



appendix 2

Outcomes of Consultation: Submissions
from Interested Persons



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3.7 Evidence and uncertainty

Introduction

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

Submitter profile

Thirty-five submissions made substantial comment on this item of the Warrant. Of these, 20 submissions came from the economic/production sector. Five submissions were received from organisations in the environment sector; three from organisations in the health sector and six submissions were received from other sectors, such as governance organisations. One submission was received from an organisation with a cultural or ethical focus.

The majority of the submissions supported the use of genetic modification, genetically modified organisms and products in New Zealand. Twenty-one of the submissions making substantial comment on the Warrant item had taken an overall stance that was ‘strongly for’ genetic modification, with another two submissions ‘tending to be for’ the use of genetic modification. Only five were ‘strongly against’, with a further four submissions taking a stance that ‘tended to be against’ genetic modification. The remaining three submissions took a stance that was ‘neither for nor against’ genetic modification.

The majority of the submissions came from organisations with an interest in either researching genetic modification or the development or promotion of genetic techniques or genetically modified products. Five of the submissions came from private companies, some of which dealt with genetically modified products and some of which dealt with natural and organic products. Nine submissions came from industry networks or associations and six from research organisations. Seven advocacy networks and associations also made substantial comment and the remaining eight submissions came from a variety of organisations, including two from Maori organisations and two from consumer networks and associations. One organics organisation and one occupational or professional organisation each made submissions.

Content of the submissions

Some submissions discussed briefly the future uses of genetic modification. Several submissions from patient representative organisations and from other agencies working in the health sector stressed the increasing importance of the technology, particularly since completion of the human genome project. Submissions from primary sector organisations outlined the likely future uses of the technology in pastoral agriculture and cropping. Aventis CropScience [IP14] listed the genetically modified plant varieties that it intended to make available in New Zealand. The forestry industry submissions also referred to the future use of genetic technology in the production of timber and timber products.

None of the submissions, however, dealt in any length with the future uses of genetic modification. Instead, this Warrant item was used as an opportunity to express views on the level and scope of uncertainty relating to genetic modification, and, in particular, to deal with issues relating to the risks and safety of the technology. This focus on uncertainty, rather than evidence of use, may have been the result of an apparent overlap between this Warrant item and the previous Warrant item (a), which had sought information on the present use of genetic modification in New Zealand.

Key themes

Three key themes relating to uncertainty emerged from the submissions making substantial comment on this Warrant item. These were:

- the public's perception of the technology
- uncertainty about the ability to manage the risks of genetic modification
- the possible impacts of the use of genetic modification.

Public perception

Several submissions discussed the public's perception of genetic modification, genetically modified organisms and products. Irrespective of whether the submissions supported or opposed the use of genetic modification, there was agreement that the public had, in general, a negative perception of genetic modification and was uncertain whether it should be used.

Causes of public uncertainty

There was no shared common view of the cause of public uncertainty about genetic modification. Some submissions, particularly those from opponents of genetic modification, considered that the public's reluctance to accept genetic

modification was because of the risks associated with the technology. They suggested that an awareness of the inherently unpredictable nature of gene technology and the potential for widespread and irreversible adverse effects provided a justified basis for public uncertainty about the acceptability of genetic modification.

Proponents of genetic modification, and some submissions that took a more neutral stance, suggested that the public's concern about the safety of genetic modification was no different from the doubts that had been expressed in the past when a new technology was introduced. They suggested that public uncertainty would diminish with time and familiarity. Submissions from the opponents of genetic modification, however, saw no similarity between past new technologies and the development of genetic technology, which was seen as moving into areas beyond current scientific knowledge. These submissions did not, therefore, accept that public uncertainty would lessen with time: they suggested that public uncertainty could be removed only when there was adequate proof that the use of the technology would be without risk.

Several submissions suggested that public uncertainty arose from insufficient knowledge and understanding of the technology. Monsanto New Zealand [IP6], for example, suggested, "Much of public uncertainty in New Zealand arises from poor communication to the public of the science behind genetic modification and of the real and potential value of its products." Other submissions suggested that uncertainty about the technology resulted not simply from a lack of understanding of the technology but also from the difficulty the public experienced in accessing "reliable" information. In the absence of easy access to information, even people who had an understanding of the technology had insufficient information on which to make judgments about its use.

