

Chair
CABINET POLICY COMMITTEE

GOVERNMENT RESPONSE TO THE ROYAL COMMISSION ON GENETIC MODIFICATION: ECONOMIC ANALYSIS RESULTS AND HSNO ACT IMPLICATIONS

Purpose

1. This paper reports back on the economic aspects of the Government's response to the Royal Commission on Genetic Modification (GM). In particular, the purpose of the paper is to:

- outline the results of economic modelling undertaken on the risks and opportunities arising from the use of GM and non-GM technology; and
- provide advice on whether the Hazardous Substances and New Organisms (HSNO) Act 1996 appropriately provides for potential economic effects to be considered in an application dealing with genetically modified (GM) organisms.

Executive Summary

2. This paper identifies for Ministers the key issues raised by the economic analysis, including:

- New Zealand does have a “clean-green” environmental image in our key export markets, and a majority of consumers surveyed in these countries indicate that this has an impact on the prices they are prepared to pay for New Zealand goods. Maintenance of this “clean-green” image is important so as to minimise the impact the release of a GM organism may have on the prices received for New Zealand exports in these markets;
- The impact of releasing a GM organism in New Zealand or not using GM organisms in production can result in both negative or positive overall economic outcomes, depending on the assumptions made;
- price impacts are one of the key determinants of the size of the movement in Gross Domestic Product (GDP). Price impacts are the size of any decrease in

price of New Zealand non-GM exports as a result of a GM organism release. Officials advise that the likely price impacts are likely to be lower than those used in the modelling and therefore the results for GM organism release scenarios are more likely to be a positive rather than a negative movement in GDP;

- the size of productivity gains from GM releases are the other key determinant of the size of the movement in GDP. Government policy interventions can have a significant impact on maximising the gains from the use of GM organisms in terms of promoting biotechnology research;
- the Government's current GM regulatory framework should minimise the negative price impacts through a robust regulatory regime (including the proposed conditional release category), a case-by-case approach to applications, and encouraging successful co-existence. The Environmental Risk Management Authority (ERMA) is currently required to consider the economic impacts of an application, including likely spillover effects and price impacts;
- the productivity gains to be derived from the use of GM organisms are also a key determinant of the overall economic impact. Promoting biotechnology through the Growth and Innovation Framework will help develop domestic research into possible innovations. The results indicate that the bigger gains from GM organisms come from domestic development of technology rather than imported technology;
- the potential negative price impacts were lowest where the proposed GM organism release was for medical purposes. The potential negative price impact increased as the proposed release got closer to the human food chain;
- the best producer returns are generated where there is successful co-existence between GM and non-GM production methods;
- a conservative estimate of the cumulative impact on GDP of several GM releases is a gain of at least 1% in GDP, but this may well be higher; and
- given that officials consider that international price premiums for non-GM goods are likely to reduce over time, the GM-free scenarios are more likely to be negative for GDP.

3. Officials consider that the current HSNO Act provisions and associated Methodology already provide for appropriate consideration of the economic impacts, both direct and indirect, of an application for the release of a new GM organism. Public consultation and the ability of submitters other than the applicant to make a case on the economic consequences are also appropriately provided for in the HSNO Act.

Background Information

4. As part of its November 2001 response to the report of the Royal Commission on Genetic Modification, the Cabinet directed officials to report back on:

- an economic analysis of the risks and opportunities that may arise from GM and non-GM technologies [CAB Min (01) 33/22 refers]; and

- the best ways to make more specific reference to the economic impacts of a GM crop release on the proposed strategy of “preserving opportunities” [POL Min (01) 30/4 refers].

5. This paper responds to these Cabinet directions. The economic analysis was carried out through a cross-departmental research project, using a range of external contractors, and had two component parts. The first part of the research was a survey of international consumers of New Zealand products to determine the possible impacts of a hypothetical generalised release of a GM organism on New Zealand’s “clean-green” image. The second part of the research was economic modelling of three scenarios involving GM organism releases and one scenario forgoing GM organism releases. The results of the survey fed into the modelling, along with other assumptions about likely productivity impacts of the use of GM organisms.

6. This paper is due to be considered along with two other papers on mechanisms to encourage co-existence in primary production between GM and non-GM organisms. There is a strong linkage between the economic analysis and the proposed co-existence regime. Consideration of co-existence mechanisms will be a key part of ERMA’s assessment of economic costs and benefits of a release application. Similarly, the promotion of successful co-existence is shown to maximise the potential economic gains to New Zealand. Co-existence does not mean that there will necessarily be widespread release of GM organisms, but it does mean that each application to release a GM organism will be treated on a case-by-case basis to preserve opportunities.

