NEW ZEALAND

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May 2019

In this issue

New Zealand Institute of Forestry
– Te Pūtahi Ngāherehere o Aotearoa Incorporated –

The Forest Newsfeed:

COMMUNICATING FORESTRY IN THE CONNECTED AGE

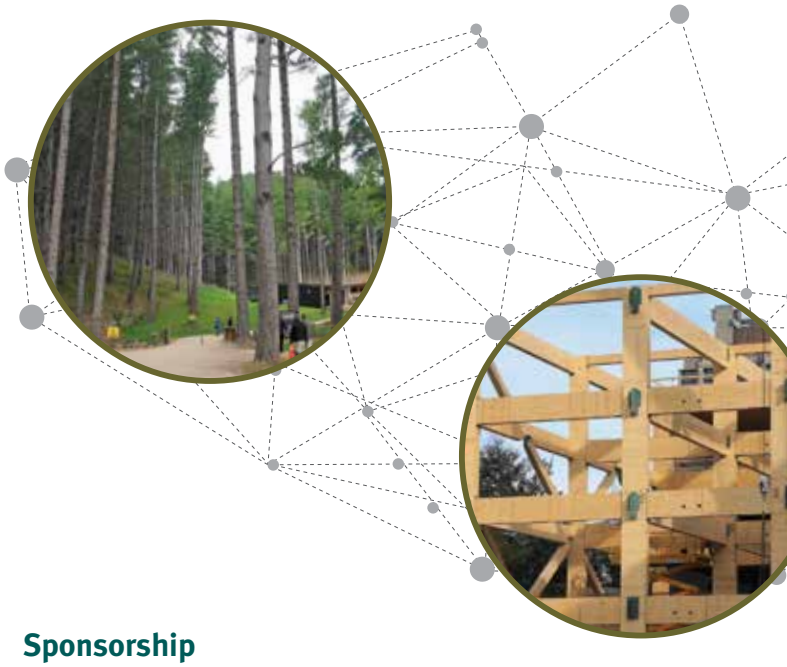
Book yourself out ...

... 25–28 August 2019!

The combined Australian and New Zealand Forestry Conference occurs every four years on New Zealand soil. It provides an excellent forum for forestry professionals to meet and exchange ideas, and an excellent opportunity for companies and organisations to sponsor events and activities that benefit the profession.

Highlights of our conference programme all housed on-site at the University of Canterbury:

- International and nationally based keynote speakers and presenters
- CPD sessions
- NZIF and IFA Annual General Meetings
- AGM networking drinks sponsored by CBRE Ltd
- Women in Forestry working breakfast
- Future Foresters Mentoring/Mentoree session
- Future Foresters Quiz Night sponsored by IFS Growth Ltd
- Student posters, on-site voting
- Not to be missed field trips
- Two fabulous post-conference tour options
- Networking opportunities throughout the catering breaks held within the exhibition area
- Prestigious Awards dinner



Women in forestry

Women in Forestry welcome you to attend their annual event 'This working breakfast'. The event will start with tea/coffee and a presentation from Julie Collins, Deputy Director-General Forestry New Zealand and Head of Te Uru Rākau. Julie is a leader in the forestry sector, with a Bachelor of Forestry Science and more than 30 years' experience in forestry and land-use policy.

All are welcome to attend this event (irrespective of gender!) and hear an inspirational woman in forestry speak about her involvement in the sector over the years. Following the presentation, a glorious buffet.

Field trips

The conference presentations and field trip will show how forest managers are meeting the challenge of communicating the roles that forests can play in a modern economy, and engaging with those who represent the changing societal needs from forests. Topics will include impacts of public perceptions on forest management activities, fire management, future career skills in a changing world and the formulation of government policies that impact on forestry.

Sponsorship

The sponsorship prospectus is located on the conference website. Please review opportunities for your organisation to be included in the ANZIF conference.

Conference updates – registration

The conference organising committee is working hard to secure and finalise all details for the conference – please keep an eye on the conference website for updates. Registration along with accommodation options will be live shortly.

Contact

For further information please do not hesitate to contact our Conference Managers:

EventMergers

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INSTITUTE OF FORESTERS OF AUSTRALIA

New Zealand Institute of Forestry
– Te Pūtahi Ngāherehere o Aotearoa Incorporated –

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Front cover photo: Kauri plantation at Papamoa. Photo courtesy of Euan Mason, University of Canterbury

Back cover photos: (top) Bealey Lodge Backpackers, Christchurch, under construction. Photo courtesy of John Stulen; (bottom) Experiential learning is key for the effective design and implementation of afforestation policies. Barton Gully, Waiapu Catchment, East Coast. Photo courtesy of Tui Aroha Warmenhoven

Social licence to operate

Chris Goulding

Several papers in this May 2019 issue are in response to the Government's 'one billion tree' proposal, discussing the forest sector's licence to operate, interaction with Māori landowners, and the perception of the industry by the media and general public. The proposal has received a large amount of publicity and comments, some very positive from the production forest sector, imagining large areas of new planting and a consequent increase in the long-term sustainable harvest. There has also been negative pushback, with doom-laden predictions of forests of pine blanketing the landscape, loss of rural communities, and more catastrophes with clear-felling and logging slash.

One billion trees sounds a lot, even over a decade. When written as 1,000,000,000 it reads even bigger. If all of the trees were used for production forest afforestation, and the new planting was assumed to occur at 1,100 trees/ha, then this would imply just over 900,000 ha added to the existing national forest estate after 10 years, indeed a very significant increase. With another assumption that forest productivity increases to 25 m^3/ha/year due to the recent increases in final crop stocking, and to tree improvement from breeding, this one billion trees would increase the national long-term sustainable yield by between 22 and 23 million m^3 (or tonnes) per year.

However, it was made clear that the one billion included replanting any harvested areas. It is by no means certain that replanting would be carried out for all the existing plantations, especially all of the large area of forest planted in the boom period of the early 1990s by farmers and small-scale forest investors. Whether this would occur will depend on whether the non-corporate owner makes as much cash as they were expecting, or if they decide that the whole exercise barely broke even and wasn't worth the trouble.

The Ministry for Primary Industries 2016 Wood Availability Forecast suggests that in the next decade there will be a harvest of some 35 million m^3/year, based on model predictions with a 'smooth' annual harvest. At an average of, say, 550 m^3/ha harvested, this would imply, in round figures, that 63,000 ha is to be logged and replanted each year. At a planting density of 1,100 trees/ha, this will require 700 million trees in the next decade, well over half a billion. (These are very approximate calculations.)

It has also been stated that two-thirds of the remaining target for new planting is to be with native trees. This would imply 10 million trees/year for new planting in radiata (mainly), or say 9,000 ha/year, which is not really very much new production forest, especially when the recent-past conversion to dairy farms is taken into account. Even so, it is a welcome change in attitude from the Government, particularly when coupled with the re-establishment of the government forest agency, Te Uru Rākau.

In this issue, Edwards et al. lead with a paper about forestry's licence to operate, concluding that '… there is an imperative to gain acceptance for these "resource operations". Social risks and uncertainties must be adequately addressed.' Velarde et al. discuss lessons for policy design learnt from the Erosion Control Funding Programme on the East Coast, suggesting that following adaptive governance principles is necessary for afforestation schemes. Both these papers are supported by the refereed paper from Bayne et al. who examined articles published online between January and September 2018 from mainstream media outlets, including newspapers. The forest sector is described as a poor cousin in terms of the media, lacking 'standing', and seen as the main causer of the log debris flow outcomes. The authors state that the sector needs to build strong relationships with the New Zealand media.

In other papers, Erica Kinder discusses 'Where to for Wood Councils?' and Telfer et al. explain factors affecting the genetic worth of a radiata pine stand over its rotation. John Stulen provides an update on building using mass timber (or engineered timber), including cross-laminated timber (CLT), laminated veneer lumber (LVL) and glue-laminated timber (GLT), citing advantages over conventional, high-energy demanding steel and concrete. In New Zealand, its use is still held back by deficiencies in the codified engineering guidance available for practising engineers. The Government could help by providing support for such guidance and by insisting on using mass timber for new public sector construction. It is thrilling to see that Air New Zealand will use engineered timber to build what will be the world's biggest single-span timber-arch aircraft hangar, one-and-a-half times the size of their largest existing hangar.

John Purey-Cust provides the 'Last word', querying New Zealand production forestry's virtual dependence on one species and the reliance on log exports. He states that both threaten the public view of the industry, an opinion from a retired forestry professional arrived at independently of the authors of the first three papers in this issue.

One billion trees – thoughts on gaining and maintaining a social licence to operate

Peter Edwards, Karen Bayne and Barbara King

Slash piles that may contribute to social licence to operate problems

Abstract

The 1 Billion Trees Programme (1BT Programme) has the potential to significantly transform New Zealand's landscape for decades to come by introducing one billion trees to the land. This is not without risks, particularly where landowners and communities may harbour concerns with potentially long-lasting, large-scale changes through afforestation. This paper raises a number of questions in order to start a discussion between government proponents of the 1BT Programme, foresters, landowners, and interested and affected communities. We hope that by opening up an opportunity for dialogue it will result in a broad acceptance of these changes by all involved.