Submissions from various organisations involved in the research and development of genetic modification suggested that increasing the public's understanding and knowledge of the technology would help allay some of the public uncertainty about the use of genetic modification. The view that access to information would increase the acceptability of the technology was not shared by all the submissions. Interchurch Commission on Genetic Engineering [IP49] agreed that there was a need for more information to be made available to the public but did not agree that increased information would necessarily result in a greater public acceptance of genetic modification. Interchurch Commission suggested that uncertainty was

caused by “fear of the unknown” and by “feelings of powerlessness” and commented that there were “deep-seated and fundamental ethical concerns to be addressed with the general public” which would not necessarily be dispelled by providing additional information about the technology. Other submissions, particularly from religious and spiritual groups, confirmed this view, and some submissions from Maori groups indicated that there was considerable uncertainty about the appropriateness of using genetic modification within the Maori cultural and spiritual framework, the precepts of which amounted to a rejection of the technology.

Some submissions claimed that the public’s negative perception of genetic modification and uncertainty about its safety was the result of an international political campaign against “free trade and the global marketplace”, which the submission from New Zealand Life Sciences Network [IP24] suggested was based on the “calamity theory”. The submission explained that this theory “postulates [the] worst-case scenario as though it were an inevitability” and therefore encouraged the public to be uncertain about the safety or appropriateness of the use of genetic modification..

Acceptable and unacceptable uses

Submissions tended to agree that, because of the current level of uncertainty, it would be difficult to determine what future uses of the technology would be acceptable to the public. Notwithstanding the general concern and uncertainty about genetic modification, some submissions suggested that the public already accepted certain uses of genetic modification. Submissions also suggested that other uses of genetic modification were unlikely ever to be acceptable.

Some uses of genetic modification that were identified as likely to be unacceptable to the public for a long period of time, such as cloning and xenotransplantations, fell outside the Warrant’s ambit. Of the uses that came within the scope of the Warrant, the creation of transgenic organisms using human genes was one use that many submitters were certain would not gain public acceptability.

Several submissions also stated the belief that genetic modification in food was a use that would never be acceptable because of the long-term risk to human health. Other submissions did not go as far as to suggest that genetically modified food would never be acceptable, but did suggest that there was a general discomfort with the idea of eating modified foods knowingly. Submissions from organisations involved in the production of food, while strongly disagreeing that there was a risk to human health, acknowledged that genetically modified food was not widely acceptable to the public and that there was strong consumer resistance to its use.

Because of this, the submitters suggested New Zealand producers would be unlikely to use genetic modification in the production of foodstuffs such as meat, fruit and vegetables until there was a change in public attitudes.

Submissions also suggested that, despite public uncertainty, some uses of genetic modification were already accepted by the public. Submissions from organisations involved in pure research stated that low-risk, scientific research projects involving genetic modification that were carried out in containment in the laboratory were generally accepted. These submissions, particularly those from universities, emphasised that any policy with regard to genetic modification should not result in the prohibition of genetic modification for research and teaching purposes.

Medical research organisations also emphasised that the use of genetic modification as a diagnostic and therapeutic tool was already widely accepted by the public. The submissions suggested that this public acceptance arose either because the use was seen as being carried out in containment or because the use of the technology was considered to be a matter of individual choice. Only a handful of submissions suggested that medicines and treatments involving genetic modification were not acceptable. The reasons given were concerns either about safety or about the reduction of research into alternative, non-genetically modified methods of treatment if the focus shifted to development of treatments using gene technology.

Research into public attitudes

Several submissions considered that it was not easy to determine which future uses of genetic technology would be acceptable to the public because of the different factors that influenced individual perception. Nevertheless, because the acceptability and consequent use of genetic modification would be determined by the public's perception of genetic modification, the submissions suggested there was a need to research public attitudes towards the technology.

Some submissions indicated that research into public attitudes had already been undertaken or were under way. Landcare Research [IP12] discussed the research it had undertaken into public attitudes as part of its research into possum control. AgResearch [IP13] advised that it had been asked by University of Waikato to contribute to a Foundation for Research, Science and Technology (FRST) tender proposal to determine key potential effects and acceptability of genetically modified organisms. Church groups, such as Interchurch Commission [IP49] and Anglican Church in Aotearoa New Zealand and Polynesia [IP42], had also carried out research and consultation among church members to determine attitudes towards genetic modification.

