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# Future proofing the biosecurity of New Zealand

*Biosecurity is widely viewed by industry to be critical to the economic prosperity of New Zealand. This article is an overview of the challenges this country faces in preventing and managing pest, weeds and diseases. The next 10 years will see dramatic changes in how scientists, industry and the general public contribute to the biosecurity system. These changes should lead to a more efficient and coordinated approach, but they will also increase uncertainties about the way we predict and respond to the future risks we might face.*

Biosecurity describes the strategies, regulations and activities involved in the exclusion, eradication or effective management of risks posed by pests, weeds and diseases to the economy, environment and human health. There are at least three good reasons why biosecurity is arguably more significant to New Zealand than any other country in the world. First, relative to most developed countries, our economy depends on vibrant agriculture, horticulture and forestry sectors – making up 70 per cent of our export earnings.

Second, our primary industries mainly depend on the productivity of exotic species, be they livestock, pasture grasses, pip fruit and stone fruit, forestry trees or aquaculture species such as salmon and Pacific oysters. The fact that these species do so well in New Zealand is partly a reflection that they have left many pests and diseases behind in their regions of origin. Third, the long isolation of New Zealand and rapid transformation of our landscape to support primary production means that our agricultural and forestry systems are very simplified and lack effective native predators and parasites which might stem the incursion of new pests. This can result in severe outbreaks of pest species which are viewed overseas as relatively benign.

Such is the case of the eucalyptus tortoise beetle, which is rare in its native Australia but is the most serious defoliator of eucalypts in New Zealand, virtually curtailing the planting of several species. In general, the relative freedom from pests and diseases combined with excellent growing conditions in this country has made the primary sector highly competitive globally. However it also means that even a single incursion of a high profile pest or disease could have major economic effects.

The Reserve Bank of New Zealand has estimated that an outbreak of foot-and-mouth disease would reduce

gross domestic product by \$8 billion after one year and \$13 billion after two years, effectively devastating our economy. How well are we doing in protecting the border and securing our market advantage? This overview aims to summarise recent developments in biosecurity, examine how best we can judge the performance of our biosecurity system, discuss the roles of citizens, scientists, industry and government in preventing and managing incursions, and show some of the future challenges.

## The cost of protecting our border

Not surprisingly, maintaining a world-class biosecurity system to protect New Zealand is often the top priority among leaders of our primary industries. Nevertheless, our current awareness of the importance of biosecurity has come at a cost of learning some tough lessons. For example, pastoral weeds are conservatively estimated to cost the New Zealand economy \$1.2 billion each year in lost animal production and control costs. Annual production losses attributable to invertebrate pests have been estimated to be around \$880 million. Overall, the losses to the primary sector from pest, weed and disease incursions account for almost two per cent of gross domestic product. This might not sound much, but given that primary industries contributed 6.4 per cent of total gross domestic product in 2012, it represents a substantial loss of the potential value that primary industries could bring to the country.

It is against such biosecurity challenges that the government's Growth Agenda aims to increase the ratio of exports to gross domestic product from 30 per cent to 40 per cent by 2025. The considerable efforts of primary industries to rise to this challenge could easily be offset by one or more pests or diseases.



The financial effect of a Queensland fruit fly incursion on New Zealand's kiwifruit industry could cost as much as \$430 million if it triggered a severe market reaction. This would jeopardise the short-term financial viability of the \$1.5 billion industry. Reducing biosecurity risks helps encourage investment in primary industry and freedom from pests and diseases makes us a more attractive exporter. Undoubtedly, biosecurity must play a critical role in such potential productivity and economic growth.

### Significant investment

New Zealand therefore invests heavily in biosecurity activities to protect its economy, environment and people from the risks associated with the introduction of new plant and animal diseases, pest insects and weeds. There is a wide range of biosecurity activities along a continuum which starts offshore and ends in our own backyards. Work beyond our borders aims to reduce the risks posed by our trading partners and includes undertaking risk assessments, developing import health standards, and negotiating favourable trade agreements.

The most visible aspect of biosecurity concerns is at the New Zealand border where inspection and screening are in place to stop pests, diseases and weeds from entering our country. Within the border, a range of additional activities is in place to detect, locate, eradicate or manage organisms which have crossed the border and established in this country. This all requires considerable investment from the border to the boardroom.

The government invests around \$200 million a year in biosecurity via the Ministry for Primary Industries. However, this is a fraction of the public funds spent on biosecurity by other government departments, regional, city and local councils, Crown Research Institutes and universities. Industry invests significantly by import and export compliance as well as crop and livestock protection. For example, importers contribute between \$80 million and \$125 million annually to the cost of biosecurity management in New Zealand using levy income as well as compliance and clearance costs.

