Seeding Purity

Improving Practices to Avoid GM Contamination of Seed Imports

SUSTAINABILITY
COUNCIL of NEW ZEALAND

Contents

First published July 2004

This second edition, September 2004, updates sections 5.3 and 5.4 to take account of official documents unavailable at the time of first publication.

Sustainability Council, PO Box 24304, Wellington, www.sustainabilitynz.org
Tel: 64-4-9133-655, Fax: 9133-760, Email: council@sustainabilitynz.org

Executive Summary

New practices adopted for supplying maize seed to the New Zealand market demonstrate how the policy of zero tolerance to GM contaminated seed can be maintained at little or no cost to the economy.

- Government is currently considering changes that would allow all types of imported seed to contain small quantities of GM seed that was unintentionally present. The policy review has been triggered by trace quantities of GM seed being discovered in a recent maize shipment, and maize seed contamination events in past years.

Scope and Sources of Risk

- Just four crops account for 99% of all GM plantings globally and New Zealand imports seed for only three of these. The Ministry of Agriculture and Forestry (MAF) recognises that this narrows the range of risk sources and it requires testing at the border only for three seed types that have GM counterparts in significant commercial production overseas – soy, rapeseed and *Zea mays* (maize and sweetcorn).

- Of these, New Zealand imports substantial quantities of seed only for maize and sweetcorn. These account for 95% of the area under crops identified by MAF as meriting border testing. Thus the current issue is essentially one of the options for responding to the potential contamination of maize and sweetcorn seeds.

- The degree of risk that seed imports pose is heavily dependent on the choices made by the importing party. This includes the choice of seed source and the quality assurance programme the seed supplier uses.

- Some importers find benefits from seed lines developed in countries that are higher risk sources of supply. There are a number of quality assurance options for seed lines from these higher risk sources. Some options reduce the risk of GM contamination to extremely low levels and are sufficiently cost competitive to have already been voluntarily adopted for use in supplying the New Zealand market. Pacific Seeds, for example, has developed the Gateway programme to check GM contamination by planting US cultivars in glasshouses and leaf-testing these to select the plants from which seeds are bred for sale. This system will be delivering price competitive seeds to New Zealand this spring.

Benefits and Costs of Options

- Nearly all sweetcorn producers and a significant proportion of maize producers must ultimately meet zero tolerance standards set by the markets they deliver to. If GM contamination enters the New Zealand supply chain as a result of lower border standards, this raises their costs and threatens their access to those markets.

- Tolerance of some level of contamination in maize and sweetcorn seed imports would offer benefits only to producers who supply markets that allow a greater level of contamination. Were the zero tolerance standard to be relaxed, the main beneficiaries would be seed importers that did not innovate and invest to provide enhanced customer protection.

- More broadly, removal of the zero tolerance standard involves knowingly accepting routine and randomly distributed contamination. This has clear potential to impact across a range of other agricultural sectors as its presence could negatively impact on the nation's image as a supplier of pure and premium quality foodstuffs. The extent of resulting economic damage is very difficult to quantify but an indication can be obtained from studies that suggest quite strong responses from even limited moves toward intentional release of GM food varieties.

- Overall, given the availability of commercially competitive means of importing desired cultivars while at the same time reducing to extremely low levels the risk of GM contamination costs, the case for rejecting a tolerance standard is strong. A contrary conclusion recently reported by the Crop and Food Institute painted two stark alternatives: banning maize seed imports or providing a tolerance limit. However, the report undertaken for MAF did not scope either option and provided insufficient analysis of the two options presented to support its conclusion.

Improving Zero Tolerance

- There are, however, a number of improvements that can be made to the zero tolerance policy.

- Importing parties have a great deal of control over the degree of contamination risk. For those that seek to utilise higher risk seed sources, the tradeoff is between the additional benefits of a particular cultivar versus the potential costs of GM contamination. Improved agronomic performance and/or product quality are the potential benefits and these are gains only to the purchaser and downstream buyers. Allowing routine GM contamination degrades Brand New Zealand and affects producers far beyond the grains sector. In order to properly incentivise the risk-taking party to make good judgments about the overall value of utilising higher risk sources, any costs arising from these decisions must also lie with the importing party in the first instance.

- At present, liability and compensation arrangements are poorly defined. Prior to the October 2003 amendments to the Hazardous Substances and New Organisms Act, no compensation was normally payable to parties required to clean up GM contamination. Following the amendments, legal interpretation suggests that in order for MAF to ensure the removal of GM material from non-GM seeds or plants, Government will become liable to pay compensation for at least a considerable proportion of the product losses suffered. Accordingly, compensation payments become compulsory irrespective of the degree of risk implicitly selected by the importing agent. This means that payments would be made in circumstances when it is not desirable to remove the financial incentive otherwise acting on importers to minimise the risk of contamination. Removing this incentive exposes parties taking due care while socialising losses caused by those that elect to take greater risks.

- Specification of arrangements for liability and compensation should commence from the principle that importers bear the costs of risks they choose to adopt. However, MAF should define quality assurance processes that would entitle the importer to compensation if GM contamination occurred in spite of these having been correctly observed. In other words, zero tolerance would remain the standard in all cases but MAF would compensate if importers adopted predefined safe harbour practices for quality assurance. The Gateway programme developed by Pacific Seeds could be one such qualifying set of practices.

- Whether importing parties would share the residual risks with downstream agents is a matter for market players to determine by individual contract. Government can however assist by developing a model contract that will allow importers and other parties to clearly allocate liability between them. Market forces could be expected to see importers return to the original position of retaining responsibility for most risks.

- Increasing the seed sample size to match the testing protocols many producers use for their own quality control is a further measure that would strengthen border control of seed imports. There is also a good case for strengthening the zero tolerance policy by expanding the scope of GM materials tested to anticipate new varieties such as those that make use of food plants to produce drugs.

- As a matter of principle, tolerance levels should not be considered before a coexistence strategy has been developed. Providing for levels of GM contamination in advance of fleshing out the coexistence framework would pre-empt any process for the development of credible coexistence systems.

- If Government ultimately favours relaxing border standards to set a tolerance threshold, the change should not be implemented by means of statutory reform, as proposed by ERMA at an earlier time. This would amount to a bypass of the ERMA process, undermining the HSNO regime that Government has stressed will provide comprehensive case-by-case assessment. An application should instead be made to ERMA and the normal procedures followed.

Recommendations

1. No relaxation of the zero tolerance standard is required as there is no significant tradeoff to be made given the availability of commercially viable, extremely low risk pathways to import seed - including new US cultivars.

2. Government can improve the incentives for compliance and significantly reduce its exposure to costs by ensuring that the law does not provide for inappropriate compensation. Liability and compensation provisions require clarification and amendment to ensure that costs arising from GM contaminated seed imports rest with the importing party in the first instance.

3. MAF should define the general principles of quality assurance practices for seed imports such that if contamination occurred while the importer correctly observed such safe harbour practices, compensation would be payable by MAF.

4. Government should facilitate development of a model contract that will allow importers and other parties to clearly allocate residual liability between them, based on individual negotiations.

5. Sample sizes for the mandatory testing of seeds for commercial planting should be increased to a minimum of 7,000 seeds. A standard for testing the identities of GMOs approved overseas and could cause contamination in foods should also be developed.

1. Introduction

The Ministry of Agriculture and Forestry (MAF) has been asked to set out options for Cabinet on how other jurisdictions are managing border control for potential GM contamination of seed imports. This advice is being requested with a view to reconsidering New Zealand's zero tolerance policy for GM contamination.[1]

New Zealand has had a legal standard of zero tolerance to the presence of unauthorized GMOs since the Hazardous Substances and New Organisms Act entered into force in 1997. "Knowingly" releasing a GMO that has not been approved by ERMA for such purposes is illegal under the Act.

With respect to border control of seed imports, zero tolerance remained a 'paper tiger' until 2002, lacking a programme of mandatory monitoring or enforcement. Until that time, testing and monitoring of seed imports was conducted on a purely voluntary basis by interested parties.

2002 saw the introduction of testing protocols for seed imports with respect to crops that have GM counterparts under significant commercial cultivation. The need to respond to GM biosecurity breaches in 2002 and 2003 also contributed, by virtue of necessity, to the fleshing out of testing and incursion response measures to enforce the standard. The initial proposal recommended mandatory testing of every third seed consignment. Following consultation, MAF introduced a mandatory testing of each seed consignment.[2]

We understand that a key impetus for the current review of the zero tolerance policy is the cost of maintaining this policy for border control. This year's recent GM contamination incident has resulted in the seizure of 4000 tonnes of maize as a result of 0.05% GM contaminated being detected. The importer concerned is destined to receive compensation and though payments cannot exceed that which bring affected parties back to a cost neutral position, industry sources suggest the total payments will be between $500,000 and $750,000.

While aspects of the seed testing and contamination response arrangements need to be further refined, there is a pressing need to clarify who should bear the costs of GM contamination under particular circumstances and to ensure Government policies and statutes are aligned with explicit decisions on this. It is primarily a question of appropriate risk distribution as different options for sourcing seeds carry different levels of risk.

In essence, the policy decision before Government is how to provide sufficient protection to New Zealand's agricultural interests given market-defined purity standards, while maintaining the integrity of the GM regulatory system and protecting the New Zealand taxpayer from any unnecessary costs.

The Sustainability Council has prepared this paper as a contribution to this policy development process. It attempts to identify the key issues for analysis and offers recommendations on a way forward.

---

1 Letter from the Minister of Biosecurity to the Sustainability Council, June 28 2002. Also see MAF Media Release, Friday 4 June 2004, "MAF supervising harvesting and processing of GM maize", and NZ Herald, 08.06.2004, "Zero tolerance for GM crops could be eased".

2 An independent review of MAF and ERMA handling of GM maize contamination in 2002 resulted in a number of recommendations to improve the GM border control policy. Amendments introduced to HSNO by the passage of the New Organisms and Other Matters Bill last year provided MAF with further options to address GM biosecurity incursions.

2. Risk Profile and Problem Definition

2.1 Scope of Review

The review MAF is leading is framed to examine the general question of whether tolerance limits should be set for seed imports. It is directed at reviewing the "principle" of zero tolerance.[3] In particular, it will address the question of whether the policy of zero tolerance to GM contamination is "sustainable" and "practical". Within this frame, any relaxation of the standard would thus apply to all types of seeds.

This is a broad scope of review, implicitly examining all seed types and sources of supply. However, those that MAF considers pose a particular risk are a very small subset. The extent to which seed imports to New Zealand will carry the risk of being GM contaminated is largely determined by:

(1) The type of seed being imported;
(2) Whether the seed is imported from one of a very few higher risk countries;
(3) The level of quality assurance used in propagation of the seed before shipment.

The following examines each of these three parameters.

2.2 Type of Seed

Very few GM varieties are grown in any quantity. Just four crops account for 99% of all GMOs under cultivation globally: soybean (46%), cotton (20%), canola/oilseed rape (11%), and maize (7%).[4] While GM varieties of a number of other crops have been approved for commercial production in other jurisdictions, commercial cultivation has not begun, has ceased (GM potato, flax and tomato) or is very limited in size and thus does not pose an appreciable seed contamination risk.

Similarly, only a handful of countries show any significant commercial cultivation. Again, four account for 99%, this time of the area under GM cultivation: US, Argentina, Canada and China.