Research organisations, however, indicated a need for increased social, as well as scientific, research as part of the development of genetic modification, genetically modified organisms and products. The submission from Landcare Research [IP12] commented:

Our experience is that social research is invaluable in defining some of the uncertainties about the likely use of particular GM products, and hence the specifications that a GM product will need to meet. We strongly believe that ongoing research on attitudes, social learning and public acceptance will be essential and, increasingly, at least as important as biotechnological research.

Changing public perception

Several of the submissions made suggestions on how the public’s uncertainty about genetic modification could be changed to increase acceptance of the technology. Submissions suggested that the provision of reliable information would develop greater public understanding and acceptance of the technology, and that uncertainty about its safety would be resolved by increasing public confidence in the ability of science to manage any risks resulting from its use. Submissions from the proponents of genetic modification believed that uncertainty would lessen if the public felt confidence in a regulatory framework that assessed the risks and the benefits resulting from the technology and ensured that the technology was applied within the bounds of public acceptability. Submissions from opponents of genetic modification, however, suggested that public confidence in the present regulatory framework and, in particular, in the regulatory agencies was very low.

Risks and safety

Most of the submissions identified safety concerns as the major source of uncertainty about future use of genetic modification in New Zealand. There was, however, general acceptance that the use of genetic modification for research purposes in laboratory containment should continue because of the low level of risk from such use. The discussion in most of the submissions focused on the environmental risks associated with the use of genetic technology for agricultural purposes, and the risks to human health from genetically modified food.

Opinions diverged sharply about the use of genetic modification outside laboratory containment for agricultural research purposes. Whereas agricultural research in laboratories was accepted in most of the submissions, the opponents of genetic modification made no differentiation between field trials of genetically modified plants or animals and the release of genetically modified organisms into the wider environment. Research organisations, however, considered field trials to be a

necessary extension of laboratory research. The submissions pointed out that field trials were subject to strict controls that minimised the likelihood of risk and were, therefore, different from the general release of genetically modified organisms and products.

In considering whether or not there were risks associated with the use of genetic modification, many submissions focused on environmental risks. Such risks included: the development of “super-weeds” from herbicide-resistant, genetically modified plants; the risk of cross-pollination of non-genetically modified crops by pollen from genetically modified plants; and the risk of contamination of honey products if bees collected pollen and other materials from genetically modified plants. The horizontal transfer of genes from genetically modified organisms to non-target organisms was also identified as a risk.

Several submissions were concerned about the risks to human health posed by the consumption of genetically modified foods. Submissions identified a risk that consumption of the food from plants into which genes had been inserted could allow transfer of those novel genes to humans. Some submissions suggested that there was a risk that genetically modified foods could contain unknown allergens or toxins or could produce unanticipated toxic and allergenic reactions as a result of genetic modification. The use of antibiotic resistance as marker genes was also identified as a risk to both human and animal health and to the environment.

There was considerable disagreement in the submissions as to whether there was any evidence to show that the risks associated with the use of the technology were actual rather than theoretical. Opponents of genetic modification quoted overseas studies that found that some of the possible adverse effects identified, particularly the contamination of non-genetically modified crops by pollen from genetically modified crops, had already occurred. They suggested that science lacked sufficient knowledge to predict the risks and ensure the safety of the technology. Supporters of genetic modification, however, pointed to the 20 years over which genetically modified organisms had been safely used and stressed the considerable body of knowledge of the technology that had been built up over that time. Submissions also cited a number of international regulatory agencies that had approved the release of genetically modified products. The findings of overseas inquiries, such as the April 2000 report of the United States Congress Committee on Science, were also cited in submissions as evidence of the safety of genetic modification.

Risk management

It was clear from the submissions that the debate between those who supported the use of genetic modification and those who opposed its use outside laboratory

containment focused on whether the risks associated with the use of genetic technology could first be ascertained and then managed within an acceptable level of risk.

