



appendix 2

Outcomes of Consultation: Submissions from Interested Persons

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3.8 Risks and benefits

Introduction

Warrant item (c) required the Commission to consider:

- 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

Submitter profile

Of the 48 submissions that made substantial comment on this Warrant item, 12 were from industry networks or associations, 10 from research organisations and six from other advocacy networks or associations. Four private companies, four consumer networks and associations and three Maori organisations made substantial comment on the Warrant item. Two religious and spiritual organisations made comment, two government bodies and two occupational or professional associations. One submission came from an organics organisation and two from uncategorised organisations.

The majority of the submissions that made significant comment on this Warrant item were either ‘strongly for’ or ‘tended to be for’ genetic modification (31). Less than half the submissions came from organisations that had indicated that they were against genetic modification. Three of the submitting organisations were neutral in their stance.

Content of the submissions

The submissions considered whether benefits, in terms of positive outcomes, would result from the use or avoidance of genetic modification. Most of the submissions sought to respond by identifying the specific benefits or risks that accompanied the use or avoidance of the technology and to comment on advantages and disadvantages that would result.

Although submitters used the term “risk” to identify and discuss hazards that might result from the use of genetic modification, many also used “risk” to mean the cost to resources, values or opportunities that would be imposed by the use or

avoidance of genetic modification. To reflect these different uses of the word, this section uses the word “risk” when describing submitters’ views on the possible adverse *events* and the word “cost” when describing the possible adverse *effects* or impacts of the use or avoidance of genetic modification technology.

Key themes

The central theme that emerged from the submissions was the relationship between the submitters’ perceptions of the risk of genetic modification and of benefit. Submissions from both the proponents of the technology and its opponents, as well as from those organisations that took a more neutral stance towards the use of the technology, recognised that benefits would result only if the risks of its use did not outweigh any possible benefits. Many of the submissions, therefore, included extensive discussion on:

- the risks and safety of the technology
- the benefits and costs of its use
- the advantages or disadvantages that would result from its use or avoidance.

Risks and safety

The submissions could be divided into two main categories: those that were from “proponents” of genetic modification, in that they emphasised the benefits that would flow from its use; and those that were from “opponents” of technology, who tended to stress the risks of the technology. None of the submissions from proponents of genetic modification, however, advocated the unrestricted use of genetic modification. Many of the submissions referred to conditions under which the technology could be used safely, such as ensuring that a robust risk assessment process was carried out under the supervision of appropriate regulatory agencies before any release of genetically modified organisms. Several submissions also emphasised the need for community acceptance of the proposed use of the technology and for a range of non-scientific factors to be taken into account as part of the risk assessment process.

Similarly, not all the submissions from opponents excluded the possibility of the future release of genetically modified organisms and products or suggested that there could never be any benefit in use of such technology. The majority of the submissions from opponents of genetic modification emphasised the inherent unpredictability of the technology and the risk that its use could cause irreversible and widespread harm. Some submissions also expressed concern about the difficulties of controlling and monitoring the technology once it had been released

and, in particular, the risks of accidental escapes and cross-contamination (of non-genetically modified systems by genetically modified ones). Nevertheless, many of these submissions also accepted that there was already some benefit being realised from the use of genetic modification in research and for medical purposes, where the technology was used in laboratory containment. Some submissions also contemplated the future use of genetic modification outside of laboratory containment, but not until extensive research had been undertaken and sufficient knowledge of the technology developed to permit a proper assessment of the risks. Until then, the risks of using the technology outside laboratory containment outweighed the benefits.

Risks of the use of genetic technology

Both the proponents of genetic modification and its opponents identified several possible risks associated with its use. Environmental risks from horizontal gene transfer to non-target plant and animal species and from the contamination of non-genetically modified plants by pollen from modified varieties were discussed in many of the submissions. Such risk was the focus of the majority of the concerns. Several submissions expressed concern about the risk that horizontal gene transfer posed to soil; some commented on the risk that pollen from genetically modified plants posed to bees.

