts
- require public liability insurance and/or bonds for environmental protection
- set a tax on genetically modified products.

Public submitters expressly asked for more principle-based processes. In particular, given their concerns about the shortcomings of risk assessment, the potential enormity of risks and the general lack of information about risks, they argued for a precautionary approach to any decision-making.

Table 3.7 Improvements to ERMA (n = 109)

Improvements to ERMA	Number	%
Expand capacity on social, economic and ethical considerations	50	45.9
Increased independence	30	27.5
Clarify assessment criteria and/or method	24	22.0
Separating process from corporate control	20	18.3
Increase enforcement – heavier fines, penalties for non-compliance	19	17.4
Increase discretion over procedures	13	11.9
Increase Maori representation	11	10.1
Reduce costs	6	5.5
Other	16	14.7

The "Other" category included the following specific suggestions about ERMA:

- legislating consideration of health, ecosystems, ethics, biodiversity, and public education, not only economic matters in risk assessment
- renewing, renaming, reorganising ERMA to focus on risk management
- more diverse membership on ERMA
- reduce time needed for approval.

Multiple response

Table 3.8 Improvements to process (n = 320)

Improvements to process	Number	%
Increase public consultation and participation	154	48.1
New organisational/instruction mechanisms required	113	35.3
Establish controls commensurate with risk	62	19.4
Case-by-case assessment	29	9.1
Increase consultation and participation of Maori	27	8.4
Provide appeal and review mechanisms	19	5.9
Establish an independent body	15	4.7
Delegate oversight of contained laboratory experiments	11	3.4
Improved protection of information and intellectual property	4	1.3
Industry undertakes regulation	3	0.9
Decrease public consultation and participation	3	0.9
Allow self-regulation through peer review processes	2	0.6
Delegate oversight of low-risk contained laboratory experiments	1	0.3
Other	12	3.8

The "Other" category included the following suggestions:

- adopting the Precautionary Principle
- directing government research funds to organic research and development
- introducing a Genetic Bill of Rights / Protection from Genetic Discrimination
- introducing a Code of Conduct
- establishing a Ministry of Organic Production
- establishing a Ministry for Genetic Modification.

Multiple response

section 3.4 |

3.

appendix 3

Outcomes of Consultation: Submissions from the Public

Section contents

3.4 Use of genetic modification, genetically modified organisms and products

Background

Warrant item (a) calls for information about the current use of genetic modification in New Zealand:

> where, how, and for what purpose genetic modification, genetically modified organisms, and products are being used in New Zealand at present

Three categories of genetic modification activity occur across land-based production, environment, human health and food production. These include:

- pure science exploration of genes and the manipulation of genes and DNA sequences
- applied research and technology development in which genetically modified products and genetic modification technologies are devised, evaluated and tested
- the end-use of genetic modification products, processes, organisms and technologies outside experimental or developmental contexts.

Amongst the public submissions, few provided details about activities, other than anecdotal information about what they believed was occurring. However, some of the more substantial submissions, especially those from related industry and research organisations, contained detail about current activity. Most, however, provided general references to activity submitters believed were occurring with little or no detail about the exact location of it.

Outline of this section

This section of the report shows public submitters' perceptions about how and where genetic modification technology is currently used in New Zealand.

Table 3.9 Public submitters' perceptions of genetic modification use in New Zealand and overseas (n = 7641)

Perceived uses	Number	%
Food unspecified	4858	63.6
General reference to GMOs, products or items	4040	52.9
Crops – food production	2463	32.2
Crops – non-food production	2263	29.6
Applied research – farming production (including field trials)	1774	23.2
Pure research	930	12.2
Environmental management (includes possum control)	600	7.9
Human health – non-defined	569	7.4
Human health – treatment	425	5.6
Horticulture – food	320	4.2
Farming not otherwise defined	294	3.8
Stock – food	210	2.7
Horticulture – non-food production	183	2.4
Food manufacturing	179	2.3
Applied research – human health	177	2.3
Stock – non-food	128	1.7
Animal health – non-defined	85	1.1
Applied research – animal health	83	1.1
Forestry production – undefined	76	1.0
Dairy	71	0.9
Fish production	64	0.8
Applied research – forestry	56	0.7
Human health – vaccines	49	0.6
Applied research – environmental protection	44	0.6
Human health – diagnostics/testing	23	0.3
Bee and honey production	21	0.3
Other manufacturing	16	0.2
Animal health – diagnostics/testing	10	0.1
Animal health – vaccines	7	0.1
Game production	5	0.1

Multiple response

How genetic modification technology is being used

Although Warrant item (a) sought information about where, how and for what purpose genetic modification activities were currently occurring in New Zealand, submitters rarely referred to the purpose of activities and where they might occur.

Public submitters also often wrote about genetic modification activities here and overseas, rather than limiting their comments to New Zealand. Further, the activities they listed were concentrated in the areas about which they expressed most anxiety. As Table 3.9 shows, these were food related: food (unspecified) and crops for food.

It was difficult to assess whether or not public submitters were aware of the wide range of applications for genetic modification. The vast majority limited their comments to genetically modified food, but it is unclear whether this was because that was the only application of which they were aware, or whether they were primarily concerned with food and merely chose not to comment on other areas (eg medical applications).

section 3.5 |

appendix 3

Outcomes of Consultation: Submissions from the Public

Section contents

3.5 Evidence and uncertainty

Background

Warrant item (b), called for information on:

> the evidence (including the scientific evidence), and the level of uncertainty, about the present and possible future use, in New Zealand, of genetic modification, genetically modified organisms, and products.

While only a small percentage of public submitters commented specifically on evidence matters, greater numbers expressed concern about the levels of uncertainty about current and future use of genetic modification technologies.

Outline of this section

This section of the report includes:
the views of public submitters in general, and with reference to:

- environmental matters
- social matters
- health matters
- food matters
- economic matters.

General comments

Generally, public submitters were unlikely to raise issues related to uncertainty and evidence. (As Table 3.10 shows, 359 submitters commented on uncertainty and the nature of evidence.) However, given the large number of public submitters overall, even this small proportion covered a wide range of topics. Although public submitters rarely addressed the issue as outlined in the Warrant specifically, anxiety about uncertainty permeated their submissions. As well as raising concerns about uncertainties in general and a need for public information, they commented about uncertainty with respect to four areas: environment, health, food and economy. In each of these areas, submitters wrote of uncertainties around risk,

safety, costs and benefits, other compounding factors, such as ethical considerations, and any evidence to support their apprehension.

Many submitters raised concerns over the lack of trustworthy information available to the public. There were two main perspectives. First, there was a call for more information from people who felt ill-informed to make a decision about genetic modification, and wanted all the facts presented in an unbiased forum. Second, some submitters wanted to see the government provide funding for the dissemination of information highlighting the risks of genetic modification. This second group were angry that the government was funding pro-genetic modification groups (perceived as linked to big business) while groups opposed to genetic modification (perceived as small collections of individuals) were struggling to raise funds and make themselves heard.

Submitters also made general comments, in particular noting their lack of faith in the safety of genetic modification technologies in general, given the relative 'newness' of the technology, insufficient or inadequate testing, equivocal results, and their lack of trust in the corporate producers and their claims of benefits from genetic modification. The lack of trust, which often was also extended to scientists and government (and the legislative and regulatory framework), stemmed from their belief that these entities do not work in the public interest. Some public submitters also noted their lack of certainty about the levels of genetic modification research and application in New Zealand currently and their lack of faith in the ability of producers to control the genetic modification technologies they develop and use.

Public submitters also displayed concern about safety assurances by scientists, arguing that the procedures used to genetically modify organisms were themselves random, and scientists could not be sure where exactly inserted genes would "end up" in the organism. They worried that this could result in dangerous products with unforeseeable consequences.

Public submitters tended to judge evidence of risk as more certain and evidence of safety and benefits as less certain. Submitters were generally aware that there was no conclusive proof of serious danger, but felt that there was ample to justify a precautionary approach. The comment was frequently made that "... absence of proof of risk is not proof of absence of risk." Submitters backed up their scepticism about genetic modification safety and claimed benefits by referring to:

- unanticipated negative environmental and economic impacts of past (non-genetic modification) technologies and current genetic modification technologies. Amongst the latter, the examples identified included studies

showing Monarch butterflies dying from genetically modified corn pollen, genetically modified crops affecting the soil, and cross-pollination from genetically modified crops to wild varieties creating "super-weeds"

- unanticipated health risks such as new allergies arising from genetically modified pollen, the evidence that insertion of genes from the Brazil nut into soy could cause potentially fatal allergic reactions in people eating soy products, the poisoning of a number of people in America through a batch of genetic modification-produced tryptophan, and studies showing evidence of possible horizontal gene transfer through genetically modified pollen in bee guts
- some submitters produced as evidence the application by Monsanto to increase the allowable residue of its herbicide 'Round-Up' on food to support their concern that genetic modification would necessarily result in greater chemical use in food production
- bad company practice through previous disasters (including non-genetic modification technologies) in which companies denied wrongdoing, hid evidence of risks, and attempted to evade responsibility
- the ambiguity of scientific results, given factors such as a perceived untrustworthiness of scientists, and conflicting reports from scientists.

Many submitters displayed outrage and anger over pro-genetic modification claims of benefits arising from genetic modification. This outrage was most often expressed over the "GM can feed the world" argument. One submitter's comment that it is a "cheap attempt to sway public opinion" reflected the views of others. These submitters pointed out that starvation was not due to a global food shortage, that genetically modified crops promising "miracle benefits" were proven to be rarely better than non-genetically modified varieties (possibly worse), and that leaders of developing countries themselves criticised these claims. Much intense anger (though less widespread) was also expressed over scientists and businesses getting funding and public support from claims of miracle health benefits that failed to materialise or would, at best, take many years to materialise. These submitters were outraged that proponents of genetic modification were preying on the fears of the sick and raising "false hopes" in a conscious act of deception.

Table 3.10 summarises the attitudes of submitters who commented on evidence relating to the safety of, or risks posed by, genetic modification technologies. Overall, few public submitters specifically commented on the strength of evidence around genetic modification safety and genetic modification risk. However, only a handful of those who commented believed that there is evidence that genetic modification is safe or no evidence that it poses risk. Most of those who

Table 3.10 Existence of evidence or information about GM-safety or risk (n = 359)

Existence of evidence or information	Number	%
Evidence that GM is safe or no evidence that it poses risk		
No scientific evidence/information that GM poses significant risks	11	3.1
There is scientific evidence/information that GM is predominantly safe	2	0.6
No evidence/information that GM poses risks	2	0.6
There is evidence/information that GM is predominantly safe	0	0.0
Evidence is equivocal	21	5.8
Evidence that GM poses risk or no evidence that it is safe		
There is evidence/information that GM poses significant risks	166	46.2
There is scientific evidence/information that GM poses significant risks	108	30.1
No evidence/information that GM is predominantly safe	36	10.0
No scientific evidence/information that GM is predominantly safe	13	3.6

commented believed that there is evidence that genetic modification poses risks or no evidence that it is safe. A small group believed the evidence is still equivocal. One submitter, who identified himself as a former manager at a pharmaceutical company wrote:

> ... the only evidence able to be adduced is from parties who have a vested interest in seeing Genetic Engineering proceed. This evidence may or may not be true and factual but it must be regarded with considerable scepticism. One of the simple facts of scientific papers and presentations is that they are heavily funded by commercial concerns and have been shown to be tainted in the past. Both the Pharmaceutical Industries and more clearly the Tobacco Industries are examples of this ... [As a former manager] I can testify to the view of a research paper being held back from publication when it does not suit the company's product objectives.

Environmental matters

The comments of public submitters reflected their general belief that scientists' and producers' uncertainty about the impacts of genetic modification technologies and applications was reason enough to avoid them altogether. Uncertainty around impacts related to:

- unknown but probably negative impacts of genetic modification applications on current and potential organic farming
- impacts of non-contained genetically modified crops on other crops
- impacts of non-contained genetically modified crops on wild varieties
- general degradation of the environment from, for instance, toxins from roots of genetically modified plants washing into waterways, genetically modified crops allowing greater use of herbicides and their run-off and impact on wild plants
- unpredictable changes and imbalances through manipulation of the evolutionary process that could take years to manifest and lead to catastrophe. One quote "Make no mistake, Nature will retaliate" is typical of these submitters' views
- risk of genetic contamination of indigenous flora and fauna.

Public submitters also commented on factors that potentially exacerbate people's levels of anxiety because of uncertainties around the impacts of genetic modification. Factors identified by submitters included:

- non-containment of genetically modified crops
- lack of ethics in genetic modification research and development
- lack of choice faced by both other producers (such as organic producers) and the general population in areas where genetic modification applications occur.

Public submitters usually did not cite evidence to back up their concerns. When they did cite evidence, it was usually of a more anecdotal nature. Thus, a number of people cited the negative impacts of genetically modified crops on beneficial insects (such as studies on the Monarch butterfly) and birds as evidence of the unpredictable nature of genetic modification impacts. Reference was occasionally made to the book *Silent Spring* as proof of the dangers of ignoring environmental impacts of new technology. They also referred to the contamination of American and Canadian corn and canola crops by genetically modified crops, and the resulting loss of markets in Europe.

They were more likely to draw analogies from environmental disasters unrelated to genetic modification, pointing out often irreversible consequences of previously sanctioned technologies. The ecological damage caused by gorse, rabbits, possum, thar and deer were presented as evidence of the unforeseen negative impacts from introducing apparently useful, but harmful, exotic species.

Submitters also offered the uncertainty felt by others as evidence of the unacceptable risk from genetic modification. The most commonly cited evidence was the reluctance of insurance companies to insure against impacts. They interpreted this reluctance as proof of great risk and potentially disastrous consequences. "Genetic engineering is so risky that insurance companies refuse to touch it, so why should we?" was one expression of this view. Also raised, though less frequently, was scientists' "unwillingness" to give 100% assurances of safety. This was seen to be proof of risk.

One of the strong themes in public submissions was growing public distrust in the scientific process, which they saw as unduly influenced by scientists' funding sources. One submitter's statement summed up wider concern:

> A growing dependence on private funding means that many academics are having their research interests aligned with those of their donors. Crown Research Institutes, which are involved in genetic engineering and work closely with many universities, are required to operate as successful going concerns, and to sell their research. This means that industry is able to capture the benefits of publicly funded research and may mean that findings which are damaging to industry interests are withheld.

The perceived lack of independence of scientists means that their assurances about genetic modification safety do not lessen public anxiety. Public submitters wrote about what, in their view, were the unrealistic claims of benefit from genetic modification. One example they commonly cited was of scientists exaggerating the ability of 'Golden Rice' to provide the necessary daily dietary quantities of vitamin A. They also drew parallels to non-genetic modification cases (eg the tobacco, nuclear power and pharmaceutical industries) in which, they argued, scientists routinely assured the public that products were harmless.

Submitters saw reason to distrust corporate involvement in genetic modification and believed multinationals were trying to monopolise food sources. They expressed concern that companies would attempt to claim royalties from farmers who have genetically modified crops growing on their land due to uncontrollable factors such as pollen drift. Submitters often cited the landmark Canadian lawsuit in which Monsanto is suing a farmer for this very reason as indicative of how New Zealanders could lose control over their crops, farms, and home gardens.

Submitters' uncertainties about genetic modification were also heightened by their religious/ethical/values stances. Some commended the "natural balance" of ecosystems, only achievable through natural selection processes and destroyed through genetic modification. The attitudes of many submitters were summed up by one who wrote to make the point that "... any way, I like imperfection because that's what makes us what we are." Other submitters identified the Bible as evidence to back up their belief that genetic modification is wrong

More generally, public submitters were inclined to trust their own feelings and gut reactions to genetic modification. They considered these feelings to carry as much weight as any other arguments. As one submitter wrote "... genetic modification makes me feel SICK and UNEASY to the depths of my very being. It must be stopped!!" [submitter's emphasis] They felt that their own beliefs and feelings should be considered and respected by Government and the Commission. Others believed that this would not be the case and strove to provide more scientific evidence to back up their ethical and emotional stance.

Social matters

Several submitters raised concerns about the impacts, or the uncertainties around those impacts, of genetic modification on human society. Their fears included:

- a potential (but unspecified) breakdown of society
- a general decline in morals and ethics as they are disregarded in the pursuit of profit
- the effects of genetic screening or eugenics on society (which they compared to the ethnic cleansing policies of Nazi Germany). Some people with specific medical conditions were concerned that people like them could, in the future, be genetically screened out
- the impacts of genetic modification applications on social and economic equity. For instance, some groups may be disadvantaged (or "ghettoised") by their lack of access to the benefits of genetic modification or genetic modification-free products.

Health matters

Public submitters wrote about their unease regarding the claimed benefits from genetically modified health technologies and their concerns about the impacts of genetic modification activities (in the environment and elsewhere) and their

impacts on the health of themselves and their children. Their concerns included:

- uncertainty about the capacity of the treatments to achieve the claimed outcomes and their effects on individual health. Submitters cited evidence of genetically modified human insulin causing allergic reactions and other negative health impacts on users. Some also presented AIDS, which they attributed to vaccine work with monkeys, as evidence of negative health effects of crossing species
- uncertainty about the health effects of releasing genetically modified products into the environment. The most commonly cited area of concern was the release of genetically modified pollens and their unknown effects on asthma and other allergies. Another less frequently raised concern came from people interested in homoeopathy. They wondered whether genetic modification would alter or remove medicinal benefits of plants, either immediately or unexpectedly, in the future
- the unknown effects of exposure to genetic modification activities (including health treatments) on people's social, psychological, spiritual, cultural or ethical integrity. These effects may arise because people are opposed to genetic modification and have little choice about their exposure to it or have no control over access to it
- the unknown effects of genetic modification technologies on the health of future generations. As evidence, public submitters referred to the ongoing effects of chemical such as Agent Orange, DDT and thalidomide
- uncertainty about the impacts of genetic modification on the public health system. The level of health benefit from genetic modification-based treatments is still unknown, as are the opportunity costs of avoiding genetic modification-based treatments and the extent to which the health system may be overburdened by any negative health effects from people ingesting genetically modified food.

Food matters

For public submitters, uncertainties associated with genetically modified food related to people's lack of choice about what they eat, the potential impacts of genetic modification on organic food production, and its impact on food safety and quality.

Consumer choice was an important issue for public submitters, and they identified several reasons why the introduction of genetic modification into food production decreased their confidence in having choices. First, the lack of food labelling

information precludes consumers in general from being able to choose what they eat. Secondly, particular groups of consumers with special need for certainty about their food composition are compromised. These include, for instance, Maori, who reject the inclusion of human genetic material in animals, Jewish and Muslim people with religious dietary restrictions and vegetarians and vegans who reject ingesting all animal products. Third, patenting of genetically modified products may restrict consumer choice by, for instance, raising the costs of some foods so that they become unaffordable.

Uncertainties around organic food production, given the unknown effects of genetic modification technologies, were also raised by public submitters. While their greatest concern was for commercial production, they were also concerned about home gardening. They felt that any genetic modification activities placed current and future production under threat, especially as cross-pollination and other potential impacts are still largely uncharted. The insertion of Brazil nut genes in soy beans and the possible contamination of genetic modification-produced tryptophan were cited as evidence of current, unanticipated risks.

With the application of genetic modification in food, uncertainty around food quality increases. Public submitters strongly defended people's rights to quality food, which they characterised as safe, nutritionally healthy, tasty and available. Several factors increase uncertainty around these components of food:

- The concept of substantial equivalence in food testing concerned a number of submitters who argued that the lack of adequate testing for those foods deemed substantially equivalent decreased consumer certainty about food safety. A number of these submitters were also concerned about a possible double standard in which genetically modified food could be both substantially different (allowing it to be patented) and substantially equivalent (allowing it on to the market with little or no testing).
- The failure of innovations like the Green Revolution and mono-cropping have increased public anxiety about the impacts of genetic modification on food quality and availability rather than assuaging it. Submitters cited the deteriorating taste of fruit and vegetables, especially tomatoes, as evidence that technological intervention often reduces food quality.
- Genetic modification activities can undermine availability of food. While scientists argue that genetically modified food has the potential to alleviate food shortages, submitters argued that shortages are as much to do with distributional problems and politics and cited difficulties in the distribution of aid in developing countries and war zones as evidence. Some also noted the negative impacts of genetically modified food production on land use in

developing countries, where subsistence farming is progressively undermined.

Economic matters

Although public submitters were most concerned about uncertainties relating to the environment, health and food, some also raised concerns about the economy and the potentially negative impacts of genetic modification on existing and future economic activities. For the most part, they focused on organic production, particularly on the damage any application of genetic modification technologies in the environment was likely to have on commercial production. While they were concerned about current organic activity, their greatest concern was for the damage to future production. A common view amongst submitters was that the demand for organic produce overseas, especially in Europe, would continue to grow. Any release of genetically modified organisms would deny New Zealand farmers the opportunity to become certified producers and take advantage of that demand. It would also deny future workers the opportunity of employment in the organic farming sector. Their view was that organic and genetic modification production cannot coexist. Submitters referred to the landmark canola case in Saskatchewan, Canada (already mentioned) as evidence of the conflict between genetic modification applications and other farming activities.

Submitters saw a unique opportunity for New Zealand to capture a niche market in non-genetic modification and organic production. They contrasted that opportunity to a future in which New Zealand "follows the herd" and adopts genetic modification and once again finds itself in a position where it has to compete directly with larger and more productive countries. These submitters saw the opportunity to be the world's only guaranteed supplier of pure food as too good for New Zealand to ignore.

At the same time as there is an increasing world-wide demand for organic produce, public submitters argued, there is a corresponding decline in the demand for genetically modified products. By going down the biotechnology road, New Zealand runs the risk of investing in a declining market area. As evidence, some submitters indicated their belief that America, Canada and other producers are not able to sell genetically modified products such as canola and corn.

Submitters noted that tourism continues to offer New Zealand a basis for economic diversity and growth. However, they were concerned about possible risks, as yet undefined, of genetic modification activities on that industry. One possible outcome of New Zealand's adoption of these technologies may be damage

to indigenous flora and fauna, loss of our clean, green reputation and, therefore, our decline as a favoured destination by those seeking high environmental values. Any degradation of fish species, including exotic and indigenous species, may also affect tourism, some also believed.

Another area of uncertainty identified by public submitters related to market intelligence. Submitters pointed out our lack of knowledge about the economic impacts of New Zealand adopting or rejecting genetic modification technologies. Some wrote of mixed signals about profitability of products of genetic modification, particularly agricultural products. A few submitters questioned New Zealand's international trade relationships, asking whether we would lose our independence if genetic modification technologies were embraced. Others had the same concerns, but as a consequence of genetic modification avoidance. A few referred to former United States Ambassador Josiah Beeman's warning that we risk trade sanctions if we do not follow the of genetic modification path.

Although referred to only rarely, some public submitters also raised concerns about New Zealand's participation in, and development of, a knowledge economy. They were concerned that any rejection of genetic modification technologies could lead to a loss of expertise, as researchers and students are closed out of future technologically based economies, variously described as a knowledge economy and a technological society. Other submitters, on the other hand, saw opportunities for New Zealand to lead the world in research into organic and biodynamic forms of agriculture and holistic medicine.

appendix 3

Outcomes of Consultation: Submissions from the Public

Section contents

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:

- 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 nutriceuticals, 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:

- possum control
- military uses
- use of antibiotic resistance markers/ viral resistance genes
- natural medicine components
- bioremediation techniques/biosensors
- artificial sweeteners
- substitution of tropical cash crops
- release 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 nutriceuticals (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.

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3.7 International obligations

Background

The Warrant, under items (d) and (l), called for information and views on, respectively:

> the international legal obligations of New Zealand in relation to genetic modification, genetically modified organisms, and products
>
> the international implications, in relation to both New Zealand's binding international obligations and New Zealand's foreign and trade policy, of any measures that New Zealand might take with regard to genetic modification, genetically modified organisms, and products, including the costs and risks associated with particular options

To consider the strategies and processes open to New Zealand in relation to genetic modification, the Commission needs to consider the international agreements and arrangements New Zealand has entered into, the obligations that arise under those agreements, and the implications that flow from them.

Outline of this section

This section of the report is short, mainly because just 1% of public submitters made any comment on New Zealand's international obligations. Comments centred on:

- trade and other agreements
- sovereignty issues.

Trade and other agreements

Of the 111 submitters who commented on international obligations, the largest group (47.7%) focused on the World Trade Organization. The next largest group referred to ANZFA, followed by the Convention on Biological Diversity (CBD). (See Table 3.14.)

If submitters did make comment on New Zealand's international agreements, they were reasonably likely to argue that the county does not have any international obligations. These submitters recognised that politicians in New Zealand may

Table 3.14 New Zealand's international obligations affecting genetic modification choices (n = 111)

International obligations affecting GM choices	Number	%
World Trade Organization (WTO) agreements generally	53	47.7
Convention on Biological Diversity (CBD) – Cartagena Protocol on Biosafety	26	23.4
Submitter states there are no obligations	19	17.1
Rio Declaration	9	8.1
CER – Australia and New Zealand trade and other agreements	8	7.2
World Intellectual Property Organization (WIPO)	2	1.8
Other (mostly ANZFA)	50	45.0

The "Other" category included the following international agreements identified by public submitters:

- General Agreement on Tariffs and Trade (GATT)
- Universal Declaration on Human Rights
- UNESCO Rights of Disabled
- development of a future Genetic Bill of Rights
- International Convention on Economic, Social and Cultural Rights
- Agenda 21
- Basel Convention on Trans Boundary Movements of Hazardous Waste
- IUCN Draft International Convention of Environment and Development/Earth Charter
- Montreal Protocol

Multiple response

have signed treaties and agreements concerning genetic modification, but argued that the country should not be bound by them. "This," one submitter wrote, "... constitutes a time for drawing back from 'binding international obligations' ... where these affect the marketing and distribution of crop seeds and foodstuffs in this country." Rather than being bound, New Zealand should renegotiate or withdraw from its international obligations, reserving the right to make its own democratic decisions without being pressured by other countries. The following quote sums up a strong feeling expressed by submitters that New Zealand:

> ... should never accept any attempt to reframe protection of our biodiversity, environment and the health, safety and indigenous and other cultural values of our people as 'trade barriers'. The people must be consulted and issues voted on in parliament if our sovereignty is threatened in this way by trade negotiations and treaties.

Sovereignty issues

One group of public submitters argued that New Zealand's participation in the international arena on genetic modification issues was a hindrance or threat to the country's 'sovereignty' or autonomy. They argued that this participation should not be a basis for determining whether genetic modification technology and products are allowed in the country. Submitters who were particularly concerned about protecting the country's 'sovereignty' or autonomy were mainly concerned about the country's ecological integrity and preventing New Zealand's becoming a "guinea pig" for other states and multinational corporations. Submitters also raised other issues, including:

- insufficient public input into international agreements that New Zealand enters into
- the opportunity New Zealand may have to opt out of agreements if they conflict with, or fall short of, national policies and standards relating to genetic modification
- the impacts on trade agreements of New Zealand's genetic modification stance. Submitters referred to the impacts of our nuclear stance on trade relations
- the degree to which New Zealand has to recognise and accommodate international policies and standards. For instance, some submitters feared that we might have to recognise and accept genetic modification technologies covered by US or EU patents.

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3.8 Liability

Background

Warrant item (e) called for information on:

> the liability issues involved, or likely to be involved, now or in the future, in relation to the use, in New Zealand, of genetic modification, genetically modified organisms, and products

Outline of this section

Rarely did public submitters specifically comment on liability issues. The comments of the 256 submitters (2.3% of the total) who did were mainly focused on attribution of liability and problems around attribution, forms of liability, the regulatory framework and liability insurance.

Problems around attribution of liability

Twenty-four public submitters wrote about inherent characteristics of genetic modification effects that they felt made it difficult to establish the extent of liability (see Table 3.15). These characteristics, described in more detail in previously in terms of evidence and uncertainty, included the unpredictability of effects, their potentially wide dispersal, the difficulties in tracing the original source of impacts, their cumulative nature and their potential longevity. Given these difficulties, submitters expressed concern about how to ensure that producers took responsibility for their actions. When public submitters commented on liability they were often more concerned about moral responsibility.

Public submitters also demanded reparation to address negative effects. However, 51 submitters wrote about problems around establishing the extent of liability (see Table 3.15). Some felt that there is no adequate policy in place to ensure that producers are held liable for any negative consequences of their genetically modified organisms and products. They expressed worry that these producers would be able to evade responsibility because of the difficulties in establishing a direct link between them and the problems they have caused. One submitter's comment provides an insight into the wider concern: "...it is unclear who will take

Table 3.15 Main issues raised on liability (n = 256)

Main issues raised on liability:	Number	%
Polluter should pay for damages	84	32.8
Implications for government liability of negative impact of GM use	78	30.5
Non-insurability of risk	73	28.5
Difficulties in establishing the extent of liability	51	19.9
Difficulties in establishing liability, given GM-impact characteristics	24	9.4
Implications for government liability where GM benefits denied	4	1.6
Other	9	3.5

The "Other" category included issues related to:

- expansion of liability to include individuals in companies, such as researchers
- requiring ERMA and/or government to assume responsibility for enforcing liability legislation
- the level of government liability. For those arguing for government liability, they assumed central, not regional, level of government
- ensuring a clear framework for liability was established and understood prior to any genetic modification activities

Multiple response

financial responsibility for any catastrophes resulting from the release of GMOs into the environment. This is certainly a burden that the public would not want to carry." The concern most frequently expressed was that New Zealanders "should not be left holding the bag". There was worry that multinational companies could reap the benefits of genetic modification, leaving the government and the people of New Zealand to deal with the mess left behind. The following sub-sections outline the different liability options raised by public submitters and their responses to them.

Producers' liability

Even though submitters acknowledged that there could be difficulties in establishing who was liable for genetic modification effects, and the extent of their liability, they were most likely to suggest the 'polluter-pays' principle. This requires producers taking responsibility for untoward side effects of their products and activities. Eighty-four submitters saw adoption of the 'polluter-pays' principle as fundamental to the introduction of genetic modification in New Zealand. They outlined proposals ranging from financial bonds to compensation funds that companies would have to complete before they would be allowed to operate. They also made more general comments about multinationals, stressing that they must not be allowed to hide in other countries to avoid taking responsibility. Some submitters suggested that the polluter-pays principle is a fundamental safety mechanism, ensuring that companies would think twice before pushing potentially harmful products on to the public or environment without proper testing.