MAF has already recognised that this narrow range of risk sources can be exploited in designing efficiently targeted enforcement. Given the above, it has imposed mandatory border testing for seed imports only on those varieties that have GM counterparts that are in significant commercial production. MAF also allows imports of these varieties, without testing, from countries that it has classified as having "area freedom from commercial GM production".[5]

When considering the pattern of seed imports into this country, the risk profile narrows still further. New Zealand imports only three of the four seed types under significant cultivation: maize, oilseed rape and soy. While testing programmes are in place for all three, New Zealand grows extremely small areas of soybeans for breeding purposes only (less than 20 hectares).[6] The oilseed rape sector is also small, estimated to be worth $1.8 million in 2000 with a total area of 1,500 ha[7], and is

[3] Peter Kettle, MAF Director of Biosecurity and Science Policy, 15 July 1004, Personal Communication.
[4] Border Control for Genetically Modified (GM) Seeds, MAF Discussion Paper No: 31, MAF Policy, May 2002.
[5] See for example: *Protocol for testing imports of Zea mays seed for sowing for the presence of genetically modified seed*, Ministry of Agriculture and Forestry (MAF), 1 June 2004, p 1.
[6] MAF, Border control for genetically modified (GM) seeds, MAF Discussion Paper No: 31, May 2002, p. 3.
[7] MAF Policy, Estimated Economic Impact of Crops with the Potential to be Grown from Genetically Modified Seeds, November 29 2000.

principally dedicated to counter seasonal seed multiplication. The scale of potential financial consequences is thus small for soy and oilseed rape.[8]

It is *Zea mays*, whose common subspecies are known as maize and sweetcorn[9], that carries by far the greatest risk of occurrence of GM contamination for New Zealand at present. In turn, maize seed imports are the much larger of the two – with an estimated 750 million maize seeds arriving annually.[10] Reflecting this, around 31,000 ha of maize were grown in 2003, and around 6,850 ha of sweetcorn.[11] Maize in particular, and sweetcorn, are therefore the crops with the greatest potential to throw up compensation claims of significance, accounting for 95% of the crop area covered by seeds subject to mandatory border testing.[12]

2.3 Seed Source

Seed breeding and multiplication may be carried out in two separate countries. Seed importers have three broad options in accessing seed:

1. *Sourcing seed bred and multiplied in "GM area-free" countries*
2. *Sourcing seed of parent lines from high-risk countries, multiplied in "GM area-free" country*
3. *Sourcing seed produced and multiplied in higher-risk countries*

In 2002, 9% of the global maize and sweetcorn area was sown in GM varieties.[13] These were grown commercially in ten countries. New Zealand allows maize and sweetcorn seed imports from fourteen countries: Australia, Austria, Canada, Chile, Finland, France, Germany, Hungary, the Netherlands, Norway, Sweden, Switzerland, the UK and the USA.[14]

Of these countries, two are significant GM maize and sweetcorn producers: the US and Canada. The US is the world's largest GM maize and sweetcorn producer: in 2002, US growers planted 11 million ha of GM maize and sweetcorn - 90% of the global total. In that year, 30% of US maize and sweetcorn production was GM.[15] Estimates for the 2004 growing season forecast that 46% of US maize and sweetcorn will be GM.[16] Canada, is also important to consider as it is the third largest GM maize and sweetcorn producer, with 45% of production in GM varieties.[17] As GM maize and

8 MAF, Border control for genetically modified (GM) seeds, MAF Discussion Paper No: 31, May 2002, p. 3. See also http://www.maf.govt.nz/biosecurity/imports/plants/papers/gm-seeds/index.htm.

9 Popcorn is a very small market in New Zealand. See *Zea mays Breeding in New Zealand: Analysis of the probability of perpetuating transgenes in breeding material*, Allan K. Hardacre, Crop and Food Institute, May 2004, p.4.

10 MAF, Additional questions about genetically modified (GM) maize inadvertently grown by Pacific Seeds, October 2 2002.

11 MAF: "Arable Crops for Silage or Balage by Regional Council During the Year Ended June 2003"; "Grain and Seed Crops by Regional Council. During the Year Ended June 2003"; "Area Planted in Sweetcorn: As at 30 June".

12 Note however the discussion in Section 5.6 on potential new forms of GM contamination.

13 ISAAA, Global Status of Commercialised Transgenic Crops: 2002 p. 16

14 MAF: Import Health Standard. Commodity Class: Seeds (Grain)/Nuts. Commodity Sub-class: Seeds for Sowing. Maize.

15 LMC International (September 2003) Supply Chain Impacts of Further Regulation of Products Consisting of, Containing, or Derived from, Genetically Modified Organisms. Prepared for the UK Department for Environment, Food and Rural Affairs and the UK Food Standards Agency, p. 99.

16 USDA, National Agricultural Statistics Service, "Prospective Plantings", March 31 2004, p. 20.

17 LMC International, "Supply Chain Impacts of Further Regulation of Products Consisting of, Containing, or Derived from, Genetically Modified Organisms", p. 100.

sweetcorn are present in high quantities within the supply chain in these countries, seed stocks imported from them can be reasonably assumed to pose a higher risk of GM contamination. The US and Canada are therefore higher-risk countries to source seeds from. US-sourced seed has been responsible for all four confirmed and suspected GM contamination incidents in New Zealand.

Conversely, countries that have not approved commercial cultivation of GM maize or sweetcorn varieties, have no known levels of contamination or illegal planting, and can demonstrate sufficient systems to provide ongoing assurance of purity can clearly be said to pose a lower risk of GM contamination. Australia is an example of a low-risk country: no GM maize or sweetcorn is grown there commercially, and according to MAF, no seed imports from Australia have been shown to be contaminated thus far.[18] An important qualification is necessary here. "Area-freedom" does not of itself guarantee that seed stocks produced in that country will be GM free, as parent lines may have been sourced from lines bred in GM-producing countries, and are therefore still prone to GM contamination.[19]

Table 1: Source of Seed Imports and GM producing countries

Source of NZ seed imports (ranked in size)	Maize/Sweetcorn seed imports to NZ (% of total imports)[20]	Commercial GM Maize/Sweetcorn producer[21]
USA	42.7%	GM
Chile	41.9%	Uncertain *
Australia	10.1%	No GM
France	4.3%	No GM†
Austria	0.2%	No GM
Netherlands	0.1%	No GM
Canada	0.1%	GM‡
Germany	0	GM
Switzerland	0	No GM
Finland	0	No GM
Hungary	0	No GM
Norway	0	No GM
Sweden	0	No GM
UK	0	No GM

** Chile is an interesting case. In 2002, MAF noted unconfirmed reports that while no GM food production was allowed for domestic purposes, counter-season GM maize seed multiplication and food production for export purposes are permitted. The extent of GM maize production is not clear.*

† For two years (1998-2000), France grew limited amounts of insect resistant maize. None has been grown commercially since 2000.

‡Germany is reported to have grown under 50,000 ha of GM maize in 2003.[22]

2.4 Quality Assurance Options for Higher Risk Sources

Quality assurance systems co-determine the level of risk of GM contamination. Some growers and food companies wish to continue sourcing seed from higher-risk countries such as the US because they want to maintain access to certain seed lines that are only available from there. These seed lines may offer greater benefits in the form of better agronomic performance or processing characteristics, but also tend to carry higher risk of contamination.

18. MAF (1 August 2002) *Border Control for Genetically Modified Seeds, Questions and Answers*, p. 10
19. See *European Union in disarray over GM seeds*, Nature Biotechnology 20(4), pp. 324-5, April 2002.
20. MAF (13 August 2002) *GM Contamination in Maize Seeds.* Briefing to the Minister for Biosecurity
21. ISAAA Global Status of Commercialised Transgenic Crops. Reports 1998-2002.
22. Ibid

In a report prepared for MAF, the Crop and Food Institute stated that short of testing every single seed, it is extremely difficult, if not impossible, to ensure that maize seed of US origin is GM free:

> "It may not be possible to prevent transgenics from reaching NZ in inbred or hybrid seed imported from the US, as testing can not detect every seed containing a transgenic event and low levels of transgenes are known to be present in many conventional hybrids."[23]

However, quality assurance (QA) systems have been developed to respond to this risk, providing access to US seed while seeking to meet New Zealand regulatory requirements. For a host of reasons, the different QA systems vary in the level of seed purity cited. The following are two examples of programmes that have been adopted to address contamination risks while maintaining access to US seed lines. These indicate the types of solutions the market has developed in response to consumer sensitivity to GM content.

Syngenta Excelis Programme: US breeding and multiplication

Syngenta's Excelis programme was established specifically to achieve high-level assurance for non-GM seed stocks. This involved setting up a wholly separate seed production system in a location called Treasure Valley.

Pacific Seeds Gateway Programme: US parent lines; Australasian multiplication[24]

In response to market demand for systems that address zero tolerance requirements, Pacific Seeds has developed a leading edge quality assurance programme called "Gateway". Based in Australia, it is designed to meet the regulatory and market demands of New Zealand and a number of other countries that seek high levels of assurance.

US parent lines are imported to Australia in very small quantities. All parent line seeds are quarantine glasshouse-grown and every single plant is then leaf-tested to determine whether the plants are non-GM. Once non-GM parent lines are established, these are multiplied out in several locations in Australia and New Zealand. Through use of multiplication sites in Queensland and Ord Valley, the company can more rapidly bulk up new lines by effectively obtaining two growing seasons each year within Australia. While details of the individual steps and stages of quality assurance are commercially confidential, additional procedures are carried out before and after this stage.

Although development of this system has involved additional costs for Pacific Seeds, the seed product will remain price competitive.[25] Pacific Seeds has made a long-term investment in the new systems, one it hopes will attract new custom. One factor that has assisted in keeping the marginal costs of the Gateway system down is that it effectively leverages off costs already required under Australian quarantine regulations. Maize seed from the Gateway programme is due to be available in New Zealand this spring.

---

23 *Zea mays Breeding in New Zealand: Analysis of the probability of perpetuating transgenes in breeding material,* Allan K. Hardacre, Crop and Food Institute, May 2004, p. 2.

24 Nick Gardner, International Division Manager, Pacific Seeds Australia, Personal Communications, 24 June and 14 July, 2004.

25 Ibid

3. Tolerance Policies in Other Jurisdictions

Tolerance levels, or thresholds, are officially accepted levels of GM contamination. Presence of GMOs in a product below the permitted level may allow that product to be marketed as non-GM or GM-free.

Government has already been briefed by MAF officials as to whether European Union (EU) policy on tolerance levels provides a viable option for New Zealand as an alternative to its current policy of zero tolerance. In a further round of papers that has been called for, we understand that officials are to brief Government on how other jurisdictions beyond the EU are approaching GM contamination of seed imports. The following outlines approaches being considered by two jurisdictions of special importance to New Zealand: the EU and Australia.

3.1 The European Union

The EU has a zero tolerance policy for unauthorized GM varieties. With respect to authorized GM varieties, there is currently no Community-wide policy on GM contamination of seed stocks, and the EU is in the process of reviewing tolerance levels for adventitious GM presence in seeds for sowing. (Up to 0.9% adventitious GM may be present in foods[26]).

At this stage, no policy has been finalized. The current policy debate is whether to allow for greater levels of contamination. The European Parliament and several member states strongly favour zero tolerance, or tolerance at the limits of technical detectability. The Commission meanwhile, favours higher tolerance levels.

The Commission issued a draft union-wide directive in September 2003 to establish minimum thresholds for adventitious or technically unavoidable traces of GM seed in other products. The proposed measures advance different thresholds for different crops. The Commission's initial draft set a 0.5% threshold for maize, sugar beet, potato, tomato, chicory; 0.3% for oilseed rape and 0.7% for soya. Below these thresholds, seeds containing GM seeds would not have to be labeled as containing GMOs, providing the presence is "accidental or technically unavoidable". An unfavourable reception to the initial proposed levels has led the Commission to develop a revised draft directive that proposes a 0.3% threshold for oilseed rape and maize, and a 0.5% threshold for sugar beet, fodder beet, potato.[27]

Several member states, including Austria, Denmark, Germany, Hungary, Italy, Luxembourg and Slovenia have a zero tolerance policy or have set thresholds at the level of detectability. The European Parliament has recommended that that labeling should be triggered at the "technically measurable and reliable detection threshold" of 0.1%.[28] It has concluded that coexistence – an official policy target of the EU - is only viable if contamination thresholds are set at the level of detectability. The Parliament has criticized the Commission for proceeding with the development of contamination thresholds without progressing legislative measures to achieve coexistence for GM, conventional and organic crops and noted that: "it makes no sense at all that this requirement is not even mentioned in the Commission recommendation".

---

26 There is confusion in media reports regarding European policy. In response to journalist queries regarding tolerance levels in the field, MAF officials are cited as stating that the EU threshold in Europe is 0.9%. This threshold, as noted, applies to adventitious presence in final food products, rather than accepted levels of contamination for seed for sowing. See Rural News, 30.06.2004, "MAF admits it may be liable for damages"

27 Draft Commission Decision (EC) establishing minimum thresholds for adventitious or technically unavoidable traces of genetically modified seeds in other products

28 European Parliament resolution on coexistence between genetically modified crops and conventional and organic crops (2003/2098(INI), Minutes of 18/12/2003 - Provisional Edition.

As of June 2003, this debate has not been resolved and the Commission has yet to formally issue a new proposal. [29] At this stage, however, the mooted proposal for 0.3% marks the upper limits of any potential contamination thresholds to be adopted in the single market.

