NEW ZEALAND
FOREST OWNERS' ASSOCIATION INC.
85 THE TERRACE, WELLINGTON 1, NEW ZEALAND
PO BOX 1208, WELLINGTON
TELEPHONE 0-4-473 4769 FACSIMILE 0-4-499 8893

MAF/NZFOA 5th Annual Forest Health Workshop

Biotechnology Solutions for Forest Biosecurity Problems

28th February – 1st March 2006 – Rotorua

Workshop Objectives

1. To review progress in forest biosecurity over the previous 12 months
2. To transfer knowledge from FBRC/FRST-funded research programmes to end-users
3. To provide an update on breeding and other technology solutions for forest health problems
4. To develop strategies for solving current and potential forest biosecurity problems including identifying possible funding opportunities

Summary from Workshop

Approximately 70 stakeholders attended the workshop. The workshop presentations have been placed on the FBRC website (www.fbrc.org.nz). Key points from the workshop follow:

- In the last 12 months industry, MAF, and research providers have achieved a great deal on the forest biosecurity front. MAF in particular has done an excellent job dealing with incursions and reviewing its High Risk Site Surveillance programmes. Industry has implemented a new Forest Health Surveillance scheme that is running well with no major problems to report. There has been considerable progress on the research front.
- Overall we can congratulate ourselves on doing a pretty good job in the last 12 months, however, our scores in the year's report card (Appendix 1) would have been higher except that we haven't been all that successful developing new solutions for forest biosecurity problems, we haven't been successful implementing condition monitoring, we still have a shortfall in industry funding, and we are not doing enough to address the biosecurity issues associated with sea containers.
- The workshop reviewed the progress that has been made in FBRC and also some FRST funded research projects. Nectria continues to be a major challenge and it is recognised that more funding is required to combat this incursion, which is causing considerable damage in southern forests and could, it appears, become a NZ-wide problem.
- It is clear from workshop presentations and discussion that we need to stretch our thinking to come up with new approaches to solving existing and future problems. For example, the issue of risk from sea containers will continue to increase and much more needs to be done to understand this pathway and develop solutions to detect potentially dangerous organisms before they can establish in New Zealand. We also need to take a much more innovative approach to dealing with existing pests and diseases in order to come up with ways to reduce their economic impacts.
- Funding will continue to be a problem as the immediate outlook for the industry is not promising. The workshop discussed promoting the "goods and services" values provided by healthy forests – urban and indigenous as well as plantation – and to look for alternative sources of funds for research and possibly operations.
- A list of **Action Items** is included in this report.

Action Items from Workshop
(responsibility in brackets)

1. Encourage greater interaction with industry on forest biosecurity issues at a high level. CEO workshop a good example. Plan another "CEO workshop" for early 2008 (FOA, MAF)
2. Encourage senior industry to participate in incursion exercises (e.g., PPC) (MAF, FOA)
3. Need for a "one forest approach". Look for a common approach where possible. I.e., include indigenous and urban forests in the approach, along with plantation forests (FOA, MAF, DOC etc)
4. Promote "ecosystem services" message to great justify focus on biosecurity and forest health issues (FOA, MAF, ensis)
5. Encourage new investment into forest biosecurity/health capability in industry, research, and government (FOA, MAF, Ensis, Lincoln Bio-protection CORE etc)
6. Build commitment to provide ongoing training in forest biosecurity (FOA, MAF, research providers).
7. More scenario planning, risk analysis, simulations, and awareness raising to deal with potential future threats (MAF, FOA).
8. Identify the benefits in dealing with potential threats (FOA, MAF, research providers)
9. Look outside of forestry for possible solutions to biosecurity problems – e.g., grapes, olives, Europe etc (FOA and research providers)
10. Look outside traditional pathology and genetics research areas for solutions – e.g., soil micro-organisms, endophytic fungi, and encourage research collaboration (FOA, MAF, RPBC, research providers)
11. Extract existing information on alternative species from NZFRI and other organisations as part of a long-term solution to biosecurity problems (Denis H, FOA, Ensis etc)
12. Consider an ecosystem approach to biosecurity management (Ensis)
13. Encourage greater leadership in industry to deal with key issues. FBRC seen as a good start. (FOA)
14. Seek new ways to fund forest biosecurity research – from all participants, government etc – consider "other benefits" from forests (MAF, FOA)
15. Seek simple solutions to biosecurity problems and use them if possible, including fumigants, gamma rays etc (MAF, FOA)
16. Use technology (videos etc) to raise awareness of biosecurity issues and also investigate technology to improve data collection (FOA, MAF, research providers)
17. Consider greater focus on pathways and how to close pathways to reduce risk (MAF, FOA, ensis)
18. Try to minimise impacts of greater biosecurity awareness and risk on trade, including trade in germplasm. Seek safe alternatives – e.g., tissue culture (FOA, MAF, ensis)
19. Share knowledge (internationally) on technology developments – post and pre-border (FOA, MAF, research providers)