Submissions from those who opposed the use of genetic modification expressed concern about the technology’s inherent unpredictability and the difficulty of reversing or containing any harm to human health or to the environment caused by the release and use of genetically modified organisms. Green Party of Aotearoa/ New Zealand [IP83] expressed strong doubts about the current ability of science to understand and predict the outcomes of the use of genetic modification and suggested that:

The inherent uncertainties of the technology itself mean that it poses inescapable risks in New Zealand, both to human health and to the environment. Genes do not operate in isolation; the transgene will affect, and be affected by, the other genes in the cell, and by where it is positioned and how many copies of it are inserted. Currently none of this can be controlled by genetic engineers when they create new chimaeric organisms.

This submission was particularly concerned about a number of hypothetical pathways, inherent in the nature of the recombinant process itself, by which unpredictable disruptions of biological systems could occur. It stressed the need for further research before the risks associated with the use of the technology could be fully ascertained and a decision made on its use in the community.

Several submissions also expressed uncertainty about the safety of the technology and recommended the application of the “precautionary approach” or “precautionary principle” to the use of genetic modification. Submissions that advocated the precautionary principle did not, however, appear to have a shared understanding of the meaning of the term¹. In some submissions the term was taken to mean that no use of genetic modification should be permitted until uncertainties about its safety and impact had been thoroughly researched and satisfied. The submission from Friends of the Earth (New Zealand) [IP78] applied the principle, as set out in the Hazardous Substances and New Organisms Act 1996, to advocate the compulsory labelling of all genetically modified products and products containing genetically modified ingredients.

Other submissions suggested that adoption of the precautionary principle was neither necessary nor appropriate to ensuring the safety of genetic modification.

¹ For a discussion of varying interpretations of the precautionary principle, and its use internationally and in New Zealand, see Appendix 1 (“Current status of genetic modification in New Zealand: Genetic modification and the precautionary approach”).

Biotenz [IP25] pointed out that there was no internationally accepted formulation of the principle and suggested that calls for its application were politically motivated and would lead to political rather than scientific decisions on the safety of genetic modification.

Proponents of genetic modification neither considered that the technology was unpredictable nor believed that the risks were inherent in the technology itself. Risk, several submissions stated, arose from the use of the technology and not from the technology itself. The actual risks associated with a particular use of genetic modification could be identified and managed only on a case-by-case basis. The submissions were confident that sufficient reliable research information existed, or was being rapidly developed, “to allow society’s decision-makers to have a workable understanding of the risks of the technology” and considered it unnecessary to delay the use of genetic technology until there was less or no uncertainty. Some submissions also shared the view expressed by New Zealand Biotechnology Association [IP47] that:

... research investments into the uncertainties of GM needs to be increased. While this is seen as integral to any research strategy/proposal involving GM a heightened awareness will help alleviate public concerns.

Opponents of genetic modification did not share this confidence and expressed considerable uncertainty as to whether current science had developed sufficient knowledge of the actual risks of genetic modification to give adequate assurances of safety before the technology was used. The submission from Bio Dynamic Farming and Gardening Association in New Zealand [IP61] said:

It is reasonable to expect those who would expose us, our food, and our natural and agricultural environments to genetically modified organisms to demonstrate that they can manage the risks to very high standards ... Risk management should be empirical. It should be based principally on observation of behaviour. ... In the long run, the only way to know what an organism does in particular circumstances is to observe it. Anything else is conjecture ...

Level of risk

The proponents of genetic modification saw the demand for complete certainty as being a requirement that proposed uses of the technology satisfied a “zero risk” standard. Several of the submissions suggested that the standard was “unrealistic and unachievable” and suggested that the appropriate response to public uncertainty was to identify and assess the risks of a particular use of genetic and to manage those risks effectively to reduce their negative impacts.

Submissions that took a more neutral stance on the use of genetic modification also suggested that absence of risk was unrealistic, although many stressed the need for caution in adopting the technology and for ongoing scientific research into its uncertainties. The submission from Rural Women New Zealand [IP52], for example, said:

It is in the nature of developing technologies — where the level of empirical knowledge is low — that various levels of uncertainty are inevitable and that risks may not be fully calculable. These uncertainties must be recognised.

The only real certainty is of our lack of certainty. Honest science is modest and cautious ... Science gets into trouble when it takes on spurious certainty in aid of commerce or government ...