Economic Impact of a GM Organism Release

7. As the use of GM organisms becomes more widespread, and more information becomes available about the impacts of this technology, it is becoming clear that the economic consequences need to be carefully considered. These consequences are likely to be both direct, in terms of possible gains to the users of this technology, and indirect to other industries and the national economy as a whole. Indirect impacts may be positive in terms of increased profitability flowing through to increased economic growth, or they may be negative. Any negative price impact may affect all varieties of a product where GM organisms are used, regardless of whether or not the individual product is GM. It is claimed that this negative price impact may extend to other parts of the economy, although this has not been supported by international evidence to date from countries that currently grow GM organisms.

International Context

Adoption of GM Crops

8. A significant driver of the magnitude and direction of economic impacts is the global trends in the use of GM organisms in crop production. The biggest uptake is in agriculture. The latest available estimates are that there were 58.7 million hectares of GM crops grown worldwide in 2002, a 12% increase in the amount grown in 2001¹. The same data also indicates that there has been a sustained growth rate of 10% per year in the area of GM crops since 1996. The main growers of GM crops are the United States (US), Argentina, Canada and China, in descending order. The main GM

¹ International Service for the Acquisition of Agri-biotech Applications (2002), “Global Status of Commercialised Transgenic Crops: 2002”.

crops grown are soybeans, corn, cotton and canola, in descending order of magnitude. Sixteen countries are now growing GM crops. These include three of the top five New Zealand export markets, as well as countries with whom our exporters compete in the international market place, such as Australia.

9. While the main GM crops listed above are not economically significant to New Zealand, these figures are indicative of a trend towards increasing use of GM crops in major primary producing countries, where it is available and farmers consider it economically and/or socially beneficial for them to adopt it. Growth in GM cotton, which is seen as a non-food crop, has been particularly significant.

10. Studies indicate mixed public reaction to GM crops, which translates into mixed economic impacts. International public opinion shows more acceptance of medical use of GM and non-food products like GM cotton, than of foods derived from genetic modification. Negative public reaction has affected the global uptake of GM crops, including the commercialisation of new GM food products. However, this public reaction, and consequent economic impacts, also varies across countries, with US consumers generally showing less adverse reaction to any sort of GM organism use than European consumers.

11. Overseas studies have indicated mixed economic results at the individual farm level from the adoption of GM crops, depending on the crop in question and whether or not its modification is beneficial for that particular location. The benefits result from increased productivity and decreased pesticide/insecticide costs, and are after taking into account increased technology fees from using GM seeds. There are also disease-resistance economic benefits to the adoption of some GM crops. For example, the adoption of GM papaya stopped the spread of a virus that was endangering the future of the Hawaiian papaya industry. Recent Australian studies have found a small but significant benefit to Australian farmers from adopting GM crops, and a risk of a drop in economic performance if Australian forgoes GM crops when the rest of the world adopts them².

12. Very few studies have considered the macro-economic costs and benefits, but those that have been carried out suggest that the impact varies with the type of crop planted. For example, food crops such as corn have not led to overall gains to the industry, but crops such as cotton have been more successful. The extent that these expected impacts translate into changes in GDP depends on the significance of the sector adopting the technology to the economy as a whole. The impacts on the New Zealand economy of using GM organisms are examined in the analysis presented below.

GM-based Pharmaceutical Industry

13. The use of GM organisms in the development of pharmaceuticals and other therapeutic goods is growing worldwide. Significant economic gains are derived from these technologies, and there appears to be comparatively less negative public reaction affecting uptake of these technologies. US companies were predicted to

² Australian Productivity Commission staff research paper, "Modelling Possible Impacts of GM Crops on Australian Trade", 2002; ABARE Research Report 10, "Genetically Modified Grains: Market Implications for Australian Grain Growers", 2001.

invest up to US\$70 billion in medical research during 2002, more than half of which was in the biopharmaceutical industry³.

Other GM-based Products

14. GM organisms are also, amongst other things, being developed to produce enzymes, for use on bio-remediation and the production of new materials.

Forgoing GM Organism Releases

15. Another important factor in predicting the potential economic impacts is whether or not trading partners and competitor countries make a decision to forgo the release of selected GM organisms in the expectation of attaining a marketing advantage. The EU currently has a moratorium on new approvals of GM organisms, although GM organisms approved before 1998 can be imported or grown in the EU. Brazil is seen as a country that has gained market advantage from banning GM organism production. However, it is currently having to address widespread illegal planting by individual producers of seeds smuggled through the border from Argentina. Tasmania has declared a limited moratorium on certain new GM food crops and other Australian states are understood to be considering similar action. However, these Australian moratoria are unlikely to affect existing GM crops, for example cotton and carnations.