The State's liability

Seventy-eight submitters explicitly rejected any state liability for the negative impacts of genetic modification use, which they equated with society taking responsibility. They were adamant that the government and the people of New Zealand should not be liable for damages caused. The concern was frequently expressed as "why should we take all the risks while they [multinationals] get all the benefits?" Public submitters addressing the question of liability were overwhelmingly in favour of making companies and those working for them liable for any and all adverse consequences.

Liability insurance

As Table 3.15 shows, 73 public submitters wrote about liability insurance. Some referred to the refusal of insurance companies to insure genetic modification activities. They interpreted this refusal in two ways. First, insurance companies' refusal to provide operators with protection was demonstration of the unacceptably high risks associated with genetic modification. Second, given the reluctance of insurance companies to provide cover, a requirement for operators to take out public liability insurance could provide an effective way to constrain genetic modification activities.

Regulatory framework

The HSNO Act provides most of the regulatory framework for establishing liability. The Act provides for significant penalties and:

- makes it an offence to knowingly import, release or process a new organism without appropriate approval and fail to comply with any conditions of the approval
- makes it an offence for a manufacturer, developer or importer of a new organism to knowingly fail to report any new significant information or adverse effect of that hazardous substance or new organism
- enables a Court to order a person who offends to mitigate or remedy any adverse effects on people or the environment and to order the destruction of the new organism.

Forty-four public submitters specifically referred to the current framework for establishing liability, of whom two considered it adequate and 42 considered it inadequate. Amongst the latter, their concerns mainly reflect their belief that:

- Current legislation favours producers and scientists.
- Current regulations cannot be enforced because risks are too difficult to assess and liability too difficult to establish.
- The lack of bonds and other mechanisms mean it will be difficult to make polluters pay for any damage.
- Current regulations are not sufficiently enforced.

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3.9 Intellectual property

Background

The Warrant, under item (f) called for information on:

> the intellectual property issues involved, or likely to be involved, now or in the future, in relation to the use in New Zealand of genetic modification, genetically modified organisms and products

Outline of this section

This section of the report presents 649 public submitters' views about intellectual property. The topics covered by these submitters included:

- definition and characteristics
- the application of patenting
- the advantages and disadvantages of its application.

Definition and characteristics

Few public submitters addressed the topic of intellectual property, and those who did tended to make more general ethical statements against the concept of "ownership of life". Many perceived the idea of patenting as a threat and a control mechanism by which multinationals would dominate the world and control the global food supply.

The application of patenting

Of those commenting on intellectual property matters, 189 discussed the potential for patenting the outputs of genetic modification activities. Although most were opposed to patenting altogether, some suggested that processes may be patented but that the outcomes, such as the "code of life" itself could not be. Others identified specific groups of genetically modified products that should not be even considered for patenting for ethical, moral, cultural (particularly from a Maori perspective) or environmental reasons. Indigenous flora and fauna, including genetic material held off shore, received the most attention. Eighty-six submitters

raised this issue, some suggesting the issue was of particular concern to Maori because they are the owners or guardians of indigenous flora and fauna (and traditional knowledge and folklore). Others identified all New Zealanders as the owners.

The list of other materials that should not be considered for patenting included:

- all human material
- human material in general, with the acceptance of some specific applications using genetic information
- naturally occurring organisms
- any living organisms and genes (so that only processes could be patentable).

Advantages and disadvantages of patenting

Few public submitters considered patents to be valuable as an incentive mechanism. They were, at a general level, against the patenting of any genetically modified organisms. The most commonly identified disadvantage (raised by 70% of those commenting on intellectual property) related to the consequences of monopoly control by patent holders. The following quote, from a group of submitters, is typical of public submitters' concerns about the economic consequences of allowing patenting of any form of life:

> Of serious concern to us, is the fact that the very basis of life — 'the seed' — will be owned and controlled by commercial interests. Corporate controlled vested interests are developing gene altered seeds and utilising the patent regime, claiming exclusive ownership of seeds to gain control over agriculture. Please ensure that this does not happen.

Other submitters focused on the moral dimension of owning life and profiting from the "genetic commons". A few wrote about how patenting could exclude them from certain activities or benefits. Some submitters from a New Zealand university mentioned that they had to cancel research because they could not afford to access material from its patent holder. Another researcher explained how researchers could be excluded entirely from participating in valuable research areas, given access costs created through patenting.

The legislative context and its adequacy

As Table 3.16 shows, only a handful of public submitters referred to the legislative context for protecting intellectual property. Some of the related legislation includes the international Trade Related International Property Rights Agreement

Table 3.16 Intellectual property and genetic modification (n = 649)

Major issues	Number	%
Monopoly control by GM patent holders	454	70.0
Potential for patenting of genetic material	189	29.1
Patentability of indigenous flora and fauna	86	13.3
Patentability of human genome	73	11.2
Biopiracy	38	5.9
Inadequate protection of GM information for patent purposes and protection of intellectual property	29	4.5
NZ needs to capture its own IP	14	2.2
Loss of intellectual property and/or patentability because of disclosure of confidential information during review process	1	0.2
Other	9	1.4

The "Other" category included the following issues related to Intellectual Property:

- Agreement between Crown and WHO in relation to indigenous plants and patenting and the Treaty of Waitangi
- immoral to own genes
- threat to biodiversity
- prohibit patenting of life forms under New Zealand's patent regime
- difficulty in establishing liability when genes jump
- patents invalid as they imply biological organism are unchanging when they are not

Multiple response

(TRIPS) and, in New Zealand, the Trade Marks, Patents, Design, Fair Trading and Copyright Acts. However, in their consideration of strategic options for genetic modification use in New Zealand, discussed in detail previously (see "Strategic outcomes, issues and options"), a small percentage of the submitters indicated that they would like to see an explicit ban on any patenting of genetically modified organisms or products (see Table 3.3).

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3.10 Treaty of Waitangi

Background

Warrant item (g) sought information about submitters' views on the Treaty by asking for comment on:

> the Crown's responsibilities under the Treaty of Waitangi in relation to genetic modification, genetically modified organisms, and products

Outline of this section

This section of the report includes the following sections:

- Treaty of Waitangi
- tikanga principles and genetic modification.

Treaty of Waitangi

Only 64 public submitters commented on the Treaty of Waitangi, with passing reference to the Crown being in breach of the Treaty if genetic modification activities were allowed. One submitter identified the Treaty as the starting point for any discussion of genetic modification. Submitters felt that Government "must consider the Treaty" or that "allowing genetic modification into New Zealand would be a violation of the Treaty of Waitangi". Only rarely did submitters go into any greater detail. Submissions in te reo Maori also made infrequent reference to provisions of the Treaty, and rarely discussed Maori cultural concerns in any detail. Any more substantial comment usually referred to the Crown being in breach of the Treaty in matters around genetic modification (see Table 3.17).

Some submitters who identified themselves as Maori expressed frustration that their concerns were being sidelined in the debate over genetic modification, one writing that "... as usual this is another disregard for the Tiriti o Waitangi, an agreement that the government should honour seeing as they drew it up."

Tikanga principles and genetic modification

The greatest concern of public submitters commenting on issues relevant to Maori was the incompatibility of genetic modification with tikanga principles. Of the 200 commenting on issues relating to Maori, 64% raised this concern. Some pointed out that tikanga is central to any consideration of genetic modification. Some stressed that recognition of rangatiratanga is an essential basis for incorporating other tikanga principles. These principles are the source of the Maori value system, govern the Maori approach to managing environmental issues and should also underline any management of genetic modification. Aspects of genetic modification that were identified as incompatible with tikanga included:

- mixing of human genetic material with other species (raised by 26 submitters)
- inter-species genetic mixing (intentionally and unintentionally)
- genetic modification contamination of the environment, thus interfering with its spiritual value

As Table 3.17 shows, 47 submitters were also concerned about the impacts of genetic modification activities on indigenous flora and fauna and traditional knowledge. As discussed in the previous section, submitters were particularly concerned about Maori loss of control/or ownership of indigenous flora and fauna, particularly if genetic information was taken off shore or slight modifications were made to indigenous flora and fauna and the new genetically modified organism was patented.

Table 3.17 Issues raised relating to Maori, including Treaty matters (n = 200)

Issues raised	Number	%
GM is incompatible with tikanga	128	64.0
Crown in breach of Treaty	63	31.5
Need to protect ownership/traditional knowledge of indigenous flora and fauna	47	23.5
Should be no human/animal transfer of genes	26	13.0
No one cultural group should have greater rights in GM-debate than any other	15	7.5
WAI 262 has implications for GM-debate	5	2.5
Maori should fully participate in economic benefits	3	1.5
Reference to international documents (eg Mataatua Declaration/ Draft Declaration on Rights of Indigenous Peoples)	3	1.5
The Treaty is the starting point for any discussion of GM	1	0.5
Other	7	3.5

The "Other" category included matters raised by public submitters that usually related to actions that were needed to respond to issues raised. These included:

- the need to consult Maori about genetic modification
- the need to establish a framework that would ensure the protection tikanga and meet obligations to Maori under the Treaty of Waitangi
- the need to address inappropriate allocation of research funding, which breaches the Treaty by not funding Maori research. Current funding enables monocultural approaches to research
- ERMA's requesting of proof of Maori spiritual and metaphysical phenomena, which is demeaning and creates uncertainty in Maori communities
- the apparent ineffectiveness of the Treaty on a world scale.

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Outcomes of Consultation: Submissions from the Public

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3.11 Global developments

Background

The Warrant, under item (h) focuses on the global context in which New Zealand genetic modification activities occur or may occur. It called for information on:

> the global developments and issues that may influence the manner in which New Zealand may use, or limit the use of, genetic modification, genetically modified organisms and products

In responding to this request for information, submitters looked to the global trends that are influencing, or are likely to influence in the future, genetic modification activities and people's responses to them. Thus, they reflected on trends such as a shift from human dominion over nature to partnership, the globalisation of the economy, the biotechnology revolution, consumer responses to genetic modification, increasing recognition of indigenous rights and legal responses to genetic modification.

Outline of this section

This section discussed submitters' views under five main headings:

- partnership with nature
- economic globalisation
- biotechnology revolution
- consumer responses to genetic modification
- legal responses to genetic modification

Partnership with nature

Some public submitters argued that a rethink was needed about the way humans exploit nature. A switch to sustainable (usually organic) agricultural methods was seen as a first step towards shifting from people claiming their right to have dominion over nature to working with nature. This push to a "partnership with nature" was seen as a global trend rapidly gaining ground, whereas genetic modification was seen as a continuation of the polluting "domination of nature"

approach that many submitters identified as the greatest threat to global environmental health.

Often public submitters explicitly rejected the argument that environmental resource pressures justified genetic modification. Many submitters believed there was more than enough food in the world to feed the growing population. Food supply problems were viewed as distribution problems resulting from corruption, war, and lack of moral initiative on the part of developed countries. Many submitters viewed other apparent resource problems as the justifications of pro-genetic modification spokespeople (loss of arable land, pollution, and pests) and indicative of problems stemming from "the way we have been doing things" since the Green Revolution.

Economic globalisation

Public submitters often explicitly identified globalisation as a bad trend and one that has resulted in increased foreign ownership of New Zealand. They attributed this globalisation to the actions of multinational companies, and saw them as the only beneficiaries. Some submitters wanted New Zealand to push for greater self-sufficiency as a way of breaking away from the control of these multinationals. There was some confusion on the issue however, as many submitters who identified globalisation as explicitly a bad thing, also viewed it implicitly as a good thing in that they wanted New Zealand to be able to sell its non-genetic modification products to the rest of the world.

Biotechnology revolution

Although a small number of public submitters were excited about the possibilities of the biotechnological revolution, more often they expressed concern. For instance, some submitters expressed abhorrence of genomics, often seeing it as ethically dubious, driven by short-term commercial interest, and risky. A few instead preferred to see New Zealand avoid this technology, concentrating instead on "more natural" research related to organic production.

Consumer responses to genetic modification

Public submitters identified consumer-related overseas developments that could affect how New Zealand addresses genetic modification. These developments, which are not necessary mutually consistent included:

- consumer concern about genetic modification, especially for food products

- consumer demand for "clean, green", "safe" and "natural" products
- decreasing demand for genetic modification-free products
- increasing demand for organic.

Submitters viewed these trends as, together, signalling the need for New Zealand to reject genetic modification and embrace organic production.

Legal and policy responses to genetic modification

Some public submitters were concerned about the lack of public input into Government's negotiation of trade and other agreements with international partners. They were also concerned about the degree to which these agreements could influence the way New Zealand made decisions about genetic modification. They saw any international pressure on New Zealand as a sovereignty issue and an unacceptable challenge to national self-determination. Thus, public submitters considered that international agreements needed to be renegotiated, so that they reflect public views about genetic modification. Also, rather than ensuring that New Zealand's legislative and regulatory framework is consistent with international frameworks, they were more likely to argue for New Zealand's taking a maverick position as the country has in other ethical matters, such as in nuclear matters. Thus, they saw some value in New Zealand clearly standing out from other countries.

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3.12 Opportunities from use or avoidance

Background

Warrant item (i) sought information from submitters about their views on the opportunities to New Zealand of using, or avoiding the use of, genetic modification. The Warrant item stated:

> the opportunities that may be open to New Zealand from the use or avoidance of genetic modification, genetically modified organisms, and products

Outline of this section

This section, as with other sections, will present submitters views about the opportunities available to New Zealand from:

- the use of genetic modification
- the avoidance of genetic modification.

Opportunities from use of genetic modification

As Table 3.18 shows, 1461 public submitters (13.4% of the total) identified opportunities from genetic modification use. Of those that identified opportunities, however, almost all added that their recognition of these opportunities did not mean they supported genetic modification use. For instance, they acknowledged that there might be a wide range of new products, given the creation of new genetically modified organisms, or new strains of existing products. Also, productivity may well increase although, submitters stated, such increased productivity and profitability would be mostly limited to multinational companies. The only exceptions to submitters' rejection of genetic modification use, despite opportunities, were in the health area. Here, some submitters would accept genetic modification use for health care opportunities.

Table 3.18 Opportunities from genetic modification use (n = 1461)

Opportunities from GM-use	Number	%
Human health benefits	690	47.2
Increased productivity – current industry sectors	511	74.1
Increased range of products	315	21.6
Increased profitability – current industry sectors	217	14.9
Environmental benefits	125	8.6
Generalised national economic benefits	78	5.3
Maintain science/research capability	77	5.3
Increase science/research capability	65	4.4
Enhance animal welfare	42	2.9
Increased competitiveness – current industry sectors	34	2.3
Develop new knowledge-based industry	22	1.5
New global leadership role	15	1.0
General/unspecified benefits	10	0.7
Cheaper food for poorer economies	6	0.4
Benefits to farmers in developing countries	3	0.2
Create more jobs	2	0.1
Retain scientific opportunities	2	0.1
Safeguard biodiversity	2	0.1
Other	25	1.7

The "Other" category included the following suggestions:

- benefits to investors
- protection of other countries from GM disaster
- fewer chemical inputs
- provision of seed and food for poor under-nourished countries
- support of universities' international status
- beneficial exploitation of environment;
- avoidance of trade embargoes
- benefits to human society.

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Opportunities from avoidance of genetic modification

Public submitters were relatively united in their views about the opportunities presented by genetic modification avoidance. Of the 5375 who wrote about opportunities, 71.1% stated their belief that New Zealand would gain substantial competitive advantage from developing our organic agricultural and horticultural sectors. Twenty percent anticipated competitive advantage from remaining genetic modification-free. Others identified environmental and health benefits. (See Table 3.19.)

Public submitters saw genetic modification avoidance as an opportunity to overcome New Zealand's current lack of competitive advantage, as primary producers struggle to compete with larger economies and producers and increase their market share. By remaining genetic modification-free and shifting to organic production processes, submitters argued, New Zealand has the unique opportunity to develop niche markets in specialist, high quality organic products.

It is worth noting the confusion that some public submitters seemed to have in their understanding of the distinction between genetic modification-free and organic. Sometimes their comments suggested they perceived them as the same thing and sometimes their comments suggested that they thought current production processes were organic, that is that organic production is the alternative to genetic modification-enhanced production. However, others acknowledged New Zealand's currently high use of fertilisers and pesticides, and the negative impacts of these on current organic production.

Submitters described how New Zealand could take advantage of its isolation and relatively unpolluted environment by remaining genetic modification-free in a world where genetic modification avoidance by other countries is likely to be rare. The country would be well-placed to provide organic produce to meet growing demand from countries that can not meet their own needs given their genetic modification use. Some cited evidence that products of genetic modification are already losing their appeal and market share. Further, given that these larger economies would be precluded from participating in this niche market, our producers would not need to compete with larger producers that currently have economies of scale that make them more competitive.

Submitters also argued that New Zealand could become a world leader in its rejection of genetic modification technologies in the same way as its anti-nuclear stance gives New Zealand a special status (in which many submitters expressed pride). New Zealand could also become a world leader in organic production techniques and research.

Table 3.19 Opportunities from genetic modification avoidance (n = 5375)

Opportunities from GM-avoidance	Number	%
Competitive advantage from organic production	3825	71.1
Environmental benefits	1283	23.9
Competitive advantage from GM-free production	1074	20.0
Protect human health	1070	19.9
New global leadership role	570	10.6
Generalised national economic benefits	484	9.0
Specific economic benefits (eg tourism, alternative farming, seedbank)	10	0.2
Other	12	0.2

The "Other" category included the following suggestions:

- protecting the disabled from genetic discrimination
- maintaining environmental and cultural integrity.

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3.13 Main areas of public interest

Background

Warrant item (j) invited submissions on the main areas of public interest. Four main areas were identified in the Warrant:

> the main areas of public interest in genetic modification, genetically modified organisms, and products, including those related to —
>
> (i) human health (including biomedical, food safety, and consumer choice):
>
> (ii) environmental matters (including biodiversity, biosecurity issues, and the health of ecosystems):
>
> (iii) economic matters (including research and innovation, business development, primary production, and exports):
>
> (iv) cultural and ethical concerns

Public submitters also wrote extensively about social concerns.

Outline of this section

This section of the report will outline views expressed by public submitters on the four main areas as identified in the Warrant, as well as social matters and risk and uncertainty. It will include the following sub-sections:

- general overview
- human health
- environmental matters
- economic matters
- cultural and ethical concerns
- social matters
- risks and uncertainty.

Distribution of concerns

Table 3.20 provides a summary of public submitters' concerns across the broad range of topics they raised. The areas of concern that stand out are environmental risks, uncertainty around risks, health risks and food safety risks.

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.

Human health

Public submitters were more concerned about health prevention measures than diagnosis and treatment. This focus on prevention measures was consistent with their worries about the negative impacts of genetic modification. They often viewed genetic modification as the latest in a long line of technologies that potentially harmed their health, including cellular telephones, chemicals in the environment and in food, and well-known disasters such as thalidomide and Agent Orange. Some public submitters compared the ill health of themselves and others with the perceived good health of their ancestors and attributed the differences to technological interventions.

Submitters' main concerns focused on the health impacts from contamination of the environment and food by genetic modification applications. They viewed any tampering with the natural order of the environment and food as threatening to their health. Anticipated problems included:

- allergies from genetic modification-contaminated food, including new foods, and genetically modified pollens from genetically modified crops and unintended cross-fertilisation
- illness from unintended horizontal gene transfer in the environment
- loss of food quality, particularly its nutritional value.

Public submitters were also concerned about genetic modification-based treatments. There was some support for medical uses of genetic modification

Table 3.20 Public submitters' concerns about genetic modification (n = 9994)

Concerns about GM	Number	%
Environmental risks	4979	49.8
Uncertainty around risks (lack of information)	4548	45.5
Public health safety risks	3620	36.2
Food safety risks (including lack of labelling)	3002	30.0
Benefits captured by multinationals	1905	19.1
Ethical and spiritual implications	1605	16.1
Irreversible	1519	15.2
Uncertainty around benefits (lack of information)	1106	11.1
Consumer choice	1043	10.4
Adverse economic impacts on industry (eg organic farming, tourism)	1023	10.2
Inter-generational equity	882	8.8
Biodiversity	729	7.3
Social and economic equity	591	5.9
Lack of trust	403	4.0
Public education on GM	383	3.8
Generalised disaster	311	3.1
Religious implications	280	2.8
Inappropriate reliance on science/technology	233	2.3
Cultural implications	195	2.0
New Zealand retaining control of flora and fauna	165	1.7
Biosecurity	64	0.6
Animal rights	60	0.6
Organic crops affected by GM crops	48	0.5
Sovereignty	8	0.1
Human rights	7	0.1

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technologies so long as any application or research was contained. However, a large number of submitters did not want to be exposed to genetic modification-based medicines and demanded their right to choose whether to use them or not. Submitters commonly cited insulin as an example of a genetic modification-based treatment over which people have not been given choice.

Ethical issues raised by public submitters about genetic modification-based treatments included the potential breeding out of human imperfections, the use of animals as "bio-factories" for human benefit and the "wrongness" of gene manipulation.

Submitters also referred to the uncertainty around other so-called "wonder treatments" such as thalidomide as justification for their caution. They noted a lack of evidence of the long-term safety of genetic modification-based health treatments and the lack of testing of new technologies.

Environmental matters

Environmental issues dominated public submitters concerns. Almost half of the public submitters made substantial comments about environmental issues. Often their concerns were of a general nature: they were concerned about the general degradation of the environment or ecosystems as a consequence of genetic modification activities. Some were concerned that the introduction of genetic modification would mean the loss of New Zealand's "clean, green" environment or the loss of New Zealand's genetic modification-free environment. Others anticipated more major consequences, for instance predicting a general destruction of the environment or some sort of undefined significant disaster. The range of concerns is briefly summarised below.

The application of genetic modification was viewed as a serious threat to the integrity of the environment. Integrity was identified as an environmental value for different reasons. Some submitters, particularly Maori, argued that people are custodians of the environment. Genetic modification activities violate this relationship in that inherent in the application of this technology is the notion that people have the right to have dominion over the environment. Others valued the integrity of the environment for religious or spiritual reasons, for instance from the perspective of Jewish, Christian, Muslim or other belief systems. Others took a "nature knows best" stance, arguing that any intervention of the scale that genetic modification entails is contrary to the natural order.

The threat to biodiversity that genetic modification poses was another strong theme amongst public submissions. The release of genetically modified organisms

into the environment could result in:

- the extinction of some species, for instance from general environmental degradation or as a consequence of specific problems such as genetically modified pollens or "super-bugs"
- the creation of new and dangerous genetically modified organisms such as "super-weeds"
- contamination of the environment from genetic modification activities, for instance with genetically modified organisms escaping from field trials or laboratories
- the irreversibility of genetic modification releases.

Genetic modification could lead to the destruction of the environment as an economic good. Public submitters believed that the current state of the environment ("clean and green") provided New Zealand with the opportunity to maintain and expand current industries, particularly agriculture and horticulture, but also tourism. It also provides New Zealand with the opportunity to develop new industries and markets, particularly those based on environmental quality and freedom from genetic modification applications.

Some submitters also acknowledged benefits to the environment from genetic modification technologies. These technologies could be used for pest control, to reduce the use of chemicals in food production and other agricultural activities, and to reduce the amount of land used for agricultural and horticultural production. The latter could be achieved if genetic modification technologies enabled land to be used more intensively, thus freeing up other land or preventing commercial encroachment on to areas of high natural value.

Economic matters

Public submitters were less concerned about the economic impacts of genetic modification, compared with impacts on health and the environment. Nevertheless, almost one in 10 of the submitters expressed concern about the impacts genetic modification use would have on industry, particularly organically based agriculture and horticulture.

When public submitters wrote about the economy, they almost always focused on the primary production sector. Very few considered the biotechnology industry and its direct contribution to the economy. They were more concerned about its impact on the primary production sector. Also, public submitters tended to perceive the economy as comprising two parts: the powerful and bad multinationals and the local and good small producers. They saw the application of genetic

modification as exacerbating this undesirable dichotomy. As multinationals foisted genetic modification upon New Zealand, the New Zealand economy would increasingly come under the control of foreign ownership and monopolies. Genetic modification, they believed, threatens the country's economic self-determination.

Submitters saw genetic modification avoidance as an opportunity to reverse current trends. That New Zealand is isolated, coupled with our cleanness and greenness, could become a strength if New Zealand is one of the few countries that rejects genetic modification. The country would be well-placed to provide genetic modification-free and organic produce to meet growing demand from countries that can not meet their own needs given their genetic modification use. Further, given that these larger economies would be precluded from participating in this niche market, our producers would not need to compete with larger producers that have economies of scale that currently give them competitive advantage.

In general, public submitters gave little attention to the value of the biotechnology industry for its own sake. However, some argued that New Zealand has the opportunity to develop its research capabilities in specialist biodynamic and organic areas. New Zealand, they believed, could become world experts in production processes that will become increasingly attractive to the rest of the world.

Cultural and ethical concerns

When writing about cultural and ethical concerns, public submitters variously argued from religious, ecological, ethical, moral and ethnic perspectives. However, their messages were similar: genetic modification is wrong because it is tampering with "what is supposed to be". It was common for submitters to cite Mad Cow Disease as the consequence of people tampering with the natural order: feeding herbivores meat products. From a religious perspective, genetic modification was rejected, for instance because it was "against the teachings of the Bible" or inconsistent with Muslims or Jewish beliefs about appropriate composition of food. From an ethnic perspective, which could often also be viewed as a spiritual perspective, tampering with the natural order was also unacceptable. For instance, a number of submitters pointed out how unacceptable the mixing of human and other genetic material is to Maori. Some people wrote about an ecologically based spiritualism that found any tampering with "Mother Nature" as abhorrent. Other ethical perspectives, including animal rights and vegetarianism, also shaped people's attitudes towards genetic modification, since they believed it

included exploitation of animals and mixing of genes from different species. The unease people felt about patenting, although sometimes argued from an economic perspective, was usually based on a belief that ownership of the "code of life" is immoral or unethical.

Altogether, of those public submitters addressing Warrant item (j), 18.1% raised concerns from an ethical and spiritual or cultural perspective (see Table 3.20). This figure, however, in some ways under-represents the extent of ethical, spiritual and cultural concerns of public submitters, many of whom articulated their unease in terms of more specific issues of genetic modification such as risk to the environment and food safety.

Sometimes public submitters also explained concerns about consumer choice and sovereignty as ethical issues. They often explained their rights to have choice, or give consent, as a human rights issue, with any removal of these rights undermining their individual sovereignty. They particularly defended their rights to have choices, or give consent, in health treatments, environmental management and food production and consumption. Sometimes, sovereignty was also discussed from a national perspective, expressing the right of the people of New Zealand to make a decision free of outside influence.

Despite the importance of cultural and ethical considerations, some public submitters believed these considerations are ignored by decision-makers. Some submitters felt that economic considerations are valued more highly than ethical considerations by decision-makers. There was a high degree of mistrust expressed by public submitters, particularly about:

- political decision-makers overly conscious of the needs of 'big business' rather than the people
- scientists responding to the needs of their funders, including the biotechnology industry, rather than the public and inclined to "do the science for its own sake" and personal ego gratification rather than for the benefit of the public
- any evidence about the safety and benefits of genetic modification, given their views about scientists, industry and government and the wide range of previous disasters. Commonly identified disasters included DDT, thalidomide, asbestos, cigarettes, Agent Orange and introduced pests.

Social matters

A number of public submitters were concerned about equity issues. As Table 3.20 shows, of those submitters addressing areas of public interest, 5.9% commented on

current equity issues and 8.8% were concerned about inter-generational equity. When referring to equity today, it was the view of submitters that the application of genetic modification could create inequities or exacerbate those already existing in New Zealand and between developed and developing countries. Given the current control of, and advocacy for, genetic modification production and research, public submitters expected the benefits to be captured by the "haves" and the costs to be borne by the "have nots". Similarly, they expected such distribution of costs and benefits on an international scale, with developing countries bearing the costs (for instance, through the destruction of local production processes) and developed countries (particularly through their multinational companies) to benefit. Those concerned about inter-generational equity issues were concerned that decisions made today may preclude future generations from access to health, a quality environment, quality food and economic choices.

Some public submitters feared that the application of genetic modification technologies would lead to total social breakdown. Some saw the origins of this in current decision-makers' willingness to disregard ethical and cultural considerations in favour of technological advancement and economic gain.

If we value democracy as a cornerstone of our current society then, some submitters argued, that basis will be corroded by the introduction of genetic modification. Submitters argued that the principles of choice and consent, inherent in their concepts of democracy, need to be protected. These principles are particularly pertinent to the genetic modification debate, they argued.

Risk and uncertainty

As Table 3.20 shows, public submitters' concerns about risk and uncertainty and benefit and uncertainty were, together, greater than any other areas of concern. These concerns, discussed in detail in the section entitled "Evidence and Uncertainty", stemmed from both a general distrust of the sources of information available to them and a belief that risk assessment processes are still undeveloped and imperfect. Thus, public submitters generally believed that scientists and those providing approvals for genetic modification applications lack the skills and mechanisms (as well as the will) necessary to properly identify and quantify the levels of risk. They also considered the evidence around benefits and safety to be uncertain.

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appendix 3

Outcomes of Consultation: Submissions from the Public

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3.14 Summary of analysis of Public Submissions

Background

This report has summarised the views of 10,861 submitters around the topics outlined in the Warrant. As outlined in "Introduction to the analysis of Public Submissions", the Warrant requires the Commissioners to report to Government on two principal matters: the strategic options available to New Zealand to address, now and in the future, genetic modification, genetically modified organisms, and products; and desirable changes to the current legislative, regulatory, policy and institutional arrangements for addressing these technologies.

The Commission is also required to report on a range of relevant matters that cover the use of genetic modification in New Zealand, liability, intellectual property, the Treaty of Waitangi, relevant global developments, opportunities from use or avoidance of genetic modification and the main areas of public interest. Submitters' views have been presented around these Warrant items.

That the report is structured around the Warrant items does not mean that public submitters presented their views according to the Warrant structure. A lack of detailed attention to the Warrant could be attributed to a range of reasons. The format of the Warrant may not have been entirely clear to all submitters, given a degree of overlap they may have seen in some of the topics mentioned. Submitters may not have seen the Warrant and/or any of the advice put out by the Commission regarding preferred or suggested submission format. Submitters may have been familiar only with the submission guides provided by organisations other than the Commission. Usually these covered two matters addressed in the Warrant: strategic options, and risks and benefits. Submitters may also have wanted to make general comments only: many made broad statements about their opposition to genetic modification and/or the risks involved, without any reference to the Warrant.