3.2 Australia

Australia has a zero tolerance policy for the adventitious presence of unauthorized GMOs. The Federal Gene Technology Act 2000 prohibits the presence of GMOs that have not been approved for release by the Gene Technology Regulator.[30] In addition, under the Quarantine Act 1908, all imported grains, seeds and biological materials which have any GM presence must be declared prior to importation. Monitoring and testing of this zero tolerance policy has thus far been conducted exclusively by importers. The present arrangement is essentially one based on declaration by importing parties.[31]

The Federal Government is currently consulting on future policy for adventitious presence of GMOs. This year, the Australian Government Working Group on Unintended Presence advanced a proposal that would see mandatory testing as well as the regulatory approval of GM varieties that are most likely to enter the country as contaminants.

3.3 New Zealand's Unique Conditions

Both the EU and Australian approaches are in draft form, and have not been subject to consideration from all interested parties. It is not yet clear what policy will emerge. On these grounds alone, they provide limited assistance to decisions that are to be made in New Zealand.

More importantly, regulatory tolerance standards do not necessarily accurately reflect the market standards that exporters must produce to. Indeed, they may diverge sharply from market requirements. It is not the case, as a senior Crop and Food scientist has suggested, that "NZ only has to comply with the designated thresholds for GE content in food – currently 1% in Europe and 5% in Japan."[32] This was plainly demonstrated in 2003 when Gisborne-based Sunrise Coast suffered a contamination incident when supplying to the Japanese market. While the official tolerance level in Japan is 5%, the company suffered losses estimated at nearly $500,000 when a Japanese pizza maker routinely tested for GM content and detected 0.05% GM contamination in one of the company's products.

The appropriateness of the outcomes of the EU and Australian policy debates will therefore need to be considered with close regard for New Zealand's specific interests and positioning. Agricultural produce accounts for nearly half of New Zealand's export income. This is five times the OECD and the European Union averages (pre-enlargement) and over two and a half-times higher than Australia. Given that this food exporting dependence is tied to the country's market positioning as a clean, green food producer, this further underscores the need for an assessment based on New Zealand's unique circumstances. The following section picks up on this issue.

---

29 There has been further confusion about the policy debate in the EU. MAF officials are cited as claiming that the official proposal is for 0.5% threshold for maize, whereas no proposal has been formally issued by the European Commission thus far. Waikato Times, 02 July 2004, "Zero GM tolerance no good – MAF".

30 GM cotton and GM canola have been approved for commercial release. The first has been. In 2003, around 100,000 ha of GM cotton were grown (Source: ISAAA (2004) "Global Status of Commercialised Transgenic Crops: 2003. Preview", p. 4). Two GM canola varieties were approved for commercial release last year. However, state moratoria in all states where canola is grown have prevented actual commercial production.

31 Australian Government Working Group on Unintended Presence (2004) "Industry Consultation Paper", p. 7 http://www.biotechnology.gov.au/library/content_library/BA_Unintended_Presence_consult.pdf

32 Why NZ cannot be 100% GE Free, Dr Tony Conner, August 10 2002.

4. Costs and Benefits

The following sections provide a preliminary analysis of the benefits and costs of the current zero tolerance policy and the option of tolerance levels under consideration and identifies the nature of different types of costs and benefits. In general, the analysis attempts to discern which of these is significant and how different influences affect their scale, rather than providing quantification. This is in part because many factors resolve through analysis alone but it is also a function of limitations on the availability of information that characterises purchaser attitudes to, and standards for, GM contamination - including the impact of perceptions. This is an area requiring primary research that is beyond the scope of this report.

4.1 Benefits of Zero Tolerance

New Zealand's current status as a GM free food producer affords marketing benefits to its food producers and is reinforcing of Brand New Zealand. Area-freedom from GM food production is thus a marketing asset and the current policy of zero tolerance maintains this market position.

New Zealand's zero tolerance policy matches a strong market demand for products that are free of GM content. As MAF states, "there are currently very strong commercial pressures in New Zealand to avoid GM crops".[33] These pressures stem from the high levels of market resistance to GM food. Most of New Zealand's principal markets are highly sensitive to GM contamination. The acceptability of GM food may change in future, but for the time being the presence of GM material, even in trace quantities, is an exposure for food producers.

Retaining a zero tolerance approach to GM contamination has value for all current producers in its ability to at least maintain, and possibly enhance, brand image. For GM sensitive markets, it demonstrates commitment to product integrity and a strong enforcement regime.

By world standards, New Zealand is a tiny, but high-quality, maize and sweetcorn producer. The New Zealand maize industry is valued at around $140 million a year.[34] This is made up of two separate crops: a grain crop that covers some 14,166 hectares (mostly destined for poultry feed and starch) and a silage crop for animal feed that covers some 16,917 hectares.[35] Sweetcorn exports for the year ending 2003 are estimated to be in excess of another $42 million.[36]

We are unaware of any statistics as to what proportion of the New Zealand maize and sweetcorn industry must meet zero tolerance. However, our discussions with the industry suggest that market demand for zero tolerance is likely to cover nearly all the sweetcorn industry and a significant portion of the maize for grain industry, while that for silage is less clear. A number of growers and food companies consider New Zealand's status as a GM Free food producer to be a precondition for maintaining market access, independent of any potential premia that may be earned. Heinz Watties confirms that zero tolerance is a necessary condition for New Zealand's sweetcorn export industry:

---

33 MAF, Border Control for GM Seeds: Questions and Answers, 1 August 2002, p. 7.

34 *Zea mays Breeding in New Zealand: Analysis of the probability of perpetuating transgenes in breeding material,* Allan K. Hardacre, Crop and Food Institute, May 2004, p 4 and 9. Maize is placed by Hardacre as "the third most important crop in NZ behind barley (~$80 million) and wheat (~$80 million)".

35 MAF statistics for 2002 year.

36 MAF Statistics, http://www.maf.govt.nz/statistics/primaryindustries/horticulture/hortslides/corn.htm

> "Zero tolerance where GM is detected is the appropriate course, because the market for the food products has zero tolerance."[37]

Sunrise Coast, a supplier of sweetcorn products to Japan, cites the unyielding position this company has encountered in that market.

> "We are supplying probably 90% of our production to the supermarket business in Japan. And they've clearly said to us that they do not want GE crops […]. They are basically saying "if it's got GE contamination, we do not want to buy it, because our consumers won't buy it from us". Probably it's best to give you an example. This GE event that we had with one of their products, we gave arguments to our customers to say, well, look, the level is below 0.05%. Their retort to us was 'It's either GE or not GE. No buts'."[38]

Federated Farmers Maize Growers spokesman, Colin MacKinnon, similarly sees zero tolerance as a requirement for the majority of maize for grain production:

> "The way our markets are, the majority of our customers require GE-Free maize. It's important that we retain our GE Free status. [Contamination] would be a major blow to the maize-growing industry."[39]

For large sweetcorn growers and processors such as Heinz Watties, perceived contamination of products is just as great a marketing concern as actual contamination in the market place, and would have an effect on the company's market positioning:

> "The implications for any GM contamination, real or perceived, anywhere in our supply chain, or even just anywhere in NZ, are potentially damaging for all of our business, such is the level of sensitivity of many of our customers to this issue."[40]

4.2 Costs of Zero Tolerance

4.2.1 Expected Costs Have Fallen Sharply Over Time

The furore that surrounded New Zealand's first suspected contamination incident in 2000 set a climate for some of the extreme arguments advanced as grounds for abandoning zero tolerance. Proponents of contamination thresholds claimed that nothing short of a national ban on all seed imports could prevent contamination and deliver on zero tolerance. As an active participant in this debate, a senior Crop and Food plant scientist argued widely that New Zealand would need to cease importing seed in order to maintain zero tolerance: "Given the almost certainty of any imported seed sample having a low inherent GE impurity, to sustain a zero tolerance to GE seed impurities NZ may have to close its borders to virtually all seed imports in order to maintain a 100%-GE-free status."[41] The cost to the nation of such a ban was put at $100 million by one official estimate.

As discussed in Section 2, there was never any reasonable case for contemplating restrictions on seeds for more than just three crops. As further discussed, zero tolerance for GM maize and sweetcorn is the only aspect of the current policy that presents serious issues for Government at this point. To argue that a policy change needs to be considered for nearly all seeds is to adopt the assumption that nearly all seeds will ultimately have GM counterparts, a proposition that is highly

---

37 Heinz Watties, Submission to MAF on Discussion Paper 31, "Border Control for GM Seeds" 2002.

38 Bruce Clark, Sunrise Coast, when speaking at a press conference on September 17 2003.

39 Rural News, May 25 2004, "Maize company wants compensation".

40 Heinz Watties, Submission to MAF on Discussion Paper 31, "Border Control for GM Seeds" 2002.

41 *Why NZ cannot be 100% GE Free*, Dr Tony Conner, August 10 2002, NZ Herald.

speculative, given the sustained high levels of market resistance to date. In any case, it is a number of years before this would need to be considered.

Two years on however, the agricultural industry has shown just how wide of the mark such portents were. In response to ongoing market demand for GM free product, seed producers have continued to devote considerable energy to developing assurance schemes that greatly reduce the risk, and hence cost, of maintaining zero tolerance.

The "Gateway" programme developed by Pacific Seeds merits special attention. It enables the company to continue to select from new seed lines developed in all countries and so maintain access to the most recent improvements in hybrid seeds in not just Europe and other research locations, but also the US - the source of most of the concern with respect to seed contamination. Through leaf testing each individual plant it uses to propagate the seeds it sells, this programme can be expected to achieve a level of confidence in removal of GM contaminants that distinctly exceeds that obtainable through a representative sample testing programme alone.

The Gateway programme addresses a crucial source of risk – the presence of GM contaminated seed in that used to breed from. It identifies and removes this in advance of the multiplication process. Rather than crushing every seed to test it for GM content, as has often been referred to as the only way to achieve certainty, the Gateway programme lets each seed grow to reveal itself as GM or non-GM. Leaf testing every plant turns out to be a practical alternative that is able to offer individual scrutiny.

As noted above, Pacific Seeds is committed to providing gateway-assured seeds at a competitive price, although the system raises the production costs for the company.[42] So the overall result is a system that delivers an extremely strong level of protection against GM contamination costs, has already been voluntarily taken up by one of the three suppliers of maize seed to New Zealand, and will impose little or no cost on the economy.

Pacific Seeds will be supplying Gateway maize seed to New Zealand from this spring. It will also be using this system to supply to several other markets with high levels of sensitivity to trace contamination.

The wider significance of the Gateway programme is that it demonstrates a method that any seed producer can use for any cultivar to circumvent a critical source of risk – the presence of GM contamination in seed stocks used for breeding. There is nothing unique or proprietary about this fundamental insight Pacific Seeds has made use of, nor is access to the Australian conditions that assist its implementation.

4.2.2 Seed Testing Costs

Costs that are clearly present are those involved in mandatory testing of import samples. Two points are important to note here:

[42] Seed suppliers in other sectors – notably Wrightsons in the forage brassicas – believe that the benefits of strong quality assurance programmes outweigh the associated additional production costs. See "Wrightsons Seeds Ltd Submission to MAF on the draft Protocol for testing imports of *Brassica napus* var. *oleifera* seed for the presence of genetically modified seed" (2002). Wrightsons adopted the "Seedtrac" QA programme, noting: "This extensive and costly program has been implemented in order to mitigate what presents a substantial risk to our business".

- Mandatory testing is a feature of all options currently being considered. It is not exclusive to zero tolerance, but will be required for any tolerance level that may be set to verify compliance with it.

- Many companies conduct their own rigorous testing of seed imports in any case. MAF concluded from its consultation with the industry on new protocols for border control of GM seeds that "a few major companies said that the testing regime would not impose extra costs or restrict the availability of seeds because they already required testing for their own commercial needs".[43]

A zero tolerance standard does not therefore impose any significant additional testing costs on seed importers or government.

4.2.3 Risks and Costs of a Contamination Event

In the event that contamination occurs, the costs will tend to include:

(1) Investigation of suspected incursion;
(2) Clean-up, including: seed recall and/or harvesting of crop, and decontaminating sites;
(3) Lost revenues, and reassuring markets.

Note that again, these costs are not exclusive to a zero tolerance policy. Identical or similar procedures will need to be followed to respond to a contamination event occurring under a 0.3% tolerance policy for example.

The difference between the two is the degree of risk that a contamination incident will occur. The key observation is that this degree of risk is largely, if not strictly, determined by (1) the choices seed importers make between competing supply sources and (2) the attendant quality assurance programmes. The more stringent the quality assurance programme selected, the lower the risk of contamination entering the supply chain.