16. The value of various “GM-free” branding strategies will be critical to the overall economic impact of the use of GM organisms. It is unclear whether the consumer will differentiate between national, regional and individual product “GM-free” branding. This is affected by the fact that GM labelling regimes are based on characteristics of the individual product, rather than country of origin. For example, a non-GM apple will be labelled as such, regardless of whether other GM crops are grown in the same country. The more producers internationally that pursue a “GM-free” marketing strategy, the harder it will be for New Zealand producers to generate high profits from “GM-free” branding. Markets may become saturated, reducing prices, and New Zealand will have to differentiate its brand from other “GM-free” producers, for example by highlighting other potential environmental benefits.

17. No detailed analysis has been carried out on the farm-level economic impacts of “GM-free” branding. Some evidence can be found in the price premiums generated by organic produce, which are estimated at between 20-50% depending on the market and type of crop. Since certified organic produce has a higher threshold than simply “non-GM” produce, it is expected that any non-GM price premium would be lower than organic. The fact that there is a growing number of “GM-free” producers around the world indicates that these producers believe there are significant benefits in that branding. The important question is whether New Zealand allowing the release of GM organisms would decrease the economic value of the “GM-free” and “clean-green” image brand. This is one of the elements considered by the economic modelling outlined below.

18. Assessing the potential macro-economic impacts of remaining “GM-free” has not been undertaken previously, mainly because it is difficult to determine whether any significant exporting nations can be universally branded “GM-free”. Those countries, other than New Zealand, that do have moratoria on new GM plantings often still have

3 “Exceptional Economic Returns on Investments in Medical Research”, Leon Rosenberg, 2002.

some existing GM organisms. As noted above, there are also significant practical difficulties with a country retaining identified “GM-free” status.

Co-existence Between GM and non-GM in Agriculture

19. All the major producers of GM crops also have significant non-GM crop exports, including organic products and other products specified as being GM-free. There has been no evidence to date from these countries of actual, economy-wide negative price impacts from the release of GM organisms. Any negative impact on price or sales volumes from a GM organism release has, in practice, been restricted to the type of crop where the GM organism was released. Canada, the US, and Australia have successful co-existence, particularly where the GM crops and non-GM crops are of different types. Switzerland maintains a “clean-green” environmental image while allowing carefully regulated use of GM organisms. Argentina continues to have significant GM and organic crop export sales, including to the EU, and has recently gained some market share from the US in the animal feed market. This demonstrates that successful marketing of co-existing products is possible.

20. This evidence on the relative economic impacts of adopting and forgoing GM organisms, and on fostering co-existence between both, was what led the Royal Commission to recommend that the most beneficial course of action for New Zealand was to foster co-existence and preserve opportunities for all forms of agriculture. The results of the economic modelling presented below reinforce this conclusion.

New Zealand Context

21. Care needs to be taken in generalising the international results to the New Zealand context. The GM commodity crops that have been the subject of economic analysis internationally are not those that are economically significant to New Zealand, so the results can only be used as a guide to the sort of impact that may occur. Similarly, since New Zealand has not approved any releases of GM organisms, it is not possible to study actual impacts of the use of GM organisms on the prices or sales volumes of non-GM exports.

22. However, what can be derived from overseas evidence is that there are two key factors that will determine the magnitude and direction of the economic impact of the commercial use of GM and non-GM organisms. These factors are:

- the size of any increases in producer returns, through increased productivity and/or reduced cost, that are generated from the use of GM organisms;
- the size of any impact on the sales price or volume of New Zealand’s non-GM exports that may arise from the release of GM organisms, or alternatively from forgoing GM releases.

23. Both of these impacts are examined in the economic analysis results presented below.

Results of Economic Analysis

24. This section of the paper outlines the results of the economic analysis work that has been undertaken to estimate the economic impacts for New Zealand of either forgoing or releasing GM organisms.

Summary of Economic Analysis Methodology

25. A survey of consumers and buyers in three of New Zealand's main export markets (Australia, the United Kingdom and the US) was used to determine the extent of any price impacts from the release or non-release of GM organisms. These price impacts were then fed into the economic modelling to determine how they affected overall economic impacts.

26. The economic modelling considers the overall impact on New Zealand's GDP of four scenarios. These scenarios reflect three potential uses of GM organisms, as well as a scenario of New Zealand rejecting the commercial release of GM organisms. The scenarios modelled, none of which is considered a GM-food crop, were:

- New Zealand allows the release of GM rye-grass, leading to an increase in productivity in agricultural production;
- New Zealand allows the release of a GM possum control organism to reduce the incidence of bovine Tb;
- New Zealand allows the release of a medicine that contains a GM organism; and
- New Zealand forgoes the release of any GM organisms.