Rarely did public submitters express specific views about all matters set out in the Warrant, possibly because of a mix of the reasons outlined above. Any summarising of public submitters' views according to the Warrant items is, therefore, somewhat

arbitrary, although necessary for reporting purposes. The topic areas they were most likely to address in a substantial way were (i) how New Zealand should respond to genetic modification (generally how to keep it out), (ii) human health, environmental and economic matters, and cultural and ethical concerns, (iii) the risks associated with genetic modification and (iv) changes needed to limit or control genetic modification use. These topic areas more or less coincided with four Warrant items:

- Warrant items (1) and (m): strategic outcomes and options
- Warrant item (j): areas of public interest
- Warrant item (c): risks
- Warrant item (2): legislative changes.

Other matters covered in the Warrant were seldom referred to in detail. It was extremely uncommon for public submitters to address issues, with more than a passing comment, from an international perspective, or to write about strategic issues (given their almost wholesale rejection of genetic modification use), liability issues and the Treaty. Thus the least-addressed Warrant items included:

- Warrant item (l): international implications
- Warrant item (k): strategic issues
- Warrant item (h): global developments
- Warrant item (e): liability
- Warrant item (g): Treaty of Waitangi
- Warrant item (d): international obligations.

The main themes with reference to the Warrant items are summarised in the next sub-section and reflect public submitters' overwhelming opposition to genetic modification.

Discussions of the main themes that emerged with respect to Warrant items need to be considered in this light. Public submitters were relatively absolute in their views, with only very small proportions prepared to consider genetic modification use, benefits or exceptions to a general ban on all genetic modification applications.

Table 3.21 shows the distribution of public submitters' views, when they have made substantial comment that coincided with matters set out in the Warrant. Other reference may also have been given to these matters, but in a more cursory way.

Table 3.21 Substantial comment against Warrant items (n = 10,861)

Warrant items	Number	%
Warrant item (j): areas of public interest	6991	64.4
Warrant item (c): risks	5580	51.4
Warrant item (m): strategic outcomes	5320	49.0
Warrant item 2: legislative changes	2549	23.5
Warrant item 1: strategic options	2521	23.2
Warrant item (l): opportunities	2141	19.7
Warrant item (b): uncertainty	506	4.7
Warrant item (n): adequacy of statutory/regulatory processes	365	3.4
Warrant item (f): intellectual property	224	2.1
Warrant item (a): uses	197	1.8
Warrant item (k): strategic issues	112	1.0
Warrant item (l): international implications	97	0.9
Warrant item (h): global developments	84	0.8
Warrant item (e): liability	95	0.9
Warrant item (g): Treaty	69	0.6
Warrant item (d): international obligations	59	0.5

Main themes against Warrant items

The main themes are summarised under headings consistent with section titles. These titles are usually consistent with matters laid out in the Warrant but, as in "Strategic outcomes, issues and options", may reflect a combination of Warrant items. The headings are:

- strategic outcomes, issues and options
- statutory and regulatory system
- use of genetic modification, genetically modified organisms and products
- evidence and uncertainty
- risks and benefits
- international obligations
- liability
- intellectual property
- Treaty of Waitangi
- global developments
- opportunities from use or avoidance
- main areas of public interest.

Strategic outcomes, issues and options

In general, the strategic outcomes sought by public submitters were premised on genetic modification avoidance. Thus, desired health outcomes were often expressed in relation to avoidance of genetic modification. In addition to general health outcomes, submitters sought freedom from the impacts they associated with genetic modification use, such as allergies. Similarly, for environmental outcomes, submitters sought retention of what they described as the current "pure environment". For them, environmental outcomes were synonymous with genetic modification avoidance. However, submitters did not suggest that desired economic outcomes would be achieved simply by way of genetic modification avoidance. Achievement of economic outcomes would also require development of organic production.

Strategic issues focused on choice, risk and risk management, and acceptability. Submitters emphasised the importance of freedom of choice and consent, which they equated with human rights and sovereignty. The most commonly discussed strategic issue was risk and risk management. Most submitters considered the risks of genetic modification too poorly understood, risk assessment techniques too underdeveloped and unreliable and risks potentially too large to even consider risk

management. For submitters, therefore, the only responsible response to genetic modification, therefore, must be avoidance, but with continued attention to improving decision-making approaches. For the small proportion of public submitters who discussed the possibility of genetic modification use, the degree of genetic modification acceptance is primarily dependent upon ethical and cultural considerations, although other factors such as potential benefits may have bearing. Usually, the ethical and cultural considerations identified signalled the non-acceptability of genetic modification.

Given most public submitters' rejection of genetic modification, the range of strategic options they identified to address genetic modification in New Zealand was fairly narrow. Most submitters (9695 in total) made some reference to how New Zealand should respond to genetic modification. Most of these suggested some variation of wholesale avoidance of genetic modification, perhaps with some limited and selected uses, usually in the health area. Only small numbers of submitters suggested options that would include wide application of genetic modification and most of these acknowledged the need for a strong regulatory framework. For most submitters, any consideration of risk assessment and risk management options was irrelevant given their rejection of any use. However, while stressing their preference for absolute avoidance, some submitters identified minimum standards or actions to protect themselves and the environment in the case of limited use of genetic modification. Thus, they stressed the importance of labelling, a cautious approach to any approvals and the continuation of the current moratorium.

Statutory and regulatory system

Few public submitters commented on specific aspects of the statutory and regulatory system, including its adequacy and operational problems, probably because they were not familiar with either the HSNO Act or the work of ERMA. However, many commented on improvements, usually from a more generic perspective. Most commonly, they wanted legislation that could be used to bar or limit use of genetic modification and require stringent labelling, particularly for food. When improvements were desired of decision-making processes, submitters seldom specifically referred to ERMA. The most common suggestion related to an adoption of some form of the precautionary principle to guide decision-making.

Use of genetic modification, genetically modified organisms and products

Public submitters' perceptions about genetic modification activity in New Zealand and overseas were consistent with their greatest fears. Most often the uses they

identified related to food production, other crops and research into farming production. Although health was the area in which submitters were more likely to consider some limited use as acceptable, few indicated awareness of current application in the health area.

Evidence and uncertainty

Although public submitters seldom specifically addressed the issue as outlined in the Warrant, issues around uncertainty permeated their comments. In general, they felt that the risks associated with genetic modification were potentially huge (and irreversible) and pointed to past technological disasters as evidence that they could be fairly certain that genetic modification-based disasters would occur. They also cited insurance companies' reluctance to insure against genetic modification-based impacts as evidence of the technology's inherent risk. In addition, submitters stressed the inherently uncertain and unstable nature of the technology. They believed that the probable environmental, economic, social and health costs of genetic modification activity would fall on the public. Public submitters were also extremely sceptical about claims of genetic modification safety and the benefits of genetic modification. They discounted scientists' and producers' claims of genetic modification safety and potential benefits because of what submitters saw as vested interests, demonstrated lack of trustworthiness and their current inability to demonstrate absolute safety.

Risks and benefits

Given public submitters' strong opposition to genetic modification, it is not surprising that they were more likely to identify risks associated with genetic modification use and benefits associated with genetic modification avoidance. Often submitters' descriptions of the risks of genetic modification use and benefits of genetic modification avoidance contained passionate language. Thus, submitters anticipated risks ranging from non-specific environmental, social and/or economic disaster to more specific impacts, particularly relating to health and environment, but also relating to the economic opportunity costs of rejecting an organic future. The identified benefits of genetic modification avoidance mostly centred around major economic growth based on New Zealand becoming a leader in organic production.

Submitters also identified a range of benefits from genetic modification use, for instance relating to health treatments and environmental enhancement. However, they did not consider the benefits sufficient to justify the risks.

International obligations

Few public submitters commented on international obligations. Of the few who did, their view was that no previously entered international agreements should compromise New Zealand's ability to make decisions about genetic modification in the country's own interest. Indeed, they considered any international attempt to limit New Zealand's internal policy-making as an affront to New Zealanders' sovereignty. Therefore, they believed that New Zealand has no international obligations. Some further commented that various international agreements needed to be renegotiated to reflect public attitudes to genetic modification. Some also took the opportunity to comment on the lack of public input into current international agreements and recommended that this lack of consultation be reversed in the future.

Liability

It was also unusual for public submitters to comment on liability issues. They were more likely to comment on responsibility, although they also noted the importance of ensuring that those responsible should also be liable. Submitters pointed out inherent qualities of genetic modification technologies that made it difficult to attribute responsibility including the lack of predictability and diffuseness of impacts and their long-term nature. However, they also stressed the need to continue to improve mechanisms for risk assessment.

While public submitters acknowledged current difficulties involved in attributing liability, they were extremely clear about who should be liable. They argued strongly for the "polluter-pays" principle and rejected any suggestion that the state should be liable. They equated state liability with public cost-bearing. They also noted the reluctance of insurance companies to provide coverage to producers and identified compulsory liability insurance as one mechanism, along with options such as bonds, to ensure decision-making and genetic modification applications take better account of public interest.

Intellectual property

Intellectual property was another area that attracted little public comment. One of the strongest messages from the few who commented was that any concept of ownership of the "code of life" was abhorrent. People also opposed patenting for cultural and economic reasons. Some people were anxious about potential loss of Maori control over traditional knowledge and use of indigenous flora and fauna if patents were established, for instance on new genetically modified organisms. Others were concerned about increasing multinational control over animal and

plant life forms in general and subsistence crops in developing nations in particular. Submitters felt that intellectual property mechanisms could only benefit multinationals and would further strengthen their monopoly control.

Treaty of Waitangi

The greatest concern of the few public submitters who commented about Maori issues in general was the incompatibility of genetic modification with tikanga. Some also commented on Government's breaching of the Treaty of Waitangi, but usually in passing rather than with further qualifying comment. The submissions presented in te reo Maori were more likely to address broad issues such as banning genetic modification than detailed comment on the Treaty, conflicts with tikanga and other specifically focused on Maori issues.

Global developments

Globalisation was explicitly identified by public submitters as an undesirable global development. They considered that genetic modification use would exacerbate that process because it would further increase the control that multinationals have. They also saw this trend as the basis for current pressurising of New Zealand into conforming to the rest of the world. Some submitters suggested that New Zealand should run against the trend and become a maverick and organic world leader.

Public submitters were convinced that the demand for organic food is large and growing, particularly in Europe. This global trend signals the advantages for New Zealand of avoidance of genetic modification and the opportunity costs of use of genetic modification. Such a global demand, coupled with increasing genetic modification use elsewhere, means that New Zealand is one of the few countries that could meet this demand.

Opportunities from use or avoidance

One theme that permeated public submissions was the economic opportunities available to New Zealand from avoidance of genetic modification. These economic opportunities centred around New Zealand gaining competitive advantage from becoming a major non-genetic modification and organic producer and, to a lesser extent, a world leader in organic research and development. Other health and environmental opportunities would also flow from genetic modification avoidance.

Conversely, submitters emphasised the opportunity costs of use of genetic modification. The major cost would be the forgoing of opportunities related to organic and non-genetic modification production. A minority of submitters

acknowledged the potential opportunities of genetic modification use, particularly in the health area. However, while some considered these opportunities worthwhile enough to consider some genetic modification use, most submitters still argued that they were insufficient to expose the country to risks of genetic modification. Some submitters also acknowledged economic opportunities from genetic modification use, but saw these captured by multinationals and providing a basis for their further control of the New Zealand economy.

Main areas of public interest

The main areas of public interest centred on risks associated with use of genetic modification, which submitters often described as unknown and potentially catastrophic. These risks related to the environment, public health, food safety and, given the likely benefit-capture by multinationals, New Zealand's economic and political sovereignty. In the absence of choice about genetic modification application, submitters also saw their personal sovereignty as threatened.

Submitters' anxiety was heightened by their belief that risk assessment is still an underdeveloped area of endeavour, yet scientists and genetic modification producers continue to claim that the new technology is safe and that the risks are predictable and manageable. As Table 3.22 shows, environmental, health and economic issues were the next most commonly identified areas of substantial comment.

Further, submitters believed that the ethical and cultural implications of use of genetic modification, which they felt outweigh economic considerations, continue to be overlooked or undervalued in decision-making processes.

Table 3.22 Topics of substantial comment (n = 10,861)

Topics	Number	%
Risk, risk assessment and risk management	5675	52.3
Environmental issues	4885	45.0
Health issues	3373	31.1
Economic issues	1802	16.6
Ethical issues	1257	11.6
Regulatory/regulation issues	1045	9.6
Social issues	970	8.9
Spiritual issues	243	2.2
Cultural issues – Maori	154	1.4
Intellectual property	114	1.0
Liability issues	68	0.6
Treaty of Waitangi issues	58	0.5
Cultural issues – other	56	0.5
Insurance and underwriting	20	0.2

Multiple response

section 3.15 |

3.

appendix 3

Outcomes of Consultation: Submissions from the Public

Section contents

3.15 Comment on policy, process and regulation provided through public submissions by public sector organisations

Background

Certain government departments and agencies made submissions to the Royal Commission through the public submission process. These organisations either had not sought or were not granted Interested Person status with the Commission.

The submissions by public sector organisations provided extensive information on the work of the organisations where they had been involved in genetic modification or biotechnology issues and on policy, processes, legislation and regulation relating to genetic modification. The Commission received such submissions through the public process from:

- Australia New Zealand Food Authority
- Department of Conservation
- Human Rights Commission
- Institute of Environmental Science and Research
- Ministry of Agriculture and Forestry
- Ministry of Consumer Affairs
- Ministry of Economic Development
- Ministry of Foreign Affairs and Trade
- Ministry of Health
- Te Puni Kokiri (Ministry of Maori Development).

A brief summary of information on public sector policy, process and regulation provided by each of these organisations is provided below, with reference to the relevant Warrant items where appropriate. (These submissions were received by the Commission before 1 December 2000 so this commentary does not reflect

recent developments in regulation and policy, eg strengthening of border control measures. For up-to-date details, contact the organisations directly.)

Full texts of all but one of these submissions are publicly available on the Commission website (http://www.gmcommission.govt.nz) until 30 June 2002. The submission from the Institute of Environmental Science and Research included some confidential sections that were not placed on the website: the public part is available.

Australia New Zealand Food Authority

The submission by the Australia New Zealand Food Authority (ANZFA) does not specifically respond to any of the Warrant items but rather is provided in two parts. The first part sets out the role of ANZFA, its establishment under the agreement between New Zealand and Australia establishing a system for the development of joint food standards (the Treaty) and the policy and processes to review and develop food standards and the regulations. The second part of the submission sets out the history and current practice for the regulation of genetically modified food in New Zealand and in Australia. The submission closes with ANZFA's position as a member of the international community involved in the investigation and regulation of genetically modified foods and some thoughts as to the future directions and implications for genetically modified foods.

ANZFA also supplied a set of attachments (obtainable from the ANZFA website, http://www.anzfa.govt.nz) ranging from the Australia New Zealand Food Authority Act 1991 and the Treaty mentioned above to specific applications and to international guidelines concerning genetically modified foods.

ANZFA is a statutory authority established by an Act of the Commonwealth Parliament of Australia with a bi-national function in the food standards area. It conducts scientific risk assessments and consults with community and stakeholders before making recommendations to the Australia New Zealand Food Standards Council (ANZFSC) concerning proposed amendments to the foods standards code.

As at September 2000, ANZFA had received 20 applications to approve genetically modified food commodities, two of which had been withdrawn after application and two of which (Roundup Ready soybeans and Ingard cotton) have been approved for inclusion in Standard A18: *Food Produced Using Gene Technology*.

The ANZFSC determined to amend Standard A18 requiring provisions for the labelling of all genetically modified foods on 28 July 2000. This standard becomes compulsory in 2001.

Also in 2001, ANZFA will be replaced by a new organisation, Foods Standards Australia New Zealand, which will have similar functions and responsibilities.

The ANZFA process for review and development of food standards

ANZFA's objectives in developing food regulations are set out in section 10 of the ANZFA Act and in Annexe A of the Treaty. These are:

- protection of public health and safety
- provision of adequate information to enable consumers to make informed choices
- prevention of misleading or deceptive conduct.

In making recommendations to ANZFSC, ANZFA must also have regard to:

- the need for standards to be based on risk analysis using best available scientific evidence
- the promotion of consistency between domestic and international food standards
- the desirability of an efficient and internationally competitive food industry
- the promotion of fair trading in food.

Applications for ANZFA's proposals for a food standard go through four steps:

- making a preliminary assessment
- making a full assessment report based on scientific risk assessment
- conducting an inquiry into any resultant draft standard or variation
- making a recommendation to ANZFSC.

ANZFA comments that the bi-national operation of ANZFA is unique. The joint code will provide the New Zealand and Australian food industries with a common set of regulations covering food manufacture. Essentially, the Treaty means that the Australian and New Zealand food industries are one and the same, with a market of 23 million people in total. ANZFA has two New Zealand members on its Board and a third New Zealand representative was appointed during the transition process to the new joint Australia New Zealand Food Standards Code.

There is a fully operational New Zealand office based in Wellington. Meetings are held in both Australia and New Zealand. Consultation takes place in non-government forums, meetings and workshops and there is special provision for consultation with Maori. Individual government agencies and the Officials Committee on Food Administration are also involved in ANZFA's consultation process. ANZFA must reach agreement with New Zealand on the outputs it must achieve each year and it reports directly and regularly to the New Zealand Minister of Health and Ministry of Health.

Regulation of genetically modified food

ANZFA's submission sets out in some detail the processes and the history of the regulation of genetically modified food in New Zealand. It also discusses the labelling of genetically modified food. In 1999-2000 KPMG was engaged by ANZFA to evaluate the cost implications of any labelling regime. The project was estimated to be NZ$43 million for one-off or set-up costs for the mandatory labelling of genetically modified foods based on a process of "due diligence" by industry and verifiable documentation. A similar amount was estimated for ongoing compliance costs.

International regulation of genetically modified foods

The ANZFA submission points out that requirements for the safety and labelling of genetically modified foods vary throughout the world. There is currently no formal global agreement on how food sourced from genetically modified organisms or containing genetically modified substances should be treated.

As members of the World Trade Organization (WTO), both Australia and New Zealand have notified it regarding the development of and amendments to Standard A18.

Australia and New Zealand also recognise the Codex Alimentarius Commission (CAC) as the appropriate body for setting international food standards, including those applying to genetically modified foods. CAC is currently considering safety and labelling issues relating to genetically modified foods. ANZFA has been an active participant in each of the Codex groups as an invited member of the Australian delegations. Although ANZFA does not speak for New Zealand at these meetings, it notes there has been close collaboration between New Zealand and Australian delegations at the group meetings. The Codex process for finalisation of international documents and standards relating to safety of foods derived from biotechnology is on a four-year time limit set to conclude in 2004. The Codex process for labelling standards for genetically modified foods may also take at least this long.

Future directions

In conclusion, ANZFA notes that future directions in the development of biotechnology will have significant impact on and present many challenges for regulatory authorities such as ANZFA. ANZFA identified some of these issues as including:

- continuing high levels of consumer and community interest in genetically modified foods and potential health impacts

- an increasing number of genetically modified foods with new properties which may provide benefits to consumers in taste, shelf-life and nutrition
- the development of genetically modified foods with therapeutic effects (ANZFA notes these will require careful consideration and will create challenges for food and therapeutic goods regulatory authorities in coordinating regulatory action)
- international developments of agreed protocols and arrangements for the regulation of genetically modified foods
- the need for careful monitoring and evaluation of potential and unforeseen health effects from both the current and future range of genetically modified foods available commercially.

Department of Conservation

The Department of Conservation (DOC) was established under the Conservation Act 1987 with responsibility for conservation management and advocacy and for the preservation and protection of indigenous flora and fauna. It is responsible for advising the Minister for Biosecurity on risks to indigenous flora and fauna and has a small operational biosecurity role under the Biosecurity Act 1993 (such as eradication and control of *Undaria* around Stewart Island and certain weed and pest control activities).

Points raised in the submission related to Warrant items (a), where, how and for what purpose ..., (c), risks and benefits, (f), intellectual property issues, (j), main areas of public interest and (n), statutory and regulatory processes.

Main areas of public interest: environmental matters

Exotic species have had dramatic effects on New Zealand's biodiversity. Invasive exotic pests are the greatest single threat to our remaining natural ecosystems, habitats and species. They damage habitats and ecosystem processes and pose high costs and threats to productive ecosystems.

The Department spends over half of its total budget on protecting natural heritage and most of this is spent on weed and animal pest control and threatened species protection work. Conventional pest and weed control is labour intensive and expensive. Despite a recent funding package for pest and weed control on public land, DOC is restricting pest control to priority areas and mostly is limited to "holding the line" until new pest control techniques are developed. The Department needs to explore new options, particularly as public attitudes are hardening towards use of pesticides and herbicides.

Conventional biological control (biocontrol) uses a natural enemy to control a pest or weed population. Examples include *Lochmaea suturalis* to control heather in Tongariro National Park, parasitoids for wasp control and *Procecidochares alani* to control mist flower. Biocontrol releases for new organisms are considered under the Hazardous Substances and New Organisms (HSNO) Act by the Environmental Risk Management Authority (ERMA).

DOC notes that it manages New Zealand's ecosystems and species on behalf of all New Zealanders and that any potential use of genetic technology for conservation purposes would have to be within the bounds of what the wider community sees as reasonable.

Risks and benefits

From a conservation perspective on requirements to be met before the release of new organisms, DOC advocated risk assessment on native species and ecosystems, minimum environmental standards and a precautionary approach.

There are many possible risks from introduction of new organisms into the environment. For example, there is a risk to native insects from bacterial endotoxins from Bt (*Bacillus thuringiensis*) incorporated into many genetically modified plants and of the toxins building up in the soil and killing soil insects.

Statutory and regulatory processes

The HSNO Act sets minimum standards. These are a statement of a level of risk considered unacceptable. Regardless of potential benefits, DOC would oppose any introduction of a genetically modified organism if these minimum standards were not met. Moreover, where there is uncertainty, the precautionary approach should be applied.

DOC has a statutory role to advise on new organisms considered for introduction and their impacts. Under s 53(4) of the HSNO Act, ERMA must notify DOC of applications for approval of new organisms and must have particular regard to the Department's views (s 58). DOC has requested significant changes in applications to field-test genetically modified organisms, for example, petunias and maize.

DOC notes that there is no scientific consensus as to the seriousness, or even existence, of potential harm from genetic modification technology. It therefore asks whether there is any advantage in postponing decisions on release of genetically modified organisms into the New Zealand environment until there is a larger body of information on their effects on the environment and on biodiversity. And it also raises the issue of whether case-by-case assessment adequately takes into account the cumulative and synergistic effects of multiple releases.

Where, how and for what purpose ...

The submission provides examples on DNA technology that helps to identify species and assist in conservation work, eg the differentiation of two species of brown kiwi, *Apteryx australis* and *Apteryx mantelli*, and how future application of genetically modified organisms could improve conservation work and pest control.

Intellectual property issues

DOC notes that New Zealand currently has no statutory management framework for bioprospecting. The Department has informally placed a moratorium on issuing permits to collect flora and fauna from public conservation lands for bioprospecting purposes. However, private landowners may allow this, except for animals protected under the Wildlife Act or conservation legislation.

The Department notes that the issue of ownership and access to benefits derived from New Zealand's biological and genetic resources has been raised by the WAI 262 claim to the Waitangi Tribunal.

Human Rights Commission

The functions of the New Zealand Human Rights Commission relate to the promotion and protection of human rights in accordance with various international covenants and conventions. The Human Rights Commission took a neutral stance on the risks or benefits associated with genetic modification. The focus was primarily on Warrant item (j), main areas of public interest: human health, with some commentary on legislation referring to Warrant item (n), statutory and regulatory processes.

The submission raised the following issues of significance or concern.

Attention to New Zealand's domestic and international human rights obligations should be part of considering strategic options on genetic modification. These are covered by:

- Universal Declaration of Human Rights 1948
- International Covenant on Economic, Social and Cultural Rights 1996.

The right to health is also included in:

- International Convention on the Elimination of All Forms of Racial Discrimination 1965
- Convention on the Elimination of All Forms of Discrimination against Women 1979
- Convention on the Rights of the Child 1989.

The Human Rights Commission suggests that the Human Rights Act 1993, which presently prohibits discrimination on 13 specific grounds, should also cover "genetic discrimination" (the discrimination against individuals on grounds of their genetic make-up). The submission notes the Council of Europe's 1997 Convention on Human Rights and Biomedicine (Convention for the Protection of Human Rights and Dignity of the Human Being with Regard to the Application of Biology and Medicine), which sets out a series of principles and prohibitions such as:

- banning discrimination on genetic grounds
- allowing predictive genetic tests only for medical purposes
- allowing genetic modification technology only for preventive, diagnostic or therapeutic reasons and only where it does not change the genetic make-up of descendants
- banning use of *in vitro* fertilisation to choose the sex of a child (except to avoid serious hereditary conditions)
- regulation of medical research
- prohibiting creation of human embryos for research purposes and requiring adequate protection of embryos where countries allow in vitro research
- prohibiting profit from the use of any part of the human body
- requiring informed consent
- acknowledgement of patients' rights to be informed about their health or to reject that information
- banning removal of organs for transplant without consent, except for regenerative tissue from siblings
- public debate and consultation.

The Human Rights Commission also refers to the United Nations Educational, Scientific and Cultural Organization's Draft Universal Declaration on the Human Genome and Human Rights 1997 with its requirement that individuals should not be reduced to their genetic characteristics but respected for their uniqueness and diversity.

The submission also raises the issue of consumer choice. Consumers have the right to know of the presence of genetically modified organisms or genetically modified products, particularly in food. The right to such information is provided for by Article 19 of the International Covenant on Civil and Political Rights (ICCPR), a United Nations convention ratified by New Zealand in 1976. ICCPR enables complaints of breaches of the convention to be made by individuals to the United Nations Human Rights Committee.

Institute of Environmental Science and Research

The Institute of Environmental Science and Research (ESR) is a Crown Research Institute (CRI) that is neither sector- nor resource-based as are the other CRIs. It presents itself as an independent agency, not involved in genetically modifying products, plants or animals, with its focus as "protection of people and their environment through science". ESR provides scientific services in public health, environmental and forensic sciences with particular capabilities in molecular technology. The Institute says it has deliberately stood aside from any alignment in the genetic modification debate to safeguard its scientific independence. ESR agrees with the general scepticism displayed by New Zealanders about the self-interest in a science environment driven by the prevailing business model.

In its written submission through the public submission process, ESR dealt mainly with Warrant items (1), strategic options, (2) and (n), statutory and regulatory processes, (b), evidence and uncertainty, (c), risks and benefits, (h), global developments and (j), main areas of public interest.

The submission made the following introductory observations:

- Biotechnology is rapidly developing worldwide.
- The 'science' is ahead of society's acceptance of its use.
- Community perceptions of harm must be addressed. These perceptions will not be influenced solely by more scientific evidence.
- Assessment and quantification of risks must be from both biophysical and social science perspectives.
- A lack of basic research, eg on horizontal gene transfer (HGT) in ecosystems, hinders development of biotechnology industries.
- There is a disparity in government research purchased between the areas of development and environmental risk of genetic technology. Around one-third of the Public Good Science Fund ($100 million) is invested annually in molecular technology development but little or none in the area of potential environmental health effects of using genetic modification in plant and animal production systems.
- ESR's particular interest is in the development and validation of methods to detect genetically modified foods. There is a dearth of information from long-term feeding trials and ESR recommends that New Zealand should promote and participate in internationally coordinated and financed research trials of this kind.

Further points by Warrant item follow.

Strategic options

ESR sets out three options for New Zealand's genetic modification strategy:

- Develop and use genetic modification in all sectors and be at the forefront of developments to move from commodity-based to high value-added niche markets.
- Adopt an organic brand for primary production to add value to food-based products. Where genetic modification is used in sectors such as medicine and health, ensure informed choice about public use is possible.
- Develop a framework and guidelines for the coexistence of the first two options to maximise benefits and minimise risks.

ESR supports the third option.

Evidence and uncertainty

HGT is a natural phenomenon occurring on land and in aquatic environments by various means. Viable free DNA has been shown to persist in soil for several years and is therefore available for uptake by microorganisms.

There is increasing evidence that HGT can occur between genetically modified plants and microorganisms. The submission cites work on transfers of the hygromycin resistance gene from decaying modified brassica plants to the soil-borne fungus *Aspergillus niger* and the kanamycin resistance gene from modified sugar beet plants to the modified soil bacterium *Acinetobacter* BD314pFGΔnptII. It suggests that HGT is a rare event but its potential impact on soil ecosystems cannot be underestimated under supportive environmental pressures.

ESR notes potential ecotoxic effects. Large-scale commercial planting of genetically modified plants may affect soil 'health' directly by modifying microbial population diversity. Current research results on this have been extremely variable.

Risks and benefits

ESR believes that greater understanding of physical contamination processes such as HGT is needed to enable a more robust risk assessment. Thus continuing scientific research could offset the risk of loss of scientific capability offshore posed by the current delay on the release of genetically modified organisms, which ESR supports.

Global developments

It is important to maintain international links with overseas researchers to ensure standardisation of the methodologies used to assess effects of genetically modified organisms.

Main areas of public interest: human health

Acceptance of genetically modified medicines is because of public appreciation of the benefits and more confidence in the regulatory regimes in place to ensure safety. The food industry, in comparison, has fuelled public concern and distrust and caused the perception that commercial interests are valued more than public interests. This is reinforced by food scares concerning bovine spongiform encephalopathy (BSE).

Main areas of public interest: environmental matters

New Zealand has unique soils and ecosystems. Therefore, genetic modification impacts must be investigated here and not simply extrapolated from overseas data.

The submission suggests that we must improve our understanding of key adverse effects of genetically modified plants on the environment in order to be able to protect New Zealand's flora and fauna from the planned environmental release of genetically modified plants, animals or other organisms, for example, for biocontrol purposes.

Main areas of public interest: economic matters

New Zealand's economy is biologically based. To build wealth, New Zealand must develop strengths it already has in the productive sector and new wealth-creating enterprises and markets.

Some producers believe they have the 'right' to access new technology to develop new products and markets. Other producers believe organic production is the future market positioning for New Zealand and that they have the 'right' not to be contaminated by genetically modified organisms.

New Zealand must develop a 'coexistence' regime, which provides a regulatory process that gives people faith in its decision-making and the ability to exercise their democratic rights.