Given the availability of means of accessing cultivars with minimal risk of contamination costs and at no price penalty to growers, it is difficult to consider contamination event costs as being simply an additional cost resulting from a zero tolerance policy. While zero tolerance may result in additional risk for those companies that seek to use particular sources of supply, this must be viewed as a risk and reward calculation that is being made by those companies. (Setting incentives for getting this calculus right, especially the distribution of costs resulting from a contamination event, is a key issue and is the subject of the following section 5.) The additional cost zero tolerance could be said to impose that is mandatory is only that required to adopt new practices that would still provide access to desired seed lines at extremely low risk, plus an allowance for any residual risk remaining that is not covered through use of the new practices.

4.2.4 Limits of Detectability

The case for introducing tolerance levels rests upon the claim that the zero tolerance standard cannot reliably be supported by technical detectability, and that representative sampling cannot always account for low levels of contamination that might be present in a seed consignment. This

[43] MAF, Border Control for GM Seeds: Questions and Answers 1 August 2002, p. 10

technical gap between the standard (zero) and the limits of reliable detectability (often set at 0.1%) is said to create an exposure for the industry.

MAF has clearly dismissed this argument in the past:

> "MAF […] rejects the suggestion that not being able to guarantee 100% assurance at the border means that we have to accept a tolerance for GM contamination. The same argument applies to all biosecurity risks including foot and mouth diseases. Border control can never be 100% yet New Zealand has so far managed to prevent foot and mouth disease from entering."[44]

In any case, markets are testing the purity of New Zealand products for contamination at levels well below the officially accepted limit of detectability (0.1%). As MAF also notes, the limit of reliable detection "is not a barrier between what is detectable and what is not"[45], it merely determines the level of confidence in the test results.

4.2.5 Perceptions of Compliance Costs and of GM Production Status

A potential additional cost of zero tolerance arises if compliance costs are perceived as being too high, whatever the actual position. That is, the risk of contamination is seen as too great given the difficulty or unwillingness of an importing party to find, negotiate or otherwise readily source supplies that are suitably low risk.

MAF reported in 2002 that certain seed multiplication contracts were lost as a result of New Zealand's zero tolerance policy: "One seed multiplication company had lost a client from the USA and another a $2 million contract to Chile because the overseas company was not satisfied that it could meet NZ's requirements".[46]

As these examples are drawn from a time when costs were perceived to be far greater than what some major seed importers are now forecasting them to be, it is possible the losses were significantly influenced by perceptions current at that time but now outdated. They may have also attracted a "political risk" weighting due to the repercussions of the "Corngate" affair that played out in the second half of 2002.

Nonetheless, it is quite likely that certain seed multiplication opportunities will be lost as a result of maintenance of zero tolerance, notwithstanding that the absence of something is notoriously difficult to measure and quantify. However, it is also quite likely that other seed multipliers will be attracted to New Zealand precisely because of its zero tolerance position. And not just seed multipliers. Seed research and development facilities have already begun to migrate to regions that provide good protection against GM contamination. As early as 2000, the world's largest corn seed company, Pioneer HiBred moved some of its seed production to non-GM producing European countries such as Austria, Romania and Hungary.[47] Pacific Seeds and Heinz Watties are among the companies that have also shifted some or all of their maize production to Australasia for purity reasons.

So while disadvantage is likely to result from compliance costs being perceived to be too high, there are offsetting benefits from such perceptions and it is difficult to provide any meaningful estimate of overall balance.

---

44 MAF, Border Control for GM Seeds: Questions and Answers 1 August 2002, p. 3

45 Ibid, p. 5

46 MAF, Border Control for GM Seeds: Questions and Answers 1 August 2002, p. 10

47 The Times, UK (29.5.2000) "Firms move to avoid risk of contamination".

4.3 Benefits of a Tolerance Standard

4.3.1 Scope of Benefits

Tolerance levels provide a margin for error with respect to low levels of contamination. They offer the party suffering contamination the potential to derive gains from being able to avoid a biosecurity incident, as they would not be legally required to notify government of a contamination incident if the level is detectable but below the threshold. The owner of the seed or plants could seek a market for the product in the normal way, and thus not be required to trace and re-export seed or denature or destroy contaminated crops.

This has the potential to produce benefits on a number of fronts. These include avoidance of: lost management time involved in tracing and complying with biosecurity requirements, negative publicity, additional costs associated with re-exporting seed and attempting to meet customer orders from other sources or devalued or destroyed crops. (The extent to which the affected party does currently or should meet such costs is discussed fully in Section 5.)

4.3.2 Benefits are Contingent on Lower Standards Elsewhere

A key observation however is that these are all contingent benefits. This margin for error will only be of advantage to producers that are supplying more tolerant markets. That is, the market for the product must have an allowance for contamination that is greater than or equal to the tolerance level that would be set in New Zealand.

The prospect that the target market will have a stricter standard but fail to test or pick up on the contamination is a slight one given the low cost and routine nature of testing.[48] Thus if a product passes tests during production but is picked up later in a destination market, a tolerance standard would have been of no benefit. It would actually be a much worse result as it would involve product rejection by the end purchaser and a drop in confidence of the producer's ability to meet the customer's requirement. This is why those supplying GM sensitive markets generally conduct multiple stages of testing so any contaminated product is picked up as early as possible.

As discussed in Section 2, it is effectively the maize and sweetcorn sectors that need to be considered in the context of any significant financial advantages.

With respect to sweetcorn production, there are virtually no benefits available from tolerance limits. The great bulk of the production is grown for export to GM sensitive markets, Japan and Australia. Japan takes by far the greater share and its purchaser standards are uniformly zero tolerance. If tolerance standards were introduced, exporters believe this alone would lead to immediate buyer demands for even stricter assurance procedures. As there is no scope for overall benefits from tolerance, the only opportunity would be distributional gains arising from the seeds being cleared as uncontaminated but the grower or processor later suffering detection.

[48] The "Starlink" contamination incident in the US (where GM maize approved for livestock, but not human consumption entered the food chain) is a dramatic example of how an inexpensive DNA test can have a devastating effect right through the supply chain. At the time that the Starlink corn entered the direct human food chain, it accounted for less than 1% of US corn production, yet it resulted in "one of the most expensive mistakes in US food history", requiring hundreds of millions of dollars in product recalls and harvest buybacks. In the end, a $500 test resulted in losses to Aventis in excess of US$500 million.

As noted in Section 4.1, it is harder to determine what proportion of the market for New Zealand maize products requires a GM Free standard. We take as a reliable indication, the previously quoted statement of Federated Farmers Maize Growers spokesman, Colin MacKinnon, that the majority of the maize for grain industry supplies buyers requiring an absence of GM contamination.

Even if a majority of the maize for silage production does not require zero tolerance, as noted above, the standards demand by buyers must still be more lenient than any newly established New Zealand tolerance standard for benefits to arise. We are not aware of information providing details of the breakdown of target markets and buyer requirements and without this an analysis can not be offered on this point.

However, the availability of maize seed under the Gateway programme sets up new choices for maize producers. Given that it will provide seed that is extremely unlikely to contain any form of contamination and will be available at prices comparable to other seed sources, the ability to grow product that can at least in part be sold into GM sensitive markets could well be attractive. It would allow one source of seed to cater to all markets and as GM sensitive markets tend to be higher value, sales could be targeted there and the residual sold to less sensitive markets. Under such a strategy, tolerance limits would not have obvious benefits for growers and processors, providing agronomic performance of the Gateway seed was suitable.

4.3.3 Distribution of Benefits Favours Importers

Even if producers growing maize for silage selected other imported seed, it is useful to explore where the potential benefits are likely to fall in the supply chain. If GM contamination is detected at the border or in the seeds before sale, then absent any other understandings, any losses would fall to the importer. Once planted, responsibility will tend to rest with the growers and processors until such time as the product is exported, consumed domestically or processed into a form that makes the GMO inviable.

If a maize grower or processor is producing to a market that is not GM sensitive, a combination of the border clearance for the seed plus New Zealand's status as a country with no commercial GM production may well be enough for the purchaser and thus no further testing would be required. In those circumstances, it seems very unlikely that tolerance limits would provide any additional benefit.

It is the seed importer that is exposed to the border clearance test and it is this agent that would appear to be the only significant beneficiary of a zero tolerance standard. Crop and Food identify just three companies as the source of virtually all maize seed for sowing.[49] These are: Genetic Technologies, Corson Grain and Pacific Seeds. Of these, just Genetic Technologies and Corson Grain would appear to be likely beneficiaries.

In an interview with Rural News, Corson Grain managing director, John Corson, advocated a tolerance limit following the detection of 0.05% contamination in the crop subject to a MAF biosecurity response in May and stated this response was an "overreaction that should never have happened".[50] Corson added:

> "A tolerance limit of contamination set at less than l% would be reasonable."

---

49 *Zea mays Breeding in New Zealand: Analysis of the probability of perpetuating transgenes in breeding material,* Allan K. Hardacre, Crop and Food Institute, May 2004, p 10.

50 *More GM Breaches Likely*, Rural News, 14 Huly 2004, p 7, http://www.ruralnews.co.nz/article.asp?channelid=34&articleid=6649

…
"We can't go on like this because it's only going to happen time and time again."

What the analysis suggests is that rather than continued contamination being inevitable, there will increasingly be opportunities for seed suppliers to demonstrate points of difference based on the ability to limit exposure to contamination that they and their clients could suffer. The point of difference will be primarily between those companies that upgrade their quality assurance procedures and those that do not.

Were the zero tolerance standard to be relaxed, the main beneficiaries would be companies that did not innovate and invest to provide enhanced customer protection. There is no gain in national economic terms from protecting importers that may otherwise suffer a decline in market share.

4.3.4 Quality assurance costs remain

Some line item costs associated with zero tolerance – such as quality assurance – will not be altered greatly if a tolerance policy is introduced. Thresholds will need to be as vigorously policed as zero tolerance for New Zealand regulatory requirements to remain credible and authoritative. Similarly, producers supplying export markets will still be required to meet standards that will be monitored and enforced at other borders.

Quality assurance systems and their associated costs are therefore a constant under any standard. Any cost differential between zero tolerance and a tolerance standard for routine testing of product will be small.

4.3.5 Contamination below the technical limits of detectability

The officially accepted level of reliable detectability is 0.1%.[51] Below 0.1%, the presence of GM material is detectable, but the level of confidence in the test results is lower. Repetition of tests may not always return the same results at levels below 0.1%.

Introducing tolerance levels is one way of covering for low levels of confidence in positive test results, particularly if subsequent testing does not detect the presence of GM material. However, while this may resolve uncertainty at the border, it does not reduce exposures when products go to market. Contamination well below 0.1% has been detected by buyers of New Zealand produce (the Sunrise Coast case). At least in the case of uncertain test results, it is not necessary to abandon zero tolerance to achieve greater procedural and evidential clarity. This can be achieved by developing clear procedures, as discussed in more detail in section 5.6.

4.4 Costs of a Tolerance Standard

4.4.1 Loss of market access

Permitting levels of contamination in the maize supply chain raises the risk of loss of market access for a significant portion of the maize for grain industry. This may not immediately follow Government's adoption of GM tolerance levels, but some maize industry leaders consider this would be a likely to result with respect to maize for grain once buyers reclassify New Zealand as

[51] For example, European Commission Scientific Committee on Plants, 2001.

exposed to routine product contamination (see Section 4.1). Loss of market access for sweetcorn exports is also a risk.

Market sensitivity to trace contamination is largely responsible for Canadian wheat growers persistent opposition to the introduction of GM wheat into the Canadian supply chain. The Canadian Wheat Board, which holds more than 20 per cent of the international market in wheat and barley, has found that even the threat of GM contamination would see many buyers go to non-GM wheat producing countries to eliminate the risk.[52]

Across the Tasman, the Australian Wheat Board is similarly opposed to the cultivation of GM canola on the grounds that at least 50% of its sales go to buyers with zero-tolerance, and markets would be lost if GM content of 'any form and at any level' was present in its shipments:

> "The introduction of GM canola makes a lot of our customers concerned and nervous about contamination – because it is any GM product. Effectively, what they want is a zero tolerance of GM product contamination."[53]

The AWB notes that if all major producers go GM, then consumers may be forced to accept trace contamination. As this is not the case, market access may be forfeited, and won by non-traditional exporters gaining market share.[54]

The Australian Barley Board objected to GM canola being released on similar grounds. The concern is that even though the canola would not cross-pollinate, the inability to reliably segregate the various grains through harvesting, transport, storage and shipment would result in contamination.[55]

A very high level of sensitivity applies to New Zealand sweetcorn as the dominant market is Japanese supermarkets. Their standard is an absolute zero tolerance and they back this with extensive quality control requirements for suppliers. As one exporter described their attitude to GM contamination: "They can't hide it and it can destroy their business".