27. Each of these scenarios was subjected to a range of "sensitivity tests" reflecting the impact of changes in the assumptions that underlie the model. The main assumptions tested were around the productivity increases from the release of GM organisms, and any price impacts on New Zealand's exports.

28. The modelling was carried out using a partial-equilibrium trade model to estimate the specific effects for producers, and a general-equilibrium model to estimate the effect these producer returns would be likely to have on the wider economy, as measured by GDP, employment, and other variables. The use of both modelling techniques ensures that there is both depth and breadth to the modelling results.

29. It should be noted that modelling results are always simplifications of reality, and, in the case of GM organisms, the modelling required predictions of likely releases of GM organisms in New Zealand, and the price and productivity impacts. These weaknesses are managed by modelling a number of different scenarios and by conducting sensitivity analysis to test the impact of changes in the key assumptions.

30. The outcome of the modelling is a range of possible impacts, rather than one specific number. Where possible, Treasury has indicated where they consider the most likely outcome to be within the range of predicted outcomes, based on the likelihood of the underlying assumptions actually occurring.

31. The modelling does not consider the distribution of any economic impacts, that is who is likely to bear the benefits and costs, as the type of modelling used does not allow this type of analysis.

Results of Price Impact Survey

32. The main results of the price survey part of the analysis can be summarised as follows:

- New Zealand consistently ranked “above average” or “among the best” in terms of environmental image.
- The release of a GM organism had a varied impact on that image. Approximately 55% of international survey respondents stated that their image would either not change or would improve as a result of a release of GM organisms. However, approximately one third indicated that their image of New Zealand would get worse if there was a release of a GM organism.
- Approximately 40% - 70% (depending on the country) of surveyed consumers indicated their purchasing of New Zealand commodities would remain unchanged if there was a release of a GM organism. However, a significant group of international consumers (20% - 30%) responded that they would cease to purchase New Zealand commodities in this situation.
- The majority of international consumers surveyed indicated that their purchasing behaviour would be based on price. If the use of GM organisms reduced the prices of New Zealand produce, they would buy more. If adopting a “non-GM” brand meant that prices of New Zealand produce increased, they would buy less.
- Approximately 85% of in-bound tourists indicated that a release of a GM organism in New Zealand would have no impact on their willingness to purchase a New Zealand holiday. However, 5% - 9% (depending on their country of origin) indicated that a GM organism release would reduce the likelihood of them returning to New Zealand for a holiday.

Officials’ analysis of price impact survey results

33. The above results suggest that there may be a negative impact from the release of a GM organism in New Zealand, affecting New Zealand’s environmental image and flowing through into the prices some overseas consumers may be willing to pay for New Zealand exports. The potential sizes of these negative impacts varied according to the type of GM organism released, with medical releases generating the lowest potential negative impact and GM rye-grass generating the highest potential negative impact. This is consistent with international evidence that GM organisms closer to the human food-chain generate a more adverse public reaction than medical releases and those not directly associated with the human food-chain.

34. However, officials advise caution in interpreting these results. We consider that any actual price impact is likely to be significantly less than those indicated by the survey for the following reasons:

- *The results of the underlying price survey are based on “willingness to pay” questions.* Respondents are asked how much more or less they would pay for a

good in particular circumstances, such as New Zealand being branded “GM-free” or known to have released GM organisms. International research suggests that, when faced with actual purchase decisions, consumers’ reactions will be quite different than what they say they would do in “willingness to pay” surveys, and that their purchase decisions are made mostly on price and quality, rather than branding, specific content, or country of origin⁴.

- *New Zealand products are often not identified on supermarket shelves as coming from New Zealand.* It is therefore the labelling as GM or non-GM products that would influence consumer behaviour, rather than country of origin. A GM release in one industry does not prevent other industries continuing to use non-GM production methods where they see a gain in doing so. New Zealand products that are produced using non-GM production methods could still be sold as “GM-free” products, extracting any non-GM price premium that exists.
- *It is unlikely that all international consumers will be aware of a release of a non-food GM organism in New Zealand, providing that release was carefully managed and appropriate controls applied.* This may mean that GM and non-GM production methods could co-exist with no significant negative price impact.
- *Generalisation of the survey results assumes that all New Zealand’s export markets are similarly affected.* While the price impact surveys cover three out of New Zealand’s four main export markets, New Zealand exports go to a wide and diverse range of markets, and often not directly to the consumer. Consumer preferences and concerns will vary over these markets, as shown by the survey results, where US consumers were shown to have less concern over GM releases. There are also a wide range of labelling requirements and practices within these markets. It is unlikely that all of the geographical and product markets will have effects of the magnitude suggested in the survey due to these differences.