Ministry of Agriculture and Forestry

The Ministry of Agriculture and Forestry (MAF) in its written public submission to the Commission dealt particularly with Warrant items (1), (k) and (m), strategic options, issues and outcomes, (2) and (n), statutory and regulatory processes, (a), where, how and for what purpose ..., (c), risks and benefits, (h), global developments and (j), main areas of public interest.

MAF is the New Zealand contact point for the Codex Alimentarius Commission, which sets international food standards and the WTO's Committee on Sanitary and Phytosanitary Measures. In addition MAF's regulatory responsibilities include

biosecurity, food safety in animal and dairy products and a joint role with the Ministry of Health on the Codex Committee on Food Labelling.

Points made include the following observations, which span multiple Warrant items.

Statutory and regulatory processes

The submission notes that it is critical for New Zealand's primary producers that consumers have confidence in the safety of their products. Confidence in the integrity and reputation of New Zealand's regulatory processes underpin access to many overseas markets.

The current regulatory system provides mechanisms for weighing up risks and benefits of new technology. The submission comments on gaps and issues in the existing regulatory system:

- The legislation covering new organisms (HSNO Act) does not recognise the capacity for post-release controls under other legislation administered by MAF.
- Ethical approvals are not required for research on animal foetuses under half way through term.
- Stockfeeds that are genetically modified products may not require safety assessments because there is no risk factor specific to genetic modification that would trigger such an assessment.

Strategic issues, opportunities, global developments

Border control alone cannot guarantee that New Zealand could remain genetic modification-free.

New Zealand has to operate within the trading framework of the bilateral and multilateral agreements and commitments between it and its trading partners.

External consumer demands and regulatory requirements will be highly influential in the profitability of New Zealand's exports of agricultural and forestry products. There are likely to be opportunities in both genetic modification and non-genetic modification markets. New Zealand could be seriously disadvantaged if its producers were locked out of the future opportunities provided by either technology.

The extent to which genetic modification and non-genetic modification production can coexist must be critically examined. Any success in this area will depend on the extent to which consumers can be confident about the separation and integrity of non-genetic modification supplies.

Where, how and for what purpose ...

The submission comments that genetic modification has been mainly used as a research tool in New Zealand but genetically modified crops have been rapidly adopted in some overseas countries. It provides an account of some of these commercial applications.

Risks and benefits, statutory and regulatory processes

MAF takes a risk management approach rather than attempting complete elimination of risk. It comments that the impacts of genetic modification are unforeseeable.

Managing biosecurity at the border alone is a physical impossibility for genetic modification. Control at the border will continue to rely on importers obtaining appropriate approvals from ERMA before importing genetically modified organisms and for documentation to determine the genetic modification status of incoming goods.

Containment facilities and operators for genetically modified organisms are approved under the Biosecurity Act. Containment control is based on standards approved by ERMA under the HSNO Act and developed by MAF and ERMA based on the Australia/New Zealand standard AS/NZS 2243.3:1995. MAF inspects facilities to ensure they meet standards plus additional controls imposed by ERMA.

Strategy, risks and benefits, main areas of public interest, statutory and regulatory processes

Should New Zealand decide to prohibit the use of genetic modification in primary production, a definition of "non-genetic modification" is needed. That could range from a "due diligence" approach to avoid genetic modification inputs or mixing to an absolute genetic modification-free proven by audit trails and/or with testing for genetically modified material.

The definition would have to reflect what standards are realistically obtainable and enforceable.

The submission comments on environmental risks and benefits from the use of genetic modification.

Maori views are balanced between significant cultural concern over whakapapa and tapu issues and as significant stakeholders in agriculture and forestry where there may be potential economic benefits. MAF feels that Maori, like other New Zealanders, are still weighing the implications of genetic modification.

Regulatory systems based on perceptions of risk or ethical considerations:

- could have unintended consequences unless there were a clear societal consensus and decisions were made with regard to all known consequences
- would not be based on scientific assessments of risk or economic assessments of costs and benefits
- could create uncertainty for industry and consumers (as perceptions and values shift over time) and discourage investment
- could be seen as arbitrary trade barriers.

MAF is concerned to protect the integrity and reputation of New Zealand's regulatory processes, which are central to gaining and keeping access to export markets. New Zealand exports have recognition from overseas regulators often denied trading competitors (eg, a bilateral veterinary agreement with the European Union accords "equivalence" to New Zealand's regulatory system).

Future values of genetically modified or non-genetically modified products are dependent on consumer demands. There is no certainty as to their future value. Given this, the submission asks whether a choice of one production system precludes the other, or can both production systems coexist? It describes various methods for keeping genetically modified and non-genetically modified products separate.

Ministry of Consumer Affairs

The submission by the Ministry of Consumer Affairs (MCA) addressed Warrant items (c), risks and benefits, and (j), main areas of public interest: human health. It focused on consumer rights, in particular, consumer safety, choice, information and education. These rights must underpin any approach to genetic modification, particularly in relation to food.

Points made included the following observations.

Two key aspects are scope and effectiveness of consumer information on genetic modification. Without adequate information on issues, consumers cannot choose whether to purchase genetically modified foods based on their perceptions of risk or other considerations. Without adequate information through product labelling, consumers cannot distinguish genetically modified from non-genetically modified products.

The Australia New Zealand Food Standards Council (ANZFSC) has agreed to a proposed comprehensive labelling regime based on the presence of novel DNA, protein or altered characteristics. MCA raises the issue of process labelling as well

as presence labelling: thus supporting consumers' right to know if the food they purchase has been subject to gene technology at any stage in the production process, not solely that the end product has novel DNA or protein.

MCA is looking at an "information alert labelling framework", which may create incentives for producers to supply consumers with effective information about genetic modification. The framework would require a standardised alert label be placed on genetically modified products drawing consumer attention to the attributes of the product.

The Ministry recognises that any requirement for producers to "alert label" products must be balanced against compliance costs. Compliance costs in food labelling are an important consideration for a food-exporting nation.

Ministry of Economic Development

The Ministry of Economic Development (MED) is charged with ensuring that the policy decisions of government agencies are consistent with the Government's goals of sustainable development.

The submission from the Ministry touched on matters relating to Warrant items (c), risks and benefits, (d), international legal obligations, (e), liability issues, (f), intellectual property issues, (h), global developments, (i), opportunities, (j) (iii), main areas of public interest: economic matters, (k), strategic issues, (m), strategic outcomes and (n), adequacy of statutory and regulatory processes. Issues raised often spanned several Warrant items. Some of the points are summarised below.

Opportunities, economic matters and strategic outcomes

Genetic modification technology is already having an impact in sectors important to New Zealand's economy and export markets. Land-based industries, including forestry and wood products, are being affected and account for 11% of gross domestic product and 70% of exports.

New Zealand has a reputation for high-quality research in agricultural and horticultural industries. Research on genetically modified products is a potentially valuable source of intellectual property for sale in world markets. It also could enhance the export potential of New Zealand's agricultural products.

Opportunities for advancement from use of genetic modification include:

- reduced production costs from biological controls and disease-resistant genetically modified organisms
- increased returns from faster growth rates and high-yielding crops
- development of new raw materials and products.

Risks from avoidance of genetic modification research and development include:

- restricted industry development
- loss of potentially valuable intellectual property
- loss of research opportunities in New Zealand's areas of competitive advantage.

Alternatively there are may be opportunities in focusing on non-genetic modification or organic technology. The choice facing New Zealand could include a spectrum of options, including genetically modified and non-genetically modified products.

The Ministry notes that New Zealand has also been identified as having a comparative advantage in "pharming" (using genetically modified animals to produce pharmaceuticals) because of the absence of most major animal diseases.

Risks and benefits and strategic issues

Weighing risks and benefits will not necessarily lead to an "all or nothing" stance on genetic modification. Uncertainties abound, particularly around reversibility, environmental risk, the longer term preferences of key trading partners and the extent to which it may be possible to maximise the use of both genetic modification and non-genetic modification to maximise benefit to the New Zealand economy.

Considerations of the risks and benefits of use or non-use of genetic modification may include the following factors.

Benefits of use:

- increase in new intellectual capital
- retention/attraction of personnel
- attraction of foreign investment.

Risks of use:

- unknown degree of reversibility of effects
- inadequate safety procedures
- environmental damage
- cost of regulation
- loss of competition
- rejection of New Zealand products by genetically modified organism-averse markets.

Risks of non-use:

- limitation of innovation
- limitation of value-added products New Zealand can trade.

International legal obligations

Any decision on genetic modification has to factor in detailed specific legislation and the complex range of international agreements already in place.

MED is responsible for the Trans-Tasman Mutual Recognition (TTMR) Act 1997. Section 10(1) states that goods sold legally in Australia may be sold in New Zealand regardless of the different standards applying in each country. The mutual recognition principle applies to genetically modified foods but not to foods that contain a genetically modified organism.

Liability issues

Under the Consumer Guarantees Act 1993, goods must be of acceptable quality, measured from the standpoint of a reasonable consumer fully aware of the state and condition of the product, having regard to a range of factors such as the nature of the product, information available and provided and all other relevant circumstances. MED considers that Courts would be reluctant to deal with acceptable quality issues regarding genetically modified organisms and genetically modified products under this Act.

Limitation period difficulties under the Fair Trading Act 1986 should be rectified by the current proposal in the Business Law Reform Bill for extension to three years from discovery or reasonable discoverability.

Intellectual property issues

New Zealand has seven intellectual property rights statutes, two of which (Copyright Act 1994 and Layout Designs Act 1994) provide rights automatically, while the other five (Trade Marks Act 1953, Patents Act 1953, Designs Act 1953, Plant Variety Rights Act 1987 and Geographical Indications Act 1994 (pending)) grant or extend protection by way of registration systems. The Patents Act is currently under review.

On the international front, New Zealand is a member of, or party to, the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement), International Union for the Protection of New Varieties of Plants (UPOV) and World Intellectual Property Organization (WIPO).

MED considers that it is not appropriate to use intellectual property rights statutes as mechanisms for regulating ownership of, or access to, New Zealand's genetic resources. A distinction should be maintained between review of intellectual property laws and the regulation of material or activities generally labelled "intellectual property".

The submission noted that if plant material cannot be field-tested in New Zealand before the grant of a plant variety right, then, even if the Plant Variety Rights

Office were to issue a plant variety right using the results of field trials from another country, the right to grow the variety in New Zealand cannot be exercised in the absence of ERMA's consent for its release.

Treaty of Waitangi responsibilities

The Ministry noted particular Maori concerns with the review of New Zealand's intellectual property rights statutes commenced in the early 1990s. Consultation continues with Maori on the proposed recommendations.

Adequacy of statutory and regulatory processes

The submission notes that Regulatory Impact Statements, which must accompany all Cabinet papers, are an important part of the quality of the regulation process for new regulatory proposals. The Regulatory Impact Statement requirement was to be reviewed by 31 March 2001.

MED stresses the importance of adequate checks and balances in the system to ensure that regulations meet their objectives at the least cost to business.

Ministry of Foreign Affairs and Trade

The submission by the Ministry of Foreign Affairs and Trade was primarily related to Warrant items (d) and (l): international obligations and implications. It provided information on international agreements relevant to consideration of genetic modification, including the Biosafety Protocol to the Convention on Biological Diversity and the World Trade Organization (WTO) and its Agreement on Technical Barriers to Trade (TBT Agreement) and Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). It also discussed relevant agreements and arrangements under Closer Economic Relations (CER) with Australia and made reference to international consideration of human rights and bioethics of relevance to genetic modification.

Points made included the following observations on policy and international interactions.

International obligations and implications

When governments consider policy responses to genetic modification, these international agreements and arrangements must be taken into account. Rules in these agreements require that measures affecting the trade of products, including genetically modified products, are not arbitrary or indiscriminate, but rather are based on objective scientific and technical approaches. Most of these rules are generic, they are not technology specific, but their provisions are relevant to the policy challenges of genetic modification.

The international community has recently been discussing a number of specific policy issues arising from biotechnology. Many countries are still in the early stages of developing policy and regulatory responses to gene technology and there is no consensus yet on whether international agreements need more explicitly to incorporate genetic modification issues. The fluid nature of these issues means that the impacts on New Zealand foreign and trade policy of different approaches to gene technology are difficult to predict.

International bodies, of which New Zealand is a member, have been discussing issues such as:

- physical aspects of trade in biotechnology products, for example, trans-boundary movements and environmental impacts
- desirability of internationally agreed product and labelling standards
- adequacy of existing risk management approaches
- adequacy of existing international rules to deal with new technologies
- incorporation of consumer concerns into decision-making processes.

These issues traverse both domestic and international policy responses to the challenges of genetic modification, and their consideration at the international level is still in progress.

At the time of the adoption of the Universal Declaration on the Human Genome and Human Rights, New Zealand expressed concerns, especially that the Declaration did not cover the ownership of human genetic material, and the lack of time allowed for public, and particularly Maori, consultation. UNESCO's 1999 report on the implementation of the Declaration noted that New Zealand already had in place legislative measures to protect individuals' rights under its principles.

Countries have exhibited different attitudes to genetic modification, often based on the presence or absence of significant export interests in genetically modified crops and other products. The different approaches to labelling of genetically modified food, either voluntary or mandatory, and the issue of consistency of such schemes with the WTO's TBT Agreement are examples of the current absence of a common approach.

The submission raised the possibility that discussion and information sharing on genetic modification issues and challenges has the potential to enhance international understanding.

Ministry of Health

The extensive submission from the Ministry of Health (MOH) submission addressed four main areas where genetic modification affects, or may affect, its functions:

- medical products and consumer issues
- genetically modified foods in New Zealand
- environmental health
- Maori perspective of health and genetic modification.

Medical products and consumer issues

The Ministry has no position on genetic modification or genetically modified organisms. MOH does recognise that medicines derived from genetic modification are significant in the treatment of specific medical conditions. MOH believes that gene technologies, including genetic testing, screening and gene therapies, will begin to affect health care over the next five years with significant impact over the next 10 to 20 years.

MOH points out that New Zealand is a tiny part (less than 0.1%) of the international market for pharmaceuticals and has a strong interest in minimising any barriers to pharmaceutical manufacturers entering the market with the latest products. New Zealand and Australia are discussing the harmonisation of their regulatory frameworks for medicines.

Currently MOH is undertaking analysis on the implications of genetic modification for the range, costs, availability, benefits and risks in New Zealand's health system.

MOH identifies a number of consumer issues connected with genetic modification, such as privacy of health information, ethical consideration of research and treatment proposals, consumer information and protection of consumer rights.

MOH notes that currently there is no legal requirement to disclose the recombinant origin of a medicine. MOH reports that it is common practice to voluntarily provide genetic modification-related information and the MOH supports this practice.

Genetically modified foods in New Zealand

Food regulation in New Zealand is currently in a transitional phase with the introduction of a joint food code with Australia. There are mandatory standards that must be complied with and Standard A18: *Food Produced Using Gene Technology* regulates the sale and labelling of genetically modified foods. Only genetically modified foods approved by ANZFSC may be sold and the labelling requirements

have been extended to require all food that has any characteristics that have been modified as a result of recombinant DNA techniques to be labelled.

MOH believes the amended A18 is a comprehensive, workable and enforceable regime that will enhance consumer information and choice. Moreover, because it is aligned with that of the European Union, it will ease difficulties of sourcing non-genetically modified food and may lower trade barriers.

Environmental health

MOH has responsibility to identify and prevent harm from environmental risks to public health under a number of statutes, such as the Biosecurity Act and HSNO Act.

MOH notes that genetically modified organisms potentially could be both beneficial and a threat to public health. (The example given was of using genetically modified products to control exotic mosquitoes.)

Maori perspective of health and genetic modification

MOH recognises that genetic modification and related technologies raise particular concerns about adverse impacts on whakapapa, mauri and rangatiratanga. The collection and use of genetic material has the potential to breach tikanga Maori, causing cultural and spiritual offence. It also raises some complex issues around intellectual property rights. MOH also notes that appropriate use of genetic modification could lead to environmental and health benefits for Maori (as well as non-Maori). The submission gives the example of a whanau's involvement in a genetic research project into an inherited cancer affecting members over generations.

Te Puni Kokiri

The focus of the submission by Te Puni Kokiri (Ministry of Maori Development) was on Warrant item (g), responsibilities under the Treaty of Waitangi, and the implications under it in relation to genetic modification in New Zealand. It also dealt with the concerns and interests held by Maori about genetic modification (Warrant item (j), main areas of public interest) and identified five key strategic issues (Warrant item (k)). The submission did not purport to speak for Maori as a whole but to complement other government departments' submissions by focusing on Treaty issues and Maori perspectives on genetic modification.

Issues raised are summarised below.

Responsibilities under the Treaty of Waitangi

The Treaty partnership recognises the need for Maori to be involved in the design of policies and practices affecting them. Treaty principles might assist in identifying what the Crown's obligations under the Treaty of Waitangi are in regard to genetic modification, genetically modified organisms, and products. This would include the development of strategic options to enable New Zealand to address, now and in the future, genetic modification, genetically modified organisms, and products.

There are three fundamental principles that underlie the mutual obligations of the Treaty partners and from which more specific expressions of the Treaty principles can be derived:

- The Treaty partners are under a duty to act reasonably and in good faith in their dealings with one another.
- The Crown must make informed decisions by having proper regard to the Treaty when exercising its discretion and powers.
- The Crown has a duty to take positive action to redress past wrongs. This duty includes active protection of Maori in the use of their resources.

The submission sets out in some detail the application of the Treaty principles to government policy making as developed through court and Waitangi Tribunal cases. This is discussed under:

- good faith and partnership
- consultation
- obligation on Maori to act in good faith
- active protection
- right to development
- tino rangatiratanga ("the mana to control resources in accordance with custom")
- taonga
- need for compromise between Maori and the wider community.

Main areas of public interest: human health

The submission repeated comments made in an earlier submission to the Ministry of Health.

Health for Maori people places emphasis on taha wairua (spiritual), taha whanau (family), taha hinengaro (mental) and taha tinana (physical). This all-encompassing perspective of health and wellbeing contrasts with the traditional western model in which the physical aspects of health and sickness are emphasised. The labelling of genetically modified food is one aspect of the much larger issue of Maori health

and wellbeing, which is a link in the Maori belief system, an integral part of Maori culture.

The continuing disparities in standards of health between Maori and non-Maori highlight a strong need for Maori to be informed of the developments in the health sector. In 1990, the death rate for Maori men and women from cancer and heart disease was significantly higher than that of non-Maori. If genetically modified foods have even a small likelihood of causing an adverse influence on longer term Maori health, then this should be sufficient reason for ensuring that adequate measures are taken to inform Maori consumers of the ingredients of the foods they are eating. The choice to purchase rests with them. Without mandatory labelling it becomes an issue of government policy decisions.

Main areas of public interest: environmental matters

The role of Maori as tangata whenua means that any environmental impacts of genetic modification are of importance to them because it impacts on their links to the land and its natural and physical resources.

Main areas of public interest: economic matters

The submission accepted that there were possible economic gains from genetic modification but characterised them as supposition because the full impacts are not yet known.

Main areas of public interest: cultural and ethical concerns

In July 1999 Te Puni Kokiri commissioned the International Research Institute for Maori and Indigenous Education (IRI) at Auckland University to complete a report on Maori perspectives on genetic engineering. The key issues that this report identified as being important to Maori are:

- need for further discussion and debate
- incomplete knowledge of the risks of genetic engineering
- cultural and intellectual property
- links with other indigenous peoples
- whakapapa (genealogy)
- requirement for more information for Maori
- perception of genetic engineering as being market driven
- concerns for whenua (land)
- role of globalisation
- wairua (spirituality)
- potential for food monopoly

- need for collective decision-making
- mauri (life force)
- tapu (sacred)
- need for national body or Maori monitoring group.

Strategic issues

The submission raised five key strategic issues:

- Education and consultation are vital to ensure that people have the proper information to make informed decisions.
- Risk management is a key consideration in determining the risks and benefits of genetic modification.
- Ethical and cultural opinions on genetic modification are just as valid as scientific and economic assessments.
- Intellectual and cultural property rights are a key consideration for Maori in addressing genetic modification.
- The Treaty of Waitangi is a reference point for Maori consideration of these issues.

section 4.1 |

appendix 3

Outcomes of Consultation: Submissions from the Public

Section contents

Section contents

4.1 Analysis of oral and written submissions from Hui

Background

The Commission established a programme of workshops and Regional Hui to:

- provide Maori with access to information about the role and work of the Commission and how to make a submission to it
- provide the Commission with access to the views and opinions of Maori.

The organisation of this consultation programme of workshops and Regional Hui is described in Appendix 1 (see "Maori Consultation programme: the process"). Briefly, 28 workshops and 10 Regional Hui were held throughout the country between 24 October 2000 and 13 March 2001. A National Hui took place on 6–8 April 2001.

The Commission received written and oral submissions during its consultation with Maori. Transcripts of the oral submissions and the written submissions at each hui were placed on the Commission website. The submissions related to genetic modification and the application of tikanga Maori, the Treaty of Waitangi and the rights of Maori as an equal Treaty partner to determine the future of genetic modification in this country.

To illustrate the issues raised by Maori, this section provides a brief outline of each of the 10 Regional Hui and the recommendations arising from the National Hui. It then analyses the main points raised in submissions throughout the country.

The reported responses, whether taken from transcripts or from written submissions, have been lightly edited for grammar and style consistency. Respondents' use of "GM" (genetic modification), "GMOs" (genetically modified organisms) and "GE" (genetic engineering) is retained in the summary of responses.

Outline of Regional Hui

The first of the 10 Regional Hui took place in Wanganui on 4 November 2000, the last in Auckland on 10 March 2001. The complete schedule is published in Appendix 1 (see "Operational detail: Maori Consultation programme: Schedule of workshops and hui").

Wanganui Regional Hui

The Wanganui Regional Hui was held on 4 November 2000 at Te Ao Hou Marae, Wanganui. The Chair was Rangipo Metekingi. Around 50 people attended.

Pre-Regional Hui workshops were held in Palmerston North on 24 October, Wanganui on 25 October, and New Plymouth on 26 October.

Maori organisations involved in arranging the workshops and Regional Hui included Te Runanganui o Rangitane, Muaupoko Tribal Authority, Whanganui River Maori Trust Board, Te Ao Hou Marae Trustees, and Te Puni Kokiri offices in New Plymouth and Wanganui.

There were 21 oral submissions at the Wanganui Regional Hui. There were no written submissions.

Submissions expressed concerns about:

- whakapapa and the mixing of genes
- control of the technology and the power of multinational companies
- effective labelling of genetically modified food.

Other themes in oral submissions included:

- Legislation is required to ensure Maori decision-making rights in respect of development of genetic modification in New Zealand.
- There is a need for effective control and containment of genetic modification experiments.

- For Maori, genetic modification is likely to be another form of colonialism.
- Maori had no say on the setting up of the Commission itself and questioned the Commission's commitment to the Treaty of Waitangi.
- There is not enough information and knowledge available to make informed decisions on genetic modification.
- An open mind on genetic modification is needed.

Whangarei Regional Hui

The second Regional Hui was held on 17 November 2000 at Pehiaweri Marae, Whangarei. Sam Kake and Pihopa Kingi chaired the hui. Approximately 11 people attended.

Pre-Regional Hui workshops were held in Kaikohe on 27 October and Whangarei on 28 October.

Organisations primarily involved in arranging workshops and Regional Hui included Te Runanga a Iwi O Ngapuhi, Ngtiwai Trust Board, Pehiaweri Marae and Te Puni Kokiri Whangarei.

There were six oral submissions and no written submissions at the hui. Submissions expressed concerns about:

- Maori are not given sufficient information about genetic modification to make informed decisions. More discussion is required.
- Kaumatua and kuia need to be approached for information they have.
- New Zealand is not ready for genetic modification. Cheap, genetically modified products will be dumped here on lower income people.
- Who will benefit from genetic modification and who will control it?
- Genetic modification might be useful. It is here already, so let us consider it.
- Fears were expressed about cross-pollination from genetically modified crops.
- Concerns were expressed about effective food labelling.

Rotorua Regional Hui

The Rotorua Regional Hui took place on 2 December 2000 at Tamatekapua Marae, Rotorua. The Chair was Pihopa Kingi. Approximately 25 people attended.

Pre-Regional Hui workshops were held in Tauranga on 20 November, Rotorua on 21 November, Whakatane on 22 November and Taupo on 23 November.

Organisations involved in arranging workshops and Regional Hui included Te Taru White Consultancy, Te Puni Kokiri Rotorua and Tamatekapua Marae.

There were six oral submissions at the Rotorua Hui and two written submissions.

The following is a summary of themes presented in oral submissions:

- Concerns were expressed over chemicals and effects of genetic modification on trees, plants and seed ("better without genetic modification").
- Idle Maori land could be used to grow "GE-free" crops.
- Concerns were expressed about Treaty of Waitangi obligations on the Crown. More information and consultation is required by Maori. Maori need to be involved in decision-making.
- Concerns were raised about control over genetic modification experiments. Stop or slow down genetic modification experiments.
- There should be a moratorium on genetic modification experiments in New Zealand.
- There should be no mixing of human and animal genes.
- Concerns were expressed about use and patenting of Maori genetic material and intellectual property rights.
- Man is looking to control too much. Look what happened to Maui.
- Maori spiritual beliefs are just as valid as western spiritual beliefs.

The written submissions outlined the following themes:

- In health there can be benefits to Maori from understanding genes.
- Maori need to be firmly in a decision-making role regarding the development of genetic modification in New Zealand.
- There should be a moratorium on the patenting of genes from Maori and rongoa material.
- Don't tamper with whakapapa or mix human and animal genes.
- There should be no genetically modified crops allowed unless there is zero risk of cross-pollination of indigenous species.

Wellington Regional Hui

The Wellington Regional Hui was held on 15 December 2000 at Waiwhetu Marae, Lower Hutt. Neville Baker was Chair. Approximately 40 people attended.

Pre-Regional Hui workshops were held in Porirua on 27 November, Wellington on 28 November and Upper Hutt on 7 December.

Organisations involved in arranging workshops and Regional Hui included Takapuwahia Marae, Tapu te Ranga Marae, Omaka Marae, Waiwhetu Marae and Te Puni Kokiri Lower Hutt.

There were 10 oral submissions and two written submissions at the hui.

Oral submissions expressed concerns about:

- the interchange of genes across species
- monitoring and regulation of genetic modification
- some lack of knowledge and time to respond
- kaitiaki responsibilities, and general ignorance of what is "out there"
- global warming, biosecurity, interference with God's work, and lack of respect for Maori advisers to the Environmental Risk Management Authority (ERMA).

Other themes in oral submissions included:

- We need to look at who we are, where we are from, before looking to the future.
- Intellectual property right is an issue. The Crown is alleged to own "everything".
- Maraeroa marae voted overwhelmingly against genetic modification based on "gut feeling".
- For performing arts, there is a concern about interference with the attributes of nature, eg with harakeke needed for Maori dance.
- There is a need for young people to be encouraged to take an interest in genetic modification and what is happening.
- There is a need to recognise the Treaty: no mixing of human and animal genes.

In addition to oral submissions, written submissions were handed to the Commission:

- One submitter was concerned with protection of biodiversity, and eliminating uncontrolled gene transfers. The submission sought containment of genetic engineering trials, that kaitiakitanga should be honoured by the Crown, and stated that Crown policies and laws on genetic modification were being heard by the Waitangi Tribunal.
- Orongomai Marae (a multicultural marae) recommended that the Treaty of Waitangi be the strategic option used now and in the future to address genetic modification issues, and the introduction of legislation to monitor genetic modification imports and require labelling. Legislation was also recommended to ban genetic modification of food.

Blenheim Regional Hui

A Regional Hui was held on 27 January 2001 at Omaka Marae, Blenheim. The Chair was Hoani Cowan. Around 10 people attended.

Pre-Regional Hui workshops were held in Picton on 18 January and Nelson on 19 January.

Organisations involved in arranging workshops and Regional Hui included Waikawa Marae, Whakatu Marae, Omaka Marae and Te Puni Kokiri Blenheim.

There were two oral submissions and no written submissions.

The following is a summary of themes expressed in oral submissions:

- tampering with genes
- intellectual property rights and the rights of Maori (noting that many Maori resources have been stolen and the same might happen in relation to genetic modification)
- interfering in whakapapa and using medicines with different genes
- 'test tube' products which do not embody spirituality.

Hastings Regional Hui

The Hastings Regional Hui was held on 10 February 2001 at Omahu Marae, Hastings. Joe Te Rito was Chair. Approximately 25 people attended.

Pre-Regional Hui workshops were held in Napier on 23 January and Dannevirke on 24 January.

Organisations involved in arranging workshops and Regional Hui included Te Whanganui-a-orotu, Rangitane Tamaki-nui-a-rua, Omahu Marae and Te Puni Kokiri Hastings.

There were six oral submissions and two written submissions at the hui.

Themes outlined in oral submissions included:

- A total moratorium on genetic modification research and trials in New Zealand.
- While such a moratorium is in place, Maori should be involved in a formalised, full, educative and ethical debate about genetic modification.
- No transfer of genes between species.
- We have no faith in the Crown to protect cultural or intellectual property rights of Maori.
- Checks and balances are needed.
- Genetic modification could be good but we need safeguards and controls.

Written submissions contained the following themes:

- We have little faith in how Maori concerns will be acted on.
- We have concerns about the Treaty of Waitangi.
- The Maori view is portrayed as unscientific compared with the 'western' view.
- Maori intellectual tradition has been ignored.

Gisborne Regional Hui

A Regional Hui was held on 17 February 2001 at Te Poho-o-Rawiri Marae, Gisborne. The Chair was Toko te Kani. Around 16 people attended.

Pre-Regional Hui workshops were held in Ruatoria on 1 February and Gisborne on 2 February.

Organisations involved in arranging workshops and Regional Hui included Te Runanga o Ngati Porou, Te Poho o Rawiri Marae and Te Puni Kokiri offices in Gisborne and Ruatoria.

There were six oral submissions and one written submission.

The following is a summary of themes outlined in oral submissions:

- Concerns were expressed about damage to the environment.
- Rights of indigenous people should be protected.
- Genetically modified foods must be labelled.
- Say no to genetic modification except perhaps for medicine.
- Genetic modification will be driven by the dollar rather than by welfare.
- Concerns were expressed about effective control of genetic modification, genetic modification processes and experiments.
- More information is required by Maori for effective consultation.