1BT Programme goals

The New Zealand Government, as a component of its Provincial Growth Strategy, announced that it would support the planting, including 'business as usual' replanting, of at least one billion trees over the next 10 years – 2018 to 2027. The programme, led by Te Uru Rākau – Forestry New Zealand:

> *… supports landowners to grow both native and exotic trees to create employment and workforce development, optimise land use, mitigate climate change, support Māori values and aspirations, protect the environment and support New Zealand's transition to a low emissions economy.'*
>
> (Te Uru Rākau, 2018: 1)

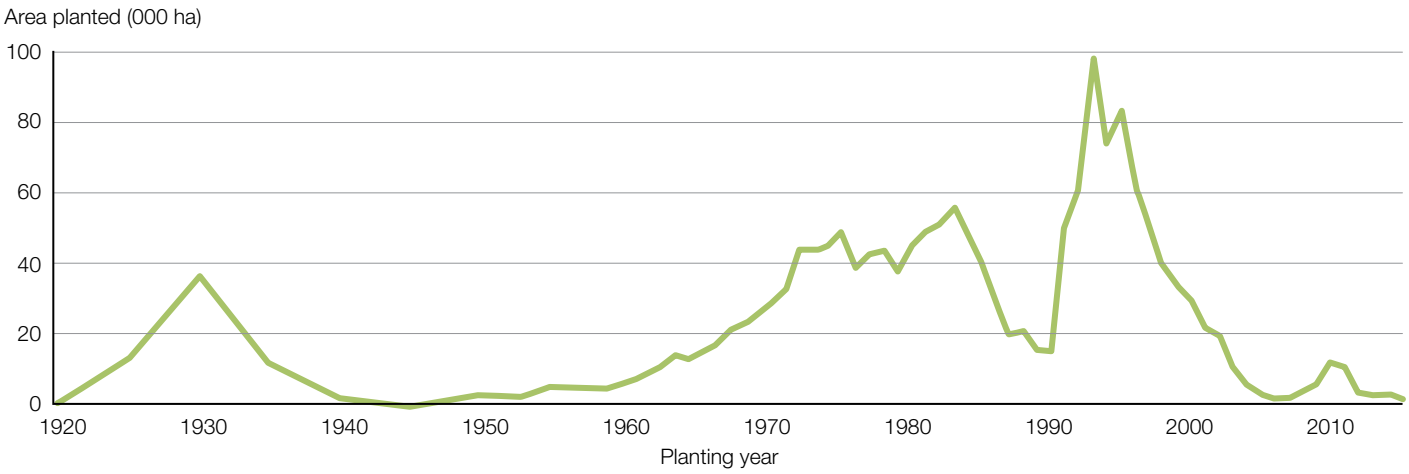

Figure 1: Area planted in trees in NZ since 1920. Source: Data from the MPI National Exotic Forest Description (NEFD) statistics

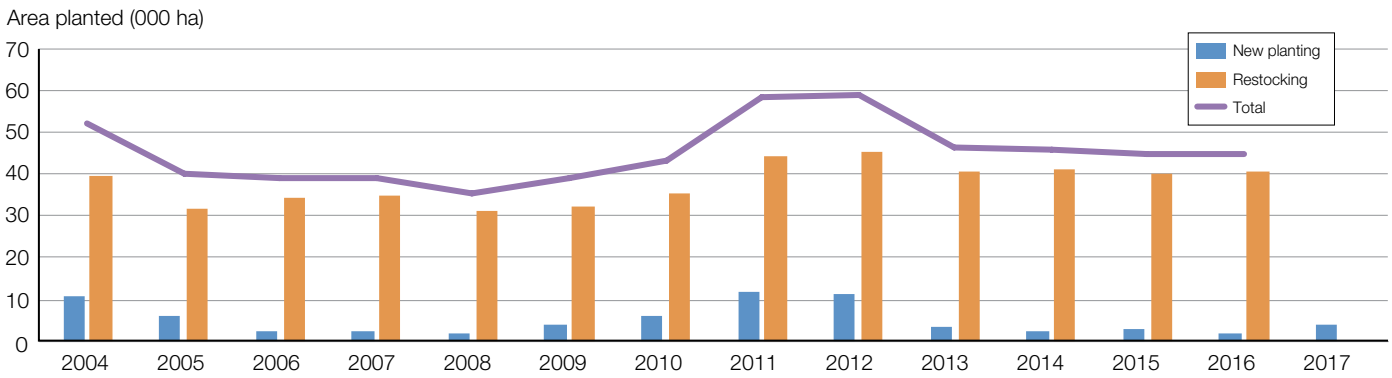

Figure 2: Total area of exotic tree planting in NZ over the period 2004–2017. Source: Data from the MPI NEFD statistics

With these goals, the 1BT Programme needs to navigate sometimes competing environmental, social, economic and cultural goals within a sustainable development framework, balancing these four elements.

NEFD statistics

One billion trees over 10 years seems a large requirement, if planted all in exotic species. This equates to an average of 90–100,000 ha/p.a. if stocked at 1,000–1,100 stems/ha. Such a planting rate has not been seen since the peak of the 1990s planting boom (Figure 1).

Much of the planting over the past 15 years has been from restocking of harvested areas, with only a limited amount of afforestation (Figure 2). A significant proportion of the peak of new planting (of a little more than 11,000 ha/year in 2011 and 2012) was due to imputation corrections for small forest growers with less than 1,000 ha, correcting differences between annual nursery surveys and official figures. [MPI surveys forest owners with less than 1,000 ha every 10 years, rather than every two years for larger forest owners. There is uncertainty as to whether and how much these small-scale forest owners replant and this is corrected every 10 years.]

However, with the Government planning for two-thirds of the new planting to be in native species, less land would be needed due to much higher stocking rates for native planting. The Ministry for Primary Industries (MPI) do not currently cover native species planting rates in the same manner as the NEFD, but as the 1BT Programme develops, such data will need to be collected and monitored.

Similar overseas initiatives

New Zealand is not unique in introducing a large-scale (one million or more trees) afforestation policy. Inspired in part by India's 2016 initiative to plant 50 million trees in a single day, many tree planting initiatives are currently underway internationally, mostly in response to climate change. China has mass tree planting initiatives (Stanway, 2018). Zambia has a 'Plant a Million Trees' fund, while on Earth Day 2018 America's National Forest Foundation launched a scheme to plant 50 million trees (Coleman et al., 2018). Cities are also getting in on the tree-planting bandwagon. Both Auckland and New York City have initiatives to plant one million urban trees within their cities.

In the case of international tree planting initiatives, these have not been without issues (Marritz,

2012; Pincetl, 2010; Kaminski, 2016). While India overshot their one-day target with 66 million trees planted, alongside Pakistan being ahead of schedule (Hutt, 2018), wealthier nations have not fared as well. Ireland is behind on their tree planting schedule (Finn, 2018), with general concerns that mass tree planting has changed the land ecology and endangered other flora and fauna species (c.f. Veldman et al., 2015). New York City's million tree urban afforestation has the public concerned about the long-term management of the trees, particularly the increased aboriculture and pruning that would be required. Other urban concerns include impacts from increased shading once mature, improper spacing (Gromke & Ruck, 2009), and who pays for sidewalk and drainage repair costs due to large root invasion from planting the wrong species. In Auckland, concerns have arisen about views, and a small winter window for community planting (Pasley, 2016). These concerns demonstrate the need for social acceptance of not only the vision, but the impacts and implications of what large-scale afforestation will require.

Previous NZ mass planting schemes

Prior to the 1BT Programme, the largest mass planting scheme in New Zealand occurred between 1925 to 1935 with an estimated peak of 37,000 ha planted in 1930 (NEFD, 2014). Many State Forest areas were established during this time, the Kaingaroa State Forest being the largest. More recently, there was commercial expansion of radiata planting in both the late 1970s (with an average of 44,800 ha/p.a. planted between 1974 to 1983) and the 1990s, peaking in 1994 with 98,200 ha planted.

Mass tree-planting, or even hillside regeneration, may impinge on the cultural and landscape values of local peoples within of a region. Historically, large-scale planting has led to the development of a commercial forest industry supporting new employment, infrastructure and regional economic development. But it has also seen a shift in how people from a region associate with the land and the local industries that support local economies, and a shift in the value of key skills. Landscape-level change can also mean permanent shifts, not only in societal make-up and identity but in land ecology and biodiversity.

Social licence to operate

The 1BT Programme comes at a time where forestry has had its image somewhat tarnished by high levels of harm in the industry (Adams et al., 2014), poor perceptions in the aftermath of extreme weather events and debris floods (c.f. Bayne et al., 2019), impacts on rural communities (Robertson, 2017), and chemical use and public safety. Considering the 1BT Programme in the context of the social licence to operate, it has a number of laudable goals but must still contend with community perceptions and acceptance of forests and forestry (Macfie, 2018).

The slogan 'Right Tree, Right Place, Right Purpose' denotes a commitment to ensuring that trees planted are appropriate to the circumstances. This begs the question of what circumstances are deemed 'appropriate' afforestation, and by whom? One billion trees planted with no plan around future use of the forest resource created could be a large impediment to both confidence in landowners planting, including market development, regional industrial processing and new business creation that the Government and sector desire (c.f. MPI, 2019).

The 1BT scheme in New Zealand has also met with a degree of scepticism, mainly arising from already apparent labour shortages to plant trees, species mix, and the need for private landowners to commit to tree planting. Tree planters are already in short supply (c.f. Skerrett, 2019), and nurseries are concerned that increasing wages will only see their margins per tree further squeezed (c.f. Hancock, 2018).

Results from the 2016 Public Perceptions of New Zealand's Environment survey suggest that the public perceives the management of native bush and forests as 'good', but the quality of native bush and forest is declining (Hughey et al., 2016). Given that two-thirds of planting will be of native species, this element could contribute positively to the programme's public perceptions.

Federated Farmers have voiced concerns about the impacts on small rural communities, including school numbers, through loss of traditional sheep and beef country to forestry (Rennie, 2018). Health impacts from greater pollen loads also need to be anticipated.

Forest management in New Zealand has evolved into a two-fold forest concept of 'Conservation management' (natives), and 'Production forestry' (timber). Since both the demise of the Forest Service in 1987 and the creation of the conservation forest estate, the concept of forest and its use has been changing, led by:

- Diversification in forest revenues
- Changed ownership models
- The growth of agroforestry linked to carbon markets
- The importance of biodiversity and nature values
- Greater forest access with recreational facilities in production forests.