20. Consider making better use of data – e.g., what's in Forest Health database, dead organism information etc (ensis, FOA, MAF)
21. Piggyback on others (sectors and countries) as new technology, and even old technology, can be expensive and not always accepted by public (MAF, FOA)
22. Determine if we can use existing databases (e.g., FH database) to identify potential useful genetic crosses in the breeding programme; use Dothi surveys to evaluate crosses (FBRC)
23. Evaluate risk of narrower radiata pine genetic diversity and impact of new introduction on any resistance in breeding stock; consider protecting some trees for preserving germplasm (RPBC)
24. Determine what the currently collected needle retention data tell us about foliage disease resistance in Pinus radiata (RPBC).
25. Consider development work on propagation methods to enable rapid multiplication of germplasm in case of an incursion (FBRC, RPBC)
26. Consider new and novel approaches to propagation to reduce biosecurity risk (RPBC, others)
27. Consider more work on site specific forestry, specifically allocation of new breeds/genotypes to sites (RPBC, ensis)
28. Produce a workshop report and distribute to participants (BD)
29. Post presentations and report on FBRC website (BD) and link to FOA and MAF sites (FOA/MAF).
30. Discuss and potentially plan a workshop for next year (FOA/MAF).

Introduction

This was the fifth annual Forest Health workshop sponsored by FOA and MAF. It was well attended with approximately 70 stakeholder representatives. Approximately half were from industry, including consultants as well as forest owner staff, roughly 15% were from Government, and the remainder were from research organisations.

The focus of this year's workshop was on biotechnology solutions for forest biosecurity problems, but the workshop provided a forum to present recent developments from FBRC-funded research as well. Day 1 (starting at 4 pm) was focused on setting the scene and getting the attendees thinking about the issues. The format included a social event, which enabled attendees to get to know each other better, and "break the ice" in preparation for robust discussion the next day.

This report captures the highlights from the workshop and main points of discussion. A series of "action items" was developed that will be addressed over the next few months to a year.

Workshop Programme and Discussion

The programme for the workshop is copied below and key points of discussion noted. For copies of the presentations see the FBRC website www.fbrc.org.nz.

Day 1 late afternoon session:

Opening Address by the Dr Stephen Goldson – Chief Science Strategist, AgResearch – "Technology Solutions for Biosecurity Problems – Stretching Our Thinking"

- The basic message was that we need to stretch our thinking if we are going to develop solutions for biosecurity problems. The issues are becoming bigger, e.g., more sea container traffic, and it will take step-change thinking and implementation of new technologies to keep pace.

FBRC Science – What's Been Done and What's Been Learned?

Ensis presentations – Lindsay Bulman and Tod Ramsfield

Lincoln Bio-protection CORE presentations – Robert Hill

- Ensis and Lincoln Bio-protection Core research partners have achieved a considerable amount in their FBRC and FRST funded research programmes over the past 12 months.