Scientific risk management

In response to uncertainty about the risks of genetic modification, many of the submissions from research organisations and from private companies involved in the research and development of genetically modified products, suggested that an acceptable level of risk management would be achieved through properly conducted, scientific risk assessment processes. The submission from New Zealand Dairy Board [IP67] suggested:

The proper approach to the uncertainties involved in any new technology or scientific discovery is to research the possible known consequences, and to assess the risk of possible unforeseen consequences, by proper scientific methodology.

Other submissions supported the view that science allowed for a reduction in uncertainty by ensuring appropriate risk management. Many submissions also added that a robust regulatory system would ensure that a proper scientific assessment of the risks was undertaken. Approval of the current regulatory framework was expressed by several submissions from organisations working within the primary sector and within health and medicine research. Some of the opponents of genetic modification, however, expressed strong doubts about the ability of regulatory authorities such as Australia New Zealand Food Authority and Environmental Risk Management Authority to respond appropriately to public uncertainty about the use of genetic modification.

Scientific uncertainty

Submissions from opponents of genetic modification were not confident that scientific method would offer certainty that the risks could be managed. The submission from Safe Food Campaign [IP86] sought to “conceptualise what the level of ‘scientific uncertainty’ ... means”. The submission pointed out that traditional risk assessments were based on quantifying the probability of

occurrence based on past events. It suggested that:

Genetic modification defies traditional risk estimates as both the probability of occurrence of harm and level of possible harm are unknown.

This submission concurred with that of Bio Dynamic Farming and Gardening Association [IP61] that current risk assessment was based on “conjecture” rather than on empirical fact.

The strongest expressions of uncertainty about the lack of long-term scientific research came in the submissions from consumer networks and associations expressing concerns about the effects of genetic modification on food and, as a consequence, on human health. Submissions from organisations in the area of food and food ingredient production, however, emphasised the safety of their products and cited the effectiveness of the relevant regulatory agencies in ensuring food safety.

Proponents of genetic modification considered that sufficient knowledge had been developed over the 20 years in which the technology had been used to ensure the safety of current use of genetic modification. Some submissions also stated that the technology was more precise in achieving desired outcomes than the equivalent traditional methods, particularly in relation to the development of specific traits in plants by genetic modification rather than by conventional plant breeding techniques. Submissions from organisations in the health sector suggested that genetically modified products, such as human insulin from recombinant DNA production methods, were purer than pharmaceuticals produced by conventional means. It was not accepted, therefore, that use of genetic modification necessarily involved an unacceptable level of risk.

Opponents of genetic modification not only were uncertain about the ability of the scientific method and of current scientific knowledge to identify and accurately assess the risks of using genetic modification in New Zealand but also were distrustful of scientists and of the context in which genetically modified products were developed. This distrust was clearly evidenced in the submission from Royal Forest and Bird Protection Society, Nelson/Tasman Branch [IP43], which stated:

Scientists themselves have given us a feeling of uncertainty and unpredictability. They have been influenced by a world view which is manipulative and exploitative. To carry out research they have had to canvas funding from vested interests which gives an emphasis to exploration but not to environmental effects. Their world focuses narrowly on genes, without consideration of organic wholes, such as organisms, ecosystems, societies and communities. Globalisation is pushing genetic engineering biotechnology with quick profit the goal. Government has been helping, with power and kudos as well as profit, the goal.

Submissions from research organisations emphasised that scientists themselves had a responsible attitude to ensuring the safety of genetic modification, genetically modified organisms and products. Several submissions explained that, in addition to satisfying any regulatory requirements, concerns and potential risks had been addressed by agencies voluntarily developing their own policies and best practice procedures and by establishing committees to oversee and monitor such activities.

AgResearch [IP13], one of the organisations involved in primary sector research and development, outlined its internal risk management and best practice policies. The submission referred to the inclusion of an environmental research strategy in its research projects that had environmental outcomes. It also mentioned contributions of its staff to the exploration of the ethical dimensions of biotechnology through a number of forums.

Amongst the private companies involved in the development of genetic modification, the submission from Monsanto New Zealand [IP6] described in detail the environmental and health and safety assessments undertaken by the company, in response to public concerns, during the research and development stages of its products.