The recent announcement of the Labour-led Government to plant one billion trees by 2028 further purports a change in the nature of forest conceptualisation, particularly in respect to establishment, ownership, management and product markets.

The social licence to operate, or social licence, was originally popularised in the mid-1990s in the mining industry. Social licence has increasingly been applied

to other industries involved in public and private resource development and management, including aquaculture, agriculture, forestry, energy generation and conservation management (Edwards et al., 2019). This broader application of the social licence to operate to other industries has been driven by changing community expectations that they should receive a greater share of benefits from industries in their communities (c.f. Prno, 2013).

The social licence to operate has been generally defined as broad community acceptance of a resource operation (Boutiller, 2014), but according to Joyce and Thomson (2000: 52) 'such acceptability must be achieved on many levels, but it must begin with, and be firmly grounded in, the social acceptance of the resource development by local communities.' Social licence is a metaphor that can be both tangible and intangible, as acceptance or opposition by communities can be expressed and felt in significant ways, and intangible in that it is not like a legal licence (Nelsen, 2006; Moffat et al., 2016).

Conceptually, social licence 'presents a radical challenge to some pervasive tropes in contemporary discourses about transnational corporations and communities' (Boutilier, 2014: 266). When the issue at stake is a government initiative, the legal role and standing of community stakeholders becomes more complex and potentially fraught. This makes early consultation and 'socio-political groundwork' (Boutilier, 2014: 267) with communities imperative.

Four levels of social licence

Social licence is not static, but dynamic, requiring renewal and re-evaluation at each step of a project as it gets underway and over the entire life of the project. The renewal and re-evaluation involves examining multiple elements of social licence, including credibility, legitimacy and trust (Thomson & Boutilier, 2011), and procedural fairness, social infrastructure, governance, distributional fairness, and trust, leading to acceptance (Moffat & Zhang, 2014).

Each of these elements, whether Thomson and Boutilier's (2011) or Moffat and Zhang's (2014) model, are closely linked. Thomson and Boutilier (2011) suggest four levels of social licence:

- **Non-acceptance**
- **Acceptance** – linked to legitimacy, or the acceptance by society that an organisation or entity has the right to exist and pursue its matters (c.f. Knoke, 1985)
- **Approval** – the next higher level is approval, linked to the entity's credibility, which is a foundational pillar of trust and trustworthiness
- **Psychological identification** – the highest level is psychological identification, linked to trust between the company and the community, where trust can be defined as the willingness to be vulnerable to others based on the positive expectations of the intentions or behaviours of others (c.f. Rousseau et al., 1998).

Thomson and Boutilier (2011) highlight that legitimacy can be earned through simply listening to others, while credibility requires the company to act on what they have heard.

Moffat and Zhang (2014) and Moffat et al. (2017) do not distinguish levels of social licence, but provide insights into what communities perceive as most important in granting acceptance of mining activities in Australia. Fairness, governance and trust were identified as key elements of a social licence to operate. Procedural fairness is where communities perceive that they have a reasonable voice in decision-making, while distributional fairness is where they perceive that the benefits of a resource operation are distributed fairly, including whether the government receives a fair share of tax (Moffat et al., 2017).

Governance is described as the perceived ability of legislation and regulation to hold industry to account; trust is the perceived levels of trust in key stakeholders in resource development. Moffat et al. (2017) expanded on Moffat and Zhang (2014) with the addition of an extremely strong factor called 'balance of benefits and impacts'. In the balance of benefits and impacts, communities' perceptions of whether the benefits they receive (e.g. employment and community benefits, regional infrastructure or general economic benefits) outweigh the impacts they may have to live with (e.g. environmental impacts, impacts on other sectors and cost of living) (Moffat et al., 2017).

Questions

In considering the 1BT Programme and social licence, along with examining a range of documents associated with the programme, a number of questions emerge that we feel merit a robust discussion. These will also provide food for thought for a wider discussion amongst industry, government, communities and researchers.

The overarching question that needs to be addressed is where do communities stand in the 1BT Programme, and should (or does) the programme need to think about its own social licence to operate?

In a more traditional sense of social licence to operate, questions have been raised as to whether government, in particular, requires social licence to undertake their activities (Malpass, 2013; Klenk, 2015). In the case of the 1BT Programme, by directly supporting, promoting and encouraging large-scale tree planting, Te Uru Rākau has entered a multi-faceted social, environmental and economic/commercial area that is facing rising stakeholder (and community) expectations and rising criticism (c.f. Bayne et al., 2019). By providing direct support for resource

development and extraction activities, Te Uru Rākau will likely need to consider its own social licence to operate, not relying solely on promises made during elections or government policy (that may not enjoy wide popular support).

With mass planting or regeneration in an ever-changing social environment, is there support locally, regionally and nationally for wholesale landscape change towards forests and forestry? Have communities and stakeholders been asked to think about the future issues that face forestry (such as post-harvest debris, worker safety and trucking) as part of gaining and maintaining social licence?

Further questions need to be considered including:

- What are the (wider) impacts on societal and economic systems due to the potential disruption to the 'status quo' forestry model of today: on forestry; on regional development; on land usage and community settlement patterns; on labour; on industry capacity and processing investment; on business and enterprise?
- What are the ripple effects of an extra one billion trees in the forestry estate 'mix'?
- What scale and diversity of issues (local, regional, national, international) need to be considered in relation to social licence to operate and stakeholders? Can a network approach to identify stakeholders reduce potential scale conflicts and facilitate understanding about whose stakes need to be taken into account?
- What new business forms, emergent sectors and policies are required to enable desired outcomes (including the creation of legitimacy, credibility, trust and entrepreneurial activities)?
- We suggest that an emphasis on the appropriate landscapes and the place of widespread afforestation within local landscapes through engaging with the public early may provide a better opening for community discussions and support for the 1BT Programme. In particular, the forest sector needs to work alongside those communities who will support the 1BT vision and share our values of a healthy, productive, sustainably grown, well-planned resource (c.f. Kaminski, 2016).
- In relation to the goals of the 1BT Programme overall, the elements of social licence may or may not be present. For example, does the programme have legitimacy, credibility and/or do stakeholders have trust in the programme and its stakeholders? Will communities have a voice in decision-making? Are current regulations and policies sufficient to ensure good governance? Will they receive benefits commensurate with the impacts on their communities?

Discussion

Trust between communities, industry and government needs to be improved. The Victoria University of Wellington public trust survey in 2018 found that while there was a slight rise in public trust in government, there was still significant distrust. Similarly, for industry in general the public held significant distrust towards them. With respect to forestry, in a 2017 MPI survey, 42% (down from 52% in 2008) of urban and 52% (up from 47% in 2008) of rural respondents had positive views of the forest sector. With 13% of urban and 11% of rural respondents having negative views of the forest sector, the three primary reasons given were foreign ownership, perceptions that it is a dangerous industry and it does not take its environmental obligations seriously (MPI, 2017). Conversely, on the positive side, MPI (2017) found that forestry was good for the economy, provided employment for rural areas and was positive for climate change. These positive aspects are certainly highlighted in support of the 1BT Programme.

Inverting the 1BT slogan

We posit that from a community perspective, where it is unlikely that they have been involved in the decision process to plant trees on particular tracts of land, the 1BT Programme slogan of 'Right Tree, Right Place, Right Purpose' can be seen to pre-suppose that trees are the solution to whatever problems landowners are facing. We suggest that the slogan should be re-examined in order to be more 'engaging' with communities and landowners. To this end, we believe an inversion of the slogan provides more opportunity for community input and ultimately acceptance:

- By first engaging with landowners and their communities about the problem they are trying to solve (right purpose), a determination whether trees are the best solution can be made
- Once trees have been determined to be the right solution, then decisions on where trees should be planted should be made (right place)
- Then the determination of the most appropriate tree species for the stated purpose (right tree) can be made.

This new conception follows best practice in establishing multifunctional forests (Tim Payn, Personal Communication, 13 February 2019). Mirroring the social practice described above, best practice in multifunctional forest establishment involves knowing and understanding the purpose of the forest as the first step.

From there one must ask and decide the right location for the forest, then determine the regime, and finally determine what tree or mix of trees will achieve the stated purpose in the proposed location.

Right purpose, right location, right regime, right tree(s) (Tim Payn, Personal Communication, 13 February 2019). This suggests that forest policy-makers, landowners and forest managers should mirror good forest establishment practices in order to help them gain and/or maintain their social licence to operate – this is not to say that following these steps will guarantee a social licence.

Figure 3 provides a graphic representation of the parallels between forestry planning and the idea of first understanding the needs of the community (determining the purpose for which trees may be needed), before then deciding where and what to plant, if appropriate.

As forestry in New Zealand becomes more complex, viewing our forest estate as an open and dynamic integrated social-ecological system can be helpful in formulating the necessary paradigm shifts required in the forest sector, for industry, science and government, in order to create a more responsive, adaptive sector. While it adds complexity, the inclusion of both exotic commercial and native species in the programme provides some level of balance – the public are generally supportive of native bush and forests (Hughey et al., 2016). However, this must be balanced by the thinking that native species may be used for commercial ends and the social and cultural risks and issues associated with this (along with the risks and issues associated with traditional commercial forestry).

More specifically related to social licence, with at least half of the proposed planting to be commercially harvestable species, the 1BT Programme does not necessarily consider the implications in the future of issues that may be contributing to current community disquiet around forestry. These issues include post-harvest debris, worker safety and trucking. While it is possible to discern how today's community members feel about these issues and others, and whether they accept the associated risks, it is not possible to know what future community members will accept as forestry technology and practices change over the next 30 years. Future foresters, communities and government will have to negotiate acceptable outcomes for all concerned in the future – under future conditions.