The written submission contained the following themes:

- The Crown needs to consult properly with Maori on genetic modification. There has been not enough information or time.
- The Crown needs to pay more attention to tikanga Maori and the Treaty of Waitangi.
- Genetic modification not opposed in general, but genetic modification technology out of control is intolerable and dangerous.
- Proper controls need to be put in place to monitor genetic modification.

Christchurch Regional Hui

The Christchurch Regional Hui was held on 24 February 2001 at Te Waipounamu House, Christchurch. Paul Hiroti was Chair. Approximately 20 people attended.

Pre-Regional Hui workshops were held in Christchurch on 12 February and Hokitika on 19 February.

Organisations involved in arranging workshops and Regional Hui included Te Runanga o Ngai Tahu and Te Puni Kokiri offices in Christchurch and Hokitika.

There were 11 oral submissions and no written submissions at the hui.

Submissions expressed concerns about:

- intellectual property and Treaty rights of Maori
- genetic modification experiments being conducted without public's knowledge
- mixing genes and whakapapa
- patenting genes
- scientists playing God
- the Treaty of Waitangi.

Other themes in oral submissions included:

- Scientists cannot handle genetic modification issues alone. They are not able to enter the Maori world, nor do they want to.
- Legislation is needed to ensure Maori participation in genetic modification decision-making in New Zealand.
- More information is required for proper consultation.
- Genetic modification cannot be classed in black and white terms. We want health benefits and should have access to that knowledge.
- Slow genetic modification down and get the proper and effective controls into place first.

Dunedin Regional Hui

The final South Island Regional Hui was held on 6 March 2001 at Otakou Marae, Dunedin. The Chair was Edward Ellison. Around 12 people attended.

Pre-Regional Hui workshops were held in Invercargill on 4 December 2000 and Dunedin on 5 December 2000.

Organisations involved in arranging workshops and Regional Hui included Te Runanga o Ngai Tahu, Nga Hau e Wha Marae, Otakou Marae and Te Puni Kokiri Dunedin.

There were six oral submissions and no written submissions.

The following is a summary of themes presented in oral submissions:

- Genetic modification is fine as long as it is by normal evolution and not human interference.
- Concerns were expressed about whakapapa and the mixing of genes between species.
- Genetic modification is not necessarily a bad thing, but we need to be very careful about potential damage. Controls need to be in place.
- Maori have been an innovative people but under the control of their own tikanga and kawa. The present legislation and controls are inadequate.
- Treaty of Waitangi obligations should be written into genetic modification legislation.
- Precautionary principles need to apply.

Auckland Regional Hui

The Auckland Regional Hui was held on 10 March 2001 at Orakei Marae, Auckland. Danny Tumahai was Chair. Approximately 50 people attended.

Pre-Regional Hui workshops were held in Papatoetoe on 26 February, Henderson on 27 February and Northcote on 28 February.

Organisations involved in arranging workshops and Regional Hui included Manukau Urban Maori Authority, Waipareira Trust Office, Orakei Marae and Awataha Marae.

There were 12 oral submissions and two written submissions at the hui.

The following is a summary of themes presented in oral submissions:

- Take time to consider all the implications of genetic modification properly.
- Social funds (health and nutrition) should be used to clean up the environment and to provide better health care and nutrition, not diverted to genetic modification.
- It is faulty to think that genetic modification will provide an effective fix to all our problems.
- Multinationals are looking at genes as a new commercial commodity and indigenous people will be exploited for their genes.
- Concerns were expressed about lack of information for Maori and protection of intellectual property rights.
- Concerns were expressed about effective controls over genetic modification experiments and commercialism.

- Opposition was expressed to mixing of genes between human and others.
- Consultation like this is inadequate without Maori having all the facts to make an informed decision.
- Keep an open mind. Gene therapy could be useful and we should have access to information and knowledge on the medical benefits of genetic modification.
- It is important that Maori be in a position to use the tools of genetic modification and to help manage it in New Zealand.
- Maori rights under the Treaty to equal authority must be observed fully.

The written submissions included the following views:

- Can we trust the geneticists and their technology?
- The Treaty of Waitangi is the best means of protecting Maori heritage, culture, flora and fauna, and full ratification of the Treaty is required.

Outline of National Hui

A National Hui was held at Turangawaewae Marae, Ngaruawahia on 6–8 April 2001. All the Commissioners were present and at least two representatives from each of the previous 10 Regional Hui. Taki Turner, Chris Webster and Kingi Porima chaired the three-day hui.

Attendance at the event varied over the three days: approximately 50 people took part on Friday 6 April, 120 on Saturday and 65 on Sunday.

The hui also served as a Regional Hui for the Waikato, King Country and Counties area.

Pre-Regional Hui workshops were held in Pukekohe on 12 March, Hamilton on 12 March and Te Kuiti on 13 March.

Organisations involved in arranging workshops and Regional Hui included Huakina Development Trust, Maniapoto Maori Trust Board, Te Puni Kokiri Hamilton and Turangawaewae Marae Committee.

There were 16 oral submissions and three written submissions. The hui also endorsed 16 recommendations on genetic modification which it presented to the Commission.

Oral submissions referred to:

- whakapapa and the marketing of Maori intellectual property
- the breaking down of traditional relationships in the natural world
- western constructs of patents hiding behind the ethic of stewardship

- controls over genetic modification experiments and field tests
- labelling genetically modified foods properly
- health risks.

Other themes in oral submissions included:

- Genetic modification is a direct offence to Te Ao Maori, is a breach of Maori rights and perpetuates colonialism.
- Maori will be further disadvantaged and alienated from their taonga.
- Maori own the responsibility to protect the legacy of their own future generations and need to be able to give informed consent to genetic modification.
- Genetic modification development without Maori consent is a breach of the Treaty of Waitangi.
- Genetic modification agenda will be undermined by multinationals. Concerns were expressed about Government's ability to control outcomes.
- There should be a moratorium on genetic modification developments now and until such time as the Maori Treaty partner agrees.
- There is a lack of information and time to make informed decisions on genetic modification.
- Many concerns were expressed over Maori rights under the Treaty being ignored. Who will benefit and who will control? Who knows what is truly happening?
- Scientists and Crown Research Institutes should be held responsible and accountable for the results of their work.
- Flora, fauna and rongoa need to be protected.

Written submissions expressed similar concerns to those in oral submissions. Additional issues included:

- Public money is being used on genetic modification without any clear understanding of the risks and whether or not it is in the public interest. The Commission has a duty to comment on this.
- Maori views are sought when convenient and scoffed at if 'unsuitable' or considered not scientific.
- Legislation needs to be passed to ensure and guarantee Maori a full decision-making role covering all aspects of genetic modification development in New Zealand.
- Genetic modification interferes with the integrity of species and the mauri of the affected species.

Recommendations on genetic modification from the hui

On Sunday 8 April the National Hui attendees considered and passed a resolution of support for 16 recommendations on genetic modification:

1. That the Crown honour Te Tiriti o Waitangi.
2. That a process for implementing constitutional change is negotiated between Maori and the Crown which includes a revision of all legislation inconsistent with Te Tiriti o Waitangi including the Hazardous Substances and New Organisms Act 1996.
3. That following such a process, any constitutional change implemented reflects a basis in tikanga Maori and acknowledges the following constitutional documents as the foundation for such process:

   Declaration of Independence

   Te Tiriti o Waitangi

   Draft Declaration of Indigenous Rights

   Mataatua Declaration

   An Aotearoa (New Zealand) Constitution
4. That the Crown fund a parallel process which seeks Maori knowledge and opinions on genetic modification (GM) sourced from kaupapa Maori processes and contexts immediately.
5. That a moratorium be placed upon all activities related to GM and GMOs immediately.
6. That we outlaw the patenting of any life forms.
7. That an inventory on GMOs and GM activity in Aotearoa be completed by Maori and the Crown. Such an inventory must source all GMOs and GM research, outputs and activities to date.
8. That Maori in negotiation with the Crown commence immediately an environmental, spiritual and cultural GMO impact assessment, followed by a cultural, spiritual and environmental clean up.
9. That the Crown stops free-trade negotiations and stops biotechnology multinationals from entering Aotearoa to conduct GM experiments.
10. That Maori in negotiation with the Crown develop separate standards from the current ANZFA and other food standards that label GM foods.
11. That Maori in negotiation with the Crown label all GM foods.
12. That Maori in negotiation with the Crown halt the import of GM foods for the future.

13. That the Crown fund sustainable organic agricultural practices and implement processes that will ensure that Aotearoa is an organic nation by 2020.
14. We declare that Aotearoa should be an independent, nuclear- and GE-free nation.
15. That the Royal Commission include the resolutions from the National Maori Hui held 6–8 April 2001 in their final report, and to the New Zealand Government.
16. National Hui held at Turangawaewae acknowledge and support the recommendations presented by Nga Wahine Tiaki o te Ao and other whanau, hapu, iwi, and Maori submissions that were received and delivered.

Analysis of main points in oral and written submissions

The submissions, both oral and written, received through the Maori Consultation programme of workshops and hui were predominantly opposed to genetic modification. However, although a large part of that negativity stemmed from the submitters' views about the mixing of genes between species, a major concern also was the abrogation of Maori rights under the Treaty of Waitangi, a lack of information and time to make informed decisions on genetic modification, and concerns about who will control genetic modification in New Zealand and who will benefit from it.

The following summary of the main findings from submissions made through the hui programme is grouped into the broad topic areas of:

- tikanga Maori
- Treaty of Waitangi
- controls and benefits
- information and time.

Tikanga Maori

Upsetting whakapapa, mana, mauri and wairua by the mixing of genes between humans and other species was roundly condemned at every hui.

At the first regional hui at Wanganui, James Okeroa Broughton, a Muaupoko Kaumatua, said:

> Although we are all related and linked to each other through Rangi and Papa, all species have their own mauri which must stay with their own species. In our culture, we, as

> human beings, are seen as in no way superior to other living things. We make use of other species in the natural world and they make use of us when we die. But we are not superior to them. ... the mixing of the life force of one species with another by human beings is not tika and will adversely affect all of us.

At the final hui at Turangawaewae in April, a representative of Totara Nations, a rangatahi group, said:

> When the balanced cycle is interfered with through genetic manipulation, whether it be intentional or accidental, [it] will ultimately cause an imbalance. The hua, the product of this interference, is uncertain; [it is] undeniable the kawai whakaheke will be broken and the link to our tradition and traditional relationships with the natural world will be severed.

Mahara Okeroa, a Member of Parliament, also said at the Wellington Regional Hui:

> My submission is that, while I understand and appreciate the medical benefit that comes from this, I suggest very strongly to the Commission that genetic modification, where we look at the genes' ira tangata and use those interchangeably for whatever scientific anticipated benefit it might have for us, raises very strong issues for me personally ... [the] whakapapa to all of those other things that exist ... why should those things be mixed with regard to a scientific advancement?

There were many similar expressions of concern at all the Regional Hui without exception, reinforcing the view that for Maori the concepts of whakapapa, mauri and wairua in respect of genetic modification are very important.

Lack of western knowledge and respect for tikanga Maori and Maori intellectual tradition was raised too, with the suggestion that both were confined to a hazy, cultural, spiritual, 'feel-good' area. Moana Jackson, a lawyer, commented at the Hastings Regional Hui:

> There is little recognition that the Maori 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 ... Because the Maori consideration of many issues is reduced to a cultural phenomenon, the efficacy of the Maori intellectual tradition is itself denied. In its place, Maori are asked to offer a mere 'perspective', which easily leads to rejection on the grounds of unreasoned, if interesting, spirituality or minimalisation as something that may be noted, but ignored if more compelling scientific or economic reasons can be discovered.

Many submitters made the point that the Commission and the Government must accept that there is a difference in approach and analysis inherent in the Maori intellectual tradition and in tikanga Maori.

Treaty of Waitangi

Concerns about Government going ahead with genetic modification development in New Zealand without proper consultation with and agreement of the Maori Treaty partner were expressed many times at all the hui.

Sir John Turei in his submission at the Auckland Regional Hui encapsulated the views expressed at all of the hui, about Government's need to fully honour and ratify the Treaty. Sir John pointed out that consultation, power-sharing and shared decision-making was a vital part of the relationship between Maori and the Crown, and stated that "the Treaty is the best means by which we can protect our unique heritage, our cultures, our people, flora and fauna, in the future from the ravages of misguided technology".

The first two of the 16 recommendations endorsed at the National Hui at Turangawaewae dealt with the Treaty: "that the Crown honour Te Tiriti o Waitangi" and "that a process for implementing constitutional change is negotiated between Maori and the Crown which includes a revision of all legislation inconsistent with Te Tiriti o Waitangi, including the Hazardous Substances and New Organisms Act 1996".

The need to ensure that Maori rights are not ignored or abrogated by the Crown and multinational companies in the development of genetic modification was also voiced many times. Demands were made to ensure legislation guaranteeing Maori a decision-making role in genetic modification development:

- "Legislation must be passed to ensure and guarantee to Nga Hapu Maori o Aoteroa, Te Iwi Maori, a legislated Treaty of Waitangi, tangata whenua, rangatiratanga right to a full decision-making Treaty Partner role covering all aspects of the development of genetic engineering and genetic modification in Aotearoa-New Zealand" (a resolution proposed by Te Iwi o Muaupoko representative at the National Hui).
- "I seek the following decisions from the genetic modification Commission … [that] tangata whenua [be] involved in the decision-making, as the Treaty of Waitangi has been breached in so far as our future generations' wellbeing, our birthright to that of the whenua and the respect and care given by our people" (Angela Harmer at the National Hui).
- It is further submitted that Maori be given equal representation with non-Maori within all legislative decision-making structures involving the natural and spiritual environment on the basis of both their particular and special role as guardians of the natural world and as tangata whenua or first peoples of the land" (written submission by Makere Stewart-Harawira at the National Hui).

At the Wellington hui, Fred Allan requested the Commission caution the Crown "that future Maori claims to the Crown for gross negligence will occur unless Maori concerns about genetic modifications are recognised and processed".

Similar concerns were expressed about protecting Maori intellectual property rights, particularly in respect of indigenous plants and medicines and the patenting of the genes of Maori people and exploiting them. Jodie Toroa, at the Gisborne hui, commented: "The other thing that came through strong with our Kaumatua is that they believe that this is a global activity and that it is driven by an economic market dollar rather than the welfare and sanctity of our environment and our people".

Control and benefits

There were many expressions of concern about who would control and monitor genetic modification in New Zealand and how this would be done in terms of experiments and research and control of access to expected benefits. Views were expressed that scientists could not be left to oversee genetic modification experiments and that all genetic modification experiments must be fully authorised and monitored independently.

Chris Webster at the Rotorua hui, said: "With this GM, we have the potential for opening up a whole bunch of problems, fast, and we can not guarantee that we are actually going to be able to protect our public."

Sister Makareta, at the Wanganui hui, said:

> I am here to protect ourselves in the face of an advancing technology. To protect ourselves against efforts of a new form of colonialism, a new form of colonisation which has been hidden for quite a while.

And at the Hastings Regional Hui, Mereana Pitman stated:

> Our whanau and hapu believe that the past record of the Crown in adequately ensuring these taonga be protected has been negligible and doubt very much that the current authorities, the Crown now, will be able to balance its need and desire for economic investment and the protection of these cultural and intellectual properties of whanau, hapu and iwi. So I suppose in essence what I am saying is that we have little faith considering that track record of the Crown ... that they will adequately protect these taonga of ours.

Although there were many negative comments about access to the perceived benefits of genetic modification by Maori people, including "cheap genetically modified products will be dumped on lower income people", there were some who pointed out benefits they or their family had experienced or wanted.

Maria Tini, at the Rotorua hui, gave an example of how her whanau had benefited from research work carried out by Otago University to study familial gastric cancer prevalent in her whanau.

Cath Brown said: "I don't believe that genetic modification research can be categorised as all black or all white and that is my personal opinion and from discussion with my whanau and my wider whanau, my hapu at Taumutu. I want the health benefits that can accrue from such research."

As referred to previously, there were many expressions of concern about the control of genetic modification in New Zealand and the access to benefits. These included Government's ability to control genetic modification development in New Zealand, the power of multinational companies, food labelling, field trials of crops, the need for a moratorium, patenting of genes, use of public money on genetic modification experiments, intellectual property rights and so on. At most of the hui, however, there were some people who expressed the view that, although they too were concerned about the control and safeguards on genetic modification development in New Zealand and the Treaty and protection of Maori rights, they also urged Maori to keep an open mind on genetic modification, particularly in the areas of medicine.

Dr David Jansen said at the Auckland hui:

> Maori are very keen to adopt new technologies … Many of our Maori families are grappling with issues about genetic treatment, about transplants, about blood transfusions … And I support our people working through those issues and it needs to be a process, which is supportive of bringing our tikanga. … I want them to have access to that knowledge and that information, within the concept of being Maori, within our worldview, our tikanga and our traditions and our values … But I do think that it is important as Maori doctors we bring to this korero and advocate on behalf of our Maori patients who potentially will gain great benefit from genetic engineering or genetic modification.

Information and Time

At all the hui criticisms were voiced about a perceived lack of information and time for Maori to make fully informed decisions and submissions on genetic modification.

Chris Webster at the Rotorua hui said that there had been "very little discussion, very little knowledge generated within our community, including my own industry [public health] … The conversation needs to happen so that we are all

making informed input to this process."

Two of the 16 recommendations endorsed at the National Hui at Turangawaewae were: "That the Crown fund a parallel process which seeks Maori knowledge and opinions on genetic modification (GM) sourced from kaupapa Maori process and contexts immediately" and "That Maori in negotiation with the Crown commence immediately an environmental, spiritual and cultural GM impact assessment, followed by a cultural, spiritual and environmental clean up".

section 4.2 |

4.

appendix 3

Outcomes of Consultation: Submissions from the Public

Section contents

4.2 Analysis of cultural, spiritual and religious issues for Maori raised in Public Meetings

Background

The purpose of the Public Meetings was to allow the Commission access to the views and opinions of a cross-section of New Zealanders. Fifteen meetings were held throughout the country between September and November 2000. The planning and programme of Public Meetings and the process for seeking and recording public views is set out in detail in Appendix 1 (see "Processes of the Commission: Public Meetings: the process" and "Operational detail: Public Meetings operation"). A summary of outcomes is presented previously in this volume. This section deals with the issues for Maori raised in the Public Meetings.

Of relevance to the Maori Consultation programme is the fact that meetings were facilitated by two independent, bilingual (in English and Maori) contractors.

Workshop discussion questions were grouped into eight categories derived from the Warrant and were of general relevance, except four in the cultural/spiritual grouping that specifically asked about issues for Maori in relation to genetic modification (and four that asked the same questions about non-Maori views).

The questions were as follows:

> What are the cultural, spiritual and religious issues for Maori associated with the use or avoidance of genetically modified food (production and consumption)?
>
> What are the cultural, spiritual and religious issues for Maori associated with the use or avoidance of genetically modified crops (production and consumption)?
>
> What are the cultural, spiritual and religious issues for Maori associated with the use or avoidance of genetically modified pharmaceuticals (production and consumption)?
>
> What are the cultural, spiritual and religious issues for Maori associated with the use or avoidance of genetically modified medical procedures?

A further workshop question on cultural/spiritual issues asked:

> How should spiritual, religious and ethical concerns be weighted against societal/ economic benefits?

Early in the programme of meetings, the basic groupings of issues was followed fairly closely; that is, persons attending the meetings grouped their responses in a similar way. However, later meetings often developed their own categories in addition to those used in the schedule of questions. There are therefore responses on such matters as the Treaty of Waitangi (which was not specifically referred to) that arose either in answer to the cultural/spiritual questions, or because those attending meetings identified this as an essential topic.

Methodology

For the purposes of this analysis, written responses on the summary cards have been used. Feedback from the second part of the meetings was recorded and noted by the Commissioners. The opinions voiced during this segment have been included in the Commissioners' deliberations, contributing to the content of their report.

Whose views?

People attending meetings were not asked to identify themselves by ethnicity, nor by age, residential locality or any other identifier. However, on occasion, members of the public who were Maori identified themselves as such when speaking from the floor or in the course of writing their views on the summary cards. Equally, some of the responses on the summary cards indicate that the respondent was non-Maori. Where it is possible to confirm that a response is non-Maori (through self-identification in the response), this is noted below.

Overall, there was a noticeable Maori presence at most of the Public Meetings, ranging from a kura kaupapa and accompanying adults at the Manukau City meeting to a meeting in Greymouth with approximately 60% of the attendees identifying as Maori.

The following summary of views cannot therefore be described as an outline solely of Maori views on issues for Maori. However, a proportion of the views summarised on the response cards talk of such things as "my tupuna", or "we Maori", or of Treaty promises for "our taonga". In other cases, some views (a smaller proportion) appear to set out non-Maori views: one for instance refers to "we Pakehas", another talks of "their" and "them" in referring to Maori. On the basis of this approach, it is possible to say that this summary captures a predominantly Maori outline of views.

Maori responses were not confined to the cultural/spiritual questions, and Maori views are also present in the summary of responses to the general questions presented earlier in this volume (see "Public Meetings: summary of outcomes").

Issues raised

The responses reflect, to a degree, the categories of issues raised by the questions. However, some "categories" have been added, for instance the Treaty of Waitangi, as indicated above, and intellectual property, because of the frequency with which comments on these topics appear. The responses have been grouped as follows:

- attitudes and knowledge
- Treaty of Waitangi
- tikanga/spiritual
- food and medicine
- intellectual property.

Respondents' use of the terms "GM" (genetic modification) and "GE" (genetic engineering) is retained in quoting their responses.

Attitudes and knowledge

Some meetings recorded preliminary issues about the way in which the questions had been framed and categorised. In New Plymouth, there was a query about whether there was a difference between the ethical concerns of Maori and non-Maori. In Nelson, it was stated that cultural, spiritual and religious issues about genetic modification are not exclusive to Maori. One Auckland respondent was "exceedingly annoyed" at a perceived "lack of real acceptance of people other than Maori having spiritual attitudes regarding land, animals, plants etc".

Another theme (primarily in the northern part of the country) was that of the need for more knowledge about the issues. A respondent in Manukau City said:

> We are Maori and we should have the right to know what GE is all about. We need honest answers.

Another spoke of a lack of knowledge around the world, and the right to have this knowledge so that decisions could be made on whether genetic modification is "good or not".

Treaty of Waitangi and genetic modification

Some responses about the Treaty asked how the Treaty "relates" to the debate on genetic modification. This query was raised several times in different ways at

Palmerston North. In most areas, however, there were clear views on the relationship between the Treaty and genetic modification. There was a view that genetic modification is a breach of the Treaty. This was clearly stated in Dunedin and, at the other end of the country, in Manukau City.

In other areas, more detailed comments were provided. For instance, in Wellington, one response indicated that genetic modification is a breach of the Treaty because it "denies the element of partnership" in decisions. Another response came from a person who identified as a "young pakeha" and indicated that Maori will soon be in the majority and Maori views should have a standing at least equal to that of other views. Treaty principles of partnership and good faith were referred to in Manukau City. Genetic modification was seen as contrary to these, and to the guarantee of tino rangatiratanga.

In Hamilton the question posed was "Does GM breach the Treaty?" There were mixed responses: some said they were uncertain about the legal answer to the question; another stated an inability to answer the question adequately and noted that there were "transgenic sheep" at Whakamaru "with local hapu blessing". There was one clear response that genetic modification does not breach the Treaty and could potentially be a tool to maintain the integrity of the native flora and fauna. There was also a firm answer of "yes" to the question of whether genetic modification breaches the Treaty, together with the comment that the "rights of tangata whenua" should be affirmed. The response from Gisborne was straightforward: it called for the Treaty to be honoured for both partners and concluded "we don't know what we are mucking about with!" In Whangarei, there was opposition to "GE" because under the Treaty, "all Maori taonga are ours", and "Our genes are us. They are taonga". Other Treaty references were made in connection with specific issues (for example, food) and are referred to elsewhere.

Tikanga/spiritual

This category attracted the most comment, in part because the formal questions specifically asked about spiritual/cultural issues. In Dunedin, there was concern about the "reductionist" effect of genetic modification on the practice of tikanga and kaitiakitanga. Palmerston North responses were unclear about the relationship between the Treaty and genetic modification, but it was clearly stated there that Maori concerns about taonga and whakapapa need to be addressed. In Wellington, it was said that "spiritual, intellectual and physical matters inform each other", that respect for individual mauri and wairua must be maintained, and that species relationships should be respected, together with the mana, wairua and mauri of particular species. One respondent cautioned against making decisions that

might harm future generations. Another referred to the obligations and responsibilities of mana tangata tiaki.

Responses in Rotorua similarly referred to mauri and wairua, and to whakapapa.

In Whangarei, one response stated:

> I am opposed to GE because it discounts my whakapapa. All my ancestors are disregarded when our genes are tampered with. It is our responsibility to protect our ancestry for our tamariki.

Again in Whangarei, it was said that the body is tapu — sacred even when dead. In Napier, the view was expressed that "GE" is "against the natural process" and against the whole process of creation, with a conclusion that "species borders should not be crossed". There was also concern about the "social implications" of genetic modification and who might profit from it.

At northern meetings (in Hamilton, Manukau City and Auckland City), there were more detailed responses from Maori and non-Maori. In Hamilton, one non-Maori response stated that "we Pakehas understand species connection at a deeper and frankly more correct level than any pious evocation of religious myths". Another response asked whether any ethnic or cultural grouping can "lay claim" to be guardians of species, even indigenous species that evolved millions before the arrival of humans.

Other responses in Hamilton spoke of the need for protection for tikanga, mauri, kawa, te ira tangata, whakapapa, te taiao, hauoratanga and nga taonga tuku iho. One mentioned a "lack of recognition" of human relationships with historical and aquatic species "eg tuakana/teina roles" and fear of contamination of indigenous species.

In Manukau City, there was concern that cultural, spiritual and moral reasons for opposing genetic modification were not seen as being as important as scientific facts and the mitigation of risks.

In Auckland, one respondent commented that there were several groups that opposed the transfer of genes between species because of their spiritual beliefs including Maori, Jewish, Muslims and others. Another response focused on Maori as the indigenous people of New Zealand with a cultural and spiritual connection with the land. To introduce genetically modified foods "into these subtle vibrations of their energy" was seen as likely to be "highly toxic".

Food and medicine

There was consistent anxiety nationally about the effects of GM on food. In Wellington the Treaty was seen as the basis for an agreement to protect the food

chain and taonga tuku iho. In Manukau City, one response stated "my mana Maori comes from my tupuna, not a riwai, kumara or ika." There was a call for scientists to "leave our food alone"; again, a view that food is taonga to be protected against experimentation, summed up in one comment that "the Treaty of Waitangi said leave our kai alone". There was also concern about transgenic issues: one response in particular said "Maori don't need moth genes in our tomatoes…. We say no to GE food."

There was also concern that Maori medicines be protected from modification, and from commercial exploitation.

In Hamilton, issues of genetically modified food, crops and pharmaceuticals were considered together and recommendations made for:

- active involvement by whanau and hapu in research or experimentation, or monitoring research or experimentation
- appropriate Maori specialists to be on any decision-making bodies, and whanau and hapu to be represented
- a genetic bill of rights to be drafted by whanau and hapu and circulated for wider comment
- development of containment guidelines in partnership with whanau and hapu to prevent escape of genetically modified materials
- whakapapa protection mechanisms
- development of guidelines by and for Maori on risk management ensuring recognition for each whanau and hapu
- ethical protocols to be developed with whanau/hapu/iwi for their particular area.

Intellectual property

There was concern about ownership of the intellectual property rights in plants and crops. In Palmerston North, a question was asked about what constitutes the spiritual property of a plant. In Wellington, it was said that that intellectual property rights should remain with indigenous cultures, and not be patented or modified. People in Rotorua were concerned about protection of flora, fauna, native plants and medicines and the guarantees provided in the Treaty, and there were similar concerns in Auckland and Whangarei.

Summary

Overall, there seemed to be a clear distrust of genetic modification in relation to Maori.

In Maori responses there were constant and consistent references to the Treaty of Waitangi throughout the country, ranging from the view that genetic modification breaches the Treaty principles of partnership and good faith to the view that the Treaty guaranteed protections for taonga, including native flora and fauna, and tino rangatiratanga, meaning that decisions about genetic matters involving tangata whenua or taonga were matters for Maori. There was a view that transgenic modification was unacceptable, that there were Maori obligations to respect and protect plants and animal species from genetic modification, and that foodstuffs should not be interfered with. There were also recommendations about the need for Maori involvement in decision-making if genetic modification did proceed.

Non-Maori responses fell into one of two broad categories. There were those that questioned or opposed the idea that Maori views be sought, either because they were not sure what differentiated Maori and non-Maori views, or because they believed there was too much emphasis on Maori views on spiritual matters, to the exclusion of others. There was also a small group of responses that was strongly sceptical or dismissive of perceived Maori views.

The other category of non-Maori responses supported the approach of seeking Maori views. One asked "How have you sought Maori views in a safe and robust manner?" In others, there was a concern to address Maori issues, to acknowledge protections in the Treaty, and expressions of respect for perceived Maori views of safeguarding the environment.

section 4.3 |

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appendix 3

Outcomes of Consultation: Submissions from the Public

Section contents

4.3 Analysis of views relating to Maori raised by the Youth Forum

Background

A Youth Forum to obtain views of young New Zealanders on genetic modification was held at Te Papa Tongarewa (Te Papa, Museum of New Zealand) in Wellington on 5 March 2001. The nature of the event and its programme are outlined in Appendix 1 (see "Youth Forum: the process") and a summary of the outcomes is provided in this volume (see "Youth Forum: summary of outcomes").

Participants at the Youth Forum identified seven major topics for discussion, including the Treaty of Waitangi (together with cultural issues). This part of the report briefly describes the forum from the point of view of comment on Maori and genetic modification, and the impact of the Treaty of Waitangi.

The forum was attended by 99 young people of whom 14 identified themselves as Maori. Many of these came from the South Island (from Nelson and Blenheim). Others came from the Wellington/Wairarapa area, and one from Napier.

Views expressed

Comment on Maori in relation to genetic modification arose through several aspects of the Youth Forum: through competition essays, from role-play and through a brainstorming session.

Essays

In preparing for the forum, the Commission conducted a national essay competition to select 20 young people aged between 16 and 18 from outside Wellington to attend the event. The Commission paid the travel costs of these 20 young people. All the winning essays have been placed on the Commission website.