Access to scientific information

Several submissions mentioned the importance of information in allaying uncertainties about genetic modification. Sometimes the reference was to information by way of general knowledge or education. Some submissions, however, stressed the importance of information to risk management. Concern was expressed in some submissions over difficulties in accessing scientific information relevant to the risks of genetic modification. A number of submissions from opponents of genetic modification, for example, suggested that the barriers to accessing test results and other research information, particularly information held by private companies, led to uncertainty about the safety of the technology, and also raised ethical doubts about its development. The submission from Golden Bay Organic Employment and Education Trust [IP104] stated:

Since unbiased and independent short and long term testing of GE, GE organisms, and GE products is not available and since the data that has been made available has been provided by the corporations, institutions and scientists who stand to profit monetarily, the level of uncertainty is very great.

Comvita New Zealand [IP74], a private company dealing in bee products, had a particular interest in ascertaining that the use of genetically modified crops would not result in contamination of honey and other bee products. The submission commented on the scarcity of good science information relating to

this question, “at least in the public domain” and referred specifically to research on bees carried out in Canada, the results of which had not been made available because of “the work was confidential”. Other submissions, from both the proponents and the opponents of genetic modification, also referred to the difficulty of gaining access to research information held by private companies. Concern was expressed that the development of genetic modification by private interests would result in research information essential to risk management becoming increasingly less available.

Uncertainty about impacts

The submissions demonstrated that the uncertainty about the impact of genetic modification focused mainly on the likely environmental impacts, on the impacts on human health from the ingestion of genetically modified food and on the commercial and economic impact of the use, or avoidance, of genetic modification. Medical research organisations and the universities expressed concern about the impact that prohibition of genetic modification in New Zealand would have on research and tertiary education and there was some discussion of the social impact of either the use of genetic modification or its avoidance.

Environmental impacts

The submissions indicated uncertainty about the possible environmental impacts of the use of genetic modification. The submissions from the opponents of genetic modification, in particular, were uncertain about the safety of releasing genetically modified organisms into the New Zealand environment. The submissions expressed concern that the impact of genetic modification on non-target systems would threaten ecosystems, weaken biodiversity and increase the possibility of the development of plant diseases and insect pests more resistant to control measures. Several submissions pointed out that much of the research on the impact of genetically modified organisms had been carried out overseas: insufficient research had been done to predict with any accuracy the likely impact on the New Zealand environment, particularly on indigenous flora. Particular concern was expressed in some submissions about the possible impacts of genetic modification on soil and on honey bees.

The submissions from private companies and from organisations involved in the primary production sector emphasised that there was sufficient scientific evidence to prove that no adverse environmental impacts would be caused by the current uses of genetic modification. Nevertheless, they agreed that there was a need to carry out research specifically in relation to the New Zealand environment.

Submissions from the Parliamentary Commissioner for the Environment [IP70], as well as from environmental agencies such as Greenpeace New Zealand [IP82] called for additional research into the potential environmental and ecological effects of genetic modification, as did a number of the Crown research institutes. Submissions from some of the research organisations and particularly from Landcare Research [IP12] referred also to the potential environmental benefits that would result from the use of genetic modification. The submissions suggested that, within the next decade, it would be possible for the technology to be used for the management of pests, diseases and endangered species and for the avoidance of environmental degradation and promotion of sustainability.

Health impacts

The majority of submissions that discussed the use of genetic modification for therapeutic or pharmaceutical purposes considered that the impact, at least for individual patients and their families, would be beneficial. Several submissions, including some that concentrated mainly on the environmental impacts, did not consider this usage of the technology. Only a few submissions suggested that there might be “difficulties” with the use of genetic modification, genetically modified organisms and products in the treatment of disease or genetic conditions. The submission from Nelson GE Free Awareness Group [IP100], for example, stated: “There is much proof that there are many problems in the medical application of Genetic Engineering”, and raised issues about the approval of drugs overseas and the role of pharmaceutical companies in the promotion of genetically modified products. Submissions also expressed concern that focusing on the development of genetic technology could result in the neglect of research into alternative, non-genetic strategies.

Patient representative groups and medical research organisations were, however, more concerned about the impact of the withdrawal of genetically modified treatments if use of the technology were to be prohibited in New Zealand. All the submissions stressed the increasing importance of retaining and extending the use of genetic modification for therapeutic and diagnostic purposes and the potential for new developments in the treatment of diseases that were presently difficult to treat.

