Reducing biosecurity business risks for logs and timber

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Abstract

New Zealand is heavily reliant on export markets for wood products. International agreements to minimise the movement of quarantine pests and pathogens allow countries to specify export treatments that reduce trade-related phytosanitary risks. Current treatment options for wood exports from New Zealand are limited and rely heavily on available chemical fumigants (methyl bromide and phosphine). The release of methyl bromide to the atmosphere will be prohibited in this country from 2020 as it is an ozone depleting gas. Numerous examples exist from other countries where trade has been disrupted by a biosecurity pest that may be transmitted on an export wood commodity. To maintain current market access New Zealand must: 1) expand export treatment options; 2) maintain forest surveillance to demonstrate area of freedom and maximise eradication success of new pest incursions; and 3) conduct proactive research to prepare for high-risk quarantine pests not yet present in this country.

What is a quarantine pest?

A quarantine pest is a species that is 'A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled' and pests can be 'Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products' (IPPC, 2012). A pest risk assessment of the potential economic and environmental impacts that might occur if that pest were to become established must be undertaken before a country can classify a species as a quarantine pest. Appropriate methodologies for such pest risk assessments are prescribed by the International Plant Protection Convention (IPCC) (IPPC, 2007).

Who sets the global rules for phytosanitary measures?

Two international organisations set standards and frameworks that coordinate multilateral trade in plant products while minimising the biosecurity risks posed by quarantine pests. The World Trade Organisation (WTO) via the Sanitary and Phytosanitary Measures Agreement (SPS) provides a framework for the international trade in animal and plant products and an infrastructure for dispute resolution. The Agreement stipulates that measures imposed cannot be protectionist, and must be scientifically justified and robust. Imposed phytosanitary measures must be transparent, applied consistently, based on an assessment of actual risk, and be the least restrictive of available effective options.

The International Plant Protection Convention uses the principles of the Sanitary and Phytosanitary Measures Agreement to develop standards, guidelines and recommendations to mitigate plant health risks. These standards are referred to as International Standards for Phytosanitary Measures (ISPMs) and are followed by the National Plant Protection Organisation (NPPO) when setting import phytosanitary requirements. The Ministry for Primary Industries summarises these import requirements to produce the Importing Country Phytosanitary Requirements (ICPR) documentation that advises all New Zealand exporters of their international phytosanitary trade obligations.

This documentation provides a prescriptive statement of the export certification requirements for a commodity including required import permits or phytosanitary certificates, commodity specific declarations such as official assurance statements, acceptable phytosanitary treatments, and subsequent inspections for each commodity such as logs, sawn timber, chip and so on. The importing country may not require a phytosanitary certificate and may choose to manage quarantine risks by applying phytosanitary treatments on arrival, as happens with log imports into Japan and Korea.

The Ministry for Primary Industries is New Zealand's National Plant Protection Organisation and official representative to the International Plant Protection Convention. As a National Plant Protection Organisation, the Ministry oversees New Zealand's export certification system and ensures that our exports meet the requirements of our trading partners. If a phytosanitary certificate is required, the Ministry issues this as a written government-to-government assurance stating that all importing country phytosanitary requirements have been met.

Phytosanitary certificates must specify that a consignment is free of any quarantine pests, and may include a statement specifying that it is practically free of other pests. New Zealand has a number of forestry quarantine pests, including one pathogen, that are specifically referred to by at least one of our key trading partners – China, India, Korea, Japan, Australia and the United States. These are *Arhopalus ferus, Hylurgus ligniperda, Mitrastethus baridioides, Oemona hirta, Platypus apicalis, Platypus gracilis, Sirex noctilio* and *Phytophthora kernoviae*. Complete quarantine pest lists for some countries can be extensive and encompassing, for example, Australia specifies entire orders (such as termites) or broader taxonomic groups (such as the Cucujiformia that includes all weevils, longhorn beetles and leaf beetles).