- See website (www.fbrc.org.nz) for presentations and also 2005 FBRC Annual Report, also available on the website and in hardcopy from the FOA office.

Day 2 Session

Bill Dyck (for FOA) – What's been achieved? A review of 2005 Workshop Outcomes and other forest health achievements over the last 12 months. (See Appendix 1 for details).

Jeremy Fleming (Chairman FHC and FBRC) – The need for solutions to biosecurity problems. Making the case for solving existing and potential problems.

- Established pests and diseases are costing the industry over $200 million/year in direct and economic losses. (A table of existing diseases and pests and their estimated cost to the forest industry is provided in Appendix 2)
- MAF has spent over $90 million on eradicating and managing forest related pest incursions since 1990.
- Central and local government benefits from healthy forests as forest provide many benefits other than just timber. They should contribute more to maintaining forest health and reducing biosecurity risk.
- However, industry should also contribute more than the $300K currently raised from FOA and FFA members for forest health research.
- Sea containers and imported motor vehicles are seen as a continuing and increasing biosecurity threat to NZ's forests

WHAT DISEASES AND INSECT PESTS ARE WE WORRIED ABOUT AND WHAT'S BEEN DONE TO PROVIDE SOLUTIONS IN NEW ZEALAND?

1. Overseas pest threats (Tod Ramsfield - Ensis)

- We can't predict new incursions or how serious a pest will be if it establishes in New Zealand, therefore pathway management is key to preventing establishment of exotic diseases.

2. Nectria from an industry perspective (Gordon Hosking – consultant)

- While considerable progress has been made understanding and combating Nectria, the biggest impediment to progress is the lack of sufficient funds to support management and operational research.

3. Pests and diseases present in New Zealand (Margaret Dick – Ensis)

- Appendix 2 lists the diseases and insects present in NZ plantation forests. There has been considerable work on these pests over the last several decades with a variety of control mechanisms developed and implemented.

4. Single gene for cypress canker resistance (Luis Gea – Ensis)

- Cypress canker is a major constraint to greater plantings of cypresses in New Zealand

5. The genetic basis of biotic risk management (Roly Burdon – Ensis)

- New Zealand forestry's genetic defences are in need of urgent attention.

6. Pattern of Genetic Diversity of the Dothistroma Fungus Implies a Potential Biosecurity Risk to New Zealand (Sue Carson – Carson Associates Ltd, with input from Rosie Bradshaw – Massey University)

- There is an urgent need to better understand the threat of overseas strains of Dothistroma on the New Zealand radiata pine resource.

7. The Radiata Pine Breeding Company Strategy – Biosecurity Risk Considerations (Denis Albert – RPBC)

- Tree breeding is a strategic response to biosecurity considerations.

8. Biotechnology Solutions for Obtaining Pest and Disease Resistance (Mike Carson – Carson Associates Ltd)

- There are several biotechnology opportunities for obtaining pest and disease resistance. An urgent need is to promote the use of tissue culture to safely move germplasm across borders.

BIO-PROTECTION SOLUTIONS TO FOREST BIOSECURITY PROBLEMS

9. Growth enhancement of containerised *Pinus radiata* seedlings following application of Trichoderma commercial product (Arborguard) formulations (Danny Paderes – PF Oslen, TIF);

- The application of beneficial organisms, including Trichoderma strains, has been demonstrated to effectively improve pest and disease resistance of seedlings in radiata pine nurseries. There are many promising opportunities in this area.

10. **(Bio-protection solutions to forest biosecurity problems (Travis Glare – AgResearch)**

- There are many promising opportunities for insect bio-control technologies to protect New Zealand forests.

Workshop Session

Questions addressed:

Group 1 (C Holden, Jeremy Fleming) What do we see as the big biosecurity issues facing the industry in the near to medium future?

Group 2 (D Hammond, Denis Hocking, Ecke Brockerhoff) Are we trapped in narrow thinking and not looking wide enough for solutions to current problems? Especially given the expected future. Pro-active non-high tech-measures for ensuring forest health – what are they? Are we missing something simple?