Conclusions

With the current state of knowledge it is difficult, if not impossible, to answer many of the questions that we pose. While we do not have answers to all of these questions, we hope that this provokes thought and dialogue around the 1BT Programme and social licence to operate. Significant enquiry into community perceptions of issues and the acceptance of forestry now and on an ongoing basis is needed to understand the impacts of forests and forestry on communities. This understanding of the changing community dynamics will be vital for government, industry and communities themselves to negotiate an appropriate balance between benefits and impacts, provide a community with a voice in decision-making, and build stronger trust relationships between these three parties.

To this end, there should be more engagement with communities by landowners undertaking significant land use change, forest companies and government, with appropriate action taken on what

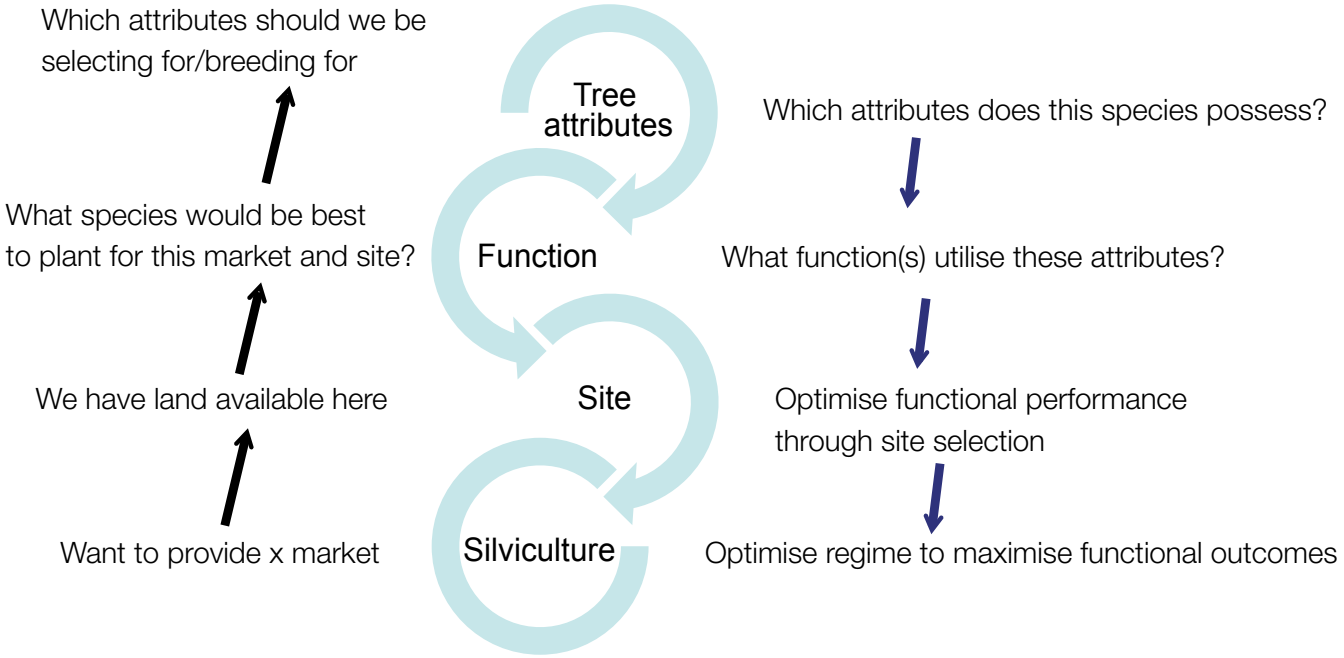

Figure 3: The need to think about EITHER the function (ecosystem services) desired from the trees on the landscape, or the market (utilisation) that is to be met for a business portfolio, BEFORE selecting species and/or site, thus meeting the 'purpose first' argument

is heard (builds legitimacy and credibility). Ongoing genuine efforts towards these ends could conceivably contribute to better trusting relationships over time.

As Te Uru Rākau becomes more involved in the large-scale promotion of long-term land use change that will ultimately alter the landscape and how communities live their lives, there is an imperative to gain acceptance for this 'resource operation'. Social risks and uncertainties must be adequately addressed. Despite indirect claims that the government does not need to gain and maintain social licence because they have it through the rule of law (c.f. Malpass, 2013), as it becomes more involved in commercial and development promotion (which may be beyond the traditional mandate of core government agencies) it will need to gain and maintain social licence. This would certainly need to be done in conjunction with its commercial, iwi and landowner partners but it is, of course, dependent on the specific contexts in which this is taking place.

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Policy design lessons from the Erosion Control Funding Programme – afforestation through an adaptive governance lens

Sandra J. Velarde, Lisa Sharma-Wallace, Tui Warmenhoven, Pia Pohatu, Peter Edwards and Tim Barnard

Does this look like a dried riverbed? Look closer for the roof of the Barton homestead now buried in the sediments coming from the surrounding gullies. Waiapu Catchment, East Coast, New Zealand. Photo courtesy of Tui Aroha Warmenhoven

Abstract

We focus on lessons for policy design learnt from the Erosion Control Funding Programme. This programme started in 1992, and its evolution and results provide invaluable knowledge on barriers to afforestation and potential avenues to address these barriers. We track the progression of the programme from its inception until 2017, and highlight that at the core of its slower-than-expected uptake are issues of indigenous co-development of forest systems and lagging learning cycles. We recommend that institutions implementing afforestation programmes should more quickly incorporate lessons learnt in their operations, and follow adaptive governance principles from the outset in their design to increase policy uptake and engagement with local communities.

Introduction

The East Coast of Aotearoa New Zealand is the most erosion-prone area of the country and one of the most erosion-prone areas of the world. As part of the Treaty of Waitangi settlement process, the New Zealand Crown and Ngāti Porou signed a historic 100-year Memorandum of Understanding (MOU) in 2014, with the Erosion Control Funding Programme (ECFP) (formerly the East Coast Forestry Programme) as its main implementation tool. The ECFP is one of the Government's long-standing afforestation programmes, started in 1992 and situated in a historic context of systematic Māori land alienation and landowner absenteeism.

Traditional approaches to land management and decision-making have not resulted in the best outcomes

for Māori, in particular on the East Coast. A series of non-conventional approaches to decision-making, known as 'Adaptive Governance', provide a useful lens to trace the evolution of the ECFP and distil lessons that can support the design and implementation of current and future afforestation programmes in Aotearoa New Zealand, such as the One Billion Trees Programme.

Land alienation, the East Coast and the historic 100-year MOU

A brief history of Māori land alienation

Before colonisation, land ownership did not exist in Aotearoa New Zealand. Māori enjoyed fluid boundaries of 'their' lands and determined use rights based on residence, participation in the community, and good relationships within and across tribal and kinship links (Kingi, 2008). European settlement throughout the mid-1800s led to a systematic process of Māori land alienation through acquisition and individualisation in a blatant breach of the Treaty of Waitangi signed in 1840. Customary or collective land was lost into Crown title deeds which, in turn, led to individual land ownership and fragmentation. The problem was further exacerbated under the Native Land Act 1873, which required all owners to be registered in the land title, and consequently generated ownership shares so small they are virtually unusable (Lyne, 1994; Tuuta, 2013) (Figure 1).

More recently, the Te Ture Whenua Act 1993 acknowledges the importance of land retention for the benefit of Māori owners, but requires that Māori adhere to western governance structures such as land incorporations and trusts to unite the fragmented land shares created during colonisation. In the view of Coombes (2003), these structures reflect the Government's distrust of Māori effectively managing their own land.

It is in this wider context of land fragmentation, combined with landowner absenteeism, that past and current afforestation efforts exist.

The East Coast – erosion is also a symptom of disconnection from the land

The East Coast of Aotearoa New Zealand generates 40 million tonnes of sediment per year flowing directly into rivers and the ocean (Statistics New Zealand (SNZ), 2018). The region is also sparsely populated, with only 46,653 people in the entire Gisborne District. Almost 49% of the population identifies as Māori, and Ngāti Porou makes up the largest tribal affiliation in the region (SNZ, 2013).

Inseparable from the biophysical erosion of the region is the erosion of the Ngāti Porou iwi's cultural, spiritual and social values (Warmehoven et al., 2014; Scion, 2012) (Figure 2). Therefore, any effort to address the erosion must account for the desire, drive and right of Māori for *tino rangatiratanga* (or self-determination) in relation to land and other governance matters (Sharma-Wallace et al., 2019).