The essay topic was "What future does genetic modification have in New Zealand?" One winning essay was written by a young person who identified herself as Maori.

Two of the essays, by non-Maori, made specific reference to Maori views. Both essays noted Maori objections to genetic modification as an interference with whakapapa and mauri, and one referred to Maori concerns about protection of native flora and fauna. This essay stated that "in the future there should be "stronger" discussions on genetic modification among Maori.

The other essay referred to the rejection by Ngati Tuwharetoa of a proposal by a company to field-test genetically modified pine trees. The writer went on to suggest that Maori cultural concerns are similar in many areas to those of the wider community, but that such views "cannot be allowed to stifle research that can provide such massive benefits to the community, benefits that Maori themselves acknowledge".

Role-play

Part of the programme for the day involved a role-play session to look at different perspectives in the genetic modification debate. Ten participants were selected to take on specified roles, including medical scientist, parent-to-be, environmentalist and iwi representative. The "iwi representative", a young Maori woman, expressed the view that genetic modification is a "Waitangi issue" and that thought needed to be given to how Maori feel about genetic modification. She herself indicated that she did not like the idea of taking "fish from Tangaroa and blending them with birds from Tane Mahuta. It doesn't work that way". This view received support from another Maori attendee at the Forum.

Other role-players suggested that Maori would benefit from genetic modification-based medicines, or that there was little point in dividing the human race into, say, Europeans and Maori, since, from the genetic point of view, there was little difference.

Treaty of Waitangi

Arising out of the role-play and a brainstorming session, the Treaty of Waitangi (and cultural issues) were identified as one of seven major elements of the genetic modification debate. In addition to the comments on the Treaty set out in the following section (see "Youth Forum: summary of outcomes"), the view was expressed that if the Treaty is accepted as a political agreement between Maori and the Crown, then cultural issues should not be considered "under" the Treaty.

There were comments on the nature of New Zealand society , and whether it can be regarded as "bicultural" or multicultural. There was a sense that Maori were opposed to genetic modification, and concern over what this meant for the future of genetic modification in New Zealand. One suggestion was that the Maori perspective should be respected, but not predominate, as New Zealand was "a

multicultural society". A supporting comment indicated that the Treaty required Maori views to be considered, but that genetic modification could not be stopped purely on the basis of Maori opposition.

An alternative view from a Maori attendee was that New Zealand was "bicultural" in a political sense, with the relationship being between Maori and the Crown, "and that's probably why the consultation goes more between Maori and Pakeha as opposed to the minority groups".

A further suggestion from a Maori attendee was that genetic modification issues should not be considered until contemporary Treaty claims before the Waitangi Tribunal had been heard.

Conclusion

The views expressed by rangatahi (young Maori) attending the Forum generally mirror the views of the Maori community as expressed in submissions to the Commission. In particular, the concern about mixing the genes of different species, and the reference to the relationship between Maori and the Crown reflected in the Treaty of Waitangi are matters frequently raised in Maori submissions.

Comments from non-Maori youth indicate some understanding of the basis of Maori concerns from the point of view of tikanga concepts such as whakapapa and mauri. However, there was a degree of confusion over how to describe New Zealand society and the role of the Treaty of Waitangi.

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Outcomes of Consultation: Submissions from the Public

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5. Youth Forum: summary of outcomes

Introduction

The Commission held a Youth Forum to hear from young New Zealanders on the issue of genetic modification, as part of its consultation programme. The Youth Forum was held at Te Papa, Wellington, on 5 March 2001.

The day was designed to allow participants to hear a range of views regarding genetic modification and then discuss and report their own views. A workshop programme incorporating a role-play, brainstorming session and reporting-back session was developed. Details regarding the process involved in establishing this event are outlined in Appendix 1 (see "Youth Forum: the process").

The meeting was facilitated by two independent contractors, experienced in working with young people. Ninety-nine youth attended, together with the Commissioners and the Commission Kaumatua. A transcript of the forum was placed on the Commission website.

Programme

The day started with the Commission introducing itself. The Chair said the Commission had attended a large number of hearings, received many written submissions and was holding the forum to hear young people's views on genetic modification. He reiterated that young people's views were important because today's young people are the ones who will have to live with the consequences of whatever decisions are made in regard to genetic modification.

A role-play was conducted looking at different perspectives on the genetic modification issue. Ten participants selected to take on the roles of medical scientist, parent-to-be, international agriculture consultant, tourist operator, environmentalist, consumer representative, plant scientist, orchardist, church leader and iwi representative were provided with basic information about each persona.

After the role-play, the participants identified key genetic modification issues in the brainstorming session and then worked in 10 smaller groups to select their

priorities for discussion. The seven most commonly prioritised genetic modification issues were identified and participants spent the rest of the day discussing and reporting their views on these topics.

Issues for discussion

The issues identified by participants for discussion were:

- environmental
- cultural
- medical
- developing countries
- animal rights
- economic importance to New Zealand
- natural selection
- individual choice
- genetic modification in New Zealand already
- labelling food
- agriculture
- resources, natural resources
- who is making the decisions
- ethics, world view
- containment issues
- philosophical understanding of the issue
- testing
- effects
- genetic modification and the "soul" or spirit
- limits
- obligations under the Treaty of Waitangi
- overpopulation issues
- religion
- liability
- international competition
- international political obligations

- corporate domination
- secrecy
- human rights.

From the above list participants prioritised seven topic areas for each small group to discuss. These were:

- medical and human health
- environmental
- economic (including agriculture and developing countries)
- consumers and food (including labelling)
- Treaty of Waitangi (including cultural)
- ethics and morals (including philosophy and religion)
- political and legal (including restrictions, liability and who makes decisions).

Participants' views on the seven priority topics

The participants' views were tape-recorded and transcribed, the outcomes of their 'reporting-back' noted on wall charts and they also had the opportunity to contribute to a 'graffiti board' which was later displayed in the Commission office. Following are samples of the discussion to illustrate the breadth and depth of young people's thinking on genetic modification.

Respondents' use of "GM" (genetic modification) and "GE" (genetic engineering) is retained in the summary of responses. The responses have been lightly edited for grammar and style consistency but are otherwise presented as a series of quotations. These 'quotations', however, are not always the words of an individual but may present multiple responses grouped by subject matter, sometimes offering both 'pros and cons' of an issue.

Medical and human health

The medical and human health issues surrounding genetic modification were identified as the priority for youth. An articulate, informed and often personal debate was held on these issues. Points made included:

> Does New Zealand really need genetic modification in health? There will be some health benefits to a small number of people, but what about the effect on the environment and other people? There is a tension between curing people and doing what you can to save lives — after all, people have to die some time. There will be less need for antibiotics if genetic modification is used in health.

Genetic modification is a 'technocentric' approach — in the past more complex diseases have been created by 'pill fixes'. We should look more at the causes of diseases such as cancer.

Everyone has good intentions regarding genetic modification, but who will actually be able to afford it? Won't it be used for things like biological warfare instead of for good? Should the Olympics be 'GM-free' in addition to 'drug-free'?

Genetic modification in health is a personal choice issue. Without genetic modification in New Zealand, people with diabetes will have to move to other countries.

Will humans become susceptible to animal diseases if they have genes implanted in them?

Genetic modification has potential; there should be more research so we can fully understand it.

There should be compulsory standards and codes for genetic modification.

It would be bad if in the future it became in vogue to genetically modify your children. Genetic modification may mean that people in same-sex relationships can have their own children.

Environmental

Debate on environmental issues by youth was equally spirited, with the following points being raised:

Genetic modification is another example of humanity looking for quick and simple fixes for things. Let's think creatively about answers to the problems genetic modification is trying to solve — as we know from the case of health, alternative medicines can be used which have fewer side effects.

Because we do not know what may happen through introducing genetic modification; we cannot plan for it. Many mistakes have been made in the past, so let's wait and see with genetic modification. If we make crops all the same, then one disease could wipe them all out.

Already food contains too many unknown things; adding genetic modification will simply make it worse.

The chances are that genetically modified crops will get into and move up the food chain through cross-pollination and then damage the environment.

The ultimate environmental cost of using genetic modification technology is not currently factored into the price of genetic modification products.

Because many of our plants and animals are unique they need to be protected; already, imported species have caused major problems.

Natural selection already modifies genes anyway and endangered species could be saved. But shouldn't we be trying to prevent extinction rather than trying to bring back extinct species?

Genetic modification may help reduce problems with horticultural sprays and nitrogen-related soil and water pollution, but it may not always result in a reduction in pesticides. Marginal land may be able to be saved because of better yields from genetically modified crops.

Economic

Youth selected economic issues surrounding genetic modification, including its usage in agriculture and in developing countries, as their third priority to discuss. The tourism and organic produce markets were identified as major players in the economic debate. Issues raised included:

Introducing genetic modification will destroy New Zealand's 'clean green' image. If we stay GM-free, and everyone else in the world is selling it, we will always have a market for our GM-free food and an economic advantage. We need to do something to stop other countries sending genetic modification products here.

New Zealand agriculture has always remained up to date with technology, why not do this with genetic modification? If we are going to go genetic modification, we should jump right in and attract investment from research companies early on.

The organic market is just starting in New Zealand and will be overrun by cheaper genetic modification food if it is introduced. You cannot claim that you are producing organic food if there is any genetic modification production nearby. All of New Zealand's agricultural production would be threatened by genetic modification cross-pollination.

If we don't introduce genetic modification and just wait and see, in 20 years' time we can always go GM if we want to. Decisions should not just be market-driven.

There are other ways of helping developing countries, apart from genetic modification; for instance, our growing more food for them. People in developing countries should be given the choice as to whether they want genetic modification or not. Genetic modification won't cure world starvation; poor countries will not be able to afford genetically modified food.

New Zealand is too small to do its own thing; we will have to follow the lead of larger countries. With economic globalisation, it will be hard to keep New Zealand GM-free.

Consumers and food

Food, consumers' right to choose and the labelling of food containing genetically modified components were also raised as issues. Again, the risk of the unknown

was also identified. Following are samples of some of the responses:

> As a country, we need to have control over what goes into our food supply. We can't ban genetic modification food, we can only hope to control it.
>
> Because genetic modification's long-term effects are unknown, we should be careful and not rush in so fast that we can't back out of it.
>
> There should be good labelling because people have the right to informed choice when deciding what they want to eat. This is particularly important for vegans and people with allergies. There should also be consumer education. However, how far we should go in labelling is a complex question; for example, what about milk from cows that have eaten grass that may have been genetically modified?
>
> We need to decide what price we are willing to pay for this new technology.
>
> If genetic modification develops a thicker-skinned fruit, won't larger bugs just develop?
>
> Isn't putting human genes in our food like cannibalism?
>
> It is a mistake to think of genetic modification as 'putting pieces of animals into fruit' as it only consists of rearranging the order of the natural chemical bases within DNA.
>
> Genetically modified food is cheaper and looks better. When apples are sprayed now, you end up eating dead bugs. We are already eating preservatives, so genetic modification couldn't be any worse. However, it is not a good argument to just say that, because what we eat now is bad, genetic modification could not be worse.

Treaty of Waitangi

The role of the Treaty of Waitangi in the genetic modification debate and cultural issues were also raised by youth. Samples of some of the comments made follow:

> New Zealand is not multicultural in a political sense, it is a 'bicultural' country with the relationship being between Maori and Pakeha.
>
> The Treaty is a political relationship, how do we respect Maori views on genetic modification, which we believe to generally be negative? The Treaty debate needs to be more than just finding out what Maori want and doing it.
>
> Genetic modification is not a Maori/Pakeha issue: it is an ethics issue. Each individual's views should be respected. Not all Maori are for or against genetic modification.
>
> We need to have ground rules that apply to all cultures to stop one culture just going and cloning lots of itself.
>
> If they are successful, Treaty of Waitangi claims may make it difficult to do genetic modification in the future.

Ethics and morals

Youth debated the ethics and morals surrounding genetic modification including aspects of religion and philosophy. Some of the issues raised included:

Everyone's views should be heard on the genetic modification issue.

Just because we can use genetic modification, should we?

What will our children's ethics be regarding genetic modification? Their views should be given more weight than ours; we shouldn't make decisions for generations to come.

Why put animals' rights below ours? Animals are not commodities to be experimented on. Anyway, rats are different from people, therefore experiments on rats are not useful. If it is not ethical to test on animals, then how should we test things? It is better to test things on animals than on humans.

Non-religious people are for genetic modification because they want to live longer and religious people are against it because they are not afraid of dying. We are constantly trying to prevent nature from taking its natural course. But people need to die; we should not be cloning people when overpopulation is a problem. We are still feeling the effects of atomic radiation; genetic modification may be dangerous and it may take a long time to find out.

If you had a disease would you use a genetically modified product?

Political and legal

While the political and legal issues surrounding genetic modification was the last of the top seven priorities, discussion was extensive and included reference to restrictions, liability and who actually makes the decisions. Samples of the debate are included below:

Not everyone will agree on the genetic modification issue; that is the nature of majority government. If the majority is wrong, don't we have a duty to do what is right?

The Green party is only three to five percent of the vote, but in the end the majority will win. But green ideas are growing and the Greens are not the only ones against genetic modification. Consumers have already spoken out against genetic modification, and politics is about power and people pressure — people saying 'no'.

We should not let a small number of people control what happens, for example, seeds being produced that have the ability to 'turn off' after a period of time. Anyway, the Americans can just determine our policy such as labelling.

We also have obligations under the World Trade Organization.

The biotechnology companies want to get rid of organics.

> There are always problems with any new invention. Any codes and regulations need to be tested. If genetic modification is used for warfare and we don't know anything about it, we won't be able to protect ourselves.
>
> There will be huge problems if people with illnesses have to get their drugs from overseas.
>
> Government should provide better knowledge to educate the public. People need to form an opinion and take a side in the debate. Some people just don't have enough information.

Conclusion

As expected, the participants in the role-play rose to the occasion and clearly articulated the diversity of views on the issue. Participants then identified the issues they wished to discuss in small groups. (Small groups were considered the most appropriate method of working with the young participants because it encouraged all participants to speak and provided opportunities for informal discussion.)

The Youth Forum reported a diversity of views amongst young people in regard to genetic modification. The issues and views provided at the Youth Forum reflected those collected from the adult community in the Commission's broader consultation programme. The order of priority given to the issues, however, differed in that youth addressed medical, human health, environmental and economic issues before the issues of consumer choice and food.

The Commissioners thanked the participants for their well-informed discussion and commented that they were better informed on the subject than the older generation. They said that some of the questions which the participants found difficult, the Commission had also found difficult, and that the questions participants thought important were the same as those raised in the wider discussions. The Commissioners said the energy and diversity of the participants was impressive and highlighted that there were massive issues to deal with, ranging from insulin production right through to human cloning.

The Commissioners said the Youth Forum continued the debate that they had been hearing around the country and they were continuing to investigate whether there were areas where genetic modification techniques could be used and those where they should not be used. The Commissioners noted that, while they had had a year to discuss this issue and come to terms with it, in one day the youth participants had raised most of the issues the Commission had been thinking about.

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Outcomes of Consultation: Submissions from the Public

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6. Analysis of Public Opinion Survey

Introduction

To ensure the opinions of the general public were fairly canvassed in a representative way, the Commissioners decided to commission a public opinion survey. The objectives of the survey and the methods used are described in Appendix 1 (see "Processes of the Commission: Public Opinion Survey: the process"). The survey, carried out in March–April 2001, involved interviewing 1153 New Zealanders 15 years of age or over. The survey was conducted by BRC Marketing & Social Research.

This section reports the key findings. Full details of all findings are provided in two appendices to the Public Opinion Survey: *Public Opinion Survey: Tabular results* and *Public Opinion Survey: Verbatim comments.* These documents are available on the Commission website.

Key overall findings

The key findings of the survey may be summarised as follows:

- **Genetic modification is not a 'top-of-mind' issue**.

  When asked on a completely unprompted basis to identify all the issues that were of importance to New Zealand's future, very few respondents mentioned genetic modification. At most, genetic modification was identified by 2% as an issue of importance. This is despite there being a high awareness of the term, "genetic modification", after prompting (93%).

- **Over one half believe genetic modification is of importance to New Zealand's future**.

  When respondents were asked to focus on genetic modification and indicate to what extent it was an issue of importance to New Zealand's future, nearly all were decisive in their response. Just over one half (51%) believed it was important to some degree or other, while 37% claimed it was unimportant. Few claimed it was neither important nor unimportant (6%) or they didn't know (6%).

Based on these results, the total sample interviewed for this survey has been segmented into two groups and these groups have, in turn, been used for reporting purposes:

(a) Those respondents who believed genetic modification is an issue of importance to New Zealand's future (referred to in this report as the "GM important" group).

(b) Those respondents who believed genetic modification was unimportant (referred to as the "GM unimportant" group).

- **Demographic differences hardly discriminate**.

  When the "GM important" group is compared on a demographic basis with the "GM unimportant" group, there are few differences. In fact, the only differences are in terms of age and gender, with the "GM important" group tending to have a slightly younger age profile and comprise more males.

  Importantly, there are few significant differences between the groups by other demographic descriptors, including ethnicity, employment status, occupation and income etc. (See "Demographic differences", after the summary of key findings, for a more detailed commentary of the results by these descriptors.)

- **The "GM unimportant" group is more likely to consider genetic modification to be important to them personally**.

  Although the "GM unimportant" group was identified as those respondents who did not believe genetic modification was an issue of importance to New Zealand, a greater proportion (75%) claimed it was an issue that was of importance to them personally compared with the "GM important" group (63%). This may be because, as a group, they hold much stronger (negative) convictions about genetic modification.

- **Relatively high proportions of respondents believed genetic modification is currently being practised in New Zealand**.

  Many of the survey questions focused on genetic modification in terms of eight specific areas or categories. Over 50% of respondents claimed genetic modification is currently being practised in New Zealand in terms of seven of these areas: research using plants (79%), medical research (72%), commercial crops (68%), processed foods (68%), research using animals (67%), pest control (65%), and medicines and vaccines (62%).

  The only exception was in terms of farm animals (43%).

  Although the "GM important" group was more likely to claim that genetic modification is being practised in New Zealand in each of the eight areas,

over 50% of the "GM unimportant" group claimed that genetic modification is currently being practised in terms of research using plants, processed foods, medical research, commercial crops, research using animals, pest control, and medicines and vaccines.

- **Few respondents claimed to be "very informed" about genetic modification**.

  Respondents' beliefs about the extent to which genetic modification is practised in New Zealand need to be considered in relation to the extent to which they felt informed about the subject.

  While most respondents (57%) claimed to be informed about genetic modification to some extent, only 7% claimed to be "very informed" as opposed to "just informed" (50%). This compares with just over one-third (36%) claiming to be uninformed.

  Slightly more of the "GM important" group (61%) than the "GM unimportant" group (58%) claimed to be informed.

- **Most respondents claimed there were "more advantages" in using genetic modification in four of the eight specific areas, while most claimed there were "more disadvantages" in the other four areas**.

  Over one-half of respondents believed that there were "more advantages" in using genetic modification in four particular areas: namely, medicines and vaccines (71%), medical research (71%), pest control (58%) and research using plants (56%).

  However, in contrast, over one-half also claimed there were "more disadvantages" in using genetic modification in four other areas: namely, processed foods (69%), farm animals (59%), research using animals (53%) and (marginally) commercial crops (49%).

  In general, the "GM important" group was more likely to claim there were "more advantages" and less likely to claim there were "more disadvantages".

- **Medical research, and medicines and vaccines were the two areas most approved of in terms of genetic modification**.

  In addition to medical research (65%) and medicines and vaccines (64%), pest control (54%) and research using plants (52%) were the four areas most frequently approved ("just approve"/"strongly approve") of by the majority of respondents. However, 25% of respondents claimed there was no area in which they approved of genetic modification.

  In contrast, the other four areas were most frequently disapproved ("disapproved"/"strongly disapproved") of by the majority of respondents:

namely, processed foods (73%), farm animals (70%), research using animals (66%), and commercial crops (58%). Seventeen percent (17%) claimed there was no area in relation to which they disapproved of genetic modification.

For both the "GM important" group and the "GM unimportant" group, approval of genetic modification was highest for medical research (84% of the "GM important" group and 39% of the "GM unimportant" group) and medicines and vaccines (83% of the "GM important" group and 38% of the "GM unimportant" group). However, with the exception of these two areas (medicines and vaccines, and medical research), fewer than 30% of the "GM unimportant" group approved of any of the other areas.

Table 6.1 summarises the key results of the survey.

Importance of genetic modification to New Zealand

There are many ways that the results of the Public Opinion Survey could be analysed and reported. In addition to analysing the results on a demographic basis, one of the more insightful ways is to draw a distinction between those who feel genetic modification is of importance to New Zealand in terms of its future, and those who do not feel this is the case.

In this regard, respondents were asked to state how important they believed the issue of genetic modification was to New Zealand's future, using the following question:

> Q12 "And how important do you believe it is to New Zealand's future to use genetic modification?"

The results for this question are presented in Table 6.2. This shows that just over half (51%) of respondents believed genetic modification is important ("just important" or "very important") to New Zealand's future, while just over a third (37%) believed it is unimportant ("just unimportant" or "very unimportant"). Another 6% considered it neither important nor unimportant, and 6% simply "didn't know".

Given the existence of these two discrete "importance" groups, the analysis and reporting of the results of the survey is undertaken in this report from this perspective. (The section "Demographic differences" later in this report and the Public Opinion Survey appendix volume, *Public Opinion Survey: Tabular results* (available on the Commission's website), provide further analysis based on a range of demographic descriptors.)

Table 6.1 Summary of key results of Public Survey (by "importance to New Zealand's future")

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 538[1] %
GM first mentioned as an issue of importance (Q1a)	1	0	2
GM mentioned at all (Q1a/Q1b)	2	2	3
Awareness of term GM (Q2)	93	93	95
GM already used in NZ (a lot/ somewhat) (Q4)			
Commercial crops	68	69	67
Farm animals	43	45	41
Pest control	65	68	62
Processed foods	68	68	69
Medicines and vaccines	62	66	59
Research using plants	79	80	79
Research using animals	67	68	66
Medical research	72	74	67
GM has more advantages (more disadvantages) (Q5)			
Commercial crops	42(49)	57(39)	21(74)
Farm animals	30(59)	45(46)	13(78)
Pest control	58(33)	71(21)	40(53)
Processed foods	22(69)	33(58)	9(86)
Medicines and vaccines	71(20)	85(9)	51(39)
Research using plants	56(35)	72(21)	37(58)
Research using animals	37(53)	52(39)	19(73)
Medical research	71(20)	87(8)	51(39)
Approve (disapprove) of GM (Q6)			
Commercial crops	36(58)	55(39)	12(85)
Farm animals	25(70)	39(55)	6(91)
Pest control	54(39)	72(22)	29(66)
Processed foods	21(73)	35(59)	6(92)

[1] Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a)

Table 6.1 continued

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Approve (disapprove) of GM (Q6) *continued*			
Medicines and vaccines	64(28)	83(13)	38(53)
Research using plants	52(41)	73(23)	26(70)
Research using animals	29(66)	45(49)	9(89)
Medical research	65(28)	84(11)	39(53)
Area **most** approve of for GM (Q7)			
Commercial crops	4	6	2
Farm animals	1	1	1
Pest control	10	10	9
Processed foods	1	2	0
Medicines and vaccines	22	26	16
Research using plants	5	5	6
Research using animals	1	2	1
Medical research	29	38	17
Approve of none	25	9	48
Don't know	1	1	0
Area **least** approve of for GM (Q8)			
Commercial crops	10	6	15
Farm animals	15	16	15
Pest control	3	3	3
Processed foods	26	25	28
Medicines and vaccines	2	1	3
Research using plants	2	1	3
Research using animals	16	16	13
Medical research	4	3	7
Disapprove of none	17	27	3
Don't know	1	1	1
GM has a lot/some to offer NZ (Q9)	54	77	21
Personally very informed/just informed about GM (Q10)	57	61	58
GM very important/just important to me personally (Q11)	67	63	75

[1] Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a)

Table 6.2 Importance of genetic modification to New Zealand's future

Q12 And how important do you believe it is to New Zealand's future to use genetic modification?

	Sub sample n = 1093[1] %
Very important	18
Just important	33
Neither	6
Just unimportant	19
Very unimportant	18
Don't know	6
Total	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a)

Demographic profile of the two "importance" groups

In this section, we provide a demographic description or profile of the two "GM importance" groups; that is, the 51% of respondents who believed genetic modification is of importance (ie, "just important" or "very important") to New Zealand's future (referred to here as the "GM important" group), and the 37% who believed it is not of importance (ie, it is "just unimportant" or "very unimportant"), referred to here as the "GM unimportant" group (see Table 6.2).

In many respects, the two groups are demographically similar (eg, in terms of ethnicity, occupation, scientific background, income, household type, education, area), suggesting that demographic variables do not necessarily hold the key to understanding the attitudes and opinions of these groups[1].

However, what demographic differences exist, appear to be mostly in terms of gender and age and are as follows. Those in the "GM important" group are more likely to be:

- male (50%, compared with 36% of the "GM unimportant" group)
- under 30 years of age (25% are aged 15–29, compared with 14% of the "GM unimportant" group)

In comparison, the "GM unimportant" group is more likely to be:

- female (64%, compared with 50% of the "GM important" group)
- between 30 and 59 years of age (63%, compared with 53% of the "GM important" group).

Tables 6.3–6.12 present the demographic profile data for the "GM important" and "GM unimportant" groups.

[1] Results between these two groups need to be greater than plus or minus 4% to be significant.

Table 6.3 Gender (by "importance to New Zealand's future")

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Male	42	50	36
Female	58	50	64
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.4 Age (by "importance to New Zealand's future")

Q13 Which of the following age groups do you fit into?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 538[1] %
15 to 19 years old	6	9	4
20 to 29 years old	13	16	10
30 to 39 years old	21	17	25
40 to 49 years old	21	21	21
50 to 59 years old	16	15	17
60 to 69 years old	12	11	13
70 years and over	11	11	10
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.5 Ethnicity (by "importance to New Zealand's future")

Q20 And finally, which of these ethnic groups do you fit into? You can be in more than one.

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 538[1] %
Maori	11	10	13
NZ European	80	79	82
Other European	8	8	8
Samoan	1	0	0
Cook Island Maori	0	1	0
Tongan	0	0	0
Niuean	0	0	0
Other	7	8	4
Refused	1	1	1
Total	**	**	**

Note: Total may exceed 100% because of multiple responses.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.6 Employment status (by "importance to New Zealand's future")

Q16 At present, are you…?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 538[1] %
Self-employed	14	14	14
Full-time salary or wage earner	38	38	36
Part-time salary or wage earner	11	9	12
Retired	18	18	17
Full-time home maker	7	5	10
Student	8	11	6
Unemployed	1	2	1
Other beneficiary	3	3	3
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.7 Occupational status (by "importance to New Zealand's future")

Q17 And what is your current occupation?

	Sub sample n = 716[1] %	Sub sample GM important n = 353[1] %	Sub sample GM unimportant n = 259[1] %
Clerical or sales employee	20	17	24
Semi-skilled worker	6	5	4
Technical or skilled worker	14	15	13
Business manager or executive	10	11	9
Business owner or self-employed	2	2	2
Teacher, nurse, police, other trained service worker	19	17	20
Professional or senior government official	12	13	11
Labourer, manual, agricultural or domestic worker	10	10	9
Farmer owner or manager	3	4	2
Other	4	4	4
Refused	1	0	1
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Only includes respondents who said they were full- or part-time wage or salary earners or retired (at Q16) and excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.8 Scientific background (by "importance to New Zealand's future")

Q17a Can you please tell me if you have, or have had, any professional background or training in the sciences?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Yes	15	16	16
No	85	84	84
Refused	0	0	0
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.9 Income (by "importance to New Zealand's future")

Q18 And which of these best describes your annual income?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Under $20,000	32	32	31
$20,000 but less than $30,000	15	15	15
$30,000 but less than $40,000	15	17	13
$40,000 but less than $60,000	18	16	20
$60,000 or more	13	13	13
Refused	5	4	4
Don't know	2	2	3
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.10 Household type (by "importance to New Zealand's future")

Q15 Which of the following situations best describes your household type?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Parent/guardian with pre-school children	10	8	12
Parent/guardian with school-aged children (<18)	24	23	26
Parent/guardian with adult children living at home	12	14	9
Couple, no children in the household	27	28	26
Group flatting together (not relatives)	4	4	4
Single, living with parents	3	4	2
Single, living alone	19	17	20
Extended family	3	3	2
Other	2	2	2
Refused	0	0	0
Total	**	**	**

Note: Components may not always add to 100% exactly because of multiple responses.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.11 Highest educational qualification (by "importance to New Zealand's future")

Q15 What is your highest educational qualification?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
No school examinations	12	12	13
NZ School Certificate in one or more subjects	18	18	19
NZ Sixth Form Certificate in one or more subjects	7	7	8
NZ University Entrance before 1986 in one or more subjects	5	5	6
NZ Higher School Certificate or Higher Leaving Certificate	3	3	3
University Entrance qualification from NZ University Bursary	6	7	6
NZ A or B Bursary, Scholarship or National Certificate Level 3	3	4	2
Other NZ secondary school qualification	1	1	1
Overseas secondary school qualification	2	1	2
New Zealand certificate, Trade certificate	7	8	6
Polytechnic, University course below Bachelors Degree	10	9	10
Bachelors Degree	14	14	13
Degree higher than a Bachelors Degree	6	9	4
Other Tertiary	3	3	3
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.12 Area – Geographical region (by "importance to New Zealand's future")

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Auckland	39	37	38
Christchurch	14	14	14
Dunedin	5	5	4
Gisborne	1	1	1
Hamilton	6	6	7
Hawke's Bay	5	5	5
Invercargill	2	2	3
Nelson	2	2	2
New Plymouth	2	2	3
Palmerston North	3	3	3
Rotorua	3	2	3
Tauranga	3	3	4
Wairarapa	0	0	0
Wanganui	2	1	1
Wellington	14	15	12
Whangarei	2	2	1
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Key findings

Awareness and understanding of genetic modification

In order to determine whether genetic modification was a 'top-of-mind' issue, the interview began with respondents being asked the following question:

> Q1a/Q1b: "First of all, in your opinion, what issues are of greatest importance to New Zealand's future? These could be social, cultural or economic issues, for example. Anything else?"

All issues mentioned were recorded as a matter of course. However, if respondents did not mention genetic modification in response to the question, they were asked directly if they had heard of the term:

> Q2: "Have you heard of the term genetic modification?"