Group 3 (G Hosking, Wei-Young Wang) What are potential biotechnology solutions to focus effort? And what are the advantages and disadvantages of advanced biotechnology solutions?

Group 4 (N Heron, Elaine Birk) Are we missing some of the linkages between biotic risk and genetic diversity? How do we deal with these?

Groups also to discuss "Identifying possible funding opportunities"

Report Back (notes as captured follows)

Group 1 - "What do we see as the big biosecurity issues facing the industry in the near to medium future?"

General – not just industry but indigenous and urban forests too
Four themes:

1.Issues: - Role of industry in funding for research and more general needs, pre-border to response stage; need for partner-ships with researchers and govt; what interest does industry have in biosecurity? – new owners – are they committed?

Strategies – more interaction with industry at a senior level – e.g., CEO w/shop; more of this needed; encourage to participate in planning exercises, e.g., PPC exercise;

2. Issues: - Fragmentation of institutions – research – a whole bunch of committees; fragmentation around funding; need for a “one forest” approach.

Strategies - Aggregating consultative committees; engender whole of forest focus; find ways to do this; other owners, DOC, councils, etc; promote “ecosystem services”

3. Issues: - Capability – need for succession planning; maintaining skills;

Strategies – Encourage new investment into capability; Govt; and industry; build commitment to provide ongoing training etc

4. Issues: - Future threats – containers; uncertainties around new organisms and problems – surprises!; climate change – new organism establishment; alienated communities – increasingly urban;

Strategies – More scenario planning; risk analysis, simulations, raising awareness of the need for biosecurity. And the benefits.

Group 2 -“ Are we trapped in narrow thinking and not looking wide enough for solutions to current problems? Especially given the expected future. Pro-active non-high tech-measures for ensuring forest health – what are they? Are we missing something simple?”

- Yes – we are trapped in our thinking.
- We should be looking further a field – outside of forestry – outside of NZ. Other crops – grapes, olives, Spain.
- Understanding role of soil microorganisms. Learning from other countries. Encourage collaboration amongst researchers; In-kind as well as $ contribution to funding
- The future is “unexpected” – we don’t know what we are going to have to deal with; therefore we shouldn’t get too focused on one or two issues; be somewhat conservative;

- Alternative species as a way to mitigate risk; need to extract existing information; ecosystem approach to biosecurity risk management.
- Risk perception varies. e.g., timeframe of rotations.
- Leadership as a key issue. FBRC seen as a good start – leadership and direction; more needed in other areas for industry.
- Spend on forest health – especially in non-commercial estate; One-forest theme – more cohesive approach;
- Funding a key issue - levy? Or similar? Capture more of the beneficiaries. Ecosystem services etc

---

Group 3 – "What are potential biotechnology solutions to focus effort? And what are the advantages and disadvantages of advanced biotechnology solutions?"

- Technology solutions covered. Don't invent a complex solution when you can use a simple one.
- Pre-border – application of technology – risk goods and people; people ok but not perfect; use technology to raise awareness – videos etc – but difficult; technology to collect data – understanding and evaluating risk at the most critical point can only pay dividends; id pathways and how to close pathways; we've lost data in the past (dead organisms);

- Border – technology – (1) existing – refine and apply; (2) new tech – risky – future; Don't overlook – fumigants – have we put enough effort into looking at alternatives to MeBr? Etc heat treatment; gamma rays;
- Border tech – enabling technologies – we need trade; import of genetic material (applies to other sectors too); swap info with colleagues in Oz; sharing knowledge – this is in technology areas; Oz $ -
- Post-border – early detection technology – resource monitoring, remote sensing; CSI – forensic technology; nanotech;

- Funding – Whole-forest approach and ecosystem services – others should pay (as well) – increasing risk from newer pathways – e.g., containers; National Issue!
- Make better use of data – identifying risk at the border for e.g.,
- Need to access best information when we do have problems – expertise, real time, video conf etc
- Heaps of advantages; but risky and expensive for new tech – but can be strongly offset with old tech; public acceptance can be a disadvantage to new tech (or even old tech); piggyback on others

---

Group 4 – "Are we missing some of the linkages between biotic risk and genetic diversity? How do we deal with these?"

