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Special Contribution

Forest Biosecurity - a policymaker's viewpoint

Integrating Biosecurity Science and Public Policy in New Zealand†

Summary: Achieving greater integration of science and policy is essential to achieving better results in biosecurity. Science provides essential under-pinning for biosecurity policy and decision-making yet there are tensions and challenges that make the required integration difficult to achieve. These tensions arise from the complexity inherent in many of the problems that policy decisions are trying to address, the level of uncertainty often faced when making decisions in the biosecurity setting, the distribution of research funding, and the timeliness needed for policy decisions. Despite these difficulties, progress is being made to ensure that policy decisions are informed by science and deliver positive results in the management of biosecurity risks. If scientists and policy makers continue to work at understanding the challenges each face and increase their connectedness, improved results will continue to be delivered.

In 2003, *Tiakina Aotearoa – Protect New Zealand: the Biosecurity Strategy for New Zealand* (Young, 2003) highlighted the role of science as a critical underpinning element of the biosecurity system. This Strategy noted three specific needs: to increase integration of science into biosecurity policy and decision-making; to protect and develop science capability across the biosecurity system; and to ensure balanced investment was occurring across whole of government biosecurity priorities.

While policy and regulation rely heavily on a sound scientific base, some real challenges and tensions exist. This paper discusses the most important of these challenges and provides some recent examples to illustrate the important contribution science is making to biosecurity policy and regulation in New Zealand.

What is Policy?

Public policy development is concerned with the process used to determine actions of governments as they deal with the issues of the day. Often policy is aimed at trying to determine whether or not government agencies should: intervene and provide a service, opportunity or constraint; protect an asset valued by the public, or; promote private actions that are in the public good. The process of policy development is complex and involves a consideration and balancing of historical, political, economic and social factors.

Science in the Biosecurity System

In developing public policy to support biosecurity outcomes, an important additional input is science. Good policy development for biosecurity involves integrating science into all aspects of the process - from defining the issue, identifying and selecting options, implementing solutions, reviewing, and finally evaluating the success of any of the outcomes achieved. Scientific endeavour generates the knowledge and tools required to undertake most biosecurity-related activities. The range of sciences relevant to biosecurity is incredibly broad and includes not just biological

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disciplines but also other physical sciences (e.g. physics and chemistry), social sciences, and Matauranga Maori, (the knowledge systems, values and concepts that enable Maori to live, engage and interact with their environment). It is multidisciplinary covering all environments (marine, freshwater, terrestrial) and all values (environmental, social, cultural and economic).

Internationally, the biosecurity system operates within the context of the World Trade Organisation (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) (WTO, nd). The SPS Agreement sets out rules within which member countries take measures to protect the life or health of their people, animals and plants while, at the same time, facilitating trade. The SPS Agreement requires that any restrictions on trade be non-discriminatory, transparent and scientifically justified (Ministry of Agriculture and Forestry, 2009). The discipline of risk assessment, and the research required to underpin risk assessment, helps regulators to ensure decisions about managing trade risks can be made on a sound technical basis. This reliance on scientific discipline and research reaches far beyond decisions made at New Zealand's border and is fundamental to all aspects of policy setting and regulation in the biosecurity system.

Some of the fundamental policy questions in the biosecurity system include:

- How much should we invest at each point along the biosecurity continuum?
- Should we agree to a particular new international standard?
- Should we dispute specific measures imposed by a trading partner?
- Will a systems approach mitigate risk to the same extent as an on-arrival fumigation approach?
- What are the hosts of any new organism?
- What will the impact of a new organism be?
- What biosecurity response options should be considered for a specific pest?
- Should government take action or leave industry or private individuals to decide what action to take?

Each of these questions requires science to inform the decision-making process.

Challenges & Tensions

While both policy and regulation rely heavily on an underpinning of science, some real challenges or tensions continue to exist.

Complexity

The complexity of the biosecurity operating environment is increasing through development of new inter-agency linkages across the biosecurity system, detection of new micro-organisms, redefinition of taxa, recognition of new ecosystem interdependencies, and identification of new community concerns. Everyone involved in biosecurity must be able to recognise where new risks/solutions are created or revealed as a result of this higher level of complexity. For example, how will new scientific developments in the areas of genomics or nanotechnology help with biosecurity issues?

In a policy context, the aim is first to understand the problem and then ideally come up with the optimum solution. When policy makers invest in research we are, more often than not, looking for simple answers to complex problems. We understand that there is no easy "answer to Life, the Universe and Everything". "Forty-two" is not the answer (Adams, 1979)! No one is going to come along and provide ready-made solutions. What we need is for researchers to do two things:

(1) communicate science in a such a way that either simplifies complex issues, or allows us to find the core issues upon which good policy can then be built; and

(2) offer the best science for formulating a solution. Other factors (e.g. economics, social values and cultural considerations) also have to be built into any policy so the clearer the science the better the result will be once those other considerations are blended into the decision process.