If respondents claimed they had not heard of the term, they were then asked if they had heard of the term "genetic engineering" or "GE":

> Q2a: "Have you heard of the term genetic engineering or GE?"

Finally, if respondents were aware of the terms "genetic modification", "genetic engineering" or "biotechnology" on an unprompted or prompted basis, they were then asked to define what the term[2] meant to them:

> Q3: "If you had to describe to a friend what genetic modification/genetic engineering/ biotechnology means, what would you say to them?"

Note that the question on the importance of genetic modification to New Zealand's future, which forms the basis of this report's segmentation between the "GM important" group and the "GM unimportant" group, was asked only of respondents who were aware of the term "genetic modification" or "genetic engineering" (Q1a/Q1b, Q2 Q2a) and hence, awareness of genetic modification for these groups is higher than in the total sample.

The following conclusions can be made:

- Very few respondents identified genetic engineering/genetic modification as an issue of importance to New Zealand's future on a completely unprompted basis. There were no marked differences between the "GM important" group and the "GM unimportant" group in this regard.

[2] Respondents were asked to define whatever term (ie, genetic modification, genetic engineering or biotechnology) they recognised or mentioned first.

- After prompting, similar proportions of the "GM important" group (93%) and the "GM unimportant" group (95%) claimed to be aware of the term "geneticmodification".
- When asked to define what genetic engineering/modification was, the most common response was that it involved the alteration/modification of DNA or the genetic structure of cells (29%):

  "… manipulation of the gene sequencing and components of plants and animals"

  "… modification of an organism's genes either by the removal of its natural gene or the addition of a foreign gene"

  "… the addition or removal of a portion of DNA from a gene which causes or changes a response".
- Other respondents stated that genetic modification was basically a man-made version of a natural product (19%). A further 12% believed genetic modification was a means of improving/refining something by removing or enhancing certain features, whereas others frowned upon it as they considered genetic modification to be no more than Man interfering with Nature (12%):

  "… using scientific knowledge to create something to a pattern devised by man instead of God"

  "… taking the DNA from one organism and putting it into another organism to improve or eradicate certain characteristics"

  "… altering the genetic codes to eliminate disease and improve quality of produce, animals and plants"

  "… interfering with nature"

Tables 6.13–6.17 present the data on awareness and understanding.

To what extent is genetic modification already being used in New Zealand?

In order to establish whether respondents believed genetic modification was already used in New Zealand, they were asked the following question:

> Q4: "To what extent do you believe genetic modification is already used in New Zealand in the following areas? As I read each area, please tell me if it's a lot, somewhat, a little, or not at all?"

Table 6.13 First-mentioned issue of importance to New Zealand's future (by "importance to New Zealand's future")

Q1a What issues are of greatest importance to New Zealand's future?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Genetic modification	**1**	**0**	**2**
Genetic engineering	**0**	**1**	**0**
Biotechnology	**0**	**0**	**0**
The economy in general	28	32	22
Health in general	9	7	12
Education in general	13	12	14
The environment	2	2	3
Race relations	7	8	7
Other	34	32	37
Refused	0	0	0
Don't know	5	6	4
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.14 Total unprompted mention of genetic modification as an issue of importance to New Zealand's future (by "importance to New Zealand's future")

Q1a What issues are of greatest importance to New Zealand's future?

Q1b Anything else?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Genetic modification	**2**	**2**	**3**
Genetic engineering	**2**	**1**	**3**
Biotechnology	**2**	**2**	**1**
The economy in general	40	44	35
Health in general	24	21	30
Education in general	29	27	32
The environment	7	6	9
Race relations	15	17	14
Other	54	52	56
Refused	0	0	0
Don't know	5	6	4
Total	**	**	**

Note: Components may not always add to 100% due to multiple response.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.15 Prompted mention of the term "genetic modification" (by "importance to New Zealand's future")

Q2 Have you heard of the term genetic modification?

	Sub sample n = 1068[1] %	Sub sample GM important n = 545[1] %	Sub sample GM unimportant n = 394[1] %
Yes	93	93	95
No	6	7	5
Don't know	0	0	0
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had unprompted awareness of genetic modification at Q1a or Q1b.

Table 6.16 Prompted mention of the term "genetic engineering" or "GE" (by "importance to New Zealand's future")

Q2a Have you heard of the term genetic engineering or GE?

	Sub sample n = 71[1] %	Sub sample GM important n = 42[1] %	Sub sample GM unimportant n = 20[1] %
Yes	100	100	100
No	na	na	na
Don't know	na	na	na
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had unprompted awareness of genetic modification or genetic engineering at Q1a or Q1b or prompted awareness of genetic modification at Q2.
na: The "importance to New Zealand's future" segments (ie, the "GM important" and "GM unimportant" groups) are derived from those respondents who had awareness of genetic modification or genetic engineering at Q1a/Q1b, Q2 or Q2a.

Table 6.17 Definition of genetic modification/genetic engineering/ biotechnology (by "importance to New Zealand's future")

Q3 If you had to describe to a friend what genetic modification/genetic engineering/ biotechnology means, what would you say to them?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Altering the genetic structure of cells etc/manipulating DNA of things	29	31	25
Altering something/altering a natural thing/creating something man-made	19	16	22
Altering something to make it better/improving something	12	13	10
Playing with nature/altering the order of things/playing God	12	10	15
Cloning/Dolly	4	4	4
General disapproval	4	2	6
Taking genetic material from one thing and putting into another	4	5	5
Other	5	6	3
Answer not given/unspecified answer	12	14	9
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

The areas or categories in question were: commercial crops, farm animals, pest control, processed foods, medicines and vaccines, research using plants, research using animals, and medical research. Results are shown in Table 6.18.

The following conclusions can be drawn:

- Relatively high proportions of respondents claimed genetic modification was currently being practised in New Zealand in certain areas. Over 50% claimed this was the case in terms of: research using plants (79%), medical research (72%), commercial crops (68%), processed foods (68%), research using animals (67%), pest control (65%), and medicines and vaccines (62%).

Table 6.18 Extent to which genetic modification is already being used in New Zealand (by "importance to New Zealand's future")

Q4 To what extent do you believe genetic modification is already used in New Zealand in the following areas? As I read each area, please tell me if it's a lot, somewhat, a little, or not at all?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Commercial crops			
A lot	36	37	37
Somewhat	32	32	30
A little	24	26	22
Not at all	3	2	5
Don't know	4	3	6
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.18 continued

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Farm animals			
A lot	16	17	15
Somewhat	27	28	26
A little	38	39	37
Not at all	13	13	13
Don't know	7	4	10
Total	100	100	100
Pest control			
A lot	40	40	41
Somewhat	25	28	21
A little	18	19	16
Not at all	6	5	6
Don't know	12	8	15
Total	100	100	100
Processed foods			
A lot	38	37	40
Somewhat	30	31	29
A little	24	25	23
Not at all	4	4	3
Don't know	5	3	5
Total	100	100	100
Medicines and vaccines			
A lot	40	44	38
Somewhat	22	22	21
A little	17	18	18

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.18 continued

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 538[1] %
Medicines and vaccines *continued*			
Not at all	5	4	5
Don't know	16	12	18
Total	100	100	100
Research using plants			
A lot	52	55	50
Somewhat	27	25	29
A little	14	15	15
Not at all	1	1	2
Don't know	6	4	5
Total	100	100	100
Research using animals			
A lot	34	33	38
Somewhat	33	35	38
A little	24	24	25
Not at all	4	4	4
Don't know	5	4	6
Total	100	100	100
Medical research			
A lot	43	45	40
Somewhat	29	29	27
A little	17	17	19
Not at all	3	3	4
Don't know	8	5	9
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

- The "GM important" group was slightly more likely to believe genetic modification was already being used in New Zealand than the "GM unimportant" group.

  Areas where they were more likely to believe genetic modification was being used in New Zealand were pest control (68% of the "GM important" group claimed "a lot" or "somewhat", compared with 62% of the "GM unimportant" group), medicines and vaccines (66% of the "GM important" group, compared with 59% of the "GM unimportant" group), and medical research (74% of the "GM important" group, compared with 67% of the "GM unimportant" group).

Are there more advantages or more disadvantages?

In order to establish whether respondents believed there were more advantages or more disadvantages to using genetic modification in each of the areas or categories referred to earlier (namely, commercial crops, farm animals, pest control, processed foods, medicines and vaccines, research using plants, research using animals, and medical research), they were asked the following question:

> Q5: "I'd like you to tell me whether you think there are more advantages or more disadvantages to using genetic modification in these areas".

The following conclusions can be drawn:

- First, it is significant that most respondents were able to give a clear-cut answer (ie, "more advantages" or "more disadvantages"). In other words, few used the option of claiming there were "both advantages and disadvantages", they "didn't know", or it "depended".
- Second, the areas or categories fell into two broad groups:

  Over one-half of respondents believed that there were "**more advantages**" in using genetic modification in four particular areas: namely, medicines and vaccines (71%), medical research (71%), pest control (58%) and research using plants (56%).

  In contrast, significant proportions also claimed there were "**more disadvantages**" in using genetic modification in four other areas: namely, processed foods (69%), farm animals (59%), research using animals (53%) and (marginally) commercial crops (49%).
- The "GM important" group was more likely to see "more advantages" in the use of genetic modification as opposed to disadvantages:

  With the exception of farm animals and processed foods, more than 50% of the "GM important" group believed genetic modification had

"more advantages" in all areas. They especially believed it had "more advantages" when used in medical research (87%), medicines and vaccines (85%), research using plants (72%) and pest control (71%).

In contrast, only two areas were regarded as having "more advantages" by at least half of the "GM unimportant" group. These were medical research (51%) and medicines and vaccines (51%), although 40% of this group also claimed pest control had "more advantages" rather than "more disadvantages".

However, it is interesting to note that over half of both groups (58% of the "GM important" group and 86% of the "GM unimportant" group) believed there were "more disadvantages" in the use of genetic modification in processed foods than "more advantages".

Table 6.19 shows the data on advantages and disadvantages.

Table 6.19 Are there more advantages or more disadvantages to the use of genetic modification? (by "importance to New Zealand's future")

Q5 I'd like you to tell me whether you think there are more advantages or more disadvantages to using genetic modification in these areas.

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Commercial crops			
More advantages	42	57	21
More disadvantages	49	34	74
Both	3	4	2
Depends	1	2	1
Don't know	5	4	2
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.19 continued

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Farm animals			
More advantages	30	45	13
More disadvantages	59	46	78
Both	4	3	3
Depends	2	2	2
Don't know	5	4	4
Total	100	100	100
Pest control			
More advantages	58	71	40
More disadvantages	33	21	53
Both	3	3	4
Depends	1	1	1
Don't know	4	4	2
Total	100	100	100
Processed foods			
More advantages	22	33	9
More disadvantages	69	58	86
Both	3	3	2
Depends	1	1	1
Don't know	5	5	1
Total	100	100	100
Medicines and vaccines			
More advantages	71	85	51
More disadvantages	20	9	39
Both	2	1	2

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.19 continued

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Medicines and vaccines *continued*			
Depends	2	1	2
Don't know	5	3	6
Total	100	100	100
Research using plants			
More advantages	56	72	37
More disadvantages	35	21	58
Both	3	3	1
Depends	2	1	1
Don't know	5	3	3
Total	100	100	100
Research using animals			
More advantages	37	52	19
More disadvantages	53	39	73
Both	3	3	3
Depends	2	2	2
Don't know	5	4	3
Total	100	100	100
Medical research			
More advantages	71	87	51
More disadvantages	19	8	39
Both	3	2	4
Depends	1	1	1
Don't know	4	2	5
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Do you approve or disapprove of genetic modification?

In order to establish respondents' approval or disapproval of genetic modification in relation to specific areas of its use (namely, commercial crops, farm animals, pest control, processed foods, medicines and vaccines, research using plants, research using animals, and medical research), they were asked the following question (see Table 6.20):

> Q6: "Would you say that you approve or disapprove of using genetic modification in these areas?"

Those respondents who listed areas of which they approved, were asked the following question (see Table 6.21):

> Q7: "And thinking about these areas again, which **one** of these areas do you approve of most, with regard to the use of genetic modification?"

They were then asked to explain their reasons for approving of genetic modification in this one area. Results are presented in this report on key findings for the two areas most approved of (see Tables 6.22–6.23):

> Q7a: "You've said you most approve of … with regard to the use of genetic modification. What are your reasons for saying this?"

Those respondents who listed areas of which they disapproved, were asked the following question (see Table 6.24):

> Q8: "And thinking about these areas again, which **one** of these areas do you approve of least, with regard to the use of genetic modification?"

They were then asked to explain their reasons for disapproving of genetic modification in this one area. Results are presented in this report on key findings for the two areas least approved of (see Tables 6.25–6.26):

> Q8a: "You've said you least approve of … with regard to the use of genetic modification. What are your reasons for saying this?"

The following conclusions can be drawn:

- The results for approval/disapproval reflect the results for the earlier advantages/disadvantages question. Four areas were approved ("just approve"/"strongly approve") of by the majority of respondents: namely, medical research (65%), medicines and vaccines (64%), pest control (54%) and research using plants (52%). Reflecting these results, medical research (29%) and medicines and vaccines (22%) were the two most approved of areas. Note, however, that 25% of respondents claimed there was no area in which they approved of genetic modification.
- In contrast, four other areas were disapproved ("disapproved"/"strongly disapproved") of by the majority of respondents: processed foods (73%),

Table 6.20 Do you approve or disapprove of the use of genetic modification? (by "importance to New Zealand's future")

Q6 Would you say that you approve or disapprove of using genetic modification in these areas?

Is that strongly approve/disapprove or just approve/disapprove?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Commercial crops			
Strongly approve	5	8	1
Just approve	31	47	11
Neither approve nor disapprove	4	4	3
Disapprove	34	28	41
Strongly disapprove	24	11	44
Don't know	2	2	1
Total	100	100	100
Farm animals			
Strongly approve	3	5	0
Just approve	22	34	6
Neither approve nor disapprove	4	4	2
Disapprove	39	38	39
Strongly disapprove	31	17	52
Don't know	2	1	1
Total	100	100	100
Pest control			
Strongly approve	10	15	5
Just approve	44	57	24

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.20 continued

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Pest control *continued*			
Neither approve nor disapprove	4	4	4
Disapprove	24	17	34
Strongly disapprove	15	5	32
Don't know	2	1	1
Total	100	100	100
Processed foods			
Strongly approve	2	4	0
Just approve	19	31	6
Neither approve nor disapprove	4	4	2
Disapprove	39	39	36
Strongly disapprove	34	20	56
Don't know	2	2	1
Total	100	100	100
Medicines and vaccines			
Strongly approve	16	24	7
Just approve	48	59	31
Neither approve nor disapprove	4	3	6
Disapprove	15	9	24
Strongly disapprove	13	4	29
Don't know	3	1	3
Total	100	100	100
Research using plants			
Strongly approve	8	13	3
Just approve	44	60	23
Neither approve nor disapprove	4	3	4

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.20 continued

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Research using plants *continued*			
Disapprove	25	17	36
Strongly disapprove	16	6	34
Don't know	2	1	1
Total	100	100	100
Research using animals			
Strongly approve	4	7	0
Just approve	25	38	9
Neither approve nor disapprove	4	4	2
Disapprove	38	34	39
Strongly disapprove	28	15	50
Don't know	2	2	0
Total	100	100	100
Medical research			
Strongly approve	16	23	7
Just approve	49	61	32
Neither approve nor disapprove	5	3	6
Disapprove	14	7	23
Strongly disapprove	14	4	30
Don't know	3	1	2
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.21 Which one area is most approved of? (by "importance to New Zealand's future")

Q7 And thinking about these areas again, which **one** of these areas do you approve of most, with regard to the use of genetic modification?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Commercial crops	4	6	2
Farm animals	1	1	1
Pest control	10	10	9
Processed foods	1	2	0
Medicines and vaccines	**22**	**26**	**16**
Research using plants	5	5	6
Research using animals	1	2	1
Medical research	**29**	**38**	**17**
Approve of none	25	9	48
Don't know	1	1	0
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.22 Reasons for approving of genetic modification in medicines and vaccines

Q7a You've said you most approve of medicines and vaccines with regard to the use of genetic modification/genetic engineering/biotechnology. What are your reasons for saying this?

	Sub sample n = 247[1] %	Sub sample GM important n = 147[1] %	Sub sample GM unimportant n =67[1] %
General benefits/advantages	40	40	41
We have to find new cures/cures for incurable diseases	20	23	20
Cures are needed for specific disease eg cancer/I am sick	15	14	16
To improve quality of life/extend life	6	7	2
Vaccines/cures stop people getting sick/prevent disease	4	5	2
More advantages in this than in other areas mentioned	2	2	3
No answer given/answer not specified	13	9	16
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a) and only includes respondents who selected medicines and vaccines as the area they most approved of.

Table 6.23 Reasons for approving of genetic modification in medical research

Q7a You've said you most approve of medical research with regard to the use of genetic modification/genetic engineering/biotechnology. What are your reasons for saying this?

	Sub sample n = 317[1] %	Sub sample GM important n = 210[1] %	Sub sample GM unimportant n = 70[1] %
General benefits/advantages	47	50	39
We have to find new cures/cures for incurable diseases	17	15	22
Cures are needed for specific disease, eg, cancer/I am sick	13	14	9
To improve quality of life/extend life	6	7	2
Medical research stops people getting sick/prevents disease	1	2	0
More advantages in this than in other areas mentioned	2	3	0
No answer given/answer not specified	13	10	28
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a) and only includes respondents who selected medical research as the area of which they most approved.

Table 6.24 Which one area is least approved of (by "importance to New Zealand's future")

Q8 And thinking about these areas again, which **one** of these areas do you approve of least, with regard to the use of genetic modification?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Commercial crops	10	6	15
Farm animals	15	16	15
Pest control	3	3	3
Processed foods	**26**	**25**	**28**
Medicines and vaccines	2	1	3
Research using plants	2	1	3
Research using animals	**16**	**16**	**13**
Medical research	4	3	7
Disapprove of none	17	27	3
Don't know	1	1	1
Disapprove of all/not able to specify	4	2	8
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Table 6.25 Reasons for disapproving of genetic modification in research using animals

Q8a You've said that you least approve of research using animals with regard to genetic modification/genetic engineering/biotechnology. What are your reasons for saying this?

	Sub sample n = 174[1] %	Sub sample GM important n =88[1] %	Sub sample GM unimportant n = 56[1] %
Cruelty to animals/ it's inhumane/ need to protect animals	54	55	54
Research on animals will lead to research on humans/too dangerous	12	14	10
General disapproval	9	9	14
Want things to be natural/it's messing with nature	6	5	5
Unknown side effects	3	3	2
No answer given/answer not specified	16	15	16
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a) and only includes respondents who selected research on animals as the area of which they most disapproved.

Table 6.26 Reasons for disapproving of genetic modification in processed foods

Q8a You've said that you least approve of processed foods with regard to genetic modification/genetic engineering/biotechnology. What are your reasons for saying this?

	Sub sample n = 286[1] %	Sub sample GM important n = 140[1] %	Sub sample GM unimportant n = 112[1] %
Unknown side effects/don't know what's in it	23	27	23
Want things to be natural	21	14	24
Poses too many risks to humans/flow-on effect to humans/too dangerous	13	10	16
General disapproval	10	9	12
Not enough research done/not enough info/too much commercial involvement	9	9	11
No answer given/answer not specified	23	31	14
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a) and only includes respondents who selected processed food as the area of which they most disapproved.

farm animals (70%), research using animals (66%), and commercial crops (58%). Reflecting these results, processed foods (26%) was the area most disapproved of. However, 17% claimed there was no area in relation to which they disapproved of genetic modification.

- For both the "GM important" and "GM unimportant" groups, approval of genetic modification was highest for medical research (84% of the "GM important" group and 45% the "GM unimportant" group) and medicines and vaccines (83% of the "GM important" group and 45% of the "GM unimportant" group). With the exception of research using plants (32%), fewer than 20% of the "GM unimportant" group approved of any of the other areas.

  Processed foods was the area most disapproved of by both groups (59% of the "GM important" group and 86% of the "GM unimportant" group) and farm animals (55% of the "GM important" group and 85% of the "GM unimportant" group).

  Similarly, medical research (38% of the "GM important" group and 20% of the "GM unimportant" group) and medicines and vaccines (26% of the "GM important" group and 18% of the "GM unimportant" group) were the two areas most approved of by both groups. The "GM unimportant" group was significantly more likely to claim they "approve of none" (42% of the "GM unimportant" group gave this answer, compared with 9% of the "GM important" group).

  When invited to identify the one area or category they most disapproved of, there were fewer differences between the two groups than when invited to identify an area they approved of. Both groups most disapproved of the use of genetic modification in processed foods (25% of the "GM important" group, compared with 27% of the "GM unimportant" group), farm animals (16% of the "GM important" group, compared with 15% of the "GM unimportant" group) and research using animals (16% of the "GM important" group, compared with 15% of the "GM unimportant" group). Reflecting the differences in approval noted above between the two groups, the "GM important" group was significantly more likely to claim they disapproved of none (27%, compared with 6% of the "GM unimportant" group).

- Whilst many respondents believed there were advantages to genetic modification in medical research and in medicines and vaccines, when asked

to stipulate what these advantages were, at least 40% offered no more than a general response relating to the general wellbeing of the human race:

> "… to maintain the health of our future and to help preserve mankind"

- However, some (approximately 20%) mentioned that the use of genetic modification in these two medicinal areas was particularly important in the development of remedies/cures for diseases, and a further 15% named specific health complaints/diseases (eg, cancer) that would benefit from this type of research:

> "Anything that can help with the control of diseases is good."
>
> "There are a lot of diseases that could be cured by changing the genes that cause the problem."
>
> "I have a cold at the moment and no one has a cure for it."
>
> "Hopefully it's going to help cure things like AIDS and cancer."

- When respondents were asked to specify the reasons for their disapproval of genetic modification in relation to research using animals, their biggest concern related to the potential harm that may be inflicted on the animals during the course of the research:

> "I think that God's creatures are being abused. I don't think the general public knows half of what these animals are put through."
>
> "I don't like the idea of lab rats and monkeys being prodded and poked and blown up. That sort of thing."

- Some respondents were also concerned that this type of research (with animals) might lead to similar work being carried out on humans (12%):

> "If they start to alter animals, they will end up altering man."

- With regard to their concerns about genetic modification in relation to processed foods, respondents were basically wary of eating something without knowing exactly what it contained. Twenty one percent (21%) claimed they preferred their food to be "natural", and 23% objected to "unknown" ingredients that, in turn, could lead to unknown side effects:

> "I want to know what I am eating."
>
> "Something can go wrong and you don't want to eat a mistake."
>
> "We don't know what they are putting in and how it is going to affect us."

What genetic modification has to offer New Zealand

In order to establish what respondents believed genetic modification had to offer New Zealand, they were asked the following question:

> Q9: "Overall then, how much do you feel genetic modification has to offer New Zealand?"

The following conclusions can be drawn (see Table 6.27):

- Just over one half of respondents (54%) claimed that genetic modification had "a lot" (19%) or "some" (35%) to offer New Zealand. In contrast, 42% claimed it had "a little" (26%) or "nothing" (16%).

Table 6.27 How much genetic modification has to offer New Zealand (by "importance to New Zealand's future")

Q9 Overall then, how much do you feel genetic modification has to offer New Zealand?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
A lot	19	33	2
Some	35	44	19
A little	26	17	37
Nothing at all	16	3	38
Depends, some areas only	2	1	3
Don't know	1	1	0
Don't know enough to comment	1	1	2
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

- Not surprisingly, the "GM important" group was more likely to believe genetic modification had something to offer New Zealand.

  Over three-quarters (77%) of the "GM important" group believed genetic modification had "a lot" (33%) or "some" (44%) to offer New Zealand, compared with just 21% of the "GM unimportant" group. In fact, more than one-third (38%) of the "GM unimportant" group believed that genetic modification had "nothing at all" to offer New Zealand (compared with 3% of the "GM important" group).

Knowledge and personal importance of genetic modification

In addition to asking respondents about the importance of genetic modification to New Zealand, they were also asked about its personal importance. Note that to help put this into perspective, they were first asked to comment on how well informed they believed they were about the subject:

Q10: "How informed do you believe you are at present about genetic modification?"

Q11: "And is genetic modification an issue that is of importance to you personally?"

The following conclusions can be drawn (see Tables 6.28–6.29):

- Most respondents (57%) claimed to be informed about genetic modification to some extent, although only 7% claimed to be "very informed" as opposed to "just informed" (50%). This compares with just over one-third (36%) claiming to be uninformed.
- Both the "GM important" group and the "GM unimportant" group claimed to be informed and uninformed to more or less the same extent.

  Sixty-one percent (61%) of the "GM important" group claimed they were "just informed" or "very informed" about genetic modification, compared with 58% of the "GM unimportant" group. However, note that only 8% of each of the "GM important" group and the "GM unimportant" group claimed to be "very informed".
- Two-thirds of respondents (67%) claimed that genetic modification was either "very important" (28%) or "just important" (39%) to them personally. This contrasts with the 28% who claimed it was unimportant to some degree or other.
- Interestingly, the "GM unimportant" group was more likely to claim that genetic modification was an issue that was important to them personally.

Table 6.28 Level of personal informedness about genetic modification (by "importance to New Zealand's future")

Q10 How informed do you believe you are at present about genetic modification?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Very informed	7	8	8
Just informed	50	53	50
Neither	6	6	5
Just uninformed	23	23	24
Very uninformed	13	11	12
Don't know	1	0	1
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

This may be because, as a group, they hold much stronger (negative) convictions about genetic modification.

Seventy-five percent (75%) of this group claimed genetic modification was important to them personally (37% "very important", 38% "just important") compared with 63% of the "GM important" group (23% reported it was "very important, 40% reported it was "just important"). Note that 32% of the "GM important" group and 22% of the "GM unimportant" group claimed genetic modification was unimportant to them personally.

Table 6.29 Personal importance of genetic modification (by "importance to New Zealand's future")

Q11 And is genetic modification an issue that is of importance to you personally?

	Sub sample n = 1093[1] %	Sub sample GM important n = 555[1] %	Sub sample GM unimportant n = 404[1] %
Very important	28	23	37
Just important	39	40	38
Neither	5	5	3
Just unimportant	25	30	18
Very unimportant	3	2	4
Don't know	0	0	0
Total	100	100	100

Note: Components may not always add to 100% exactly because of rounding.
[1]Note: Excludes respondents who had no awareness of genetic modification or genetic engineering (Q1a/Q1b, Q2, Q2a).

Demographic differences

As noted earlier, there are few demographic differences between the "GM important" and the "GM unimportant" groups. However, this section comments on the results in terms of the demographic descriptors used to classify respondents.

Supporting data for the comments on demographic differences are available in the appendix to the Public Opinion Survey: *Public Opinion Survey: Tabular results*, available on the Commission website. This section includes tabulated data for key findings by gender and age, which were the two demographic descriptors with the greatest differences between the "GM important" and "GM unimportant" groups. Tables 1–3 in the survey appendix summarise key findings by educational status,

Tables 28–30 by scientific background, Tables 55–57 by occupational status, Tables 82–83 by income and Tables 108–110 by region and household composition.

Gender

In general, females were more likely than males to claim genetic modification is being practised in New Zealand, that there were "more disadvantages" and to be more likely to "disapprove" of genetic modification (see Table 6.30). For example, 75% claimed genetic modification was being practised in relation to processed foods (58% of males), 73% claimed there were "more disadvantages" in this area (63% of males), and 78% "disapproved" of genetic modification in relation to processed foods (65% of males).

Not surprisingly, females were less likely to claim genetic modification had something to offer New Zealand (47%, compared with 64% of males), or that it was important to New Zealand's future (44%, compared with 61%). While fewer claimed to be informed about the subject (54%, compared with 62% of males), more claimed genetic modification was of importance to them personally (71%, compared with 60% of males).

Age

The survey results have been analysed by six age groups as follows; those 29 and under, 30–39, 40–49, 50–59 and 60 or more.

Compared with the total sample (ie, all respondents), respondents in the youngest age group (ie, 29 and under) were more likely to claim that genetic modification had something to offer New Zealand (see Table 6.30). They were also more likely to claim that genetic modification is being practised in New Zealand, and to claim genetic modification had "more advantages" and to approve of it in relation to the eight areas or categories surveyed.

This age group did not, however, claim to be the most informed about genetic modification or to most frequently claim that genetic modification was of personal importance to them.

Ethnicity

The survey results have been analysed by those respondents who identified as Maori and those who did not (ie, non-Maori).

As a general observation, Maori were more likely than non-Maori to claim that genetic modification was being practised in New Zealand.

However, Maori were as likely as non-Maori to claim there were "more advantages"/"more disadvantages" with genetic modification, and to "approve"/"disapprove" of genetic modification in the eight areas or categories focused on

Table 6.30 Summary — Key results by gender and age

	Total sample n = 1153[1] %	Total Male n = 475[1] %	Total Female n = 678[1] %	Total <29 n = 250[1] %	Total 30–39 n = 242[1] %	Total 40–49 n = 236[1] %	Total 50–59 n = 173[1] %	Total 60+ n = 252[1] %
GM first mentioned as an issue of importance (Q1a)	1	1	1	1	2	0	1	1
GM mentioned at all (Q1a/Q1b)	2	3	2	4	3	1	1	2
Awareness of term GM (Q2)	89	90	88	87	91	93	89	87
GM already used in NZ (Q4)								
Commercial crops (A lot/somewhat)	68	62	73	68	72	71	74	59
Farm animals	43	33	48	40	45	45	45	37
Pest control	65	60	67	63	66	71	68	56
Processed foods	68	58	75	69	69	75	67	60
Medicines and vaccines	62	63	61	72	69	70	57	46
Research using plants	79	76	81	80	84	83	81	67
Research using animals	67	61	71	67	75	72	66	55
Medicalresearch	72	78	74	76	75	75	65	65

[1] Note: not all results are based on the total sample.