Port of Tauranga, New Zealand's busiest log port. The sheer scale of activity here highlights why alternative phytosanitary treatments need to be cost-effective and practical to implement at large scales. Source: Port of Tauranga

Alternatively Japan specifies both quarantine and non-quarantine pests, so all species not listed as a non-quarantine pest can potentially be considered as quarantine pests on arrival. In practice, the National Plant Protection Organisation of each country revises their pest lists regularly, meaning the assignment of quarantine status for a given species can change quickly. Hence, primary industry sectors including the forest industry cannot assume that the phytosanitary requirements of importing countries will remain constant. Such changes may threaten existing market access or necessitate additional phytosanitary treatments.

Phytosanitary issues are major business risks to NZ forest industry

Key trading partners have temporarily refused forest product imports from other countries because of quarantine-related issues (see below, impacts of new incursions). New Zealand exported 16.5 million cubic metres of logs and two million cubic metres of sawn timber in 2013 (MPI, 2013a). Such wood-based exports (for example logs, sawn timber, chip, pulp, and manufactured wood products) represent approximately 10 per cent of all exports from New Zealand valued at $4.5 billion (FOA & MPI, 2013).

Self and Turner (2009) estimated that economic losses to forest owners would be between US$369 and US$3,007 million from a one-year suspension of trade. Since 2009, the New Zealand log trade alone has increased by 88 per cent so the economic losses could be expected to increase proportionately. The potential economic consequences of phytosanitary-related trade disruption highlight the importance of maintaining an export phytosanitary certification system of the highest integrity. Why? Because the presence of a quarantine pest on arrival could immediately halt exports, including ships en route, on the basis of phytosanitary concerns.

Maintaining existing market access and securing new markets requires exporters to meet all current and future potential phytosanitary requirements. Without effective treatment options to overcome phytosanitary risks our export options for forest products are compromised. As specified by the Sanitary and Phytosanitary Measures Agreement, phytosanitary risks must be addressed scientifically to ensure treatments, handling methods or technologies effectively reduce or eliminate the risk to the satisfaction of the trading partner.

The science to reduce or eliminate phytosanitary risks requires time and funds to adequately develop robust data that can be used to support market access negotiations conducted by the Ministry for Primary Industries. To open new markets, and to maintain the confidence of existing trading partners, it is vital that investment is made in phytosanitary treatment research.

Phytosanitary treatments available to NZ exporters

Maintenance of New Zealand's forest export market access is underpinned by a longstanding systematic surveillance programme across our forest estate, elimination of soil and needle debris from the surface of export logs, application of phytosanitary treatments, and inspection of logs at ports. A number of treatments can be applied to specific commodities to meet the current phytosanitary requirements of our key trading partners. These treatments are:

1. Phytosanitary measures with broad approval across multiple commodities and countries:
    - Methyl bromide is accepted by most trading partners for use on all wood products. The duration and concentration of treatment often varies, depending on the commodity and temperature, with higher concentrations required at lower temperatures. Methyl bromide is an ozone depleting gas for which the New Zealand Environmental Protection Agency (EPA) has specified that residual fumigant present in the head space at the end of treatment must be recaptured and/or destroyed from 2020 (ERMA, 2010).
2. Phytosanitary measures for use on specific commodities or to specific countries:
    - A 10-day in-transit phosphine fumigation at no less than 200 parts per million is permitted as a phytosanitary treatment for export logs to China.
    - Heat treatment of 56°C for 30 minutes is accepted by India for the treatment of *Pinus radiata* logs and sawn timber, and by Australia for sawn timber.
    - Kiln drying is accepted as a treatment for some markets, but approved drying schedules vary between countries. Kiln dried timber may also be subjected to additional phytosanitary

treatments to control infestation by hitchhiker pests, for example, Australian timber exports must be fumigated if exported more than 90 days after kiln drying.

- Australia permits the use of sulphuryl fluoride, ethylene oxide and permanent preservative treatments for sawn timber imports.
- Insecticidal fogs and sprays, such as Pestigas, are approved by Australia as options to control the hitchhiking pest *Arhopalus ferus* on sawn timber products during its summer flight season. Alternatively containerised kiln dried sawn timber that has been secured from potential *Arhopalus* infestation can be exported to Australia as part of a secure pathway agreement negotiated by the Ministry for Primary Industries (MPI, 2013b).