Uncertainty

In science, people are taught from a young age to require a statistically significant difference before accepting or rejecting a null hypothesis. This requirement for a substantial burden of proof drives society to aim for a level

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of certainty that is both useful and problematic in biosecurity implementation. Such precision is useful to ensure decision makers do not develop policies that change risk management interventions in unjustified ways, impose requirements that are unsupported, or result in no real improvement. However, statistical significance is problematic in that decision makers seldom have the luxury of the highest levels of certainty before biosecurity policies need to be set. Decision makers constantly work in an environment of uncertainty which requires the weighing up of different probabilities. This is more akin to the judiciary than science (Haas, 2003).

This lack of certainty presents a challenge. Tension can occur between policy makers and scientists when policy decisions are made without "sufficient" scientific evidence. At other times it seems that scientists are being asked to provide advice on a matter for which they feel there is insufficient and/or conflicting evidence. Sometimes scientists are uncomfortable with the amount of "judgement" that is applied by policy practitioners who need to make a decision now, rather than wait for further information to be developed.

This uncertainty also means policy makers make some decisions that, in hindsight, are wrong. We try to address/minimise risks by taking a precautionary approach but acknowledge that risks exist since we operate in an environment of high uncertainty.

Where and How Much to Invest in Research

Most researchers at some time will have finished a report for a client with the words "further research is required". Often the questions requiring new science are endless, unlike the funds available to invest in getting the answers required!

With limited resources, delivering core biosecurity services will almost always come first, in terms of both the money and time invested by any organisation. Determining how much resource should be directed either at new research, or maintaining scientific capability is a real challenge faced by government on a daily basis. Research budgets are coming under even more pressure in the current difficult economic times. A potentially positive outcome will be an increase in collaboration and synergy across research programmes as everyone tries to deliver more for less.

International collaboration is becoming increasingly important because pests do not recognise national boundaries. Three examples of recent collaborations between New Zealand and other countries are given below:

(1) Three years ago MAF Biosecurity New Zealand played a key role in initiating a programme of biosecurity science collaboration across NZ, USA, Canada and Australia in 12 key areas of research and policy development.

(2) An initiative, the "Better Border Biosecurity (B3) outcome-based investment" (http://www.b3nz.org/public/index.php) has established a memorandum of understanding to support collaboration between nine New Zealand organisations (Scion, Plant and Food Research, AgResearch, Lincoln University Bio-Protection Research Centre, MAF Biosecurity, Department of Conservation, Environmental Risk Management Authority and the Forest Biosecurity Research Council) and the Australian Cooperative Research Centre for National Plant Biosecurity.

(3) New Zealand and US scientists are assisting each other in dealing with infestations of light brown apple moth in the USA, and both painted apple moth and Asian gypsy moth in New Zealand.

Each of these collaborations enables more to be achieved with the same or fewer resources.

Timeliness

In a policy setting, timeliness is critical. In order to make appropriate decisions in a timely fashion, we need to know both what information is available now and what new knowledge can be obtained within policy setting timeframes. Waiting another year for that extra bit of information usually just doesn't work. By then views will have been formed, decisions made and actions taken. This is not only true in policy setting situations – the same pressures exist for forest managers. There are exceptions of course, but the cost of waiting for information is difficult to bear when decisions need to be made, unless the marginal value of the additional information is high.

Successful Integration

There have been, and will continue to be, many success stories illustrating where science and policy have been integrated to deliver great results. Scientists and policy makers coming together to understand the challenges each faces and then working together to a common goal has been key to achieving these results. Some of these

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successes include:

- *Management of Didymo* (*Didymosphenia geminata* (Lyngbye) M. Schmidt) – new DNA-based diagnostic protocols were developed to speed up processing time and increase diagnostic accuracy to support more timely biosecurity decisions on didymo management.
- *"Equivalent Quarantine 3" Initiative* – a new container hygiene protocol has dramatically increased cleanliness of empty containers coming into New Zealand from the Pacific Islands with a resulting drop in the number of new invasive ant incursions. This has resulted in not only reduced biosecurity risk but significant improvement in container logistics on arrival in New Zealand and cost savings for shipping companies.
- *Methyl Bromide Reduction* – science research is assisting the development of chemical and non-chemical alternatives to methyl bromide treatments so that New Zealand can adhere to its Montreal Protocol commitments. Many alternatives are being explored with some good collaboration occurring internationally. Interest is strengthening in systems approaches to manage risk along production and importation pathways without fumigation treatments.
- *Emergency Responses* – there are many examples of science supporting emergency responses to new pest and diseases. These include: the use of sterile insect technology in New Zealand's eradication programme for the painted apple moth; improvement of spray deposition in built-up environments; and research to test assumptions on longevity of mosquito egg survival.

New structural arrangements also appear to be helping. These include: the establishment of a strategic science team within the Biosecurity New Zealand section of the Ministry of Agriculture and Forestry; the establishment of the Better Border Biosecurity (B3) outcome-based investment bringing end-users and research providers closer; and the publication and implementation of the *Biosecurity Science Strategy for New Zealand* (Ministry of Agriculture and Forestry, 2007).

Conclusions

Progress is being made to address the Biosecurity Strategy concern for integration of science into biosecurity policy and decision-making. Challenges and tensions will continue to exist between policy makers and scientists but by recognising them and having all parties step forward to deal with them, the problems they cause can be minimised.

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