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Summary of Facilitated Discussion

Managing the biosecurity threat to forests in a changing global environment: links between science, policy, regulation and management.

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Internationally, forests make vital contributions to economies, the conservation of biodiversity, environmental protection and to global carbon and water cycles. They also play a key role in strategies developed by many countries for offsetting CO_2 emissions and as a potential source for bio-energy. These benefits are increasingly at risk from biosecurity threats resulting from continued growth in international trade and tourism and also from changing climates. The term “biosecurity” refers to the exclusion, eradication, or effective management of pests (weeds, insects, diseases).

Management of biosecurity threats at regional, national and international levels is complex and relies on sound policy frameworks, effective and flexible management systems, all underpinned by sound science.

The purpose of the Organisation for Economic Cooperation and Development (OECD) workshop was to provide a forum to bring together scientists and policy makers along with the stakeholders that have to implement these policies. This forum provided a valuable opportunity for all parties to better understand each other’s challenges and to find more effective ways of aligning their collective efforts.

The discussion, which was chaired by New Zealand forest biosecurity specialist, Gordon Hosking, focused on the following questions:

1. *How can scientists be more effective in their contributions to policy and operational management?*
2. *In a changing global environment, what are important future forest biosecurity challenges from both a science and policy perspective?* and
3. *How can international collaboration help to meet these science challenges?*

Following is a summary of the main points that arose in response to these questions. We have concluded with a list of recommendations that were crystallised from the worthwhile discussion that took place over several hours between workshop delegates and the panel of presenters (listed below). These recommendations are identified as priorities for the improvement of forest biosecurity worldwide, with particular emphasis on creating more meaningful interface between science, policy and management.

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As we reflect on the results of this discussion, it is important to consider ways in which the recommendations can be actioned. Such actions point to the need for an international body that can drive policy changes arising from scientific insights. The International Union of Forest Research Organisations (IUFRO) and the International Forestry Quarantine Research Group were identified as potential bodies to fill this need.

The recommendations could also provide a basis for further exploration at a future international forest biosecurity conference. The value of this conference in bringing the various disciplines relating to biosecurity was clear and it is hoped that similar meetings will be held on a regular basis.

Question 1: *How can scientists be more effective in their contributions to policy and operational management?*

Applied biosecurity science is inherently complex and uncertain as it is built on the integration of many traditional biological and environmental science areas. It has the added complexity of being aligned with international trade concerns whereby the movement of goods is regulated by standards that are grounded in science (International Phytosanitary Measures – ISPMs). Biosecurity science also requires effective and defensible decision making in situations where data are scarce or even non-existent.

Presentations made by Peter Thomson and Don Hammond reflected these issues. They highlighted the challenges faced by policy makers and operational managers, respectively, who have to make rapid decisions at times of pest incursion, often in the absence of solid information.

Obtaining definitive answers from science usually takes time but operational managers often don't have the luxury of time. If a new pest comes into the country, agencies need to act quickly. This means that they have to make educated decisions based on the best information immediately available, and through balancing probabilities at any given point in time. This challenging situation has implications for all parties involved in biosecurity management and research.

Adapting science to the operational environment

Scientists with years of experience are often the best source of information on which to base decisions during a pest incursion. However, they are often reluctant to venture opinions because their formal training demands that conclusions can only be reached with a high level of supporting evidence. Many scientists are also concerned about making public statements when they are not certain; doing so could effect their reputation, credibility, and ultimately their career. However, the perspective of policy makers and operational managers is that researchers working in the biosecurity field need to be aware of operational imperatives and must learn to apply their science knowledge in a more dynamic fashion. They need to be able to draw from their experience to provide advice or formulate opinions quickly based on incomplete data.

Many scientists and biosecurity managers are not very well equipped to deal with decision making in an environment of high uncertainty. The Australian Centre of Excellence for Risk Analysis is one of many organisations working to develop improved risk management frameworks needed to guide decision making where levels of uncertainty are high. There is an opportunity for the forest biosecurity sector to further develop and apply the science of decision making in uncertain environments.

The importance of communication

Policy makers need to understand the constraints on scientists and to clearly define their needs to scientists. Regular dialogue is critical, and not just when there's an emergency. The integration of policy people into research programmes has resulted in very good outcomes. The Australian Centre for Excellence of Risk Assessment has found that the most successful programmes are those that have policy people from the Australian Department of Agriculture, Fisheries and Forestry embedded in the projects. They have found it is incorrect to assume that communication will automatically happen when it's needed. Rather an adoption strategy needs to be included as part of the project that is owned equally by the scientists and the policy makers.

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Other ways to facilitate dialogue include organisations like the Forest Biosecurity Research Council in New Zealand (FBRC). The FBRC is a partnership between biosecurity researchers, government agencies and forest growers specifically formed to ensure an effective interface between these key parties. The national funding agency in New Zealand (Foundation for Research Science and Technology) has acknowledged these benefits through its funding decisions.