In some circumstances it is possible to reduce the biosecurity risk of a commodity and negate the need for phytosanitary treatments. For instance, debarking or processing logs reduces the risks associated with many quarantine pests, such as bark beetles, as they feed only within the bark layer. China recognises that debarked logs (less than five per cent residual bark per log and a total of less than two per cent residual bark per consignment) and sawn timber are lower risk commodities and it does not specify mandatory application of phytosanitary treatments, such as methyl bromide or phosphine fumigation.

Potential impacts if a quarantine pest breaches NZ borders and is detected

Multiple international examples of forestry-related trade disruption illustrate that trade bans are a possibility if: A) quarantine pests are intercepted at the border by trading partners; or B) a new quarantine pest is found in New Zealand. For example, China prohibited log imports from Virginia and South Carolina in the United States in April 2011 due to pinewood nematode interceptions. Hardwood exports resumed on a trial basis in May 2012, subject to additional phytosanitary treatments. However, softwoods such as conifers from these states remain prohibited (USDA, 2014).

Similarly, Korea prohibited the import of Chilean *Pinus radiata* in October 2008 after a new *Phytophthora* species that was later identified as *Phytophthora pinifolia* and the causal agent of Daño Foliar del Pino (DFP) (Duran et al., 2008) was assessed as having the potential to cause cankers on host trees. Since 2008, Korea has not imported *P. radiata* logs from Chile. In contrast,

Fumigation tarp. Methyl bromide, currently widely used as a biosecurity treatment for export logs, will need to be used differently or replaced to meet an EPA-imposed deadline of 2020. Source: Scion

sawn timber exports have increased by more than 200 per cent and now represent 26 per cent of total lumber imports (Peter Hill, pers. comm.). In addition, Korea prohibits log imports of some species from parts of the American Pacific north-west as they may potentially carry *Phytophthora ramorum* (USDA, 2014).

As New Zealand's National Plant Protection Organisation, the Ministry for Primary Industries is required by international phytosanitary agreements to assess all new pest incursions and report them to our trading partners. If the pest presents a biosecurity risk to our trading partners, the Ministry must act quickly to prevent exports leaving New Zealand that may be infested with the new pest. Subsequent actions that affect trade may then occur with little warning to exporters, and the potential economic losses if trade is halted can be substantial (Turner & Self, 2009). As an example outside the forestry sector, Treasury and the Reserve Bank modelled the costs associated with the loss of trade following a foot-and-mouth outbreak, concluding that it would cost New Zealand $60 billion over a number of years in lost trade and production and its downstream effects on the national economy (Reserve Bank of NZ & NZ Treasury, 2002).

Re-opening trade requires a detailed technical justification that includes significant underpinning research to demonstrate that the new organism is either not capable of being transmitted on the export pathway or is controlled by the application of existing, or new, phytosanitary procedures. The science to reduce or eliminate phytosanitary risks requires funding and time based on the biology and risk posed by the detected quarantine pest. The timeframe for the resumption of trade depends on the requirements to adequately develop robust data that the Ministry for Primary Industries can use to renegotiate market access with trading partners.

Critical information required during market access negotiations includes but is not limited to:

- Whether the quarantine pest is the subject of an incursion response.
- The pest distribution within New Zealand – this may provide opportunities for exports to resume quickly from regions shown to be free of the pest or disease.
- Confirmation that the pest or disease is or is not present on the export pathway, for example, proof that a new foliar pathogen or foliar-feeding insect was not present on export logs would be sufficient justification to negotiate the resumption of trade (Ahumada et al., 2012).
- Efficacy of current phytosanitary treatments such as methyl bromide, debarking or heat for controlling the new pest or disease. New phytosanitary treatments would need to be developed if existing treatments were not effective.

Additional measures may be imposed to mitigate phytosanitary risks and allow trade to resume.