### How well are we doing?

Is New Zealand getting good value for its investment? Arguably, MPI is the most important Ministry in terms of its role in securing a positive economic future for this country. As a result it probably receives more detailed scrutiny than any other ministry and when it occasionally

drops the ball the ramifications can be dramatic. Few can be unaware of recent incursions which have had major implications for primary industry –

- The introduction of PSA, the cause of bacterial kiwifruit vine disease, has had a significant effect on the sector and will probably cost the economy between \$310 million and \$400 million over five years
- The tomato-potato-psyllid, a sucking bug, which has wiped out \$86 million in potato production in just one year
- In aquaculture annual production losses from a single species of sea squirt, *Styela clava*, have been estimated to be \$15 million.

No national biosecurity system can be 100 per cent effective and it is easy to focus on the few species which have breached the border rather than the countless many that have probably been kept out by effective risk assessment, inspection and surveillance procedures. Yet it is impossible to estimate the effectiveness of MPI biosecurity operations in simple percentages of incursions avoided and they are therefore often judged against what slips across the border.

It is also easy to forget the successes which MPI, and its predecessor the Ministry of Agriculture and Forestry, have had in responding to incursions and preventing the establishment of economically important pests. The net economic benefit of eradicating forestry pests such as the white tussock moth, painted apple moth, gypsy moth and fall webworm are estimated to be as much as \$870 million.

### Ministry performance

The Office of the Auditor General examined the performance of biosecurity management by the Ministry of Agriculture and Forestry and MPI in 2002, 2006 and 2013 and in each case has found there is considerable room for improvement. This is not surprising given the thoroughness of investigations undertaken and the transformation of New Zealand agriculture, trade and tourism over the last decade. The regular checks and balances on the performance of the New Zealand biosecurity system are at least a good sign that the government takes the problem seriously and it has resulted in continuous improvements in the way MPI operates.

MPI has also continued to support a Biosecurity Ministerial Advisory Committee to provide independent advice on the performance of the overall biosecurity system. Drawing on experts from across primary industry sectors, biosecurity scientists and leaders in

regional government, the committee focuses on how the biosecurity system can help in creating an environment which supports growth and sustainability across primary industry. It also helps to identify opportunities to improve the performance, efficiency, cost-effectiveness and capability of the biosecurity system.

The committee's current work programme is focused on assessing progress towards adopting the recommendations of the most recent report from the Office of the Auditor General. These include –

- Lifting the profile of biosecurity nationally to ensure citizens take personal responsibility for biosecurity
- Establishing suitable performance measures for MPI
- Assessing national readiness for future incursions
- Discussing how best to manage compliance and enforcement.

### It is our place to protect

MPI is the lead agency responsible for biosecurity, but preventing the introduction of harmful species into the country is the responsibility of everyone. An independent review of the PSA incursion highlighted that a systemic lack of communication and information exchange among industry, science providers and MPI was at the heart of the problem. Ensuring that there is a well-connected national capability for biosecurity is essential. There are at least four groups which need to be mobilised and coordinated to ensure a robust biosecurity system –

- The general public
- Science providers
- Biosecurity specialist organisations, including central and local government
- Industry.

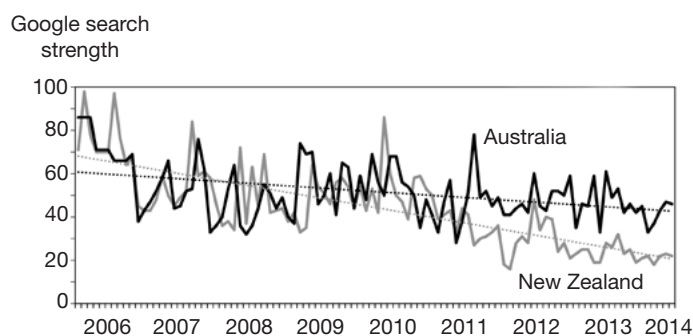
### Role of the public

A fundamental question is how much involvement is there from the general public? Episodes of the TVNZ *Border Patrol* reality programme, depicting inspections at the New Zealand border, are popular and may be seen by up to 10 per cent of the population. We might therefore expect New Zealanders to be well informed and important contributors to the biosecurity system. However, much of this emphasis has been on ensuring citizen compliance with regulations about the importation of goods and movement of risk organisms, either deliberately or unintentionally.