Several submissions, such as that from Safe Food Campaign [IP86], emphasised concerns about the risks of genetically modified food, particularly of the development of unexpected allergenicity properties in genetically modified food sources and increased resistance to antibiotics through the use of antibiotic resistance as marker genes.

Whereas some submissions suggested that genetic technology was risky because of the unpredictability of the technology, others suggested that it was risky because of the difficulties of ensuring that genetically modified agricultural products did not contaminate unmodified products (either through cross-contamination by pollen or because of human mistakes in handling genetically modified commodities). The submissions from Commonsense Organics [IP66] and Greenpeace New Zealand [IP82] cited various overseas events that had resulted in unauthorised releases of products (eg, Starlink corn); they also quoted evidence to show that there had been instances both of cross-contamination by pollination and of product contamination.

Safety of the technology

Most of the submissions that supported the use of genetic modification acknowledged possible risk but emphasised that there was evidence that the use of

the technology was safe. Organisations involved in the research and development of genetically modified plants claimed that, during the 20 years over which the technology had been used, there had been no evidence of any adverse incidents. Other organisations, such as those involved in the production and distribution of food, pointed to the work of the relevant regulatory bodies in ensuring the safe use of genetic modification. Medical research organisations, and groups representing patients, particularly emphasised that no risks had been identified from the use of gene therapies.

Although many submissions expressed confidence in the safety of genetic modification, most were cautious in their approach to issues of risk management. Submissions pointed out that no technology was risk free and that science could not, therefore, give an unconditional guarantee of safety. Submissions, particularly from the Crown Research Institutes, referred to the need for “responsible” use of genetic modification and for a robust risk assessment process to be carried out within a credible regulatory framework.

The submissions from the opponents of genetic modification, however, expressed doubts whether the technology could be used safely, either because of concern about the inherent risks of the technology or because of doubts that the adverse impacts of genetically modified organisms released into the environment could be managed.

Green Party of Aotearoa/New Zealand [IP83] placed particular stress on the inherent unpredictability of genetic technology and provided witness evidence to demonstrate the possibility of unexpected effects resulting from the use of genetically modified organisms. The submission referred to the identification of “risk pathways” that suggested modified organisms could behave, under certain conditions, in ways that had not been predicted during the risk assessment process.

There were two main convergences in concerns about the safety of the technology: environmental risks and risks posed by genetically modified food. Submissions from organisations such as Safe Food Campaign [IP86] and GE Free New Zealand (RAGE) in Food and Environment [IP63] emphasised the inadequacy of the tests carried out by the Australia and New Zealand Food Authority to ensure the safety of genetically modified food. Several submissions called for the banning of genetically modified food because of safety concerns; others, such as that of Green Party [IP83], suggested there was a need for robust and appropriate pre-market safety testing to ensure the safety of genetically modified foods before they were made available to consumers. Submissions also stressed the need for enforcement of labelling requirements so consumers could avoid the risks of genetically modified food.

Many of the submissions from the opponents of genetic modification pointed out that, even where there was no evidence of harm having resulted, there was also no evidence that the technology could be used safely in the future. Several also pointed out that, in relation to food, the long-term effects on human health of ingesting genetically modified food were unknown.

Assessing the risk

Several submissions from organisations involved in the research and development of genetically modified food pointed out that benefits from its use could not be realised until an assessment of the risks and benefits established that the risks would not outweigh the benefits. The proponents of genetic modification, however, emphasised that this risk-benefit analysis could be carried out only in relation to specific uses of genetic modification and could not be done in relation to the technology as a whole.