Even if a single, isolated case of contamination did not lead to a loss of contracts, the minimum response the sweetcorn industry would expect to result from a relaxation of the zero tolerance standard would be a major rise in quality assurance costs.[56] One producer expected there would be a requirement to test each product line and that this could well result in a five-fold increase in quality assurance costs.

4.4.2 Damage to Country Brand

Government policy on adventitious presence – whether maintaining tolerance levels at zero or allowing levels of contamination – involves managing a common asset, Brand New Zealand.

---

52 Canadian Wheat Board, March 20 2003, "Current State of Market Acceptance and Non-acceptance of GM Wheat".

53 South Australian Parliament Select Committee on Genetically Modified Organisms, Final Report, July 2003, p. 58.

54 Ibid, p. 55.

55 Australian Barley Board, November 2002, "Our world markets don't want GMO", Chairman's Newsletter.

56 There have been four known incidents of suspected or actual GM contamination in New Zealand since 2000. These do not appear to have inflicted harm but this may be attributable to the zero tolerance policy and its explicit commitment to eliminate GM contaminants as they are discovered in the New Zealand supply chain.

The New Zealand country brand could suffer damage through the introduction of a tolerance standard. Allowing for some producers to grow GM contaminated maize and sweetcorn undermines the integrity of the New Zealand food supply chain and in turn the country brand that New Zealand growers and exporters have invested substantially in over time.

The extent to which the brand value would be degraded would be difficult to precisely measure. However, attempts to gauge consumer reactions to New Zealand permitting the growing of GMOs (as deliberate crops rather than as trace contamination) give an indication of the potential for shifts in consumer sentiment based on rather limited changes. Market research undertaken for Government as a part of its assessment of the potential economic impacts of a GM release yielded the following findings:[57]

- "Between 20% to 30% [of consumers in major export markets] state they would cease purchasing New Zealand commodities if New Zealand released GMOs".
- 47% would be "more inclined" to purchase New Zealand products if no GMOs were released in New Zealand compared to just 2% that would be "less inclined" to purchase.

Whatever the limitations of the above results, they clearly indicate that a significant fraction of consumers in the UK, US and Australia (those surveyed) see GM food in terms broader than the individual commodity they may be buying. It has a distinct negative impact on Brand New Zealand – only the degree of this effect is in question. As Jonathan Dodd, Research and Marketing Manager for Research Solutions concluded:

> "Most New Zealand exporters stand to be negatively affected if New Zealand becomes known as a GM-using country, and this includes many of the New Zealand's fastest-growing 'glamour' brands such as Orca, Icebreaker, and Karen Walker, as well as established stalwarts such as Canterbury, MacPac, Air NZ and the All Blacks
>
> …
>
> If New Zealand becomes a recognized user of GM technology, then the brand equity of "New Zealand" will be degraded, creating problems of varying degrees for a wide variety of local brands and exporters."[58]

Canada is a country with direct experience of negative impacts from GM agriculture. The Canadian Government is privately very concerned about the impact of GM production on export markets and damage to "Brand Canada". While the commercial plantings of GM crops have not been anywhere near as extensive as in the US, it has significant GM production. A declassified paper prepared in March 2003 by the Department of Agriculture and Agri-Food states:[59]

> Consumers are becoming more worried that they can't distinguish between GE and non-GE products.
>
> …
>
> These concerns could precipitate a loss of confidence in the integrity of the Canadian food system, which could be very disruptive to the domestic system as well as Canada's ability to export to demanding markets.

The Canadian paper details in particular the problems Canada faces exporting non-GM canola.

> The production of GE canola is currently adversely affecting the value of non-GE canola in some markets. The EU is effectively closed to all Canadian commodity canola.

---

57 Economic Risks and Opportunities from the Release of Genetically Modified Organisms in New Zealand, Ministry for the Environment, April 2003, p 26. http://www.mfe.govt.nz/publications/organisms/economic-impact-apr03/

58 GM allowance to hurt the "New Zealand" brand?, Jonathan Dodd, National Business Review, October 2003

59 Canadians Contradict Government Assurances on GM, Sustainability Council media statement, October 6 2003.

Again, the above concerns relate to the intended commercial production of GM crops rather than tolerance for contamination. But the key concern is contamination of non-GM production by GM material – the same fundamental issue that tolerance limits raise. Equally, what the Canadians see at sake - "a loss of confidence in the integrity of the [the nation's] food system" - is the same ultimate threat.

4.4.3 The Relevance of Compounding Contamination

There is some debate as to whether once permitted, contamination levels can be maintained within the official limits. Compounding contamination would most likely be a function of outcrossing in the field by (1) contaminant GM varieties cleared under tolerance levels, or (2) by so-called volunteer plants persisting from earlier seasons, either in the field or on field borders. Crop and Food has recently advised Government that adventitious GM maize plants do not persist or multiply in New Zealand maize production systems. This is due, it concludes, to a low probability of a GM plant outcrossing with a neighbouring field of conventional maize, and because the entire germplasm base is renewed each year.[60]

The extent to which a GMO is able to persist is an important matter to address when considering potential environmental impacts but it is not necessary to resolve this question for the purpose of determining whether to retain zero tolerance. This is because economic harm is not contingent on contaminated seeds carrying through and multiplying in subsequent seasons. A single production season in which hundreds, or even thousands, of GM maize plants are tolerated in the supply chain (that is, not simply in the field, but also in harvesting, storage, and processing) is sufficient to increase the level of exposure that the production chain is subject to.

4.4.4 Pre-empting Coexistence

Coexistence – the idea that GM and non-GM food production can be conducted side-by-side – is central to Government's "preserving opportunities while proceeding with caution" approach to GM technologies.

Conditional release is the cornerstone of Government's coexistence strategy and provides for controls to be placed on GM releases. While the nature of the controls to be imposed is left to ERMA's discretion, roughly half the control options specified in section 38D of HSNO are designed to limit the spread of GM material.

> **38D Controls**
> (1) The controls that the Authority may impose on a conditional release approval include:
> (a) controlling the extent and purposes for which organisms could be used
> […]
> (c) imposing any obligation to comply with relevant codes of practice or standards (for example to meet certain co-existence requirements)
> […]
> (e) limiting the dissemination or persistence of the organism or its genetic material in the environment
> […]

[60] Crop and Food Confidential Report: *Zea mays* breeding in New Zealand: Analysis of the probability of perpetuating transgenes in breeding material. Allan K. Hardacre, May 2004, Executive Summary, p. 2. See also Chapter 5, for further discussion.

> (g) limiting the proximity of the organism to other organisms, including those that could be at risk from the conditionally released organism
> […]

Coexistence would thus be achieved by applying spatial and temporal controls on GM plants to limit or prevent their migration beyond the site of release as well as in the supply chain. Government recognised from the outset that contamination is the key risk to successful coexistence:

> "The main problem with coexistence to date relates to the unintended presence (either illegal or unwanted) of GM material in products that are supposed to be non-GM. This particularly arises in the plant products."[61]

Also recognised by Government is that coexistence strategies are not limited to the field, but involve the entire supply chain. A "whole of production chain" approach is required to address any identified concerns from seed production and follow-up paddock management to post-harvest handling, management, and distribution".[62] Thus far, segregation systems that would prevent GM contamination from spreading under commercial cropping conditions have not been demonstrated. The technical/economic limitations of segregation systems are a further reason that global grain traders such as the Australian and Canadian wheat industries have opposed the introduction of GM wheat.[63] "Whole of production chain" coexistence strategies for the New Zealand have yet to be identified or considered.

Agreeing to tolerate levels of GM seed in their hundreds or thousands before coexistence has been seriously developed would severely compromise the policy and Government's commitment to look after the interests of non-GM producers.[64]

Consider that around 750 million maize and sweetcorn seeds are imported into New Zealand annually.[65] On the basis of this figure, up to 7.5 million GM maize and sweetcorn plants could be allowed to grow uncontrolled in New Zealand if a tolerance level of 1% (as proposed by certain industry bodies) were introduced.[66] Even at the level of 0.3% currently proposed for maize seed by the European Commission, this could mean up to 2.25 million GM maize and sweetcorn plants could "knowingly" be grown in New Zealand every year without controls being in place.

Ultimately, coexistence and tolerating random contamination are in direct conflict. As MAF informed the Royal Commission: "If standards demand zero tolerance for accidental GM contamination, then coexistence may not be possible"[67]. While MAF's advice was originally framed around the compatibility of organic and GM production, the relevance of this assessment to the food industry producing for zero-tolerant markets (conventional as well as organic) is apparent.

---

61 Cabinet Policy Committee: Government Response to the Royal Commission on Genetic Modification: Report on Managing the effects of GM organisms and coexistence in primary production – Paper 1: Overview, p 5.

62 Hon Jim Sutton Co-existence papers released, Media Release17 April 2003; Cabinet Policy Committee: Government Response to the Royal Commission on Genetic Modification: Report on Managing the effects of GM organisms and coexistence in primary production – Paper 1: Overview, p 6.

63 Australian Wheat Board (March 22 2004) Letter to Hon Bob Cameron, Minister of Agriculture, Victoria.

64 The European Parliament has similarly advised the European Commission that the development of rules and principles of coexistence must precede the consideration and potential adoption of tolerance levels.

65 MAF, Additional questions about genetically modified (GM) maize inadvertently grown by Pacific Seeds, October 2 2002

66 Border Control for GM seeds: Questions and Answers 1 August 2002, p. 5

67 Royal Commission on Genetic Modification, Report (2001), p. 171.

4.4.5 Encouraging Free-riders

If Government is convinced upon analysis that the industry overall seeks zero tolerance, but government is still concerned about the level of costs it may incur, a tolerance threshold is not the answer. As Heinz Watties notes, this would simply invite free riders:

> "The implications of unauthorized GM seeds entering NZ are potentially catastrophic for the industry. Relying purely on voluntary industry compliance is not sufficient protection for the industry. The large growers and companies servicing export markets such as Europe, Japan and SE Asia are likely to comply, but the access to market could be destroyed by small parties with nothing to lose who didn't comply"[68].

The appropriate response in this case is to maintain zero tolerance and address the question of when compensation payments should be made, as discussed in Section 5.4.

4.4.6 Wrong Time to Relax Standards

A final overarching argument is that this is the wrong time in the product development cycle to be considering a relaxation in standards. The GM crops currently on the market (known as "first generation" varieties) continue to face difficulties gaining regulatory approval around the world and their eventual acceptance in markets important to New Zealand can not be assumed on current trends. The withdrawal of GM wheat from regulatory consideration may mark a high tide for first generation applications. Opening New Zealand to first generation GM crops may take away the option to later market product from new technologies as being uncompromised by first generation GM varieties. Instead of considering lowering standards, there is a case to be made for strengthening the zero tolerance policy by expanding the scope of GM materials tested to anticipate new biopharming products that make use of food plants, as discussed in Section 5.6.

4.5 The Balance of Advantage

To recap on the foregoing discussion:

- The problem at this time is one of how to respond to potential GM contamination of imported maize and sweetcorn seed.

- The degree of risk posed is heavily influenced by the choices made by the importing party - in selecting the seed source and the quality assurance programme the supplier uses.

- Some importers find benefits from seed lines developed in countries that represent higher risk sources of supply and there are a number of means of obtaining the benefits of these seed lines. Some result in extremely low risk of GM contamination costs and are sufficiently cost competitive to have already been voluntarily adopted for use in supplying New Zealand.

- Benefits from relaxing zero tolerance are contingent on target markets having an allowance for contamination that is greater than or equal to the tolerance level that would be set in New Zealand.

[68] Heinz Watties, Submission to MAF Discussion Paper 31: Border Control for GM Seeds, 2002.

- An important cost of allowing tolerance limits is the diffuse and less easily quantified costs of degradation of New Zealand's reputation as a source of GM free food products, an impact that has consequences for market access and grower returns into the future.

Given the availability of commercially viable means of accessing a chosen cultivar under a quality assurance programme capable of reducing to an extremely low level the risk of GM contamination costs, there is a clear prima facie case for rejecting a tolerance standard. While quality assurance programmes do add extra costs, these would appear to be relatively small in comparison to the costs that could result from reduced marketability due to any persistent contamination of crops.

Perhaps more importantly, while any benefits of allowing a tolerance standard are likely to be gained only by certain maize seed importers (and possibly also a proportion of maize growers), the costs of routine GM contamination could impact on all other New Zealand food producers, to various extents. It would first impact through requirements for stricter assurance measures for at least some producers due to New Zealand no longer being perceived as an area free of GMOs. More difficult to predict, but potentially much more significant in its impact is the influence this could have on the decisions of overseas purchasers based on perceptions of Brand New Zealand.