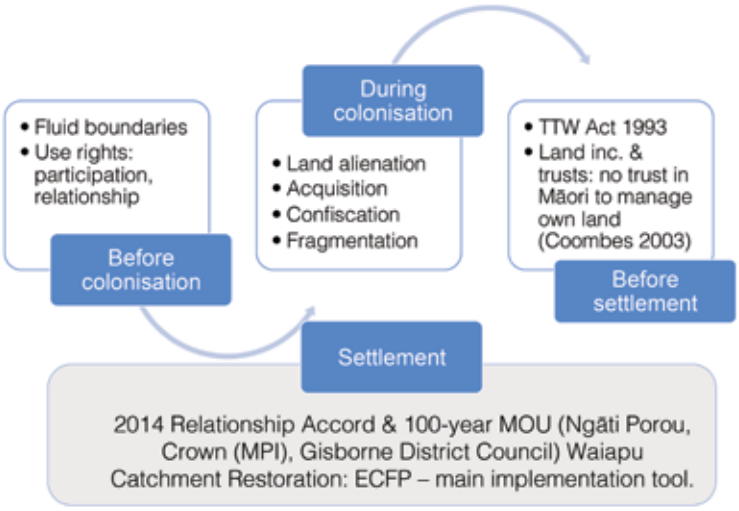

Figure 1: Historical context leading to the Erosion Control Funding Programme

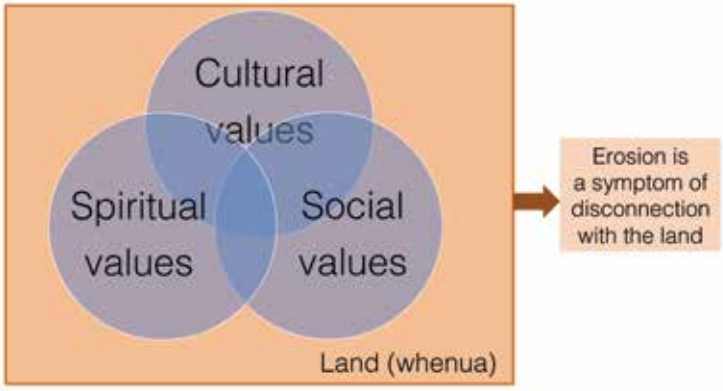

Figure 2: Links between intangible values and the whenua (land)

The historic 100-year MOU

As part of the Treaty of Waitangi settlement process, the Crown (represented by the Ministry for Primary Industries (MPI)) signed a historic 100-year MOU in 2014 with Te Runanganui o Ngāti Porou and the Gisborne District Council. This MOU outlines aspirations of 'healthy land, healthy rivers, healthy people' for the Waiapu Catchment restoration in the East Coast (MPI, Te Runanganui O Ngāti Porou & Gisborne District Council, 2014).

The ECFP afforestation programme is situated in the midst of a long settlement process and is the main implementation tool of the MOU in its first several years. The 100-year MOU is recommended reading for those who would like to understand Crown-Ngāti Porou partnerships and the spirit of the Waiapu Catchment restoration. (We do not deal with the implementation of the MOU itself in this paper.)

A different way is needed – adaptive governance

Adaptive governance is a series of methods for decision-making that recognise the complexity of people-nature problems and advocate for a flexible and

collaborative approach to help solve them. Adaptive governance responds to the local context through dialogue and sharing power, people and resources.

The 'adaptive' component of adaptive governance refers to the ability to change course based on the early results of implemented actions. 'Governance' refers to the decision-making process, including the people, power and resources involved at different levels, from local to regional to national.

Practising adaptive governance requires dialogue and collective learning from all the relevant parties. The principles of adaptive governance (Sharma-Wallace et al., 2018; 2019) can be summarised as follows:

- **Facilitating community empowerment and building capabilities:** Facilitating community-scale empowerment and engagement, and brokering collaboration and connections across a wide range of actors, scales and capabilities, by building trust and nurturing human relationships.
- **Attention to the socio-ecological and governance context:** Paying attention to the context in which decisions are made, and the development of social and physical capabilities, knowledge, resources, networks and partnerships to address this context.
- **Effective leadership and monitoring:** Supporting and institutionalising effective leadership to bring stakeholders together, coordinate governance support, design and implement innovative management ideas and mobilise communities to act, and integrating knowledge and decision-making through experiential learning and monitoring progress over time.

Methods

We tracked the evolution of the ECFP through a review of grey literature and semi-structured interviews. Grey literature was collated using Google and Google Scholar, supplemented by Cocklin and Wall (1997) and Phillips et al.'s (2013) secondary analyses of specific aspects of the ECFP. We also draw on 78 semi-structured interviews conducted in 2016 as part of an action research project on adaptive governance for enhanced environmental decision-making in the Waiapu Catchment (Edwards et al., 2018). Interviewees included 26 Waiapu community members and 52 non-hapū representatives (Pākehā landowners, resource managers, local and central government agencies, community organisations, industry groups and education providers).

The interviews highlighted the barriers and opportunities to restoring the Waiapu Catchment in the East Coast in the context of to the 100-year MOU aspirations. We document candid assessments of the ECFP, adding the human dimension to the ECFP narrative constructed from the grey literature.

Results

Using the lens of adaptive governance, we illustrate the barriers for implementation of the ECFP and the substantial changes it has undergone, both in content and scope, since its inception. As of 2017, the ECFP had planted 41,906 ha (MPI, 2018) of its 2020 target of 60,000 ha set by a Cabinet paper in 1999 (Ministry of Agriculture and Forestry, 2011). While key barriers were identified by the Office of the Parliamentary Commissioner for the Environment in 1994, major changes to the programme took six to nine years (in the best of cases), to 20 years, to be implemented.

1. Community empowerment and building capabilities

The ECFP initially presented strong barriers to uptake by Ngāti Porou, combined with delays in adapting the programme to include support for community actions and targeted enrolment of Māori landowners. These barriers include (Figure 3):

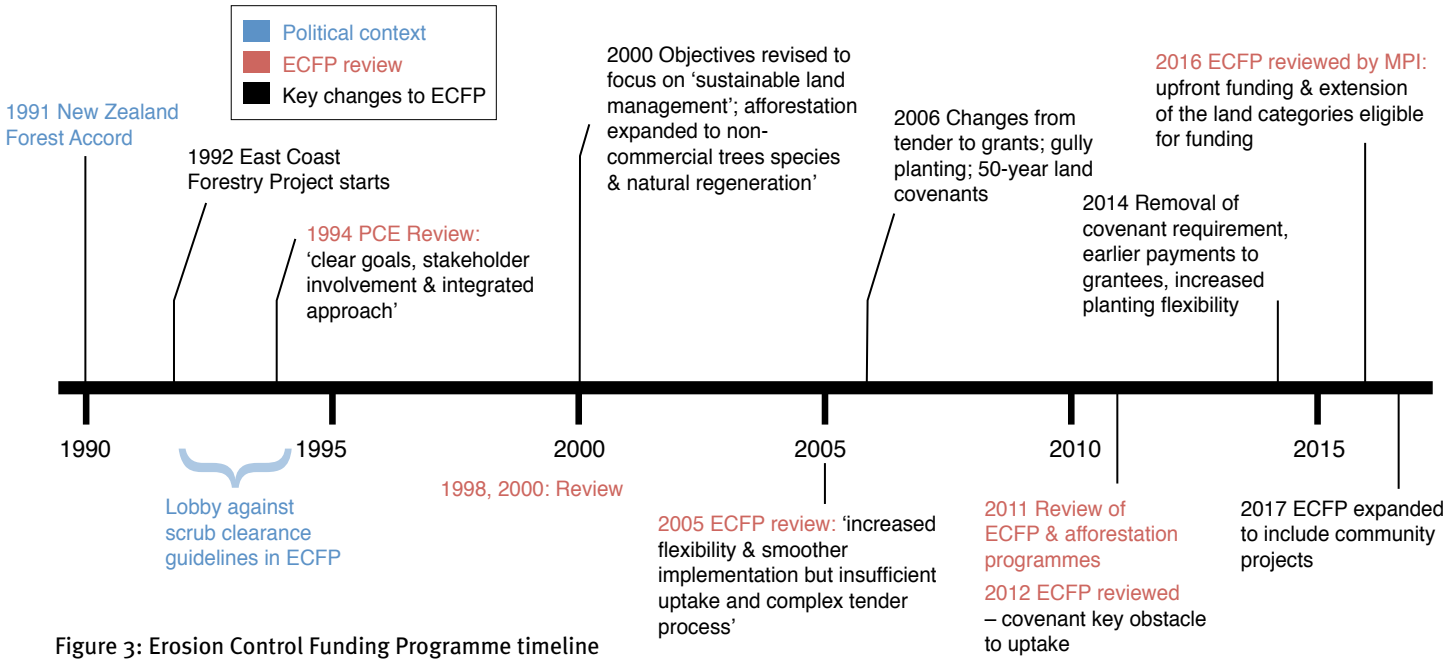

Figure 3: Erosion Control Funding Programme timeline

- Government changing the rules for native vegetation clearance within the ECFP, which effectively meant Ngāti Porou could not participate in the first four years of the programme (1992–1996)
- Requirement for forming land trusts and incorporations in order to participate in the programme.

To address these barriers, the ECFP adapted in different ways:

- Expansion to include non-commercial species from 2000
- Added resources to include one-on-one engagement and education (after 2005)
- Hiring a Māori ECFP coordinator in 2014 to increase Māori enrolments
- Including community projects in 2017.

During the development of the ECFP, Ngāti Porou was hopeful that the programme would offer a path for tribal revitalisation and self-determination (Kapua in Cocklin & Wall, 1997, 155). Specifically, they hoped to retain control of their land and forestry operations (Ngāti Porou quoted in Office of the Parliamentary Commissioner for the Environment 1994, 19-20). The newly formed company, Ngāti Porou Whanui Forests Ltd, established a joint venture with Tasman Forestry Ltd for plantation forestry.

The ECFP originally allowed for clearance of scrubland, which is the majority of Ngāti Porou land. However, environmental groups found this allowance in conflict with the New Zealand Forest Accord, a private agreement signed by a group of forestry companies that established limits on clearance of indigenous vegetation (New Zealand Forest Accord, 1991). After months of negotiations, the Government amended the ECFP to provide more protection to indigenous vegetation and Tasman Forestry withdrew from the joint venture. As a consequence, Ngāti Porou could not fully participate in the first years of the programme (Cocklin & Wall, 1997).

In 1996, Ngāti Porou Whanui Forests Ltd found a new partner and established a joint venture with the Korean company Hansol with the aim of establishing 10,000 ha of radiata pine forest on Ngāti Porou land. This new joint venture meant an 'assertion of Ngāti Porou's mana' (Mahuika in Cocklin & Wall, 1997: 158).