Despite the general acceptance of genetic modification for medical purposes, several submissions suggested that genetic modification would have a negative impact on human health through the ingestion of genetically modified food. Submissions from organisations such as Safe Food Campaign [IP86], Green

Party [IP83] and Pacific Institute of Resource Management [IP84] expressed strong doubts about the safety of eating genetically modified food. Other submissions also suggested that the public is more uncertain about the impact of genetic modification in food than it is about the medical use of the technology. The submissions suggested that uncertainties stem either from a concern about the effect that genetically modified food might have on individual health, or because of ethical concerns, or for some other undefined “unease”, particularly with transgenic food.

Commercial and economic impacts

Several submissions indicated that there was uncertainty about the commercial impact of genetic modification, genetically modified organisms and products, particularly on the primary production sector.

Submissions from organisations involved in the research and development of genetic modification for application in the primary production sector and in forestry emphasised the benefits these products would have for primary sector industries through increased productivity and lower production costs. Submissions also suggested that New Zealand could not remain internationally competitive unless the use of genetic modification was permitted.

Some submissions from organisations opposing the use of genetic modification suggested, however, that primary industry would not necessarily benefit from genetic modification. Submissions cited overseas information that suggested that the yield from genetically modified crops would not be as great as was expected. Submissions also pointed to shrinking markets for genetically modified food as a result of international concern and rejection of the technology. Many suggested that, rather than having a positive economic benefit, the use of the technology was likely to result in less than expected returns from conventional farming, together with a missed opportunity for the country to take advantage of the growing demand for organic food.

Several submissions expressed concern at the impact that the use of genetic modification would have on overseas markets for organic and natural products. Submissions from organisations involved in the marketing of natural and organic products were concerned that adoption of genetic modification would lead to a removal of certification from their products. Submissions stressed the importance of taking into account marketing and economic issues as well as safety issues when applications for the use of genetic modification were considered.

The joint submission from New Zealand Vegetable and Potato Growers’ Federation/New Zealand Fruitgrowers’ Federation/New Zealand Berryfruit Growers’ Federation [IP75] also suggested that the possible impact on other

industries should be taken into account when permitting the use of genetic modification in New Zealand. The submission referred to the importance of New Zealand's "clean green" marketing image and suggested that the impact of permitting the use of genetic modification on this image is uncertain. The submission also indicated that, because of an apparent rejection of genetically modified food by consumers, the Federations' members were unlikely to produce genetically modified products in the short-term. The use or avoidance of genetic modification was, however, a matter of individual grower choice. Other submissions from food producers suggested that the use of genetic modification would be avoided in the short term because of the likely impact on product sales.

The joint submission of New Zealand Feed Manufacturers Association/Poultry Industry Association of New Zealand/Egg Producers Federation of New Zealand [IP35] was concerned about the impact that avoidance of genetic modification would have on the industry. The submissions suggested that additional costs would be incurred by the industry if it were required to authenticate the source of its products. The submission suggested it would be difficult and costly, for example, to obtain "authenticated GE free soya meal" for stock feed, if labelling were required or if genetic modification were prohibited. The submission also pointed out that the poultry industry would have no control over decisions on the use of genetic modification taken by the overseas sources of breeding stock, on which the New Zealand industry is dependent.

A few submissions questioned whether there was a need for genetic modification in agriculture. Sustainable Futures Trust [IP51] suggested that, because current food production was sufficient to meet the country's needs, there was no need for the technology to increase food production. BIO-GRO New Zealand [IP58] also questioned the need for genetic modification to increase food production. BIO-GRO suggested that sustainable food production was best met by encouraging the development of organic food production rather than by using genetic modification, genetically modified organisms and products.

Research and education impacts

Submissions from research organisations and the universities were particularly concerned about the impact that avoidance of genetic modification would have on research and on tertiary education in New Zealand. Universities in particular suggested that avoidance of the technology would affect not only New Zealand's research capabilities, but also, because of the international importance of biotechnology in research and learning, teaching at undergraduate and graduate level. Submissions suggested that students, particularly overseas students, would

not attend New Zealand universities if teaching in the area of gene technology were prohibited, and there would also be difficulties in staff retention and recruitment.