Many of the costs and benefits identified in this section are difficult to measure. However, the above analysis suggests that rather than attempting to better quantify the costs and benefits of zero tolerance versus a contamination threshold, analysis and policy development is better focused on how to minimise the risk of costs arising under a zero tolerance policy.

This conclusion and the development of improved quality assurance systems are in line with MAF's outlook in 2002:

> "The systems to separate GM and non-GM crops are likely to improve, driven both by commercial pressures and demands from governments for assurances. It is very likely that there will continue to be incidents like this one, where GM seeds are present unintentionally. But with appropriate actions and ongoing assurance systems, it should be possible to keep them isolated. There is always a chance that low concentrations of GM seeds may not be detected, but most of the time they will be detected by the assurance systems that are in place."[69]

4.6 Contrary Conclusion from Crop and Food Institute

Following discovery of GM contamination in maize seed earlier this year, MAF contracted Allan Hardacre of the Crop and Food Institute to prepare a report to assist it. "*Zea mays* Breeding in New Zealand" [70] (the report) also focuses its findings on the question of a tolerance limit but draws the opposite conclusion to this paper. As the report advances strong conclusions and these have gained some currency, this section critiques it separately.

The terms of reference for the engagement are not provided in the report so it is unclear what brief the report was to address. However, its key finding is set out as the concluding paragraph to the executive summary:

> "Unless New Zealand is prepared to consider either tolerance levels or the banning of all imports of *Zea mays* seed for sowing, costly incursion responses will continue to be required."

---

69 MAF, Additional questions about genetically modified (GM) maize inadvertently grown by Pacific Seeds, October 2 2002

70 *Zea mays Breeding in New Zealand: Analysis of the probability of perpetuating transgenes in breeding material,* Allan K. Hardacre, Crop and Food Institute, May 2004.

The report thus paints the canvas in stark alternatives, with the option that is not favoured being framed in extreme terms. There is no deductive trail to this conclusion. Rather, it emerges without prior scoping of either option. Nor is this conclusion restated or explored in the main text.

The line of thinking presented in the report can be summarised in essence as follows:[71]

1. "Almost all the maize germplasm used in NZ is sourced" from the US.
2. "It may not be possible to prevent transgenes from reaching NZ in inbred or hybrid seed imported from the US".
3. Maize is extremely unlikely to establish self-sustaining populations, and cross pollination is very rare.
4. The accuracy of tests designed to detect GM materials is limited at very low levels of contamination and can easily give errors.
5. The options are to ban the import of maize seed or allow tolerance levels.

The non-specialist could easily be forgiven for reading the report and taking away the simple idea that unless tolerance levels are introduced, major cleanup costs will frequently be incurred if New Zealand continues sourcing seed developed in the US.

The report repeatedly makes reference only to what is current practice. It makes no attempt to examine new options rational agents (industry and/or government) might utilise in the face of a significant source of risk. In particular, it does not explore at all ways in which quality assurance procedures could be improved, or incentive structures altered, even if they were to be rejected.

If the same overall approach was taken to the advent of aircraft hijacking, the conclusion would be: "Either we ban commercial flights or else we accept that we can not detect every knife, gun and grenade and put in place tolerance limits for metal objects we can not identify". The options of getting better x-ray machines, searching bags, using handheld metal detectors, and profiling passengers would not be presented.

While the report addresses certain individual questions germane to the issue of whether or not to abandon zero tolerance, there is insufficient analysis of the two options it presents to support its conclusion.

[71] The paper covers considerably wider ground than that identified below. However, the intention here is to draw out the propositions that are key to the flow of the paper's line of argument, as are identified in much the same way by the author in the executive summary.

5. Improving the Zero Tolerance Standard

5.1 Incentives and Cost Distribution

If a zero tolerance policy is to be maintained, the current review will wish to examine:

a) The incentives for importing parties to make wise selections as to how seeds are sourced and in particular;
b) The distribution of costs arising from any contamination event.

The importing party makes the key choices that affect the degree of risk of contamination. If the maize and sweetcorn supply chain is to maintain unrestricted access to seed lines from any source, irrespective of the level of risk associated with a particular country of origin, then any costs arising from the presence of GM contamination should be picked up by risk-taking party or parties in the first instance.

For seed companies and producers that seek to utilise higher risk seed sources, there can be a tradeoff between the additional benefits of a particular seed technology versus the potential costs of GM contamination. Improved agronomic performance and/or product quality are the benefits and these are clearly private. They may be distributed variously among the parties in the supply chain, from the seed importers, through to farmers and food processors.

Internalising any contamination costs will incentivise the importer to make appropriate tradeoffs in terms of the source of seed and the quality control practices they require. Otherwise benefits will be privately captured and losses socialised, severely distorting the risk equation for the decision-maker.

As described above, placing these costs with the importer should not impose undue costs on those obtaining maize and sweetcorn seed from particular countries. Importers have a range of options for managing the risks while still securing the benefits of premium seed lines from higher risk sources.

5.2 Current Compensation Arrangements

Key to the setting of incentives are sound liability and compensation arrangements. Currently, these are not well specified and need to be addressed as a part of the review and MAF's ongoing development of HSNO related biosecurity policy.

Under the original framing of HSNO, it was implicit that those who import any unapproved GM plant material would bear the costs of its removal. Section 109 (1) (d) is breached if a party "knowingly" imports or "possesses or disposes of any hazardous substance or new organism imported, manufactured, developed, or released in contravention of this Act".

At the point it is known that an unauthorised release has occurred, HSNO empowers an enforcement officer to serve a compliance notice. The powers available are very broad and include the ability to direct the party to undertake any cleanup required. Section 104 (1) states:

104. Scope of compliance order-

(1) A compliance order may be served on any person by an enforcement officer-

…

(b) Requiring that person to do something that, in the opinion of the enforcement officer, is necessary to ensure that person complies with this Act, … or is necessary to avoid, remedy, or mitigate any actual or likely adverse effects … .

No compensation provisions were specified in respect of such compliance orders (other than in emergencies) prior to October 2003 so those compelled to cleanup shouldered the costs involved.

However, as a part of the amendments to HSNO in 2003, MAF (rather than ERMA) gained a series of new enforcement powers. In particular, it was specified in a new section 97A that when acting in this capacity, in addition to the powers available under HSNO, MAF could use the powers it exercises under the Biosecurity Act for the removal of unwanted organisms.[72]

A key change this amendment opened up is access to compulsory compensation. Section 162A of the Biosecurity Act provides for compensation with respect to certain actions and states:

162A. Compensation—

(1) Where—

(a) Powers under this Act are exercised for the purpose of the management or eradication of any organism; and

(b)The exercise of those powers causes verifiable loss as a result of—

(i) The damage to or destruction of a person's property; or

(ii) Restrictions, imposed in accordance with Part 6 or Part 7, on the movement or disposal of a person's goods,—

that person is entitled to compensation for that loss.

(2) The compensation payable under this section must be of such an amount that the person to whom it is paid will be in no better or worse position than any person whose property or goods are not directly affected by the exercise of the powers.

While the wording of the HSNO amendment leaves some room for statutory interpretation, both MAF and independent legal advice obtained by the Sustainability Council concur that if MAF enforces a HSNO provision and this leads to loss for the affected parties, then it is reasonable to interpret that the section 162A compensation provisions will be available to them. There is apparently no option for MAF to exercise its powers under HSNO without also effectively invoking the Biosecurity Act.

---

[72] 97A **Enforcement of Act in respect of new organisms**

(1) The enforcement agency must ensure that the provisions of this Act are enforced in respect of new organisms.

(2) For the purpose of complying with subsection 1, the enforcement agency may appoint enforcement officers in accordance with this Act who may exercise all the powers under the Biosecurity Act 1993 that may be exercised in respect of an unwanted organism, and the provisions of that Act apply with all necessary modifications.

(3) A person who may exercise powers under the Biosecurity Act 1993 in respect of unwanted organisms may also exercise those powers under that Act in respect of new organisms whether or not the person is appointed as an enforcement officer under this Act.

(4) In this section, -

"**enforcement agency** means the chief executive of the department of State responsible for the administration of the Biosecurity Act 1993

"**unwanted organism** has the same meaning as in section 2(1) of the Biosecurity Act 1993.

In response to questions from the Sustainability Council on this point, MAF states:

> "MAF's view, therefore, is that section 162A will apply (with necessary modifications) whenever powers under either the Biosecurity Act or HSNO are exercised for that purpose of enforcing the new organisms provisions of HSNO - regardless of whether those powers are drawn from the Biosecurity Act or HSNO itself.
>
> Fundamentally, it makes no sense for compensation to be available if a MAF enforcement officer imposed requirements under a direction under the Biosecurity Act, but not if exactly the same requirements were imposed under a HSNO Act compliance order. Such an interpretation could well lead to challenges to an enforcement officer's decision-making (i.e., someone might argue that the reason an enforcement officer used a particular power was to avoid compensation liability, and that this was an irrelevant consideration in administrative law terms)."[73]

A similar general interpretation was provided in legal advice to the Sustainability Council:

> "If, in enforcing the HSNO Act in relation a new organism, MAF exercises a power which cause verifiable loss as a result of the damage to or destruction of a person's property or as a result of certain restrictions imposed on the movement or disposal of a person's goods, we consider that compensation is payable in equivalent terms to section 162A of the Biosecurity Act."[74]

State compensation will in certain circumstances prove to be the fairest outcome and/or one that achieves vital co-operation in avoiding and removing an unwanted organism. Thus there are excellent public policy grounds for a statute to provide the ability to compensate. However, compulsory compensation raises a completely different set of issues.

If compensation is compulsory, then payments will be due irrespective of the risks taken by any party in the sourcing of seeds. This markedly reduces the incentives for importing parties to protect against contamination, especially when in some cases private gains will be available as a tradeoff for taking such risks.

We note at this point that the Biosecurity Act provisions do limit the grounds for compensation such that it may not provide complete reimbursement with respect to GM maize contamination. MAF describes some of the conditions as follows:

> "For example, it only arises where the exercise of powers causes loss as a result of damage to property and certain kinds of movement restriction. It would not, therefore, compensate an individual for the losses directly attributable [to] the organism itself as such loss would not generally be the result of the 'exercise of powers'. Compensation is also unavailable to persons that have not complied with HSNO/Biosecurity Act where this failure to comply was serious or significant, or has contributed to the spread or presence of the relevant organism."[75]

With respect to contaminated seeds or crops in the ground however, the difficulty in separating out trace GM contaminants means that compensation will tend to paid on losses sustained with respect to the entire seed shipment or crop as a result of MAF exercising its powers.[76] This may not involve destruction of seeds or crops but will tend to cover the full costs incurred in rerouting or disposing of the products to other markets for example. MAF's duty under the act to ensure that the party "will be in no better or worse position than any person whose property or goods are not directly affected" provides a clear basis for affected parties to argue for at least near complete

---

73 Dave Harrison, MAF Legal Services to Sustainability Council, 2 July 2004.

74 Jamie Ferguson, Kahui Legal, Advice to Sustainability Council of 8 July 2004.

75 Dave Harrison, MAF Legal Services to Sustainability Council, 2 July 2004.

76 Jamie Ferguson, Kahui Legal, Advice to Sustainability Council of 8 July 2004.

compensation. Negotiations in progress at the time of writing (to establish compensation payments for the most recent incident) should provide a good guide to how the provisions will be interpreted in practice.[77]

5.3 Origins of the Law Change

The new compensation arrangements were formulated in July 2003, after a bill making a series of other amendments to HSNO had already been introduced to Parliament.

The genesis for the change appears to have been MAF's wish to be able to access Biosecurity Act powers in order to perform the HSNO enforcement it was being asked to take on.

> "MAF has hundreds of inspectors spread throughout the country, and also has access to hundreds of authorised persons specifically trained for incursion response activities. By having access to Biosecurity Act powers for new organisms enforcement, MAF can make use of this significant resource of people that are trained and experienced in incursion response. **This was one of the main reasons that MAF wanted access to Biosecurity Act powers** for new organisms enforcement, in combination with the fact that Biosecurity Act powers are specifically tailored for incursion response activities."[78] [Emphasis added]

While the NOOM Bill amending HSNO made clear provision for MAF to be the agent responsible for enforcing the law relating to all new organisms (including GMOs), officials informed the Cabinet in July that the bill did not clearly specify whether the Biosecurity Act compensation provisions would apply "for enforcement actions for all new organisms".

The proposal advanced to Cabinet Policy Committee to address this question placed emphasis on consistency in arguing for compensation to be paid when MAF is responding to GM contamination incidents.