There was general agreement among the supporters of genetic modification that risk assessment should be based on scientific principles. Several submissions, such as that from New Zealand Dairy Board [IP67], suggested that non-scientific factors should not be allowed to impinge upon or distort the objective process of risk assessment. Submissions from other proponents of genetic modification, however, considered that a decision on the use of genetic modification could not be based solely on an objective scientific approach to risk because a scientific assessment could not take into account the cultural, social, political and economic factors that influenced perceptions of risk. Although science might be able to identify and determine the benefits of the use of the technology in relation to the size and probability of risk, it could not determine whether the level of risk associated with the use would be acceptable to the community. Any use of genetic modification without community acceptance would be unethical and, possibly, unwise. New Zealand Life Sciences Network [IP24] said:

the assessment of risk is only partially scientific and factual. Many risks are unable to be characterised in an objective sense and must be determined and weighed using subjective criteria ... the balance to be achieved between acceptable and unacceptable risk can be informed by science but not determined.

Submissions advocating a risk assessment process based, at least partially, on scientific principles were confident that the behaviour of the technology could be predicted and that the current knowledge and understanding of the technology was sufficient to identify the risks and to assess the probability of harm occurring. Submissions from the opponents of genetic modification, however, emphasised that the technology was unpredictable; therefore, the risks and potential harm

were also unpredictable and could neither be assessed nor be managed. Several of the submissions stated that the risks of genetic modification were “unknown and unknowable” and any assessment of risk would, therefore, be based on conjecture. Some submissions, such as that from Bio Dynamic Farming and Gardening Association in New Zealand [IP61], called for the assessment of the risks of genetic modification to be empirical and based principally on observation of behaviour. Other submissions, such as that from Sustainable Futures Trust [IP51], pointed out that:

The risks of GM, being a scientific endeavour, are assessed by those schooled in the scientific method of objective rationality. When both the risks and their consequences are uncertain and potentially catastrophic, the processes of assessment need to be open and inclusive of all the stakeholders, where subjectivity, values, morals and consensus enter into the discourse. This is the emerging realm of post normal science (Ravetz 1999)¹

Other submissions, particularly those from Maori organisations, called for an inclusive risk management assessment that would take into account the range of factors that influence perspectives on the use of genetic modification. An inclusive assessment process would ensure that genetic modification, genetically modified organisms and products were not released into the community until after an accepted level of risk had been determined.

Benefits and costs

Benefits of use

Except in relation to the use of genetic modification for research and for medical purposes, only the submissions from proponents of genetic modification were confident that benefits would result from the use of the technology.

Particular emphasis was placed on the range of commercial benefits that were expected to result from the use of genetic modification. Submissions identified benefits to agriculture, horticulture and forestry through improved production methods, increased productivity, lower production costs and new or improved products. Because of the level of concern expressed about genetically modified food, some submissions, particularly those from organisations involved in food production and distribution, emphasised the benefits in taste, quality and safety that consumers of genetically modified food were expected to experience.

¹ Ravetz J (ed). 1999. Post-normal science. *Futures* (special issue), 31 (7): 641–757.

Several of the submissions from organisations that otherwise supported the use of genetic technology doubted that benefit would result from its use in relation to food. Submissions from New Zealand Vegetable and Potato Growers' Federation/New Zealand Fruitgrowers' Federation/New Zealand Berryfruit Growers' Federation [IP75], Meat New Zealand [IP31] and New Zealand Game Industry Board [IP33] all suggested that their members were unlikely to use genetic modification until there was clear indication that its use was acceptable to consumers.

Some submissions also suggested that new commercial opportunities would arise from the use of genetic modification, both in the area of primary production and for medical and health purposes. Genesis Research and Development [IP11] referred to various new opportunities that had resulted from its involvement in gene technology. Dairy Board [IP67], in addition to identifying benefits in relation to existing dairy products, noted that new opportunities would arise from “the production of new products, particularly those with functional foods, nutraceutical and pharmaceutical applications.”

Much of the discussion in the submissions focused on the possible future benefits of genetic modification and indicated that there was a need for further research before the uses would be developed. Submissions from research and development agencies often discussed research currently under way into specific uses; and some submissions, particularly those from companies involved in the research and development of genetically modified crops, suggested that the introduction of genetically modified crops would result in an immediate benefit in New Zealand. Other submissions were more speculative in their discussion of both the uses and the benefits of genetic modification. Several submissions from medical research agencies referred to the increase in medical applications of the technology after completion of the Human Genome Project.