It is often stated that we do not make enough of the over four million pairs of eyes and ears that could support national surveillance programmes. Many incursions are first detected by members of the general public. With increasing pressure from new incursions, can the contribution of citizens be made significantly more effective and widespread to secure greater biosecurity benefits? As yet, this potential is not fully recognised. Understanding the limits of citizen involvement and the barriers to participation are essential to maximising their contribution to the biosecurity system. The public role

in surveillance may often be limited in scope due to a mostly urban population with little knowledge of pest identification as shown in the graph.

Similarly not all management programmes meet with public sympathy, as is the case for aerial spraying of pesticides, the release of bio-control agents, or the prohibition of the sale of certain species. Maintaining awareness of biosecurity among the general public and the role they may play is essential. MPI has run several successful social marketing campaigns to change citizen behaviour and a similar effort should be invested in encouraging them to be active members of the biosecurity system. Unfortunately, certain lines of evidence suggest that interest in biosecurity may be waning, at least compared to Australia.



Relative search strength of the term biosecurity using Google in Australia and New Zealand

There has been a marked decline in online interest since 2011, a period which coincided with the retirement of the Biosecurity New Zealand brand. This brand was synonymous with the Ministry of Agriculture and Forestry. However, perhaps further thought should be given to a brand which is not institution-specific and could be used on all biosecurity relevant materials produced by MPI as well as primary industry sectors, regional councils and other government departments. It would give a better idea of how biosecurity impinges on the everyday activities of each of us in New Zealand and that we all have a role to play in protecting the country.

### Working together

New Zealand benefits from a productive scientific community researching biosecurity problems. This includes scientific teams in government departments and ministries as well as those employed by industry, the Crown Research Institutes and universities. Individual teams undertake excellent science, but research is often sector-specific, it addresses different targets such as animal, aquatic or plant health, and it is mainly based within the natural sciences. The different groupings do not currently communicate effectively with each other and often approach biosecurity from diverse perspectives using different emphases and methods. There remains considerable scope to bring these research communities together to help improve ideas and approaches, ensuring a more consistent approach to biosecurity.



One example of where a more collaborative method has proved successful is Better Border Biosecurity, a science cooperative which researches ways to reduce the entry and establishment of new plant pests and diseases. The joint venture integrates investment and expertise from five science agencies – Plant & Food Research, AgResearch, Scion, Landcare Research and the Bio-Protection Research Centre at Lincoln University. There are three end-users – MPI, the Department of Conservation and the New Zealand Forest Owners Association.

Much of the research undertaken in New Zealand is still focused on only one aspect of the biosecurity system such as pre-border or post-border. An overall perspective is required which bridges the gaps between these research activities, provides the necessary context and appraises the biosecurity research portfolio. Biosecurity is an interdisciplinary topic which requires the involvement of social scientists, veterinarians, epidemiologists, economists, geographers, political scientists and information technologists. It has been weak on research.

### New programme

These limitations may be about to be resolved with the recently launched National Science Challenge, a 10-year programme to fund research in New Zealand. Biosecurity is represented in the Biological Heritage Challenge, which focuses biosecurity research on a series of important concerns including –

- Inspiring citizens to contribute to biosecurity surveillance and compliance
- Looking ahead for future threats
- New management methods and strategies
- Improved risk assessment
- Increasing the resilience of productive systems to pest, disease and weed threats.

Using new money and existing funding, the Biological Heritage Challenge will use scientists from different institutions and disciplines for common aims. It will be important for the primary industry sector to be involved and kept abreast of this important change in the way biosecurity science is directed.

Another option is the National Biosecurity Capability Network. This is a joint initiative between MPI and AsureQuality to manage a network of people and facilities which can be deployed in response to a pest incursion. Support has grown rapidly in the last year and appears to be settling at around 120 organisations.

Most partner organisations are involved in animal

capability, which reflects the concern that New Zealand resources would be stretched should a foot-and-mouth disease outbreak occur. However, the horticultural and forestry sectors still need to improve, particularly in relation to surveillance and organism management. The network was found to function effectively in the recent Queensland fruit fly incursion response in Whangarei, but the robustness of the network to different types of incursions or responses in less populated areas has not been assessed.

### Government industry agreements

A further option is the government industry agreement on biosecurity readiness and response which aims to improve joint decision-making and cost-sharing between primary industry and MPI. Closer collaboration should help ensure a more coordinated response and better results when incursions happen. Most industries have welcomed the opportunity to have a greater say in how incursions are managed. However several have expressed concerns that their responsibilities only start this side of the border rather than influencing import health risk assessments and border interventions. Kiwifruit Vine Health signed the first government industry agreement in May 2014 and more than a dozen other industry partners have signed a preliminary memorandum of understanding.