Separator trap. Scion has a nationwide network of traps to monitor phytosanitary pests. Forest protection field officer Liam Wright installs a custom designed trap that lets scientists correlate pest activity with weather conditions. Source: Scion

Although such measures cannot be predicted a priori they could include the storage of logs without ground contact, reduced length of time between fumigation, inspection and export, higher concentrations or longer durations of chemical treatments, and more stringent temperature requirements for fumigation.

During an incursion response the Ministry for Primary Industries may also limit the movement of potentially infested materials within specific zones, pathways or particular markets to prevent further spread of a quarantine pest and thereby limit any subsequent trade impacts. This occurred during the recent Queensland fruit fly incursions in Northland. Movement controls will vary depending upon the nature and risk posed by a particular pest or disease. At their most stringent controls may ban all movement of wood products between specific regions. Such controls are likely to change over time as the response progresses and new evidence becomes available, including a better understanding of risk or the provision of new tools for managing the risk.

Pests and diseases NZ does not want – a market access perspective

There are more than 3,000 named quarantine pests, pathogens and other unwanted organisms, such as viruses, not present in New Zealand which are officially regulated by the main forestry trading partners mentioned above. While most of these species are not relevant to the export of forest products we do not want them arriving and establishing in New Zealand. More than 30 of these taxa, either genera or species, that are not currently present in New Zealand are known to feed on recent deadwood of *Pinus* spp. or related conifers. Bark beetles, such as *Dendroctonus* spp. and *Ips* spp., and wood borers from the family *Cerambycidae* (same family as the native huhu beetle), are a key concern as are a number of pathogens which will be discussed below.

Pine wilt nematode (PWN, *Bursaphelenchus xylophilus*) is regarded by many countries as the most significant invertebrate pest of pines. It was the presence of this pest that resulted in the trade disruption of American logs to China markets. The potential host status of *Pinus radiata* to pine wilt nematode is currently uncertain. Some authors report resistance to infection, whereas others observed 80 per cent mortality (Sathyapala, 2004) or strong physiological responses leading to lower photosynthetic activity (Abrantes et al., 2013). The likelihood of pine wilt nematode establishing in New Zealand is considered low given the management of known pathways and the absence of any beetle vector in this country that could facilitate its establishment and long-term spread (Sathyapala, 2004).

The most significant forest pathogens that are not currently present in New Zealand, but may affect our export log trade, are those known to colonise the xylem and cause cankers or resinosus on the harvested stem (Brown & Brasier, 2007). Such species present the greatest risk as they directly impact wood quality and can potentially be spread by the trade in export logs. Key examples are *Fusarium circinatum* and *Phytophthora ramorum* (Brown & Brasier, 2007; Wingfield et al. 2008).

Pinus radiata is not a host for *P. ramorum*, but Douglas fir (*Pseudotsuga menziesii*) is a host and many understorey plants within plantations are likely to be susceptible (Hueberli et al., 2008). Trading partners may therefore request official assurance that exported commodities are not cross-contaminated with viable *P. ramorum*. This is currently the case for some log exports from the United States to China (USDA, 2014).

These unwanted organisms are listed as quarantine pests for imports to New Zealand, but the potential trade impact of their establishment in this country will depend on the response of trading partners, their subsequent pest risk analysis and the requirements determined by each to a given pest. For instance, the pre-existing presence of *Fusarium circinatum* in Japan, Korea and the United States (Wingfield, 2008) would moderate the response taken by these trading partners in the event of its establishment in New Zealand. A similar argument may be made for *P. ramorum* in Europe and the United States given its broad distribution in these regions.

The current hypothesis for the centre of origin of *P. ramorum* is Asia (based on the centre of diversity for many genera of the pathogen's hosts (Goheen et al., 2005)), however this may need to be demonstrated should the pathogen be found in New Zealand. Proactively defining areas of origin and the current distribution of key forestry pests and diseases would allow industry to minimise the potential trade disruption if such unwanted organisms arrived in this country. Trade with countries, including Australia, that share area of freedom to these quarantine pathogens are therefore the most likely to be impacted by an incursion.