35. The above results on potential price impacts also need to be considered in the context of information provided above on other countries with good environmental images successfully maintaining this image, while selling GM-based products in international markets. It is unclear whether consumers will have reliable information on New Zealand’s GM organism release status, or on the GM organism release status of competitor countries. As outlined in the previous section, it is also unclear whether there will be any genuine “GM-free” alternative source of similar goods or holidays, should consumers wish to change their purchases on the basis of New Zealand’s GM release decision.

36. As a result of the above mitigating factors, Treasury considers that the “most realistic” scenarios are those that involve smaller non-GM price premiums and smaller negative price impacts from the release of GM organisms.

37. Furthermore, as discussed below, steps can be taken to maintain international confidence in the regulatory and proposed co-existence regimes, so that any negative price impacts are minimised and New Zealand producers’ ability to market their goods

⁴ UK Institute of Grocery Distribution (2002), “Expanding Consumer Choice: Understanding the Markets for Environmental, Fair Trade, and Origin Specific Foods”.

as non-GM is maintained. Such steps would ensure that New Zealand gains maximum economic advantage.

Modelling Results

38. The results of the economic modelling predict a range of possible outcomes for both GM and non-GM scenarios.

GM release scenarios – modelling results

39. For GM organism release scenarios, the predicted implications for “realistic scenarios” range from a possible increase in GDP of 2.5% to a possible decrease in GDP of 1.3%, depending on the assumptions about productivity increase and negative price impact on non-GM exports. The most positive results for GDP occur where both the productivity increases are largest and the negative price impacts are smallest. Conversely, the most negative results occur where productivity enhancements are zero and negative price impacts are largest. A scenario of the negative price impact, but with no productivity gain, predicted a reduction in GDP of 2.4%. However, officials reject this scenario as unrealistic, as producers would not adopt GM organisms if they did not make a productivity gain.

GM release scenarios – officials’ analysis

40. The data underlying the modelling results show that the largest increase in producer returns occurs when there is release of GM organisms while maintaining successful co-existence. That means producers can gain from selling low-priced GM-based produce and also gain from selling identified non-GM produce at a small price premium.

41. Price impacts are very important in determining the final economic impact to New Zealand. For example, if price impacts are as predicted by the survey part of the study, a productivity gain of 3% per annum would be necessary from the release of GM organisms to outweigh potential negative price impacts on New Zealand exports. However, as discussed above, the actual price impacts are likely to be significantly lower than predicted by the survey. Furthermore, not all New Zealand products are likely to be subject to the same price impacts. Identified non-GM produce will still be able to be sold as such, even if there is a release of a GM organism in New Zealand. This identified non-GM produce would still receive any non-GM price premium that exists. Also, price impacts will vary across different markets, so a negative price impact in one market may not be matched by a negative impact in another market.

42. These variations in the potential price impact mean that the “threshold” productivity increase to make the release of GM organisms economic for New Zealand would be considerably lower than the 3% suggested above. Evidence from overseas would suggest that productivity increases in agriculture from the use of GM organisms of between 1-4% are not unrealistic.

43. The modelling results suggest that the economic impacts vary depending on the type of GM release being modelled. For example, the modelling results suggest potential economic gains from therapeutic GM development, as export revenue of between \$200m and \$400m from exporting GM-based therapeutics would be sufficient to offset any negative price premium and would generate positive impacts on GDP. The results also suggested that the likely negative price impacts from a release of GM

possum control are less than from GM rye-grass, which has a more direct linkage to the human food-chain. The potential economic risks, in terms of negative price impact, were largest in the GM rye-grass scenario, which reflects international evidence that the use of GM closer to the human food-chain generates relatively more negative consumer reaction.

44. Each of the above scenarios is based on one use of a GM organism. It is more likely that, over time, more than one GM-based innovation would be used in New Zealand. However, the survey suggests that any widespread negative price impact would likely only be a one-off when the first release of GM occurred. Therefore, the more GM-based innovations that generate benefits, the greater the likely economic gains to New Zealand overall are likely to be, as those benefits will compound over time. A very conservative estimate of the impact if the three GM-use scenarios considered in this study are combined suggests a possible increase in GDP of at least 1%. It is likely that the overall impact will be higher than this, as this is a conservative estimate only.

Non-GM scenarios – modelling results

45. For non-GM scenarios, that is those involving New Zealand forgoing the release of GM organisms, the predicted implications for “realistic scenarios” range from a possible decrease in GDP of 6.4% to a possible increase in GDP of 3.4% over the 10 year period. These ranges vary depending on the assumptions about both productivity decrease relative to the rest of the world, and price premiums generated for New Zealand non-GM exports. The most positive results for GDP occur when the productivity loss relative to the rest of the world is smallest and the price premium for New Zealand non-GM exports is the highest. This scenario does not factor in non-GM price premiums that would be generated for individual products, even where some GM organisms were released in New Zealand.