The following observations also arose from discussion:

- Scientists should be offered training on policy so that they understand the framework;
- Even a small contribution from a scientist can add substantially to the knowledge base of a pest eradication operation;
- The size of the gap between regulatory agencies and scientists may be correlated with the size of the country. Communication gaps between agencies within a country also exist;
- Scientists often take the long term view on biosecurity issues, while operational managers are more concerned with immediate concerns; and
- Industry needs to take some responsibility by having strategies in place so they are ready to respond when an invasive pest arrives.

Need to maintain capability

Science organisations throughout the world face a loss of experience with retirement of senior staff and inadequate succession planning due to funding constraints. This situation creates a knowledge gap which can reduce the flow of meaningful information to regulators. Loss of experienced researchers is a serious issue because, as mentioned previously, often the best source of information during new pest incursion is from experienced scientists. Science organisations and biosecurity agencies alike must recognise the need to ensure adequate funding for maintaining science capability over the long term. Greater funding stability would promote hiring of early career scientists who can be mentored by senior scientists before they retire.

Balance fundamental with applied research

The knowledge and advice required from scientists during incursions is underpinned by fundamental research programmes. While some fundamental research is carried out in government institutions, the majority is conducted by universities. The role of government research institutions is often to translate university research. Once again, good communication amongst the science community is critical to realise new opportunities for applying fundamental science. There is also a challenge for governments and the private sector to recognise that a balance of fundamental and applied research is needed to sustain a culture of continuous improvement. Funding models should also facilitate and reward collaboration.

Education

It is increasingly important for scientists to see the world through more than one lens, particularly in the biosecurity field. For this reason, it may be helpful for scientists to include some training in political science as part of their undergraduate studies.

The biosecurity sector draws on a wide range of disciplines including entomology, pathology, mycology, modelling and many others. There is clearly a need for generalists who are able to draw on all these disciplines and interpret information for biosecurity applications. It is recommended that a case be made for science degrees to be designed that major in biosecurity. New Zealand's Lincoln University is the only university currently known to be offering such a degree, reflecting the importance of biosecurity to New Zealand's economy.

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Question 2: *In a changing global environment, what are important future forest biosecurity challenges from both a science and policy perspective?*

Presentations showed how the risks associated with invasive organisms are growing worldwide due to continuous growth in trade and tourism, and also from changing climates. The need for policy makers to recognise and address these risks is more critical than ever, particularly in terms of shutting down major pathways that enable the movement of pests. It was observed that regulations are often fragmented, (i.e. IPPC strategies, domestic strategies, environmental strategies) so a more integrated policy approach is required as the risks increase.

A pathways approach

Traditional biosecurity risk assessment has tended to focus resources on individual high risk organisms, identified on lists of unwanted pests. While recognising that some high risk organisms must be singled out, the difficulty of predicting the behaviour of newly introduced organisms in a new environment means that a safer option is eliminating the risk of organism movement in the first place. This change in focus from organisms to pathways is a key step-change that was identified by the panel with overwhelming support from all participants. Closing down one pathway will usually be effective against multiple risk organisms.

One such pathway identified by several speakers was the movement of ornamental plants in Europe; occasionally whole trees up to three metres tall including root balls and soil are transported great distances. This type of trade is not allowed by all countries, but is clearly extremely high risk in the biosecurity context. A strong consensus from the workshop was that a worldwide ban on the movement of whole plants should be sought. There also needs to be more serious analysis of the risks posed by trade in other plant products (e.g. fruit, seeds, cuttings, tissue cultures) and ways to reasonably mitigate these risks. Such a move would require consumers to accept that there are certain things (e.g. potted plants) that should not be traded internationally because the risks associated with their movement are too high. Scientists don't like to, or are prevented from, making political statements so any move towards a ban would need to be driven by policy makers.

Implications of climate change

Forests are widely seen as important contributors to mitigating climate change, by capturing carbon, offering low carbon energy options or substituting energy-intensive materials. Biosecurity risks represent a potential threat to forests delivering these advantages. For this reason, an international focus on improved forest biosecurity is increasingly important.

Regardless of how climates may change, effective biosecurity systems will be required to deal with increased numbers of invasive or potentially invasive species. Countries that already have robust biosecurity systems are probably well placed. However, the pressures of climate change highlight the importance of pathway research. If pathways are effectively managed, the climate change risks become less important because the probability of organism movement is reduced.

Environmental change also affects endemic pathogens, and their behaviour may change. This means that native species could pose a risk as the climate changes, as is happening with the mountain pine beetle (*Dendroctonus ponderosae*) spreading through Canada. One aspect of climate change mitigation that needs to be considered, at least in relation to plantation forests, is the prospect of manipulating ecosystems to create more robust habitats for the future. This strategy would involve educating plantation-forest managers to grow species that are more resistant to potential incursions.