The use of genetic technology for research purposes, however, was not a contentious issue in most of the submissions, and submissions from both proponents and opponents of genetic modification tended to accept the use of the technology in the area of teaching and research. There were, however, some uncertainties that might impact negatively on research, particularly research into genetic modification. Several submissions opposed the conduct of field trials of genetically modified plants and animals. Clinical trials of genetically modified medicines were not, however, addressed in the submissions. There was also opposition to the use of transgenic animals for research purposes from SAFE (Save Animals From Exploitation) [IP85] and other submissions concerned about the use of genetic modification.

Social impacts

Submissions suggested there was uncertainty about the social benefits that would result from the use of genetic modification. Doubt was expressed over the effect of using genetic technology in ways unacceptable to the public, or without public knowledge, particularly in respect of genetically modified food. Submissions urged that the social costs, including the cost to the ethical and cultural beliefs of individuals and ethnic groups, should be taken into consideration when assessing the benefits of using the technology.

Several submissions referred to the social as well as the economic cost of ignoring, or of unnecessarily withholding, the benefits of genetic modification from the population. New Zealand National Commission for UNESCO [IP90], for example, pointed out that if the technology resulted in positive benefits, “then these benefits for humanity cannot be foregone.” The submission, however, suggested that there was a need for further research and for open access to information to reduce the level of uncertainty and apprehension.

Concluding observations

The submissions all recognised that there was a high level of uncertainty amongst the general public about the use of genetic modification, genetically modified organisms and products in New Zealand. Most of the submissions accepted that concern about the safety of gene technology was the main cause of uncertainty but disagreed as to whether this concern was justified.

Submissions generally accepted that there were less uncertainty about the use of genetic modification for therapeutic purposes and also accepted the use of genetic modification for research purposes. The two main areas of uncertainty about the use of genetic modification were in relation to environmental impacts and its use in food.

Despite the uncertainty about the use of genetic modification, genetically modified organisms and products in New Zealand that was either expressed or recognised in the submissions, few submissions called for a total and permanent ban on the use of genetic modification. Neither did any of the submissions advocate unrestricted use of the technology. Submissions across the range of organisations called for a cautious approach to the use of the technology but differed significantly in their views of the manner in which caution should be exercised.

Many of the opponents of genetically modified organisms saw caution as requiring a delay in releasing genetically modified organisms into the environment until research in laboratory confinement had created a sufficient body of scientific knowledge to ensure the safe use of the technology. Even in relation to genetically modified food, most submissions did not call for a total and permanent ban. The majority of submissions expressing uncertainty about genetically modified food required increased assurance as to its safety and the implementation of labelling of all food products which were genetically modified, or which contained genetically modified products or which were the result of a production process involving gene technology.

Proponents of genetic modification agreed to the need for a cautious approach. These submissions, however, suggested that caution should be exercised on a case-by-case basis, in relation to a specific use of the technology. This approach required a robust regulatory system and effective regulatory authorities to ensure that appropriate risk assessment and risk management measures, based on scientific principles, were applied before the use was approved. Although a number of submissions agreed that there was a need for research into specific impacts of genetic modification, particularly environmental impacts, they did not agree that field trials posed any risk to the environment. Submissions from organisations whose activities related to the production and marketing of genetically modified food did not agree that there was any risk to human health, but recognised that consumer resistance might affect the use of genetic modification in the food chain.

From the responses to Warrant item (c), it appears that:

- There is general agreement that genetic modification for research purposes should be permitted in New Zealand, but there is disagreement that

laboratory research should include field trials of genetically modified plants or animals.

- There is general agreement about need for further research into the impacts of genetically modified organisms on the New Zealand environment, but there is disagreement as to whether this research should be undertaken in relation to specific proposed uses or whether it should be undertaken only at laboratory level.
- There is uncertainty as to whether consumption of genetically modified food poses a sufficient risk to human health to warrant a total ban on all genetically modified food or food ingredients, or whether it is sufficient to permit people a choice by requiring the labelling of food that has been genetically modified or has been produced using genetic modification.
- There is disagreement over the acceptable standard of risk.
- There is disagreement over the effectiveness of the current regulatory authorities in ensuring the safe use of genetically modified organisms.