Non-GM scenarios – officials’ analysis

46. The overall impact on GDP from forgoing the release of GM organisms is mainly dependent upon the price premium that can be obtained from selling identified non-GM produce in our export markets. The smaller the price premium becomes, the more likely it is that the overall impact on GDP will be negative. The price premium of approximately 34% used in the modelling would seem high, with overseas evidence suggesting a more realistic premium of between 10% and 20%. With these lower price premiums, the impact on GDP is likely to approach zero or to be slightly negative.

47. Furthermore, the price premium generated by New Zealand non-GM goods overseas is likely to reduce closer to zero over time. The more of New Zealand’s competitors and trading partners that try to pursue a non-GM marketing strategy, the harder it will be for New Zealand producers to generate high profits from non-GM sales. Markets may become saturated, reducing prices, and New Zealand producers will have to differentiate their product from other non-GM producers. As an indication, at zero price premium, the long-term impact on GDP of forgoing GM releases is estimated at negative 6.4%.

Implications of Analysis Results for Government Policy

48. The research results indicate that there are two key determinants of the likely impact of GM organisms on the New Zealand economy. These are consistent with the key issues identified in international research. The key issues are:

- the size of any increases in producer returns, through increased productivity and/or reduced cost, that are generated from the release of GM organisms; and
- the size of any impact on the sales price or volume of New Zealand's non-GM exports that may arise from the release or non-release of GM organisms.

49. The productivity impact of the release of GM organisms is based on technological advances derived from research. This emphasises the importance of the biotechnology sector as a focus for the Government's Growth and Innovation Framework, since the modelling suggests that New Zealand-derived GM innovations lead to a much larger positive impact on GDP than those from overseas. Furthermore, the longer we can restrict overseas producers' unlimited access to these innovations, the greater the gains for New Zealand.

50. The Government's regulatory and legislative measures can also have a significant impact on the level of negative price impact that would result from the release of GM organisms. It is assumed that economically rational producers will not use GM organisms if the likely gain does not significantly exceed any negative price impact that will affect them directly. Prior to any decision on a GM release application, ERMA would consider any negative economic spillover impact that might result from that release.

51. Consistent with international evidence, the modelling results indicate that there are different potential benefits, risks, and net impacts for different releases of GM organisms. For example, uses such as GM rye-grass that are relatively closer to the human food-chain carry greater risks in terms of negative price impacts than does the release of GM possum control organisms or the development of a therapeutic from a GM organism. This is consistent with the case-by-case approach to considering GM organism releases, where the risks and benefits of each individual application are assessed, rather than a more general prohibition or approval. The appropriateness of the case-by-case approach is reinforced by the modelling results, which indicate that the selective release of GM organisms is likely to have a significant compounding increase in GDP, while forgoing releases of GM organisms is more likely to lead to a small negative impact on GDP.

52. To minimise any negative price impact from the release of GM organisms, and to maximise any gains New Zealand non-GM producers can make from their markets, it is important that New Zealand has a robust regulatory regime, and mechanisms to encourage successful co-existence. The proposed new category of conditional release will also provide new methods of managing any negative economic impacts on prices, as it will provide a way of increasing assurance that there is no inadvertent spread of GM organisms into non-GM industries. The results of this economic modelling also emphasise the importance of ERMA considering possible indirect economic costs, in terms of negative price impacts, as part of assessing an application for the release of a GM organism.

53. It is also important to maintain international confidence in the robustness of New Zealand's regime for managing GM organisms. The proposed HSNO Act amendments, particularly conditional release, and the proposed co-existence mechanisms (being considered by Cabinet at the same time as this paper), should contribute to this confidence and may well enhance New Zealand's environmental image. The case-by-case approach will allow the regulatory regime to respond to changing international circumstances over time. The management of New Zealand's "clean-green" image in overseas markets includes the careful management of new organisms, but goes beyond this and also covers wider environmental management and sustainable development issues.

Considering the Economic Implications of New Organism Applications

54. This section of the paper discusses the appropriateness of the current framework for assessing the economic implications of an application to release a new GM organism. Given the results of the economic modelling, it is clear that the economic consequences of a release of a GM organism could be potentially significant for New Zealand's future well-being. Similarly, past research has shown the potential positive and negative implications of introducing other new organisms. It is therefore important to ensure that any economic impacts, positive and negative, of any new organism application are carefully considered, and weighed against other impacts.