There is still uncertainty around how the government industry agreements will work. The government has agreed that industry will pay no more than 50 per cent of any response costs, but these costs can run into tens of millions of dollars. Once an incursion has taken place an industry sector may be facing not only lost production, but also market access problems. Bearing the costs of responding to a major incursion could be one financial challenge too many. Greater involvement by industry in decision-making cannot be a bad thing, but it will probably take an actual incursion to test how well the government industry agreement model might work. Let us hope it is not a big one.

### Working together

What we can see is that as the scale of the biosecurity challenge facing New Zealand increases, the responsibility for managing the threat of risk organisms is becoming progressively devolved, particularly within our borders. As organisations take on responsibility for biosecurity, the dynamics of the system will change from a mainly centralised government responsibility to a wider network of participants.





If managed well, this should ensure greater connection and that appropriate funding is allocated to the risks of greatest concern. Working together should also ensure responses to biosecurity incursions are run more efficiently. Several important questions arise about this new model of biosecurity management –

- How robust and dependable will it be?
- Will it possess the necessary information flows and feedbacks to perform effectively?
- What will be its emerging properties and could they impede biosecurity management?
- Will multiple partners delay response times so that opportunities for eradication are lost?

Recent failures in the biosecurity system have been attributed to the frequent restructuring of the ministry responsible. However, we should ensure that the efforts to make this more devolved biosecurity system a success do not divert resources from future threats.

## Looking to the future

The dynamic nature of biosecurity risks faced by New Zealand over the medium to long term requires foresight and the ability to apply this in response to emerging biosecurity risks. Foresight is more than simply keeping abreast of potential problems reported overseas. It should apply climate, economic, demographic, agriculture and trade forecasts to identify future events which might result in new threats to the New Zealand biosecurity system. For example, climate change is likely to exacerbate the existing problems as pests, weeds and diseases in the North Island move further south and will also open up the country to new threats that previously found the environment unsuitable.

Population growth, increasing urbanisation, novel crops, changing agricultural practice and the exploitation of terrestrial and marine resources will alter the resilience of the productive environment to established and potential future pest species. As an example, native manuka beetles have become a serious pest on recently developed pastures on the West Coast. Flipping soil to improve pastures has exposed sandy soils, which appears to be a perfect habitat for the pest.

The future will become increasingly uncertain and the biosecurity system should be designed to deal with this uncertainty. This means that risk assessments need to be dynamic and account for future uncertainty, including preparing for worst-case scenarios. These scenarios need to be worked up with industry partners, not only to secure the most effective response in the event of an incursion,

but also to adapt their practices to minimise future risk and build resilience into their production systems.

Preventative measures addressing the risks outside the border, along with surveillance and interceptions at the border, are widely viewed as the most cost-effective method to manage future threats. However improving border biosecurity is not a foolproof strategy as it can never hope to be 100 per cent effective. In addition, many future pests, weeds and pathogens may already be established, although at low density. They may become increasingly important as a result of contemporary evolution, such as pesticide resistance in the varroa mite, or relaxation of environmental constraints as a result of climate change.

There are considerable economic, environmental and social benefits in the early identification of future post-border threats, of containing outbreaks and slowing their spread before their effects can be fully realised and management required. Insufficient effort has been made to increase the cost-effectiveness of post-border interventions. Too often a species is deemed too widespread for the benefits of a response to outweigh its costs. In many cases the benefits of mounting a response may be under-estimated. This is relevant where a particular pest species may limit future options for the development of new crops, or be found at a later date to be an important vector of plant pathogens.

Finally, the ability to respond to these threats is progressively being weakened as a result of rising instability in current biological controls and the falling rate of pesticide registrations and public acceptance of chemical residues in food. Withdrawal of older broad-spectrum pesticides will reduce the arsenal available to control pests, but New Zealand's small market cannot support the development costs of replacements, particularly for niche crops. As a result, our primary production systems face increased environmental regulation and international markets demanding green credentials.

There is also the reality that, as intensifying production reaches its technical limit, resilience to damage is lost leading to higher sensitivity to the effects of pests. These increasingly complex and threatening interactions will require new and integrated approaches to biosecurity and will depend on new technology for managing pests, diseases and weeds to stem a rising tide of threats. New Zealand must invest strategically in this area.

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