After the ECFP review by Bayfield and Meister (2005), funding was made available for one-on-one programme advocacy and education. In mid-2014, MPI hired a Ngāti Porou ECFP coordinator to increase Māori enrolment, noting some success (MPI, 2017a). However, multiple-owned Māori blocks were needed to come together in land incorporations and trusts to participate. Strong community participation and information sharing were lacking for most of ECFP's life:

> *I think that there has been a lot of the confusion of the actual grant scheme itself. No one has really been clear on what it looks like and what it would achieve. They will say it is erosion control when in actual fact that does not mean anything for whānau.*
>
> (Hapū interviewee, 2016)

Supporting local initiatives or the aspirations of local landowners are also important factors to overcome the perceived distrust [in the Government] in the East Coast region:

> *To me, I look at MBIE and MPI and everyone is all about how do we generate and utilise unproductive Māori land? Well, the reality is it is not your Māori land to have a say over and care for. What we need from places like that is support in terms of resources, not only financial but the science stuff as well.*
>
> (Hapū interviewee, 2016)

In 2017, the ECFP was modified to include community projects. Examples of community project topics include optimal land use for erodible land, riparian and other river treatments for erosion, skills/labour, trials of new/alternative treatments, supply of seedling and materials and governance for erodible land blocks (MPI, 2017b).

2. Attention to the socio-ecological and governance context

The ECFP has predominantly focused on technical aspects while mostly paying little attention to the socio-ecological and governance context. This resulted in two barriers to adoption:

- The requirement for upfront payment from landowners for the first six years (1992–1998)
- The requirement for a 50-year covenant in ECFP contracts established in 2005 was removed in 2014.

Although it took six to nine years, the above barriers were removed. Other major positive changes adopted by the ECFP in the last five years include:

- Providing more upfront instead of retroactive funding in 2014 and 2016
- The introduction of community-led projects in 2017
- Field days to showcase landowner erosion control practices in 2018 (MPI & Gisborne District Council, 2018).

In 1994, the Office of the Parliamentary Commissioner for the Environment called for an integrated approach to the ECFP. However, the programme has mainly focused on technical aspects and bypasses the holistic nature of the Ngāti Porou relationship with their land and the causes and impacts of the East Coast erosion problem:

> *That's what the restoration is in the larger sense. It's not the restoration just of the physical landscape. It's actually our people, of our knowledge, and our way of doing things.*
>
> (Hapū interviewee, 2016)

> *So if you look at it at quite high level and talk about restoration, the practices that we live by every day are restorative. So whether it's connecting with our children, with our whānau's children, children from the community, whether it's preserving water, whether it's teaching our kids not to throw rubbish on the ground …*
>
> (Hapū interviewee, 2016)

Since its inception, and until 2014, the ECFP required landowners to claim costs for establishing the trees retroactively, despite Ngāti Porou's lack of financial capital being acknowledged as a barrier from the outset (Office of the Parliamentary Commissioner for the Environment, 1994).

> *… You have to pay for everything and just hope and pray that they survived so you would get back the money. It was all retrospective. For want of better words, that only worked for the really big rich farms that were never supposed to be why the fund was set up in the first place …*
>
> (Hapū interviewee, 2016)

Moreover, in 2005, the ECFP introduced a requirement of a 50-year covenant on ECFP-treated land. Although this covenant was added in response to deforestation of formerly ECFP-treated land blocks, in practice this requirement reduced Māori participation. This covenant was removed in 2014.

Further barriers include a lack of information about, for example, when and how to plant (Sharma-Wallace et al., 2019). We recognise recent efforts from central government and the Gisborne District Council through field days to showcase erosion control and landowner-driven initiatives (MPI & Gisborne District Council, 2018; Māori Television, 2018).

3. Effective leadership and monitoring

Turnover in government personnel has made the handover process and learning of lessons about the ECFP extremely challenging, impacting the ECFP's design, implementation and leadership. While the ECFP has been reviewed and major changes introduced to its content and scope in the last 26 years, the time taken to incorporate these changes highlight a lack of agility of ECFP structures.

Co-creation in the design (and review) of the programme, and better communication and responses to messages from 'people on the ground' and officials in Wellington, could play a positive role. An interviewee encapsulates the intent, design and disconnection of ground issues and policy design within ECFP as follows:

> *Fundamentally, the ECFP was created through an agreement between Ngāti Porou and the Crown. It was not intended for everybody else, but it has morphed into something different. ECFP, in its current state, is not achieving what it should. Ideally, we sit with them and co-create what it would be looking like. My challenge has always been, with working with ministries, is that they're in Wellington. They don't actually understand how it works. They do have people on the ground, but it's the people in the ministries that decide how the money is distributed – not the people on the ground.*
>
> (Hapū interviewee, 2016)

Experiential learning is key for the effective design and implementation of afforestation policies. Barton Gully, Waiapu Catchment, East Coast. Photo courtesy of Tui Aroha Warmenhoven

Conclusions and recommendations

We conclude that the adaptive governance principles described in this paper are useful in the design and monitoring of afforestation programmes and could lead to a better uptake of afforestation programmes. Specifically, in the case of the ECFP, issues related to Māori relationships with the whenua were integral determinants of the fund's slow rate of uptake (Sharma-Wallace et al., 2019).

Lessons for the design and implementation of afforestation programmes include:

- Meaningfully include Māori landowners' aspirations, values and assets in the design of afforestation policies, accounting for the quadruple bottom-line approach that includes social, cultural, economic and environmental aspects
- Pay close attention to the local context, power relationships, equity issues and history to remove early barriers to afforestation
- Increase the capacity of Māori to participate in decision-making processes through access to science, brokers and connectors, supporting local leadership and incentivising learning between different groups
- Shortening the period between policy review and policy changes, making the learning process more agile and effective. This would also support the change of mindset from monitoring as a 'performance measurement tool' to a 'learning tool'.

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Glossary

- Mana = prestige
- Pākehā = New Zealander of European descent
- Tino rangatiratanga = self-determination
- Whānau = family
- Whenua = land.

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Media coverage of recent New Zealand storm events

Karen Bayne, Peter Edwards and Tim Payn

Abstract

Twice in 2018, severe storms and the remnants of tropical cyclones battered New Zealand, resulting in severe consequences for our landscapes and, in particular, forests and forestry. First, from 19 February through to 21 February ex-cyclone Gita swept across the top of the South Island, bringing wind gusts of up to 140 km/hour and between 115 and 130 mm of rain to the same area. Four months later, a significant storm over the weekend of 10–11 June brought very heavy rainfall to the East Coast, particularly around Tolaga Bay. Both events caused landslides, sediment and debris flows, and a sustained discussion about forestry.

As a consequence of ex-cyclone Gita and other bio-geophysical factors, several landslides occurred in the Tasman district, bringing down tracts of forest and hillside sediments. The forest on these hillsides was a mixture of planted exotics and native species (Figure 1). Around Tolaga Bay, sediment and slash was washed off the hillsides, impacting property, infrastructure, local waterways and beaches.

With relatively significant impacts from these weather events on forests and forestry operations, and downstream infrastructure, land and beaches, the local and national media took a great deal of interest in this, including reporting their views on forestry operations, local planning and consent decisions, and the experiences of the people affected.

By examining and understanding the media and the public response to these events, there are at least two considerations for the forest sector. First, responding through changed practices that address the concerns where warranted may help maintain their social licence to operate and mitigate potentially unwarranted ongoing backlash. Second, the sector could develop ways in which to build 'standing' through proactive engagement with the media and public to forestall a potential backlash against the sector. This is particularly important as New Zealand ramps up attention on forests and forestry through the One Billion Trees programme.

This paper examines media reporting around the outcomes from forests and forestry operations that have been hit by severe weather/climate events. This is a complex and sensitive, but topical, discussion as it is acknowledged there will be increasing instances of severe weather and climatic events in the future (c.f. Alexander et al., 2006) that will further impact on forestry.

Damage to both exotic and native forested slopes at Marahau, Tasman region. Photo courtesy of Kyle Mulinder

Media coverage and public perceptions

Petty et al. (2009) provide an overview of how the media can influence public attitudes and behaviours. While there is no one definitive model, they highlight that individuals' attitudes are a key link between new information and behaviour change. In the Elaboration Likelihood Model there are two potential avenues to attitude and behaviour change – peripheral or temporary and central or long-term shifts. Whether attitude or behaviour change even occurs depends on how individuals internally process new information, and additional environmental cues that can trigger change (Petty et al., 2009). Reliance on personal experiences helps the public anchor the abstract nature of events to the familiar and concrete (Capstick & Pidgeon, 2014). However, where it cannot be directly experienced by a lay audience, the media become relevant sources of information and opinion (Kleinschmit & Sjöstedt, 2014).

The media are more likely to report events involving companies with either a very high record of social responsibility, or those known to be 'usual suspects' in the issue (Luo et al., 2011). Those with a higher social responsibility record are portrayed in a more positive tone. Luo et al. (2011) state that this reinforces reader stereotypes (in terms of usual suspects), as well as highlighting interest in surprising stories (in the case of

those with a superior reputation). Interestingly, Luo et al. (2011) advocate that firms should therefore seek to be in the 'upper middle' in terms of social responsibility. This is not being a top-rated firm, so they are not unduly targeted and 'fall off the pedestal' when an issue happens, but they are also not constantly lambasted in the media due to having a poor social record.

While these debris events and their effects have not seen the same media attention previously, forestry has generally been seen as a 'responsible' industry (c.f. Luo et al., 2011), and more recently prominently profiled in the media highlighting positive economic growth (Rotorua Daily Post, 2017; Porter, 2016), and good employment prospects (NZIF, 2017). These recent adverse events therefore have higher potential to sway public opinion about forestry practices, particularly when confronted with individuals' and community members' personal stories about how they have been affected. Ungar (1999) notes that while a high amount of media coverage of an event denotes the likelihood of higher public awareness about it, and greater political importance surrounding the issue, the media functions to point readers towards *what* to think about (i.e. what issues are presently important) rather than *how* to think about an issue.