The discussion in most submissions, however, suggested that, although several New Zealand organisations were involved in research, it was unlikely that the research would result in the release of genetic modification, genetically modified organisms and products for commercial purposes in the near future.

Many of the submissions that discussed the commercial benefits that were expected to result from the use of genetic modification also suggested there would be flow-on benefits to the national economy. Several of the submissions suggesting that the future profitability of the primary sector depended on the use of genetic modification particularly emphasised the importance of that sector to the New Zealand economy. Other submissions suggested that economic benefits would

result from the development of new businesses and creation of new commercial opportunities through the use of the technology.

Some submissions suggested that the use of genetic modification would result in environmental benefits, both direct and indirect. Genetic modification in agriculture and horticulture would result in the use of processes and products less damaging to the environment and to natural resources than those currently used. Conservation genetics and other environmental management tools would extend the knowledge of New Zealand's native species, decrease the threat from imported pests and ensure the protection of the natural biodiversity.

Submissions from health service providers and medical research organisations discussed the benefits to patients arising from the use of genetic modification for diagnostic and therapeutic purposes.

Several of the submissions emphasised the benefits that were expected to result simply from continued research into genetic modification. Submissions from organisations involved in primary production and in medical research suggested that, even if it were decided to prohibit the use of genetic modification, genetically modified organisms and products in the wider environment, continuation of research in laboratory containment could result in benefit. Continued laboratory research would not only ensure that New Zealand's knowledge of gene technology remained current but would also allow the development of valuable intellectual property. Other research organisations, however, emphasised the importance of field trials to the research process. To the opponents of genetic modification, any use of gene technology outside laboratory containment, including field trials for research purposes, would incur a high level of environmental risk and should not be permitted.

Some of the submissions from opponents of genetic modification also accepted that benefits could result from the use of genetic modification. The submission from Green Party [IP83], for example, identified gene technology as contributing to understanding inheritance and diagnostic techniques:

Gene technology, including in some cases the creation of GMOs in the laboratory has contributed worthwhile knowledge about the genetic basis of some diseases, heritability, and provided diagnostic techniques useful in treating disease in humans, plants and animals. These techniques can also be used to speed up conventional breeding by determining whether natural progeny have the desired traits or not.

The use of gene therapy for these purposes was approved, and also for the development of medicines such as insulin, but only if the technology was used in laboratory confinement where the risks of its use could be contained.

Costs of use

As well as being concerned about the risks of using genetic modification, submissions suggested costs that would result from its use.

The introduction of genetically modified crops was of particular concern. Many submissions suggested that the introduction of genetically modified crops would result in costs to the organics industry if cross-pollination of organic crops by genetically modified crops led to the loss of organic certification. The submissions suggested that the risk of organically grown crops being contaminated by genetically modified crops was high and would lead to loss of the required organic certification. Several submissions pointed out that additional financial costs would be imposed on organic growers if they were required to set aside part of their land to create a buffer zone to protect against possible contamination of organic crops through cross-pollination.

The submissions pointed out that, because of concerns about the safety of genetically modified food, overseas consumers were increasingly rejecting genetically modified food in preference for food that was not genetically modified. The rejection of genetically modified food, the submissions suggested, had resulted in a significant increase in the demand for organic products and increased sales overseas of New Zealand-grown organic produce. Contamination would not only adversely affect the ability of the organics industry to take advantage of this increased demand, but also had the potential to restrict overseas demand for conventionally grown New Zealand products. Concern about possible consumer rejection of genetically modified food was also expressed in submissions from organisations currently involved in conventional food production, which suggested that their members might choose not to use genetic modification for food production.