- Can we utilise existing databases to id potential useful genetic crosses; FH D/base? Dothi surveys to re-evaluate crosses;
- Genetic diversity narrower today – risk that new introduction would result in selection from a narrower range (I.e., for resistant trees); consider protecting some remnant stands or preserving germplasm;
- Needle retention data – need to re-examine this in full context of disease risk;

- Consider more than genetics – like endophytic fungi – could play an important role; structure of needles etc;
- Propagation methods – consider development work on some of the older methods – in case of an incursion we need to rapidly propagate selected material

- Put genetic trials close in incursion points – consider “sentinel forests” – e.g., port of Auckland;
- More work needed on the application of new breeds/clones by companies – to locate where they will be of most use – site-specific forestry;
- Consider new and novel approaches to propagation.

Appendix 1 – Achievements Since Last Year's (2005) Workshop

What we said we would do and what we did:

1. Industry and researchers need to make the case to both industry and minister for "FIFA" money for forest biosecurity (Urgent FHC, FBRC) – Done through FIDA
2. Industry and MAF needs to have a clear plan for what to do the next time a new fungus is detected in our plantations (FHC, MAF) – Pitch Caner simulation exercise went well
3. More effort to communicate the benefits from research and the returns to industry from operational spending to detect and control diseases (FHC, FBRC) – Reports and publications to stakeholders
4. Consider inviting DOC to participate on FBRC (FBRC) – DOC is now participating
5. Consider inviting Radiata Pine Breeding Co. to participate on FBRC (FBRC) – RPBC has now applied for membership
6. Input from workshop into FBRC Operating Plan (FBRC) – Done – now seeing more emphasis on research for solutions.
7. Consider holding a workshop on Dothistroma knowledge – Being planned for 2007
8. Encourage research organisations (e.g., NZFRI) to employ a stress physiologist to work on problems such as physiological needle blight. Ensis Australian scientists being used on PNB.
9. In addition to research, seek operational control methods for existing diseases and disorders (e.g., Cyclaneusma) (FHC, FBRC) - Nothing for Cyclaneusma; fine tuning Cu spray for Dothi; resistant seedlings for Armillaria.
10. Support the development of management tools for dealing with Nectria (FHC, FBRC, NWG) – Some progress silvicultural treatment, also looking at wound protection.
11. Produce a workshop report and distribute to participants – Done
12. Post presentations and report on FBRC Website and link to FOA and MAF sites – Done
13. Get more FOA representatives to these workshops – Done – and also running a "CEO Biosecurity" Workshop
14. Plan a workshop for 2006 - Done

Additionally:

- New Forest Health Surveillance System designed and implemented, and no new incursions detected, but
- Struggling to fully implement condition monitoring aspect because of funding gap
- Forest Health Database enhanced (NZFRI) but needs more funding to take next step
- FHS audit underway
- Participating in Better Border Biosecurity OBI
- Industry maintaining commitment to research levy, but

- Struggling to secure intended funding to leverage FRST
- Excellent working relationship with MAF Biosecurity, but
- Struggling a bit to secure SFF funding for condition monitoring
- BNZ High Risk Site Monitoring underway – 35% increase in new records
- No new major incursions, but industry concern with container inspection
- New PAM finds
- Nectria research producing good results and silvicultural tools, DNA protocol, but much more still needed
- Knowledge on Pitch Canker greatly improved
- Uraba – stem injection technique developed
- Buddleja – ERMA ok for biocontrol
- We said we needed strategies and the Armillaria review near completion and the needle fungi review planned

Last year we achieved an A- average – and the year before we scored a C+ (which was an improvement over the previous year)

This year's score:

Scorecard for last 12 months:

Improved awareness	A
Collaboration	A
Tackling key issues	B
Filling gaps in biosecurity	B
Improving surveillance	B
Strategic approach to research	B+
Effective research	A-
Incursion response	A-

Note:

Scores would have been higher except that we haven't been all that successful developing new solutions for forest biosecurity problems, we haven't been successful implementing condition monitoring, we still have a shortfall in industry funding, and we are not doing enough to address the issue of sea containers.