To minimise the trade impacts of a future incursion by known regulated pests or pathogens we can prepare by assessing the potential risk of establishment following arrival and the likely impact that the presence of each species would have on trade. This work is essential and is at the core of the development of the proposed Government Industry Agreement on Biosecurity Readiness and Response (GIA) for forestry. Once complete the Agreement will allow the prioritisation of forest health surveillance resources, and allow pre-emptive research to be considered to address potential trading issues should a known high-risk species establish in New Zealand. However, such a process will not prepare us for the unknown biosecurity threats, that is, species not yet known to cause a pest problem.

The presence of such unknowns has highlighted the need for pathway-based approaches (Evans, 2010), where biosecurity focuses on the trade pathway as opposed to a particular pest species, the intent being that a pathway approach eliminates both known and unknown threats. The internationally adopted wood packaging regulation (ISPM 15) is one example of a successful initiative targeting a specific pathway to reduce the likelihood of quarantine pests moving between countries during international trade (Haack, et al. 2014). New Zealand needs to carefully consider the high-risk pathways in a forestry context to minimise the potential establishment of unknown pests and pathogens (Brockerhoff & Bulman, 2014).

Future-proofing market access

There are important steps that we can take to mitigate risks from potential high-risk biosecurity threats to our export wood markets. In particular we must:

1. Develop additional quarantine treatments to ensure suitable tools are available if a particular treatment option, such as methyl bromide, is lost or new quarantine pests arrive that are not controlled by the options currently available. This includes developing:
    - recapture/destruction methods for methyl bromide
    - alternative chemical treatments

- alternative non-chemical treatments, which includes but is not limited to debarking, heat and irradiation
- ecologically-based risk approaches that define treatment-free opportunities such as during a winter pest-free period.

Such new approaches to phytosanitary procedures must be cost-effective, logistically feasible, and above all must have a technical justification that demonstrates their effectiveness at mitigating the quarantine risk posed by the relevant regulated quarantine pest species. Ideally new methods could be strategically targeted at contained points of the export pathway, but with broad efficacy against a range of pests and pathogens so that they control unknown pests of trade significance. Demonstrating such efficacy is challenging and requires rigorous testing as specified by ISPM 28: Phytosanitary Treatments for Regulated Pests (IPPC, 2011). We must be proactive and prepared to invest both time and money to prepare the required data for new treatments so that they meet the standards of the International Plant Protection Convention.

2. Ongoing forest surveillance to provide early detection of new incursions. The worst case scenario for the New Zealand forest industry is the establishment of a high profile quarantine pest that is resistant to the currently available phytosanitary treatments. An active, risk-based, forest surveillance programme is important for three reasons:
   - Because eradication success declines significantly with the increasing area of infestation (Brockerhoff et al., 2010), thus early detection by active surveillance improves the likelihood of eradication. If a new incursion is not detected early and/or eradication is unsuccessful, then the newly established pest may reduce forest productivity and/or export market access for wood products.
   - An active nationwide surveillance programme can provide countrywide, or regional, evidence that an area of freedom exists for particular pest species. To do this, surveillance must be undertaken in accordance with the Ministry for Primary Industries' export phytosanitary certification system requirements. The Ministry uses area of freedom data to assure trading partners of our pest free status. This is an often overlooked benefit of forest health surveillance. However, such assurances to our trading partners are crucial for maintaining access to current markets and can only be made because of an ongoing investment in national surveillance programmes.
   - Rapid assessment and response to new incursions, as opposed to endemic or naturalised species, relies on accurate knowledge of both harmful and benign pests and pathogens within the system. Changes in the behaviour of established pest and pathogens may occur in association with changed land use, forest management or climate change. As there are different biosecurity implications, risks and responses to naturalised and introduced pest species baseline knowledge upon which such assessments can be made is essential.
3. The Ministry for Primary Industries and industry must collaborate to identify opportunities for proactive research that could maintain market access in the event of a future incursion. *Phytophthora ramorum* and pine pitch canker are examples where knowledge of their presence in key trading partner countries could facilitate high-level discussions with officials to maintain trade in the event of an incursion. Where such species are not present then a full understanding of their potential association with key export pathways, such as presence and survival on export logs, would help minimise trade risks should it establish. Work on such pests and pathogens would need to be done offshore.

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