There are several key components of media interaction. Actors who are successful in getting their messages into the media and are not just an object of discussion have what is called 'standing' (c.f. Ferree et al., 2002). They have more opportunity to gain support for their messaging. Those actors who have standing are therefore often able to influence the framing of issues according to their values and preferences. Framing is a process that gives meaning to complex situations by simplifying and condensing specific aspects of the issue (Benford & Snow, 2000).

We provide analysis of media reporting, and outline from this learning some points of consideration for the forest sector around practice change and improving communications.

Methods

Media articles published online between January and September 2018 were gathered from online mainstream media outlets, including newspapers and Radio NZ reports. By October 2018, most media articles concerning these two major events had run their course, although the issue resurfaced in December 2018 when forestry companies on the East Coast were charged by the Gisborne District Council over the damage from logging debris. In contrast, the Tasman District Council decided not to lay charges with forestry firms. No new information was reported that impacted on the framing of the earlier stories and the Tolaga Bay outcome is currently still before the courts.

Without the capacity to analyse video-based media we did not include television reports, unless they posed a written story on their website. This examination looked exclusively at regular media outlets, and excluded social media and associated comments posted to media stories. Excluding both video and social media commentary limits our understanding of the richness of public views and the wider social licence to operate surrounding the industry as a result of these events. However, very different methods and analysis techniques would be required to analyse such data given the video media itself, and the very subjective and non-fact-based reactions and opinions that are the nature of social commentary, as opposed to media articles from journalists reporting on the events.

Using the Google search engine, with combinations of the search terms 'log', 'logging', 'debris', 'forest' and 'storm', media articles were sourced and identified, noting the storm event, region and news source of the article. Focusing on these search terms, articles that centred on the weather system and emergency itself, or were human interest stories (e.g. the rescue experience of a family from their rooftop due to rising floodwaters), were eliminated. This removed eight of the 11 stories that ran in the *NZ Herald*. A total of 72 articles ran over these nine months that related to forestry log debris flow and sedimentation issues.

Most articles came from either the *Radio NZ* or *Stuff* (owned by Fairfax) websites. These two publishers accounted for two-thirds of all our sourced articles. The *Stuff* website has *Stuff* articles, but also represents online content from the major Fairfax Group newspapers such as the *Waikato Times*, the *Dominion Post, The Press*, *The Sunday Star Times*, the *Marlborough Express*, the *Nelson Mail*, the *Southland Times* and the *Timaru Herald*. Similarly, Allied Publications cover several forest transportation and harvesting journals, such as *NZ Logger* and *NZ Truck and Driver*.

While most Fairfax articles ran via the *Stuff* website, some of the affiliated newspapers also ran articles from their own websites. Where the article was not on *Stuff*, but on the individual newspaper's website, this is noted in Table 1. Additional articles were sourced from a wide range of other New Zealand media sites, as well as media press releases (from Civil Defence, the New Zealand Forest Owners Association (NZFOA), the Forest Industry Contractors Association, Forest Enterprises and Parliamentary Services).

Table 1: Source and distribution of articles analysed

Media Source		Media Source	
Fairfax media	33	*NZ Herald*	3
Stuff (not attributed to a subsidiary newspaper)	19	Allied Publications Ltd	1
Sunday Star Times	1	NZ Farm Life Media	1
The Dominion Post	1	*Radio NZ*	26
The Press	1	One News	4
Southland Times	2	Newshub	1
Gisborne Herald	6	Sunlive	1
Nelson Mail	3	Māori Television	2
		Press releases	7

The articles were coded in Nvivo v11 and reviewed by: month of publication; source (publisher) of the article; frequency of actors portrayed in the articles, and whether they were quoted for opinion or comment; and the images used, which were categorised into different types of image.

Photographs can contribute to and facilitate interpretation of places and/or events. These images have embedded meanings and emotions and can be self-explanatory (Ferguson, 2013). We applied the first stage of Panofsky's (1982) iconographical approach to visuals – a pre-iconographical description. Müller (2012) outlines this as describing the visuals in neutral terms while avoiding attribution of meaning. Through examining and comparing the details of the photographs associated with the media articles and with each other, we were able to organise them into the nine discrete categories described in Table 2.

Photographs were coded (based on the similarity of the types of photographic content) into mutually exclusive piles. Photos with more than one aspect were assigned to a category based on what most of the image was portraying.

We note that, following Emmel and Clark (2011), photographs and images only provide a partial account of what is being investigated or seen, and are often purposive in relation to complementary activities, in this case reporting or providing an opinion.

We supplemented the coding and image analysis with a discourse analysis following an approach from Kleinschmit and Sjöstedt (2014), attributing statements to those portrayed as causing, helping or being victims of the events reported. We also used a modified content analysis of the 72 articles on the topic. Like Kleinschmit and Sjöstedt (2014: 120), we identified from statements in the articles the actors identified by the speaker (in this case mainly the journalist) as causer, victim and helper.

Table 2: Explanation of the image categories developed and the characteristics and/or patterns searched for in categorising them

Image type	Characteristics/patterns
Victims	Portrayal of people or beings affected by the landslips were central to these images
Debris	Images with piles of slash, harvesting debris or forest debris, sometimes shown piled up around bridges
Silt	Images that showed extensive sediment or silt damage and had no visible forest or logging debris
Logs	These images portrayed significant areas of logs – much larger than slash
Landscape*	Images of wider landscapes that showed logging debris, including both slash and logs
Stakeholders/ experts	Usually headshots (often a previously shot image) of one of the people making comment on the issue
Forestry production	General stock images of the cutover, harvest operations or logs piled at wharf
Clean-up operations	Usually involving a digger in a pile of slash debris, or smiling volunteers with spades and shovels
Aerial	Aerial images show a much wider landscape with the impacts from logging and forest debris shown from above

* The landscape type nominally refers to what Emmel & Clark (2011) call panoramic pictures – representing a wider 'view from the outside'

Results

Publications over time

Most articles correspond to the two major climatic events causing debris flow – ex-Cyclone Gita (impacting the upper South Island region on 19–21 February 2018)

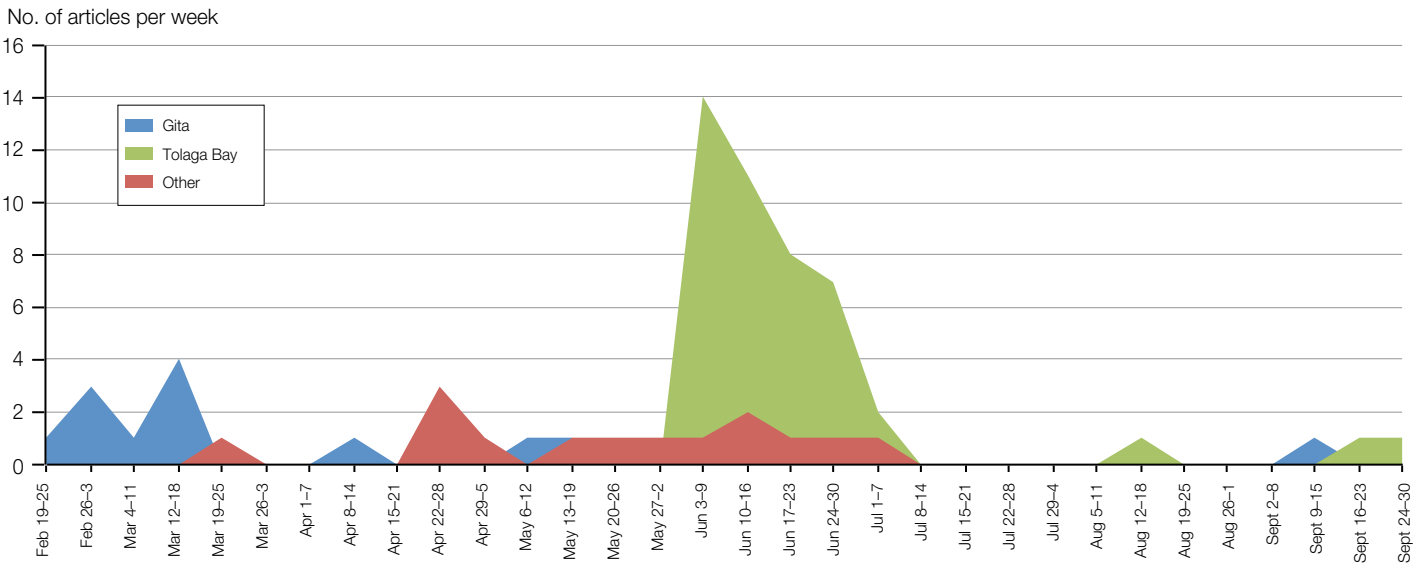

Figure 1: Depiction of the number of news articles published each week between 19 February 2018 and 30 September 2018 about ex-cyclone Gita, the Tolaga Bay storm and other related events

and the Tolaga Bay storm from early June 2018. Sixty-two percent of the articles (n=45) related to the Tolaga Bay incident, 20% to Gita, and 18% to other regions and incidents (Figure 1). During May and June, other events non-related to Gita or Tolaga Bay were also reported as sideline, but related, issues. Some of these portrayed people who felt vulnerable to threats of similar storm events in the future, and also groups such as iwi who felt they were tied to forestry with little option to change their land use. For example, one article from May reported on a log build-up in Maruia Dam, which the Department of Conservation stated was entirely a natural occurrence (Sivignon, 2018a).