Appendix 2 - Existing (in NZ) Pests and Diseases, Economic Losses, and Operational Responses

Pest or Disease	Host	Annual Loss ($ millions)	Operational Response	Comments
Cyclaneusma needle-cast	Radiata	61♣	None employed, but silviculture can reduce impact; breeding long-term	Silviculture treatment not considered operational
Dothistroma needle blight	Radiata	23♣	Copper spray; silviculture, breeding long-term	Need to be aware of potential public perception to copper drift spray
Armillaria root rot	Radiata	37♣	Some biological control/seedlings Stumping expensive	Treated seedlings now on market; Could shift species – but to what?
Flute canker (Nectria)	Radiata	10♣	Silvicultural guidelines to reduce infection	Relatively new disease – receiving considerable attention
Diplodia whorl canker	Radiata	4♣	Avoid pruning in summer and during periods of stress, avoid overpruning	Can be locally severe, but pruning recommendations solve the problem.
Other diseases	Radiata	4♣	None	Minor fungal diseases
Physiological needle blight	Radiata	unknown	None	More research required to understand disorder
Hylastes (bark beetle)	Radiata	20 in perpetuity♠	Delay planting to reduce beetle numbers	Working on biological control methods
Essigella (aphid)	Radiata	None?	None	Economic losses in Australia
Sapstain	Radiata	Up to 100♦	Guidelines including chemicals	Impact on wood quality
Swiss needle-cast	D-fir	1♣		
Cypress cankers	Cypresses	1♣	Site and species selection, breeding	
Eucalyptus insects and pests	Eucs	2?♥	Species selection, siting, biological control	Not all eucalypts affected
Total Annual Loss		Approx 200		Note uncertainties around $ loss figures

♣ from Bulman 2004 – Economic impact of exotic forest pathogens in New Zealand
♠ CHH pers comm – perpetuity value based on 3 mo.s delays to planting in CNI and impact on extending rotation
♦ Industry review – 1996 – based on downgrade, logistical costs, market perception
♥ Euc pest impacts – no good data, small plantation area – but perhaps greater area if not for pests and diseases

Appendix 3 – from MAF

High Profile New to New Zealand Forest Organisms (1 Jan 1990 – 1 February 2006)

Table 1: Outlines Ministry of Agriculture and Forestry costs for eradication and/or management of forest related pests that have been reported since January 1990. Table does not include low risk organisms and/or where investigation costs have been minor (less than $100,000).

Reported Date	Name of Organism	Common Name	Eradication/Control Costs Million $$	Comments
January 2005	*Spilosoma* sp.	NA	0.18	One moth trapped - under surveillance
April 2003	*Hyphantria cunnea*	Fall Webworrm	5.0	Response still in progress
March 2003	*Lymantria dispar*	Gypsy Moth	6.8	Eradication completed May 2005
May 1999	*Teia anartoides*	Painted Apple Moth	60.0	Response still in progress
June 1997	*Uraba lugens*	Gum leaf skeletoniser	3.5	Established – under management
April 1996	*Orgyia thyellina*	White-spotted tussock moth	10.8	Eradication completed 1998
January 1990	*Ophiostoma novo-ulmi*	Dutch elm disease	4.0	Response still in progress
Various dates since 1990	*Coptotermes* spp.	Subterranean termites	0.6	Various responses since 1990. Eradicated from Otorohanga, Matamata and Morrinsville May 2005.
		TOTAL	**$90.88 million**	

NB: Majority of new finds in New Zealand are regarded as low risk. These organisms are not included in table.