> "Officials consider that unauthorised new organisms (including but not limited to GMOs) pose a potential for national risk of sufficient magnitude that it justifies the Crown bearing the fiscal risk of compensation in order to encourage voluntary disclosure and co-operation in this area. The monetary costs that would be incurred through compensation payments are likely to be lower than the potentially large costs of direct or indirect damage to industry that could be caused by some new organisms.
>
> ...
>
> Officials conclude that, in line with key principles of consistency, clarity, equity, and natural justice, the compensation provisions of the Biosecurity Act should apply in all cases where Biosecurity Act power are used in response to unapproved new organisms in the same way as they apply to unwanted new organisms." [79]

Indeed, the financial risks are significant and in national economic terms, prevention and cleanup will be cheaper for GMOs than "the potentially large costs of direct or indirect damage to industry". It is also true that consistency is important in encouraging voluntary reporting and compliance. However, it is not at all clear that the Biosecurity Act provisions represent the best basis for comparison when determining what liability and compensation arrangements should prevail for GM contamination in seed imports. The analysis suggests that for seed imports, compliance can be

---

77 *Zero GM tolerance no good - Maf* , Waikato Times, 2 July 2004.

78 Dave Harrison, MAF Legal Services, to Sustainability Council, 2 July 2004.

79 *Legislative Changes for New Organisms – Additional matters arising from the decision to allow for conditional release, and to enable the use of Biosecurity Act powers*, Cabinet Policy Committee, 23 July 2003.

achieved without the Crown being exposed to the current degree. The sums at stake are sufficiently large that a finer cut on the general compensation provisions would therefore seem well worth the Government's investment to develop.

5.4 Principles for Policy Development

What the review brings into sharp focus is the need to consider explicitly the effect that different compensation arrangements have on incentives for compliance and maintaining standards. For the purpose of this paper, consideration will be confined to the issue of compensation for GM contamination in seed imports. However, the same question arises with respect to the Biosecurity Act generally and the need for such broader consideration as part of a separate wider review was noted by officials when proposing new liability provisions for HSNO in 2003:

> 36. If these options are adopted, longer-term consideration could be given to whether they should also be implemented in other related legislation such as the Biosecurity, Food and Medicine Acts, or extended to hazardous substances.[80]

There are two quite different stages at which incentive structures need to be considered:

- When a party is making decisions about what and how to import; and
- When a party detects GM content.

These need to be unbundled for analysis to enable design of an optimum integrated framework. To date, the design of incentive structures has focused on gaining co-operation at the point contamination is detected.

Incentivising parties to take care at the point decisions are being made about the source of seed (country, supplier, and QA practices used) is important to reduce the risk of contamination. Importers have considerable influence over the scale of risks adopted. For those that seek to utilise higher risk seed sources, the tradeoff is between the additional benefits of a particular cultivar versus the potential costs of GM contamination. Improved agronomic performance and/or product quality are the potential benefits and these are gains only to the purchaser and downstream buyers. In order to properly incentivise the risk-taking party to make good judgments about the overall value of utilising higher risk sources, any costs arising from these decisions must also lie with the importing party in the first instance.

Once those decisions have been taken and the seeds are on the water, the focus of the incentive structure then turns to early reporting. This minimises the costs of removing GMO contamination from at least the parts of the food supply chain that must deliver to markets demanding no GM content and the risk that an unapproved organism will cause harm to human health or the environment.

There are significant pre-existing incentives to declare with respect to GM contamination. These are partly a function of the small number of importing parties (three for maize seed) in a market demonstrating competitive forces. It is also a function of the degree to which routine testing for the presence of GM content has been taken up by major food buyers, to the point that it is near-universal in countries such Japan and England. Thus the risks to loss of reputation (and hence market share) from a failure to declare are high and the chances of this being discovered and traced back are greater than for non-GM new organisms due to the reduced number of points in the supply chain that entry can feasibly occur.

---

80 *Cabinet paper of Feb 03*, Government Response to the Royal Commission on Genetic Modification: Legislative changes for New Organisms – Paper 5: Liability Issues for GM

A key mechanism for incentive setting is risk allocation and hence cost distribution. Optimal cost distribution is facilitated by de-coupling the desired standard (zero tolerance) from liability and compensation arrangements. The standard remains invariant and compensation is paid on the basis of evidence of having taken due care. Liability attends where due care has not been taken, or there is a failure to declare.

The required result is a single incentives structure that encourages and defines good practices up front and puts a safety net under those that follow these, while setting a strong testing and liability regime for those that do not.

Government would define so called "safe harbour" practices that if followed, would entitle an affected party to compensation. This would tend to focus on quality assurance practices and the Pacific Seeds *Gateway* programme provides an example of one potential set of qualifying practices. This would provide a very low cost means for Government to build support for zero tolerance. However, the soundness of such measures (in terms of maintaining incentives and ensuring costs to the Crown are minimised) would depend crucially on the ability to adequately define appropriate qualifying practices and this is an area meriting research.

The flip side of safe harbour is a strong liability regime for those that do not follow what might be termed the "green line" in biosecurity parlance, and a stiff penalties regime for those that in addition fail to declare.

The importance of setting correct incentives is well recognised by Federated Farmers. In its submission on border control of GM seeds the federation stated:

> "The most cost effective way to ensure that GM seed is not imported is to rely on importer compliance and to provide sufficient incentive for importers to take care in ensuring GM free seed is imported
> …
> It is the threat of consequences that will bring a high level of compliance."[81]

Pacific Seed's experience provides further testimony as to why consideration of incentives is so important. When the company suffered a contamination incident in 2002, no compensation was payable and Government made clear that there was no prospect of this position changing in the near future. Faced with a $500,000 loss from that incident and the prospect of further such events, the company's declared response at the time was that it would cease importing maize seed from the US and would instead import maize seed from lines it had available in Australia that it was confident were free of GM contamination, although these did not offer the same advantages.[82]

Ultimately, the company sought out less risky paths to providing US varieties to the New Zealand market. Its strategy was to adopt the system of leaf-testing new cultivars and breeding from these individually checked plants. Had Government elected to provide compensation following the 2002 incident, there would not have been the same incentive for a company to have developed such procedures.

---

81 Federated Farmers Submission to MAF Biosecurity on the discussion paper, Border Control for Genetically Modified Seeds. June 28 2002.

82 Pacific Seeds, 3 October 2002, in answer to questions at media conference called to announce confirmation of the GM contamination.

5.5 Liability and Other Parties in the Supply Chain

If seed importers were liable for costs arising from GM contamination of seed stocks not brought in under safe harbour practices, the follow-on question is: how would this affect the rest of the supply chain? The answer in essence is that this will depend on the nature of contracts between seed importers and farmers. There are three broad possibilities for handling the residual liability:

> **1. The risk is passed entirely to those growing and processing the seeds.** The seed importer takes the position that it is simply accessing seeds on behalf of growers and as they will reap the gains from any better seeds obtained from higher risk sources, they should carry the downside risks and any costs of contamination.
>
> **2. The risks remain entirely with the seed importer.** The growers and processors take the view that the seed importer is in the best position to assess the risks and benefits. They are the ones with the knowledge of the market and the ability to negotiate. The importer can price the seeds to provide for the risk of having to pay for contamination costs. This would then allow the grower to directly compare any higher price with any expected benefits over and above seed that can be obtained from lower risk sources.
>
> **3. The risks are shared.** Some intermediate position is established between the two points outlined above.

In the presence of a price competitive option for sourcing premium seed varieties under which the risk of GM contamination costs is reduced to very low levels, this will foster contracts under which the seed importer takes the risk. Imports sourced through the practices such as those Pacific Seeds has developed should be able to be priced such that the importer carries the full risk and yet does not require any significant margin to cover possible contamination. In order to maintain market share, importers taking product from higher risk sources will tend to match these conditions.

A device that will assist seed importers and others in the supply chain to better negotiate and then specify who takes the risk at each stage is a model contract. This would cover the key issues and would leave spaces for the parties to specify their own parameters as regards who bears risk and to what extent. Such a model contract can be kept relatively simple and written in plain English.

A key concept for such an agreement would be that: The seed is sold on condition that should GM contamination be detected in the seed or the resulting plant or processed product, (party X) bears responsibility for any losses that are incurred as a result of compliance with New Zealand law governing unapproved new organisms, up to a value of ($Y).

Were Government to resource the development of such a model contract in co-operation with all major stakeholder parties, it could then be placed on public websites for ready access by contracting parties.

5.6 Improving the Border Testing Policy

Many food producers conduct extensive testing at multiple points in the supply chain to ensure that no GM material is present. Nonetheless, mandatory border testing is designed to provide an independent check. The standard should therefore provide for a high degree of scrutiny and adjustments to the testing programme are recommended to strengthen enforcement of the zero tolerance standard.

Currently, the mandatory testing protocol for *Zea mays* is targeted to achieve a 95% level of confidence of detecting GM seeds at a concentration of 0.1% or more, based on a single set of tests from a sample size of 3,200 seeds.

In developing the protocols for border control for GM maize in 2002, MAF considered increasing the seed sample size to 10,000 to achieve a 99% level of confidence in detecting GM seeds at a concentration of 0.1%, but rejected this on the grounds that there was, all things considered, little upgrade: "Our technical/scientific advice is that 99% confidence is not realistic in practice, when all the uncertainties from sampling, handling, and analysis are taken into account."[83]

This debate aside for the moment, MAF notes that an increased sample size would allow for lower levels of concentration to be detected: "A larger sample size will increase the chances of detecting lower concentrations".[84]

This greater detectability is a significant and distinct advantage for enforcing a zero tolerance policy. Given that MAF's testing protocol is the sole mandatory measure for enforcing the zero tolerance policy, the added sensitivity would appear to recommend itself. This is particularly the case given that the market is testing for and reacting to levels of contamination well below 0.1%. The ability to detect lower levels of contamination may help to prevent uncertainties further down the line, after the seed has already entered the country, and the costs of recovery rise steeply. For maize and sweetcorn seed, the increased sample size would involve a negligible cost increase for the testing, in the form of extra freight.[85] A number of producers voluntarily test with sample sizes around 10,000 seeds and up to 50,000 in some instances.

Increased seed sample sizes are an economically viable option for maize and sweetcorn seed imported for commercially production. For new varieties imported to assess their potential for breeding, however, the increased sample size may prove too costly for the industry as the number of seeds imported for such purposes is vastly smaller than those imported for commercial cultivation. In this case, use of the current testing regime supplemented by the mandatory quality assurance programme recommended in 5.4, should be investigated.

A recently published review[86] of the potential sources of error in undertaking analysis for the presence of GM constructs concluded that as a result of the potential for error:

> "We suggest that 7,000 corn seeds per sample must be used to approximate the confidence level called for by European labelling laws, based on stage one error analysis alone."

The overall focus of the paper was on how test reliability could be improved by critically reviewing and provisioning against error at all stages. It presented the scope for inquiry as follows:

> "Polymerase chain reaction (PCR) is a crucial tool in monitoring movements of food and animal feed both between and within countries. PCR's reputation for amplifying DNA from very low initial concentrations in forensic police work has won it a place in environmental monitoring despite significant, under-appreciated differences in these two applications. Addressing these limitations requires a holistic analysis of the monitoring process.
>
> (i) Determining sample size and sampling technique.

83 MAF, Border Control for GM seeds: Questions and Answers, 1 August 2002, p. 6

84 Ibid

85 Personal communication with sweetcorn processing company, July 13 2004.

86 *Is confidence in the monitoring of GE foods justified?*, TRENDS in Biotechnology, Jack A. Heinemann, Ashley D. Sparrow, and Terje Traavik, May 2004.

> (ii) Determining the size and homogeneity of the sub-sample from which DNA is to be extracted for analysis.
> (iii) Determining the sensitivity, or resolution, of the PCR reaction.
> (iv) Evaluating the data presented to regulatory authorities. Poor or incomplete reporting can impair proper decision-making and review by authorities and scientific advisors
>
> Each of these stages contributes to 'sampling error', in other words, uncertainty of the extent to which any PCR result is representative of the tested material. Each of the first three stages … generates a theoretically quantifiable error. Overall uncertainty is a function of the error in each step and can be significantly larger than the single largest error of any single step in the process from material isolation to PCR result. The literature on this topic tends to discuss one or at most two stages of monitoring and neglects the error contributed by the other stages. The reason to consider the error holistically is to draw more responsible conclusions about the precision of the analysis."

A key recommendation with respect to errors in the forth stage identified above was that GMO producers and testing laboratories be required make all data available for independent scrutiny.[87].