Table 6.30 continued

	Total sample n = 1153[1] %	Total Male n = 475[1] %	Total Female n = 678[1] %	Total <29 n = 250[1] %	Total 30–39 n = 242[1] %	Total 40–49 n = 236[1] %	Total 50–59 n = 173[1] %	Total 60+ n = 252[1] %
GM has more advantages (more disadvantages) (Q5)								
Commercial crops	42(49)	50(42)	36(54)	52(44)	36(55)	42(47)	40(52)	39(47)
Farm animals	30(59)	41(49)	22(67)	36(59)	27(66)	26(59)	29(60)	33(53)
Pest control	58(33)	65(28)	53(37)	61(32)	59(36)	54(34)	52(40)	63(25)
Processed foods	22(69)	27(63)	18(73)	26(69)	17(76)	19(70)	25(67)	22(63)
Medicines and vaccines	71(20)	75(16)	68(23)	80(15)	72(23)	72(20)	67(23)	63(21)
Research using plants	56(35)	65(28)	49(40)	67(28)	48(44)	56(34)	49(41)	57(30)
Research using animals	37(53)	47(45)	29(59)	39(56)	34(59)	35(50)	38(54)	38(46)
Medicalresearch	71(20)	77(16)	68(22)	81(13)	68(24)	70(19)	68(23)	70(19)
Approve (disapprove) of GM (Q6)								
Commercial crops	36(58)	46(59)	28(64)	45(49)	30(63)	34(61)	32(61)	37(55)
Farm animals	25(70)	34(61)	17(76)	30(67)	18(76)	21(71)	26(72)	29(65)
Pest control	54(39)	62(33)	48(45)	60(35)	51(44)	51(42)	49(43)	58(36)
Processed foods	21(73)	29(65)	16(78)	25(70)	17(75)	18(77)	23(70)	24(69)
Medicines and vaccines	64(28)	74(21)	59(33)	75(21)	61(31)	64(28)	60(31)	64(28)
Research using plants	52(41)	59(36)	48(45)	65(31)	48(46)	52(42)	48(46)	51(41)
Research using animals	29(66)	41(55)	19(74)	30(65)	24(70)	27(67)	32(64)	31(62)
Medicalresearch	65(28)	77(20)	58(34)	75(21)	62(31)	54(31)	60(30)	63(27)

[1] Note: not all results are based on the total sample.

Table 6.30 continued

	Total sample n = 1153[1] %	Total Male n = 475[1] %	Total Female n = 678[1] %	Total <29 n = 250[1] %	Total 30–39 n = 242[1] %	Total 40–49 n = 236[1] %	Total 50–59 n = 173[1] %	Total 60+ n = 252[1] %
Area **most** approve of for GM (Q7)								
Commercial crops	4	6	3	3	3	3	3	8
Farm animals	1	0	1	2	0	0	0	1
Pest control	10	10	10	7	9	10	13	12
Processed foods	1	2	0	1	0	1	2	1
Medicines and vaccines	22	24	21	31	26	24	16	15
Research using plants	5	3	6	4	8	6	4	4
Research using animals	1	2	1	1	1	0	1	3
Medicalresearch	29	32	27	35	24	29	29	30
Approve of none	25	19	30	17	27	26	31	25
Don't know	1	2	1	1	1	1	2	3
Area **least** approve of for GM (Q8)								
Commercial crops	9	10	9	6	11	9	11	10
Farm animals	15	16	15	18	21	16	12	10
Pest control	3	3	2	5	2	3	2	2
Processed foods	26	26	27	24	27	26	24	30

[1] Note: not all results are based on the total sample.

Table 6.30 continued

	Total sample n = 1153[1] %	Total Male n = 475[1] %	Total Female n = 678[1] %	Total <29 n = 250[1] %	Total 30–39 n = 242[1] %	Total 40–49 n = 236[1] %	Total 50–59 n = 173[1] %	Total 60+ n = 252[1] %
Area **least** approve of for GM (Q8) *continued*								
Medicines and vaccines	2	1	3	2	2	1	4	1
Research using plants	2	1	2	2	1	2	4	1
Research using animals	16	12	18	23	15	15	11	13
Medicalresearch	44	2	6	4	4	7	3	4
Disapprove of none	17	24	12	12	14	15	20	23
Don't know	1	0	2	1	0	0	2	3
GM has a lot/some to offer NZ (Q9)	54	64	47	65	50	51	51	51
GM very important/just important to NZ's future (Q12)	51	61	44	64	43	51	48	50
Personally very informed/just informed about GM (Q10)	57	62	54	52	57	66	62	52
GM very important/just important to me personally (Q11)	67	60	71	57	74	73	69	61

[1] Note: not all results are based on the total sample.

by the survey. For example, the same proportion of Maori and non-Maori (71%) claimed there were "more advantages" than "more disadvantages" with genetic modification in relation to medicines and vaccines. Almost the same proportion of Maori (71%) and non-Maori (68%) claimed there were "more disadvantages" than "more advantages" with genetic modification in relation to processed foods.

Similar proportions also believed genetic modification had something to offer New Zealand (52% of Maori, compared with 54% of non-Maori), although a slightly higher proportion of non-Maori (51%) than Maori (46%) claimed it was of importance to New Zealand's future, and a slightly higher proportion of non-Maori (68%) than Maori (61%) claimed genetic modification was of importance to them personally.

Educational status

Respondents with some tertiary qualifications claimed to be relatively more informed about genetic modification (64%, compared with 39% for respondents with no school qualifications), were more likely to claim it was of personal importance to them (74%, compared with 52% for respondents with no school qualifications), were more likely to claim it had something to offer New Zealand (58%, compared with 52% for respondents with no school qualifications), and were more likely to claim genetic modification was of importance to New Zealand's future (55%, compared with 49% for respondents with no school qualifications).

Nevertheless, those with no school qualifications were more likely to claim genetic modification is being practised in New Zealand, and to claim that there are "more advantages" than "more disadvantages". For example, 64% of respondents with no school qualifications claimed there were "more advantages" with genetic modification in relation to pest control compared with 53% of those with tertiary qualifications.

Occupational status

The survey results have been analysed by those respondents who described themselves as having a Professional/Managerial occupation, those involved in Sales and Support and those with a Manual/Semi-skilled occupation.

As a general observation, Professionals/Managers were more likely than respondents in the other two occupational groups to claim genetic modification is currently being practised in New Zealand. They were also the group that more frequently claimed to be informed about the subject.

Against this background, they were less likely to claim there were "more advantages" than "disadvantages" in certain areas, and to generally "approve" of

genetic modification. For example, 52% of Professionals/Managers claimed there were "more advantages" with genetic modification in relation to pest control compared with 62% of those with a Manual/Semi-skilled occupation. In turn, only 49% "approved" of genetic modification in this area compared with 58% of those with a Manual/Semi-skilled occupation.

Nevertheless, a slightly higher proportion of Professionals/Managers claimed genetic modification was important to New Zealand's future (55%) compared with those with a Manual/Semi-skilled occupation (50%). And more (78%) claimed that genetic modification was of importance to them personally, compared with 60% of those respondents with a Manual/Semi-skilled occupation.

Scientific background

As a general observation, respondents who claimed they had some type of scientific background were more likely to claim that there were "more advantages" than "more disadvantages" with genetic modification in relation to a number of so-called "marginal" areas than those respondents without. This was particularly the case in terms of farm animals (37%, compared with 29% respectively), research using plants (61%, compared with 55%) and research using animals (43%, compared with 36%). This, in turn, was reflected in the approval/disapproval results.

Nevertheless, while more frequently claiming to be informed (74%, compared with 54%) and that genetic modification was personally of importance to them (74%, compared with 66%), respondents with a scientific background were not necessarily more likely than those without such a background to claim that genetic modification had something to offer New Zealand or that it was of importance to New Zealand's future.

Income

Reflecting the occupational results outlined above, respondents with the highest incomes ($60,000 or more per annum) were more likely than other income groups to claim there were "more advantages" than "more disadvantages" with genetic modification, to approve of genetic modification, to claim they were more informed about it as a subject, to claim that it was personally of importance to them, and to claim it had something to offer New Zealand.

However, this does not extend to the importance they placed on genetic modification as far as its importance to New Zealand's future is concerned. In fact, they were just as likely as the lowest income group (Under $20,000 per annum) to claim it was of importance to New Zealand's future (54%, compared with 52% respectively).

Region

The survey results have been analysed by three broad geographic regions; namely, North North Island (Taupo north), South North Island (Taupo south) and South Island.

There are few regional differences of significance.

Household composition

The survey results have been analysed by those respondents with pre- and school-aged children and those without.

Aside from the fact that respondents with children were more likely to claim that genetic modification is currently practised in New Zealand, there are no other significantly different results.

7.1 Glossary of technical terms

This glossary of technical terms indicates the source of the definition. It presents, in some instances, more than one definition of a term, with the second entry providing an expanded explanation. Expanded definitions may also focus on the application of the terms in the field of genetic modification rather than in their widest context. Entries have been edited to conform with report style if necessary. Some entries, marked [New Zealand], provide an explanation particularly applicable to New Zealand circumstances.

allergen

A substance that causes an allergic reaction.

Waiter, there's a Gene in My Food

also **allergic reaction, allergy**: an exaggerated physical response to some antigen, typically a common environmental substance, that produces little or no response in the general population, resulting when histamine or histamine-like substances are released from injured cells. It involves various respiratory and dermatological symptoms, such as sneezing or itching.

Academic Press Dictionary of Science and Technology

also **allergenicity**: Ability to induce various types of allergic responses (also known as hypersensitivity responses).

Virology/Immunology

antibiotic resistance

The ability of a bacterium to synthesise a protein that neutralises an antibiotic.

BioTech Life Sciences Dictionary

also **antibiotic resistance genes**: Genes in a microorganism that confer resistance to antibiotics, for example by coding for enzymes that destroy it, by coding for surface proteins that prevent it from entering the microorganism, or by being a mutant form of the antibiotic's target so that it can ignore it.

BioTech Life Sciences Dictionary

antigen

A usually protein or carbohydrate substance (as a toxin or enzyme) capable of stimulating an immune response.

Merriam-Webster's Collegiate Dictionary

bacteriophage

see **phage**

biodiversity, biological diversity

The existence of a wide range of different types of organisms in a given place at a given time.

BioTech Life Sciences Dictionary

The variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

World Foundation for Environment and Development

also **biodiversity prospecting** or **'bioprospecting'**: The search for useful genetic and biochemical compounds and materials and related information in nature.

biodynamic

Of or relating to a system of farming that uses only organic materials for fertilising and soil conditioning.

Merriam-Webster's Collegiate Dictionary

biomedicine

Medicine based on the application of the principles of the natural sciences and especially biology and biochemistry.

Merriam-Webster's Collegiate Dictionary

also **biomedical engineering**: The use of engineering technology, instrumentation and methods to solve medical problems, such as improving our understanding of physiology and the manufacture of artificial limbs and organs.

BioTech Life Sciences Dictionary

bioremediation

The use of plants or microorganisms to clean up pollution or to solve other environmental problems.

BioTech Life Sciences Dictionary

biosecurity

The protection of people and natural resources from unwanted organisms capable of causing harm.

Environmental Performance Indicators Programme

[*New Zealand*] The cost effective protection of any natural resources from organisms capable of causing unwanted harm. The Biosecurity Act 1993 is the main act dealing with biosecurity issues. It has resulted in changes to the way biosecurity is managed and viewed.

Previously, pest management largely had an agricultural or horticultural focus. But this tended to overlook other pests, like environmental pests. With the passing of the Biosecurity Act, when we now talk about biosecurity pests, we mean a wide range of organisms that are harmful, not only to production industries, but also to the environment (including the land, freshwater and marine environments, as well as to people). That includes undesirable animals, undesirable plants such as weeds, and organisms that attack animals and plants (including disease-causing microorganisms).

MAF Rural Bulletin May 1999

biotechnology

Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

World Foundation for Environment and Development

The industrial use of living organisms or biological techniques developed through basic research. Biotechnology products include antibiotics, insulin, interferon, recombinant DNA, and techniques such as waste recycling. Much older forms of biotechnology include breadmaking, cheesemaking and brewing wine and beer.

BioTech Life Sciences Dictionary

chromosome

Structure containing DNA and proteins in the cell nucleus.

Bernie May

Components in a cell that contain genetic information. Each chromosome contains numerous genes. Chromosomes occur in pairs: one obtained from the mother; the other from the father. Chromosomes of different pairs are

often visibly different from each other.

About Biotechnology

clone

(of DNA): An identical copy. The term may be applied to a fragment of DNA, a plasmid that contains a single fragment of DNA, or a bacterium that contains such a plasmid.

(of animal): An identical offspring, generally created by transfer of an identical nucleus into a recipient egg.

The Current Uses of Genetic Modification

(1) To insert a piece of DNA into a vector for subsequent amplification and isolation of that specific piece;

(2) A piece of DNA composed of a vector and its insert.

Bernie May

also **cloning vector**: Biological carriers such as plasmids, bacteriophages, or cosmids used to amplify an inserted DNA sequence.

Bernie May

containment

(biological): Containment based on a biological barrier that prevents the transmission or escape of an organism.

(physical): Containment achieved by the control of access, restriction of air circulation, and/or the provision of other secure physical barriers.

The Current Uses of Genetic Modification

also **containment facility**: [*New Zealand*] A place approved in accordance with section 39 of the Biosecurity Act, for holding organisms that should not become established in New Zealand.

MAF Biosecurity Authority

copyright

The exclusive legal right to reproduce, publish, and sell the matter and form (as of a literary, musical, or artistic work).

Merriam-Webster's Collegiate Dictionary

cross-pollination

The transfer of pollen from the anther of the flower of one plant to the flowers of a different plant.

Garden Web

DNA

Deoxyribonucleic acid, the chemical at the centre of the cells of living things which controls the structure and purpose of each cell and carries genetic

information during reproduction.

Cambridge International Dictionary of English

A nucleic acid that constitutes the genetic material of all cellular organisms and the DNA viruses; DNA replicates and controls through messenger RNA the inheritable characteristics of all organisms. A molecule of DNA is made up of two parallel twisted chains of alternating units of phosphoric acid and deoxyribose, linked by crosspieces of the purine bases and the pyrimidine bases, resulting in a right-handed helical structure, that carries genetic information encoded in the sequence of the bases.

Academic Press Dictionary of Science and Technology

ecosystem

The complex of a community of organisms and its environment functioning as an ecological unit.

Merriam-Webster's Collegiate Dictionary

enzymes

Proteins that control the various steps in all chemical reactions.

An Agricultural and Environmental Biotechnology Annotated Dictionary

Any of numerous complex proteins that are produced by living cells and catalyse specific biochemical reactions at body temperatures.

Merriam-Webster's Collegiate Dictionary

also **restriction enzyme:** any of various enzymes that break DNA into fragments at specific sites in the interior of the molecule — called also restriction endonuclease.

Merriam-Webster's Collegiate Dictionary

field trial

A trial of a new product in actual situations for which it is intended.

Merriam-Webster's Collegiate Dictionary

gene

A unit of hereditary information. A gene is a section of a DNA molecule that specifies the production of a particular protein.

About Biotechnology

A locus on a chromosome that encodes a specific protein or several related proteins. It is considered the functional unit of heredity.

An Agricultural and Environmental Biotechnology Annotated Dictionary

gene therapy

The process of introducing new genes into the DNA of ... cells to correct a genetic disease or flaw. (1) Human gene therapy: Insertion of normal DNA

directly into cells to correct a genetic defect. (2) Somatic cell gene therapy: The repair or replacement of a defective gene within somatic tissue.

BioTech Life Sciences Dictionary

(3) Germ-line (gene) therapy: The repair or replacement of a defective gene within the gamete-forming tissues, which produces a heritable change in an organism's genetic constitution.

An Agricultural and Environmental Biotechnology Annotated Dictionary

gene transfer

The transfer of genes into a cell by any of a number of different methods available.

BioTech Life Sciences Dictionary

Insertion of unrelated DNA into the cells of an organism. There are many different reasons for gene transfer: for example, attempting to treat disease by supplying patients with therapeutic genes. There are also many possible ways to transfer genes. Most involve the use of a vector, such as a specially modified virus that can take the gene along when it enters the cell.

NHGRI Glossary of Genetic Terms

genetic code

The way genetic information is stored in living organisms.

About Biotechnology

The biochemical basis of heredity consisting of codons in DNA and RNA that determine the specific amino acid sequence in proteins and appear to be uniform for all known forms of life.

Merriam-Webster's Collegiate Dictionary

genetic engineering (GE)

see **genetic modification**

genetic modification (GM)

Altering the genetic material of cells or organisms in order to make them capable of making new substances or performing new functions.

The Genomics Lexicon

The technique of removing, modifying or adding genes to a DNA molecule in order to change the information it contains. By changing this information, genetic engineering changes the type or amount of proteins an organism is capable of producing.

About Biotechnology

Note: for purposes of the Commission, the term "genetic modification" is defined in the Warrant establishing the Commission (see Appendix 1, page 159).

genetically modified organism (GMO)

Organisms that have had genes from other species inserted into their genome.

Functional Genomics Glossary

An organism whose genome has been altered by the inclusion of foreign genetic material. This may be derived from other individuals of the same or wholly different specifies, or of an artificial nature. Foreign genetic information can be added to the organism during its early development and incorporated in cells of the entire organism. Genetic information can also be added later in development to selected portions of the organism.

Functional Genomics Glossary

genome

The total hereditary material of a cell.

About Biotechnology

The genetic complement contained in the chromosomes of a given organism, usually the haploid chromosome state.

An Agricultural and Environmental Biotechnology Annotated Dictionary

also **genome projects:** Research and technology development efforts aimed at mapping and sequencing some or all of the genome of human beings and other organisms.

BioTech Life Sciences Dictionary

herbicide

Any substance that is toxic to plants; usually used to kill specific unwanted plants.

An Agricultural and Environmental Biotechnology Annotated Dictionary

Any agent, either organic or inorganic, used to destroy unwanted vegetation, especially weeds and grasses; selective herbicides eliminate weeds without destroying desirable crop or garden plants; nonselective herbicides destroy all vegetation in the given area.

Academic Press Dictionary of Science and Technology

homeopathy, homoeopathy

A system of medical practice that treats a disease especially by the administration of minute doses of a remedy that would in healthy persons produce symptoms similar to those of the disease.

Merriam-Webster's Collegiate Dictionary

A system of therapy advanced in the late eighteenth century by Dr Samuel Hahnemann, based on the theory that "like cures like"; if the conditions produced by giving large doses of a drug to a healthy person are similar to

conditions occurring as a natural consequence of disease, then that disease may be treated by the same drug in much smaller doses.

Academic Press Dictionary of Science and Technology

horizontal gene transfer

The transfer of genes or genetic material directly from one individual to another by processes similar to infection. It is distinct from the normal process of vertical gene transfer — from parents to offspring — which occurs in reproduction. Natural agents exist which can transfer genes horizontally between individuals. These are viruses, many of which cause diseases, and other pieces of parasitic genetic material, called plasmids and transposons, many of which carry and spread antibiotic and drug resistance genes. These are able to get into cells and then make use of the cell's resources to multiply many copies or to jump into (as well as out of) the cell's genome. The natural agents are limited by species barriers, so that for example, pig viruses will infect pigs, but not human beings, and cauliflower viruses will not attack tomatoes. However, genetic engineers make artificial vectors (carriers of genes) by combining parts of the most infectious natural agents, with their disease-causing functions removed or disabled, and design them to overcome species barriers, so the same vector may now transfer, say, human genes, which are spliced into the vector, into the cells of all other mammals, or cells of plants.

ngin (Norfolk Genetic Information Network)

intellectual property

Useful artistic and industrial information and knowledge.

International Law Dictionary and Directory

That area of the law involving patents, copyrights, trademarks, trade secrets, and plant variety protection.

Shaping Genes

marker genes

Genes that identify which plants [or animals] have been successfully transformed.

About Biotechnology

monoculture

The agricultural practice of cultivating crops consisting of genetically similar organisms.

An Agricultural and Environmental Biotechnology Annotated Dictionary

nutraceutical

Any substance that is a food or a part of a food and provides medical or health benefits, including the prevention and treatment of disease. [Note:

"Nutraceutical" and "nutriceutical" are frequently used interchangeably.]

Nutraceutical Alliance

nutriceutical

Nutriceutical is a term derived from the words 'nutrition' and 'pharmaceutical'. A nutriceutical is a product that combines food and an active ingredient such as a drug or a vitamin or some other chemical substance. These products are on the leading edge of development and are a nineties phenomenon. [Note: "Nutraceutical" and "nutriceutical" are frequently used interchangeably.]

ScienceNet

organic

Of, relating to, yielding, or involving the use of food produced with the use of feed or fertiliser of plant or animal origin without employment of chemically formulated fertilisers, growth stimulants, antibiotics, or pesticides.

Merriam-Webster's Collegiate Dictionary

organism

An individual animal, plant, or single-celled life form.

Waiter, there's a Gene in My Food

patent

Title by which a government grants the exclusive right to make use of an invention for a fixed time period.

Money Words

pesticide

A substance that kills harmful organisms (for example, an insecticide or fungicide).

An Agricultural and Environmental Biotechnology Annotated Dictionary

A chemical which is used to kill unwanted organisms such as rats, insects, nematodes, etc. Pesticides often act as nerve poisons, and they are hazardous to animals and humans (some pesticides can cause nerve or liver damage, birth defects and cancer).

Biotech Life Sciences Dictionary

phage, bacteriophage

A virus for which the natural host is a bacterial cell. Used as a vector for cloning segments of DNA.

Functional Genomics Glossary

(Bacteriophage) A virus that parasitises bacteria. It initiates infection by attaching itself by its tail to the wall of bacterial cell. Through enzyme action the bacteria wall is perforated and the bacteriophage DNA or RNA passes

through into bacterial cell. It uses the cell's machinery to make more bacteriophage DNA and bacteriophages, which are released by breakage of the bacterial cell.

A Dictionary of Biology

Plant Variety Rights

[*New Zealand*] A grant of Plant Variety Rights for a new plant variety gives the holder the exclusive right to produce for sale and to sell propagating material of the variety. In the case of vegetatively propagated fruit and ornamental varieties Plant Variety Rights gives the holder the additional exclusive right to propagate the protected variety for the purpose of the commercial production of fruit, flowers or other products of the variety.

Plant Variety Rights Office

plasmid

A small, circular piece of DNA found outside the chromosome in bacteria. Plasmids are the principal tools for inserting new genetic information into microorganisms or plants.

About Biotechnology

A structure composed of DNA that is separate from the cell's genome. In bacteria, plasmids confer a variety of traits and can be exchanged between individuals — even those of different species. Plasmids can be manipulated in the laboratory to deliver specific genetic sequences into a cell.

The Genomics Lexicon

protein

A biological molecule which consists of many amino acids chained together by peptide bonds. The sequence of amino acids in a protein is determined by the sequence of nucleotides in a DNA molecule. As the chain of amino acids is being synthesised, it is also folded into higher order structures shaped, for example, like helices or like flat sheets. Proteins are required for the structure, function, and regulation of cells, tissues, and organs in the body.

The Genomics Lexicon

recombinant DNA

DNA molecules that have been created by combining DNA from more than one source.

The Genomics Lexicon

Recombinant DNA is a fragment of DNA incorporated artificially into the DNA molecule of a suitable vector so that it can express itself many times. This way a large quantity of the DNA in question can be obtained. The DNA is usually one that contains genes of interest, such as interferon, insulin, or

growth hormone. The DNA may also be intended to fix mutated genes causing diseases, such as haemophilia or sickle cell anaemia. The vector could be plasmids, bacteriophages, and cosmids (packaged plasmid DNA into a phage particle).

BioTech Life Sciences Dictionary

also **recombinant clones**: Clones containing recombinant DNA molecules.

BioTech Life Sciences Dictionary

also **recombinant DNA technology**: The technology upon which genetic engineering or genetic modification is based. The process involves DNA being joined together in novel combinations.

The Current Uses of Genetic Modification

seed bank

A facility designed for the ex situ conservation of individual plant varieties through seed preservation and storage.

World Resource Institute

also seeds naturally occurring on or in the soil.

sequencing

Determining the order of nucleotides in a DNA or RNA molecule, or determining the order of amino acids in a protein.

The Genomics Lexicon

substantial equivalence

A comparative technique recommended by the Organisation for Economic Co-operation and Development (OECD): when faced with a novel or modified food or food product, you search for its nearest equivalent amongst existing organisms used as food or sources of food. These can then be used as the basis for comparison to assess risk, given that there should be extensive knowledge available.

Waiter, there's a Gene in My Food

'super-weed'/'super-bug'

A weed or pest that has developed a resistance to a herbicide/pesticide that once destroyed it.

Waiter, there's a Gene in My Food

terminator technology

The current popular term applying to the methods used to render plant seeds sterile and unable to germinate.

The Current Uses of Genetic Modification

transgene

A gene transferred to a recipient organism using recombinant technology.

The Current Uses of Genetic Modification

transgenic

An organism that has been genetically engineered to contain the genes from another species.

Waiter, there's a Gene in My Food

An organism whose genome has been altered by the inclusion of foreign genetic material. This foreign genetic material may be derived from other individuals of the same species or from wholly different species. Genetic material may also be of an artificial nature. Foreign genetic information can be added to the organism during its early development and incorporated in cells of the entire organism. As an example, mice embryos have been given the gene for rat growth hormone allowing mice to grow into large adults. Genetic information can also be added later in development to selected portions of the organism. As an example, experimental genetic therapy to treat cystic fibrosis involves selective addition of genes responsible for lung function and is administered directly to the lung tissue of children and adults.

The Genomics Lexicon

transposon

A [DNA] sequence that can move about in the genome of an organism.

Marine Biological Laboratory

A segment of DNA flanked by transposable elements that is capable of moving its location in the genome.

Bernie May

vaccine

A preparation of dead or weakened pathogen, or of derived antigenic determinants, that is used to induce formation of antibodies or immunity against the pathogen.

An Agricultural and Environmental Biotechnology Annotated Dictionary

vector

An organism or a biological molecule used to transfer material to a different organism or cell. In genetic modification, this refers to an organism, bacterium or plasmid able to transfer DNA.

The Current Uses of Genetic Modification

A self-replicating DNA molecule that exists with, but is separate from the genome of the host cell. Many different vectors have been identified and genetically engineered for use in molecular biology. DNA inserted into a

vector will be replicated along with the vector. In this manner, DNA of interest can be obtained in large quantities, ie, cloned. For example, the human insulin gene can be cloned into the plasmid vector pBr 322 which, in turn, will replicate in *E. coli* cultures.

Bernie May

also **cloning vector**: DNA molecule originating from a virus, a plasmid, or the cell of a higher organism into which another DNA fragment of appropriate size can be integrated without loss of the vector's capacity for self-replication; vectors introduce foreign DNA into host cells, where it can be reproduced in large quantities. Examples are plasmids, cosmids, and yeast artificial chromosomes; vectors are often recombinant molecules containing DNA sequences from several sources.

The Genomics Lexicon

virus

An infectious agent composed of a single type of nucleic acid, DNA or RNA, enclosed in a coat of protein. Viruses can multiply only within living cells.

About Biotechnology

Viruses consist of a piece of nucleic acid covered by protein. Viruses can only reproduce by infecting a cell and using the cell's mechanisms for self-replication. They can cause disease; modified viruses can also be used as a tool in gene therapy to introduce new DNA into a cell's genome.

The Genomics Lexicon

xenotransplant

Transplantation of tissue or organs between organisms of different species, genus, or family. A common example is the use of pig heart valves in humans.

The Genomics Lexicon

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7.2 Glossary of Maori terms

Maori term	English equivalent in context
Aotearoa	New Zealand
hapu	clan
harakeke	New Zealand flax, *Phormium tenax*
hauoratanga	good health
hinengaro	mental
hua	result, fruit
hui	conferences
ika	fish
ira tangata	human element of life
iwi	kin group, public, communities
kai	food
kaitiaki	guardian, guardianship
kaitiakitanga	guardianship
kaumatua	elder, elders
kaupapa	topic, project
kawa	ritual
kawai whakaheke	lines of descent
kuia	female elder
kumara	sweet potato
kura kaupapa	school using Maori as the medium of instructions
mana	prestige, standing
mana tangata tiaki	standing as a custodian for cultural matters
marae	meeting house
mauri	life principle, principle
Pakeha	European, non-Maori
rangatahi	young Maori
rangatiratanga	independence, dominion
riwai	potato
rongoa	medicine
runanga	councils, boards
taha	element, aspect
taiao	environment, world view
tamariki	children

Tane Mahuta	Tane, God of Forests
Tangaroa	Tangaroa, God of Seas
tangata whenua	local people, native people
taonga	assets, belongings
taonga tuku iho	treasures handed down from the ancestors
tapu	inviolable
Te Ao Maori	the Maori world
Te Puni Kokiri	Ministry of Maori Development
te reo (te reo Maori)	the Maori language
Te Tiriti o Waitangi	Treaty of Waitangi
teina	younger sister of a female, younger brother of a male
tika	correct
tikanga	culture, cultural, customs
tinana	physical
tino rangatiratanga	independence
tuakana	older sister of a female, older brother of a male
tupuna	ancestor
wairua	spirit
whakapapa	genealogy, heredity
whanau	family
whenua	land

7.3 Abbreviations

Abbreviation	Meaning
AIDS	acquired immune deficiency syndrome
ANZFA	Australia New Zealand Food Authority
ANZFSC	Australia New Zealand Food Standards Council
BSE	bovine spongiform encephalopathy
Bt	*Bacillus thuringiensis*
CAC	Codex Alimentarius Commission
CBD	Convention on Biological Diversity
CRI	Crown Research Institute
DDT	dichlorodiphenyltrichloroethane
DNA	deoxyribonucleic acid
DOC	Department of Conservation
ERMA	Environmental Risk Management Authority
ESR	Institute of Environmental Science and Research
EU	European Union
FDA	Food and Drug Administration
GE	genetic engineering
GM	genetic modification
GMO	genetically modified organism
GMP	genetically modified product
HGT	horizontal gene transfer
HSNO Act	Hazardous Substances and New Organisms Act
ICCPR	International Covenant on Civil and Political Rights
IP	intellectual property
MAF	Ministry of Agriculture and Forestry
MCA	Ministry of Consumer Affairs
MED	Ministry of Economic Development
MOH	Ministry of Health
SPS Agreement	Agreement on the Application of Sanitary and Phytosanitary Measures
TBT Agreement	Agreement on Technical Barriers to Trade
TRIPS Agreement	Agreement on Trade-Related Aspects of Intellectual Property Rights
TTMRA	Trans-Tasman Mutual Recognition Arrangement
UNESCO	United Nations Educational, Scientific and Cultural Organization

UPOV	International Union for the Protection of New Varieties of Plants
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

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