55. In considering whether economic impacts would be appropriately assessed by ERMA, there are two relevant issues: whether the HSNO Act and the Methodology require ERMA to consider economic impacts; and how this consideration would take place in practice. There is also an issue as to whether ERMA has the appropriate resourcing and capability to make judgements on the size and distribution of economic impacts.

Legislative Requirements

56. The requirement that ERMA consider economic impacts is fundamental to the HSNO Act, the requirement being contained in sections 5(b) and 6(e) which relate to fundamental principles of the Act. There is also the power of Ministerial call-in of an application, should it be considered to have "significant economic effects". As well as specifically requiring the consideration of economic impact, the definition of "environment" in the Act includes, amongst other matters, economic conditions which affect or are affected by ecosystems, all natural and physical resources, and amenity values. The HSNO Methodology further requires ERMA to consider the magnitude, likelihood and distribution of any costs and benefits, both to the applicant and to New Zealand as a whole. This would include indirect economic impacts on other producers or industries. Any mitigation measures to reduce the likelihood or magnitude of any risks or costs would also be taken into account.

57. Given that ERMA considers both the direct and indirect impacts of an application, the wider economic consequences for New Zealand, and the indirect effect on other industries, would be taken into account on a case-by-case basis. This would mean, for example, that ERMA would consider any submission made by an industry or individual that a release of a GMO would have a significant negative impact on either the submitter or the economy as a whole, and weigh this against the potential benefit from the application. Similarly, the benefits considered would include the direct benefits to the applicant, as well as wider benefits to New Zealand as a whole. The final weighting

assigned to the costs and benefits would depend on the evidence presented in the individual case.

Practical Implications

58. In practice, when considering the economic costs, benefits and risks of an application, there are a number of methods and resources that ERMA can use. Some of these are discussed below.

59. With any major new organism application, there would be an opportunity for interested members of the public, and those who considered themselves affected, to make submissions as part of the consultation process. These submissions could include evidence that the submitter had of any economic consequences likely to arise from the application being approved or declined. Interest groups and industry collectives could make joint submissions, pooling their resources to reduce the financial cost of making the submission.

60. ERMA may call on independent experts to assess the validity of any economic claims made by the applicant or other submitters. These experts can either be part of the ERMA advisory team assessing the application, or be appointed to the ERMA decision-making committee for that application. This would include expert assistance on the validity of any models and assumptions used, advice on possible impacts on individual industries or regions, and the likelihood of the suggested impacts occurring. Independent technical expertise is already frequently used by ERMA to assess possible environmental and health impacts of an application.

61. With the proposed new conditional release category, ERMA's management of risks (including economic risks) can become more sophisticated than just approving or declining a release application. While much of the focus of conditional release has been on managing biophysical risks, this ability would also extend to economic risks. For example, ERMA could impose conditions, such as buffer zones, to mitigate any economic risks associated with inadvertent spread of the organism. The higher ERMA considered any economic risks to be, the more stringent the conditions on a release may be, up to the point at which ERMA considered it appropriate to decline the application because of those risks.

62. Although not directly related to economic risks, it should also be noted that the proposed changes to the HSNO Act add extra risk management safeguards. It is proposed to make more explicit the provision to prohibit the use of a new organism in New Zealand that displays certain risk characteristics, through adding it to the Second Schedule of the HSNO Act. The proposed HSNO amendments also extend the current reserve regulation-making power to cover conditionally released new organisms. This reserve regulation-making power can be used where it is considered necessary to avoid or mitigate damage to the environment, harm to people, or adverse affects to the physical nature of the environment.

Recommended Action on HSNO Process

63. We recommend that no further changes are required, either to the HSNO Act or to the HSNO Methodology, to ensure that the economic consequences of an application for the release of a new organism are appropriately considered. As outlined above, economic consequences are already taken into account, along with other potential consequences, on a case-by-case basis. Public consultation and the ability of

submitters, other than the applicant, to make a case on the economic consequences are also appropriately provided for.

64. However, it is important to consider ERMA's capability to administer the current decision-making framework. While a wider review of ERMA's capability is currently being conducted, officials considered ERMA's capability to consider economic consequences as part of developing this Cabinet paper.

ERMA Capability

65. Officials consider that, in general, ERMA has sufficient capability, resources and access to independent technical expertise, to make an assessment of the economic consequences of an application. However, officials do consider that further resources could usefully be applied to fund work by ERMA into what the proposed co-existence strategies mean for weighing up economic costs and benefits. This is particularly relevant when considering the economic implications of trying to ensure co-existence between GM production methods and those methods that derive value from "GM-free" branding.