The submission from ZESPRI International [IP46] considered the impact that use of genetic modification could have on products that did not necessarily use organic production techniques. The submission stressed the importance of the export market to countries where there was growing consumer resistance to genetic modification. It suggested that use of genetic modification could lead to the creation of non-tariff barriers to market access. The submission said:

A decision to allow commercial GM food production in New Zealand could be used as a pretext to refuse New Zealand non-GM food products. Retailers could judge the publicity as undesirable for sales. Our marketing evidence is that the GM status for New Zealand commercial food production calls into question the GM status of all New Zealand food produced.

The potential for significant commercial costs to be imposed on the bee products export industry if products were found to be contaminated by pollen from genetically modified crops was a specific concern raised in two submissions from organisations commercially involved in the industry.

Many submissions from both the opponents and the proponents of genetic modification suggested that New Zealand's "clean and green" image was a useful marketing tool that would be compromised by the introduction of genetically modified crops. The joint submission from Vegetable and Potato Growers' Federation/Fruitgrowers' Federation/Berryfruit Growers' Federation [IP75], which accepted that there were likely benefits to the horticultural industry from the development of genetically modified crops, commented that:

The potential impact associated with the first releases of commercial GM crops on New Zealand's "clean, green image" will need to be considered as part of the regulatory processes assessment of economic risks and benefits. We are not implying that GM is 'unclean and non-green', but "clean and green" is a real marketing tool and may be affected by the production of GM crops in New Zealand.

Whereas several of the submissions from proponents of genetic modification suggested that there would be benefits to the agricultural sector from the use of genetic modification, submissions from the technology's opponents suggested that the introduction of genetically modified crops would result in financial costs. The submissions pointed to evidence from overseas that the yields from genetically modified crops had not been as high as was suggested and that the need to recover the high development costs had resulted in a premium being added to the price of the seed. Some submissions also suggested that the use of genetic modification would result in a loss of agricultural diversity and, because of restriction on the saving of seed from the previous year's crops, in a growth of dependence on a few major companies.

The submissions from Maori organisations were particularly concerned about the cost to cultural and spiritual beliefs that would be imposed if genetic modification were permitted in New Zealand.

Benefits of avoidance

Many submissions suggested that, because of the increasing overseas demand for organic produce, there would be significant economic benefits not only in protecting organic crops from possible contamination, but also in actively promoting the growth of the industry by prohibiting the release of genetically modified organisms. Extension of the industry, submissions suggested, would help differentiate New Zealand products, making them more than commodity products.

Rather than preventing the development of new industries, submissions suggested, the avoidance of genetic modification could encourage the establishment of a range of new industries that capitalised on New Zealand's genetic modification-free status.

Costs of avoidance

In most of the submissions from proponents of genetic modification, the anticipated costs of avoiding the technology were opposite to the expected benefits. Without genetic modification, it was expected that there would be costs to industry sectors, particularly the primary production sector, through loss of international competitiveness, financial costs to sector industries through being unable to access technology and products that would increase productivity and decrease production costs. There would be environmental costs, particularly in the area of pest control and resource management.

Although many of the costs identified were “passive” costs (ie, the cost would be incurred because the benefit was not realised), some submissions suggested that avoidance of genetic modification would be to the detriment of the status quo in certain areas. Several of the submissions, for example, stressed that avoidance of genetic modification not only would prevent future benefits to human health but also could mean that patients currently dependent on genetically modified medicines would have difficulty in accessing alternatives. Few submissions, however, suggested that avoidance of genetic modification should be extended to prohibit the use of genetically modified diagnostic techniques or medicines.

The universities in particular were concerned that avoidance of genetic modification would result in difficulties in recruiting and retaining suitably qualified staff. This, in turn, would result in costs both to current research programmes and to graduate and undergraduate teaching.

In the area of pure research, concern was expressed that avoidance of genetic modification would result in the curtailing of current research projects and could prevent the continued use of transgenic animals for research purposes. Although SAFE (Save Animals From Exploitation) [IP85] expressed strong concerns that the use of animals for research purposes was likely to increase as a result of genetic modification, few other submissions expressed opposition to the continued use of genetic modification for research and teaching purposes.