As well as arguing for more tightly defined testing procedures, attention was also drawn in the above paper to the issue of the scope of constructs tested for.

> "Proper GEO [genetically engineered organism] monitoring must be as focused on detecting signs of unknown or undesirable organisms and genes as it is on monitoring known but prohibited commercial GEOs. Incomplete identification will more frequently result in pre-emptory rejection of imports at the border as countries increasingly take a precautionary stance."[88]

In consequence, the authors argue that:

> "It is incumbent on regulatory authorities to test for the unexpected in the food chain and thus be innovative in designing primers. In all cases, it is recommended that primers be designed for all known indicator sequences and that the primer pairs be used to amplify small fragments to reduce the likelihood of a recombination event having interrupted the expected DNA fragment. Ignoring these precautions could have serious implications for regulators who need to detect registered GEOs, but even more serious consequences could derive if contamination by unauthorised GEOs that result from cross-fertilisation, accident or with intent to evade detection, were overlooked."[89]

The same paper also proposes a standard for identifying approved GMOs suspected of causing contamination of food and rates the standards operable in New Zealand as of 2003 against this. Of the ten steps identified in the standard, in seven cases the authors placed question marks in the column that indicated whether or not New Zealand practices conformed to that proposed. Evaluating the merits of this recommended standard, and more precisely how New Zealand practices compare, would be a further very useful strand of investigation under the current policy review.

---

87 Also relating to stage four is an industry suggestion that the current protocol could be improved by more clearly defining where the line will be drawn following ambiguous test results. While the protocol outlines the procedures for retesting, clause 22 states "In cases where uncertainty cannot be resolved by further testing, MAF will make a judgement in consultation with other relevant agencies, including the Environmental Risk Management Authority, and appropriately qualified experts outside MAF".

88 Ibid

89 Ibid.

6. Potential Change and ERMA

The case for abandoning zero tolerance in favour of accepted levels of contamination is not apparent. On the contrary, more than ever, New Zealand's policy of zero tolerance sets the conditions in line with market demands New Zealand producers and exporters face.

However, if following consideration of the costs and benefits of zero tolerance, Government were to decide that introducing a tolerance level was the best option for the country, the next question of interest would be the scope of such a change and how these would be advanced.

With respect to scope, the risk to be addressed is not common to all seed imports, or even a minority. It primarily arises from maize and sweetcorn seed. MAF's current enforcement through targeted border testing implicitly sets aside the great bulk of seed imports as not posing a risk sufficient to merit a border testing policy. There are good grounds to believe that the very high levels of consumer resistance in many parts of the world will continue to pose major problems for GM seed developers to gain regulatory approvals. Thus, as there are negative economic consequences from abandoning the zero tolerance policy, and no difficulty in responding later if the sources of risk expand to require this, then any response should be limited to tolerance for maize and sweetcorn contamination.

With respect to means by which any change would be advanced, the main options before Government would be to change the law, or for tolerance levels to be determined by ERMA in response to an application for release. The following discusses these.

6.1 Change the Law

Amending the HSNO and Biosecurity Acts to introduce tolerance levels was a possibility considered by ERMA in 2000 when reviewing options put forward by the Royal Commission for addressing GM contamination.

Approving a tolerance level by way of a conditional release application was dismissed as an undesirable first case to launch the newly introduced category of conditional release:

> "This approach is tantamount to giving a positive approval to something which is adventitious and unwanted. The signals that would be given would be undesirable and probably unwelcome. It would also be seen as the green light for "back door" entry and would certainly require "Ministerial call-in" in terms of Recommendation 13.2. It would not be desirable to focus the first call-in on what is essentially a practical border surveillance matter."[90]

Instead, ERMA stated that its preferred approach was:

> "to modify the Biosecurity Act so that Import Health Standards can be properly used to set testing protocols, which if met, **allow seed imports to be deemed as not containing new organisms**. This means that the contaminant seed continues to be a new organism and must still have a HSNO approval if it is to be deliberately imported."[91] [Emphasis added]

---

90 ERMA Response on Royal Commission Report: 10.2: Dealing with inadvertent GMO contamination of seed imports.

91 Ibid

While ERMA was concerned that an application for tolerance levels might create negative publicity, sidestepping due process would seriously damage the regulatory regime. Green-lighting a procedure that would "knowingly" approve and then randomly distribute GMOs that had not at that time undergone the ERMA assessment process would undermine the integrity of the HSNO regime.

Full releases of GM food crops are not expected to even be applied for in New Zealand in the near future. Applications for conditional releases of GM food crops are more likely in the short-medium term, but controls to geographically confine the spread of the crops have been widely signaled by government as an expected condition ERMA would set.

Any approval of GM contaminants by law change would also raise a different set of issues: would tolerance levels allow for the presence of *any* GM varieties or would they be set only for specified GM varieties that have cleared human health regulatory requirements?

By way of example, 16 varieties of GM maize and corn have been approved for commercial production in the US[92], from which just under half of New Zealand maize seed imports are sourced. Currently, none of these are approved for environmental release in New Zealand, and only nine are approved for human consumption.[93] If tolerance levels were to be allowed for any GM contaminant, seven GM maize varieties that had not been subjected to any regulatory risk assessment by ERMA could be grown in the hundreds or tens of thousands in this country.

New generations of GMOs reaching commercialisation can be expected to sharpen questions about the scope of tolerance to GM contamination. For the time being, the range of GM varieties approved for cultivation in the US are restricted to herbicide-resistant and pest-resistant crops destined primarily for animal and/or human consumption. Yet experiments with GM corn and maize already at field trial stage include varieties for the production of industrial materials and pharmaceuticals. GM corn designed to produce an experimental pig vaccine has already been field trialed in Iowa.[94] The US National Research Council notes that such GMOs constitute an entirely new order of environmental risk from current GMOs and require individual assessment:

> "The introduction of such transgenes poses the potential for environmentally associated risks of a wholly different order than those associated with existing transgenic crops. If such a transgene moves into a wild relative, there could be widespread environmental dissemination of the pharmaceutical substance or other nonfood substances that could have impacts on wildlife as well as microbial populations."[95]

Tolerance levels by way of a general law change would also undermine a key plank of Government's "proceed with caution" and "preserving opportunities" approach": coexistence. A feature that forms the basis of the coexistence policy adopted by Government is the case-by-case assessment of each GMO. The Minister of Biosecurity stated:

> "Overseas experience illustrates the need for three essential elements for achieving effective co-existence of GM with non-GM production systems:

---

92 USDA, Petitions for Nonregulated Status Granted as of 4-20-2004, http://www.aphis.usda.gov/brs/not_reg.html

93 Food Standards Australia New Zealand, Current Applications and Approvals as of March 2004 http://www.foodstandards.gov.au/whatsinfood/gmfoods/gmcurrentapplication1030.cfm.

94 Nature Biotechnology 21, 3, 2003

95 United States National Academy of Sciences, National Research Council (2002) *Environmental Effects of Transgenic Plants. The Scope and Adequacy of Regulation*, p. 246.

- A robust regulatory approach that protects the environment and safety of people and communities by preventing or managing adverse effects, and makes clear where responsibilities for managing and enforcing any conditions lie;

- **A case-by-case approach that responds to the specific characteristics and likely of each GM organism; and**

- A "whole of production chain" approach to address any identified concerns from seed production and follow-up paddock management to post-harvest handling, management, and distribution."[96] [Emphasis added]

Conditional release is a cornerstone of both the coexistence policy and the case-by-case assessment that Government has placed at the centre of the "proceed with caution" approach. A key feature of conditional release is the ability to place controls on the location and spread of GMOs. As noted in section 4.4, introducing contamination levels by law change would mean that thousands of plants could be grown anywhere in the country without any controls or responsibilities on the part of seed companies and growers.

On a number of occasions MAF has rejected a broad sweep tolerance policy on precisely the grounds of due process:

> "We reject this approach because it undermines the government policy that GM organisms should be assessed and approved by the Environmental Risk Management Authority before being released into New Zealand."[97]
>
> "Another option being discussed internationally is to allow the unintended presence of low levels of GM seeds below a certain threshold. This approach is not feasible … because it would allow GM seeds to enter New Zealand even if they were detected, if they were present at levels below the threshold. This would undermine the approval process for GM organisms."[98]
>
> "It is an offence to knowingly, recklessly or negligently possess an unapproved new organism. This is a precautionary approach because new organisms are assumed to be unsafe until the risks have been properly assessed."[99]

There is no principled reason for taking this path. Indeed, it would constitute a significant departure from Government's 'proceed with caution' policy. Given that GM developers are required to go through the regulatory process for field trials involving far fewer plants than may be let through in the above scenarios, a tolerance policy would effectively undermine the processes required by the Act.

6.2 Application to ERMA

ERMA is the appropriate agency to evaluate any proposed tolerance limits.[100] Making decisions about tolerance levels subject to HSNO:

---

96 Hon Jim Sutton Co-existence papers released, Media Release17 April 2003; Cabinet Policy Committee: Government Response to the Royal Commission on Genetic Modification: Report on Managing the effects of GM organisms and coexistence in primary production – Paper 1: Overview, p 6.

97 *Border Control for Genetically Modified (GM) Seeds*, MAF Discussion Paper No: 31, May 2002, p. 5.

98 *Border Control for Genetically Modified (GM) Seeds*, MAF Discussion Paper No: 31, May 2002.

99 *Possible Contamination of Imported Seed With Genetically Modified Material*, MAF to Royal Commission on Genetic Modification, 15 Feb 2001.

100 The Sustainability Council has made clear in submissions its reservations about the extent to which the HSNO regime and the Authority are fit for purpose. It has provided a series of recommendations that would upgrade

(1) Allows for the appropriate level of risk assessment to be conducted, and
(2) Maintains the integrity and even-handedness of the regime.

Should members of the maize and sweetcorn processing industry consider that, on balance, tolerance levels were to be favoured, they can make an application to ERMA for a conditional release aimed at setting a tolerance level.

Above and beyond the requirements of the HSNO assessment process, two minimum conditions for tolerance levels by conditional release would include:

- **Approval for human consumption:** Any GM food variety cleared as a legal contaminant would effectively be approved for release into the food chain, and must have received clearance from Food Standards Australia New Zealand.

- **Specific crops and varieties:** For the reasons listed in 6.1 above, approval of a generic tolerance level (either at the crop or GM variety levels) would not be appropriate under HSNO. ERMA would be required to individually assess each GM variety, although they could in theory come under one application.

6.3 Coexistence Policy a Precondition for Decision-making

Government's policy of "preserving opportunities" (as discussed in Section 4.4) relies heavily on the ability to keep GM and non-GM food production separate. The Royal Commission proposed coexistence as part of the way forward, and recommended that MAF develop a coexistence regime that would include mechanisms to segregate GM from non-GM (recommendations 7.1, 7.3 and 7.7). In advising Cabinet, MAF further identified a "whole of production chain" approach would need to be developed to achieve coexistence.

Yet apart from the introduction of an enabling mechanism – the new category for HSNO consideration of 'conditional release' - coexistence remains a promise without form. It lacks clear overarching principles, rules or mechanisms to define it.

There are significant limitations on the coexistence proposition. With respect to crops, means of enabling commercial production of GM varieties to take place without contaminating non-GM production have yet to be demonstrated. However, as a matter of principle, consideration of tolerance levels should only be given as part of the development of a coexistence strategy. Providing for levels of GM contamination in advance of fleshing out the coexistence framework would pre-empt a process for the development of credible coexistence systems.

the regime and Authority in submission to the Education and Science Select Committee with respect to the New Organisms and Other Matters Bill, June 2003.

7. Recommendations

1. No relaxation of the zero tolerance standard is required as there is no real tradeoff to be made between zero tolerance and the availability of commercially viable, extremely low risk pathways to import seed - including new US cultivars.

2. Government can improve the incentives for compliance and significantly reduce its exposure to costs by ensuring that the law does not provide for inappropriate compensation. Liability and compensation provisions require clarification and amendment to ensure that costs arising from GM contaminated seed imports rest with the importing party in the first instance.

3. MAF should define the general principles of quality assurance practices for seed imports such that if contamination occurred while the importer correctly observed such safe harbour practices, compensation would be payable by MAF.

4. Government should facilitate development of a model contract that will allow importers and other parties to clearly allocate residual liability between them, based on individual negotiations.

5. Sample sizes for the mandatory testing of seeds should be increased to a minimum of 7,000 for seeds imported for commercial planting. A standard for testing the identities of GMOs approved overseas and suspected of causing contamination in foods should also be developed.