66. We therefore recommend that, as part of wider work led by the Ministry of Agriculture and Forestry (MAF) on co-existence mechanisms, ERMA, in consultation with other relevant agencies, conduct further work into any implications the proposed mechanisms may have for its consideration of economic impacts. We further recommend that MAF and Ministry for the Environment (MfE) officials report back to Cabinet by 31 October 2004 with the results and implications of that work.

Financial Implications

67. It is important that ERMA be adequately resourced to undertake the additional work on consideration of economic impacts that is recommended by this paper. Officials recommend that any new funding for ERMA to undertake this work be considered as part of any wider fiscal implications arising from the review of ERMA's capability, and the proposals for more appropriately reflecting the Treaty of Waitangi relationship. From a fiscal management perspective, it is more appropriate to determine the resource needs for ERMA to implement all the new expectations resulting from the Government's policy package, prioritise these needs, and then seek one new funding package. This will allow relative priorities for funding to be determined and will highlight any synergies and/or gaps in resourcing for implementing the policy package.

Legislative Implications

68. There are no legislative implications from these proposals.

Regulatory Impact Statement

69. There are no regulatory implications from these proposals.

Treaty Implications

70. The proposals in this paper are consistent with the principles of the Treaty of Waitangi.

Human Rights Act

71. The proposals in this paper do not have any Human Rights Act implications.

Publicity

72. We recommend that the economic modelling analysis report be made publicly available. There will be considerable interest in, and awareness of, this work and it is likely to attract public comment.

Consultation

73. The following agencies were consulted by Treasury in the preparation of this paper: Ministry of Agriculture and Forestry, Department of Conservation, Ministry of Economic Development, Ministry for the Environment, Ministry of Foreign Affairs and Trade, Department of Prime Minister and Cabinet, Ministry of Research, Science and Technology, and Te Puni Kokiri. The Environmental Risk Management Authority was also consulted.

Recommendations

74. We recommend that Cabinet Policy Committee:

Economic Modelling Results

- 1 **note** that previous international studies have produced mixed evidence of the economic implications of GM crops;
- 2 **note** that these previous international studies have considered crops that are not economically significant to New Zealand;
- 3 **note** that the economic modelling undertaken with New Zealand-specific GM organism release applications indicates a range of possible positive and negative impacts on GDP, depending on the productivity improvements, price impacts and types of technology modelled;
- 4 **note** that officials' analysis of the modelling results suggests that forgoing the release of GM organisms is likely to have a more significant negative impact on GDP than any of the GM organism release scenarios;
- 5 **note** that the analysis suggests that the two major determinants of whether the economic impact of releasing GM organisms is positive or negative in New Zealand are:
 - 5.1. the effect of a release of a GM organism on the international price of New Zealand produce; and
 - 5.2. the size of the productivity gain that can be achieved through the release of a GM organism.

- 6 **note** that Government policy interventions, such as maintenance of a robust regulatory regime and promotion of domestic biotechnology research, can have a significant impact on the determinants in recommendation (5) above;
- 7 **note** that the scenarios considered likely to lead to positive impacts on GDP reflect current Government policy of a rigorous regulatory regime, international confidence in that regulatory regime, a case-by-case approach to assessing applications, and successful co-existence between GM and non-GM production methods;
- 8 **note** that the results suggest that the release of GM organisms closer to the human food chain poses greater economic risks than releases for medical or pest control purposes;

HSNO Decision-making Processes

- 9 **note** that there is a requirement in the HSNO Act and HSNO Methodology for ERMA to take account of economic costs, benefits, and risks when considering an application for release of a new organism, including national level effects;
- 10 **note** that Ministers have previously agreed to make a number of changes to the HSNO Act largely in respect of the management of new organisms;
- 11 **agree** that no further changes, beyond those noted in recommendation (10), are required to either the HSNO Act or the HSNO Methodology to ensure that the economic consequences of a new organism application are appropriately considered;
- 12 **agree** that further work be undertaken by ERMA, in consultation with relevant departments, on how it would approach its assessment of economic impacts within the context of the proposed co-existence mechanisms;
- 13 **direct** officials to report back to Cabinet by 31 July 2003 on the funding implications of the further work referred to in recommendation (12), in the context of the wider review of ERMA capability;
- 14 **direct** officials from MAF and MfE to report back to Cabinet by 31 October 2004, on any policy implications arising from the work referred to in recommendation (12); and

Publication of Decisions

15 **agree** to release publicly:

15.1. the above decisions; and

15.2. the Report on Economic Risks and Opportunities from the Release of Genetically Modified Organisms in New Zealand, subject to minor editorial changes;

Consultation

16 **noted** that the Minister indicates that consultation is not required with the government caucuses or with other parties represented in Parliament.

Hon Dr Michael Cullen
Minister of Finance

Hon Marian L Hobbs
Minister for the Environmen