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Question 3: *How can international collaboration help to meet these science challenges?*

Effective risk management is far more likely to be realised with greater international science co-operation, which was clearly one of the benefits of this workshop. IUFRO has an important role to play in fostering this collaboration. It was suggested that policy discussions could be actively incorporated into IUFRO meetings, since many policy people already attend these meetings.

The International Forestry Quarantine Research Group was established to provide a mechanism to address critical forestry quarantine issues through discussion and collaborative research. It promotes multi-disciplinary approaches to forest quarantine-related problems of global significance. As such it provides a clear interface between policy, science and practice, so plays a key role in formulating ISPMs.This group could be an effective vehicle for promoting recommendations at an international level. It also could be expanded to broaden its scope to forest biosecurity in general.

The European Union offers collaborative opportunities for driving change through DAISIE (Delivering Alien Species Inventories in Europe), TRANZFOR (Transferring Research between E.U. & Australia-New Zealand on Forestry and Climate Change) and COST (European Cooperation in Science and Technology) actions.

The Australian Biosecurity Intelligence Network is an example of how Information Technologies can be used to span international boundaries.

Conclusions and recommendations

At a practical level:

- Research programmes that work the best have policy people embedded in the projects and the best policy frameworks and operational responses are underpinned by sound science.

  Recommendation: Opportunities for dialogue and collaboration between policy, science and management staff need to be actively encouraged.

- Biosecurity focus needs to shift from single-organism focussed risk analysis to pathway analysis – i.e. less emphasis on the individual pests, and more emphasis on how they move around and associated mitigation options.

  Recommendations: (i) Shift science focus towards pathway risk analysis (how high-risk organisms move around the world) and mitigation options. (ii) Seek a worldwide ban on the movement of potted plants and develop safer processes for trading in live plants and plant products.

- The importance of forest biosecurity in climate change mitigation strategies needs to be recognised.

  Recommendation: Seek improved communication and public awareness around the risks posed by biosecurity threats to carbon sequestering forests.

- Developing effective biosecurity policy and running effective operational responses often relies heavily on input from experienced science specialists from a range of organisations and drawing both fundamental and applied research.

  Recommendation: Biosecurity research funding models need to enable effective succession planning, promote a balance between fundamental and applied research, and reward collaboration between research organisations.

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- Effective biosecurity relies on a broad knowledge base.

  Recommendations: (i) Establish specific educational programmes that focus on applied biosecurity issues to equip agencies with well qualified people. (ii) Support new science to improve decision making where the levels of uncertainty are high and the consequences associated with decisions are large.

- Gathering regulators, scientists and policy people together in this conference has provided an excellent environment for communication.

  Recommendation: Encourage the development of an international forum, including biosecurity scientists, policy makers and operational managers, to more effectively address forest biosecurity issues. The International Forestry Quarantine Research Group could provide the basis of such a forum.

At an ideological level:

- A paradigm shift is needed in regulating species movement. International health is regulated within a collaborative framework. When serious threats to human health are identified, international steps are taken to manage and minimise that threat, as was seen during the H1N1 (swine flu) pandemic in 2009. Unfortunately forest biosecurity is still regulated within a trade paradigm even though invasive species are in the top three threats to global biodiversity.

  Recommendation: A new framework is needed for international regulation around movement of species. Worldwide control on the movement of potted plants is a tangible starting point.

Chair

Gordon Hosking - Forest Health Ecologist, New Zealand

Panelists

Peter Thomson - Director Post Border, MAF Biosecurity New Zealand
Integrating biosecurity research and science into policy and regulation

Don Hammond – Forester, New Zealand
Integrating biosecurity research and science into management practice

Tom Holmes - Research Economist, US Forest Service
Bio-economics to underpin invasion management

Alain Roques - Head of INRA Forest Zoology Unit, France
Impacts of global change (trade, tourism, climate) on forest biosecurity

Hugh Evans - Forest Research UK
Pest risk analysis - organisms or pathways?

Mark Lonsdale - Chief of CSIRO Entomology, Australia
Pest risk analysis and invasion - invasive weeds analysis

Joan Webber - Principal Pathologist, Forest Research UK
Pest risk analysis and invasion - pathogens

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Lee Humble - Entomologist, Canadian Forest Service
Pest risk analysis and invasion - insects

Mike Wingfield - Director Forestry and Agricultural Biotechnology Institute, University of Pretoria
Novel associations between pathogens, insects and tree species

Andrew Liebhold - US Forest Service
Population ecology of insect invasions

Eckehard Brockerhoff - Forest Protection Leader, Scion, New Zealand
Eradication of invaders

Enrico Bonello - Associate Professor of Plant Pathology, Ohio State University, USA
Induced resistance: a new approach to weed, insect and disease management in forests

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