Some of the submissions considered the social costs that might be experienced if genetic modification were avoided in New Zealand. The submissions from several of the tertiary institutions mentioned that, without access to the technology, New Zealand would not be able to develop a “knowledge economy”. Other

submissions expressed concerns that, if New Zealand limited its involvement with genetic modification, the potential for future benefits would be curtailed, to the detriment of the population as a whole. University of Canterbury [IP7], when emphasising the importance of retaining research and teaching staff, stated that:

Uneducated societies are more at risk of being exploited on issues of biotechnology than educated societies. Likewise they are more likely to miss out on some of the acceptable benefits of adopting biotechnology.

Advantaged and disadvantaged groups

The submissions responded in several different ways to the requirement under Warrant item (c) that consideration of the risks and benefits of genetic modification should include consideration of the groups of persons likely to be advantaged by the benefits and disadvantaged by the risks of genetic modification.

Submissions from organisations involved in research and development of genetic modification, genetically modified organisms and products tended to specify the users of the products and other commercial interests, including those with a financial interest in the promotion of genetic modification, as the groups that would be advantaged or disadvantaged.

Submissions that emphasised the risks of genetic modification, and therefore stressed the disadvantages of its use, often illustrated the potentially widespread nature of the harm that the technology could cause. Thus, they suggested that the advantage of avoidance or disadvantage of use would be incurred by “society” or by “the New Zealand public”.

Groups were identified more specifically when the advantage or disadvantage would be incurred because the use of the technology would either benefit or threaten special characteristics or needs of the group members. The submission from Comvita NZ Ltd [IP74], for example, identified people involved in the honey and bee products industry as being likely to be disadvantaged from its use. Patient representative groups, such as Lysosomal Diseases New Zealand [IP99], stressed the importance of genetic modification to their members.

Several submissions emphasised the disadvantage that would be experienced by Maori if their traditional lore and cultural and spiritual beliefs were breached by the use of genetic modification technologies.

The submissions tended to reinforce a view of the predominance of either risk or benefit of genetic modification. They expressed this either by referring to broad groups of people as advantaged or disadvantaged, or by identifying the groups whose specific needs would be met or denied by use of the technology.

Concluding observations

The submissions on the benefits and risks of genetic modification divided into two main categories: those that saw the use of the technology as predominantly beneficial and those that considered the risks of its use usually outweighed any benefit.

Submitters' perceptions of the predominant risk or safety of the technology shaped their views on the likely benefits or costs of its use. Because benefits could arise only from the use of the technology, the proponents of genetic modification emphasised the risk assessment and risk management processes that were undertaken to ensure that the technology was used safely. Opponents of genetic modification emphasised that it could not be used safely because current scientific understanding of the effects of the technology was too limited to be able to predict and assess possible risks.

Opponents of genetic modification agreed that there were benefits arising from the laboratory use of genetic modification for research and medical purposes, where any adverse outcomes could be contained. Opponents particularly emphasised the potential damage to the environment that could result from unintended and unforeseen effects of genetic modification.

Proponents of genetic modification acknowledged there were risks associated with the use of the technology but were confident that there was sufficient knowledge to identify and assess the risks. None of the submissions from the proponents of the technology suggested that genetic modification should be used without regulatory controls to ensure its safe use.

The view expressed in the submissions diverged sharply over the likely benefits of genetically modified food. Some submissions recognised that consumer rejection of genetically modified food would limit its benefits but suggested that, in general, genetic modification used in relation to food and food crops was beneficial. Other submissions expressed strong doubts about the safety of genetic modification in food and either called for a complete ban on its use or suggested that it should be subjected to a rigorous safety procedure.

The submissions identified a range of groups that would be advantaged or disadvantaged by the use of the technology. Except where the technology would benefit or adversely impact on the special characteristics or needs of a specific group, the submissions tended to describe the affected groups in general terms.