While the Gita event caused relatively few articles to emerge, the Tolaga Bay event caused log debris flows to be elevated to front page news. Despite this, the reporting lasted for a similar five to six-week period. Although both events ran articles relating to the need to rethink forestry practices, the articles about the Gita event focused mainly on the geology of the region (Separation Point granite) and council and farmer planting of hillsides in radiata. Although the Gita event affected both native and exotic forested slopes (Sivignon, 2018b), much of the media focus was on Marahau (which was first planted in radiata by the NZ Forest Service, then transferred as a Crown Forestry Licence to iwi, and is now owned by a Chinese corporate and managed by Tasman Forest Management) (Neal, 2018; Ruddick, 2018; Sivignon, 2018b).

In contrast, the Tolaga Bay event reported on the logging slash being from large forestry companies, particularly Hikurangi Forest Farms (HFF), PF Olsen and Ernslaw One. In both events, previous historical events were raised, with references made to past published reports to support various viewpoints. Council prior knowledge of the potential threat from a major weather event on harvested forestry land on the East Coast was also reported (Flahive, 2018).

Who was quoted?

Fifty percent of the articles provided comment from a local government representative, and 38% had a comment from a victim or someone directly affected. Only 14 articles (19%) provided comment from a forestry company or forest sector representative. Twenty-one articles (28%) named specific forestry companies or industry associations, 14 of which included a response from a forestry representative. Of the seven articles where there was no comment from the forest industry, three instances did not attempt to contact a forestry representative. Two articles cited that companies declined an invitation to respond, while in a further two instances the reporter stated a representative could not be reached for comment or did not return the call.

What images were shown?

We determined a number of image 'types' used in news articles and reporting. The types included those that portrayed the victims of the event, slash piles and debris, a 'sea of logs', silt and sediment without logs, and aerial images. In each category of image type, there was some 'reuse' of the same images in different articles (Table 3).

Examining the source of all of the 134 instances of images used in the articles (the same image will have been counted each time that it was used in different articles), 91 (68%) were taken by media outlet photographers, 15 (11%) were supplied (with only one supplied photo being attributed to an individual), 10 (7%) were from unknown individuals or organisations, six (4%) were unattributed, five (4%) were from government entities, four (3%) were from community members, two (1%) were from a blogger, and there was one stock photo.

Using the 'causer' terminology from media studies, we queried the articles to find out which entity or person was seen as responsible for the event. From the 108 instances where an entity was attributed as being a 'causer', the forest sector was seen as being the main causer of the log debris flow outcomes (76% of all instances). The regional council was also identified as a significant causer, as were past governments, landowners and the public to a minor extent (Figure 2). (Landowner was generally described as the owner or manager of the land impacted by the debris flow.)

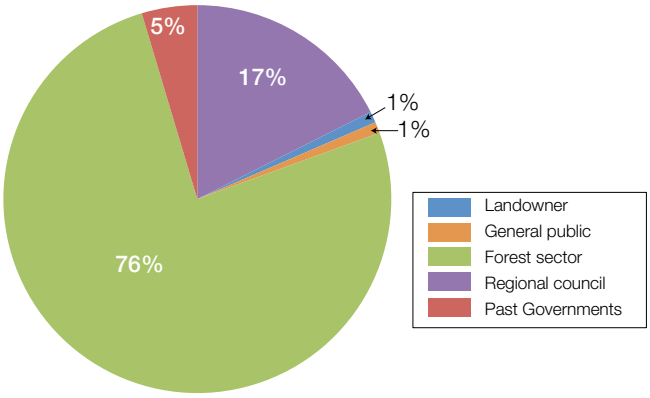

Figure 2: Breakdown of which entities were seen as the primary causer of the debris flows

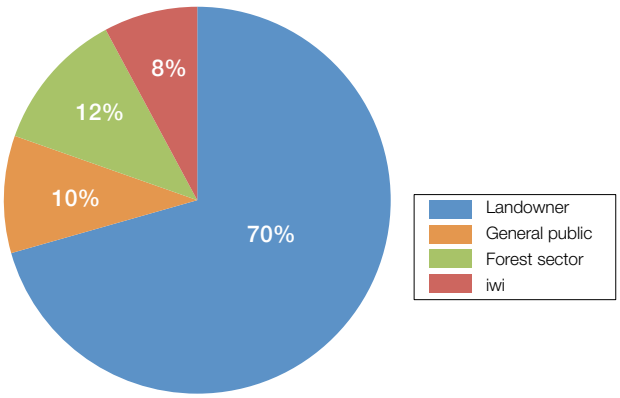

Figure 3: Breakdown of which entities were seen as the primary victims of the debris flows in the media articles examined

Table 3: Categorisation of the major types of images, how they were portrayed in media articles, and the numbers of these images used in reporting

Image type	How portrayed	Example	Total no. of images	No. of unique images
Victims/those affected	Often sitting amongst debris, with animals, pointing to debris		32	24
Slash piles/ log debris	A bundle of logs, often close-up images		18	15
Silt damage with no slash	Landscape image of impact, but no slash in image		15	13
'Sea of logs'	Land and beach covered with logs		11	5
Logging debris strewn across landscape	Landscape impacts showing slash		11	8
Aerial images	Landscape impacts		9	7

We queried the articles to understand who was seen as the victim in the aftermath of these events (Figure 3). In the 51 instances where victims were indicated within the articles, landowners downstream from the source of the debris flows were seen as the main victim (70% of these instances). To a lesser extent, the forest sector (12%), the general public (10%) and iwi (8%) were also portrayed as victims in media reports.

We also examined the articles for information as to what or who was contributing to solutions and/or helping landowners and communities recover from the aftermath of the debris flows (Figure 4). Despite the forest sector being shown as a significant causer of the debris flow outcomes, forestry companies were also recognised as the primary actors (in 79% of instances), providing solutions and assisting with the clean-up and recovery operations in the 24 instances within the articles where help was noted. Reports focused on forestry company CEOs and executives visiting the region, and forestry contractors who were re-tasking crews to assist in log and debris removal, including clearing public roads.

Others who proposed solutions in the aftermath of the debris flows were local or regional community leaders or entities. Members of Parliament were primarily ministers and local representatives. Notably, central government agencies were absent in the articles, suggesting that responses and solutions are regional and place-based.

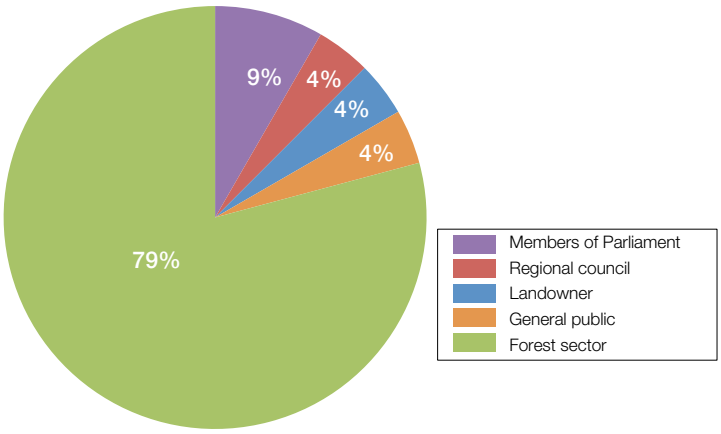

Figure 4: Breakdown of entities seen as providing solutions and assisting with the clean-up and recovery efforts

An initial focus of media reports was on the large climatic events impacting the region. Once the damage to property and structures was reported, news reports shifted attention to the primary reasons behind the debris flow events. Table 4 shows the breakdown of the subsequent factors that were reported as the primary reasons for the outcomes in the Tasman region and Tolaga Bay, being the two main regional events reported. Some media reports provided detailed scientific information. For example, in the Tasman region Separation Point granite soils (along with previous council decisions to encourage planting on these soils) were highlighted, with past reports and previous warnings of possible impacts referred to in the articles. Similarly, for the Tolaga Bay event, the media covered past government decisions to plant the region following Cyclone Bola in the late 1980s, and referenced previous reports sent to council warning of possible issues from slash build-up.

Table 4: Reported primary reasons behind the debris flow events subsequent to the initial reporting of climatic events as the primary cause

What was reported as the main reasons behind the debris flow event?		Number of articles giving this reason
Nature/climate change/Act of God	35%	17
Erodible soils/Separation Point granite	23%	10
Current legislation	21%	11
Planting of exotic species	8%	4
Slash from >5 years ago	6%	3
Afforestation following Bola*	6%	3
Total		**48**

* Refers to Cyclone Bola which hit the East Coast in 1987

Media outlets not only reported the events and their outcomes, but also provided opinion on three possible core mitigating actions given as potential solutions to reduce the consequences when such events occur again. Proposed solutions included:

- Legislative change, largely around changes to forestry practices
- The tree species being planted
- The retiring of erodible land from forestry use, e.g. planting permanent native forests.

Several revised forestry practices were also suggested (Table 5) such as:

- Increasing riparian depth
- Leaving large diameter edge trees as a buffer to slow flows
- Continuous cover forestry
- Finding and developing new markets for slash
- Investing in local processing and mills, and burning slash piles.

Many of these suggested practice changes have been highlighted by Visser et al. (2018).

Discussion

With our joint aim of examining two potential considerations for the New Zealand forest sector – changing practices to maintain and/or gain their social

licence to operate and better communicating responses to adverse events – there are a number of points of discussion.

Table 5: Reported ideas to prevent these outcomes from happening again in the future

What is reported as needed to prevent this happening again?		Number of times this was reported
Revised legislation	34%	23
Right tree in right place	17%	12
Retiring erodible land from forestry	22%	15
Increased riparian barriers	7%	5
Continuous cover forestry	6%	4
Government inquiry	4%	3
New markets for slash (pulp or firewood)	3%	2
Pulling back slash piles from waterways	3%	2
Burning of slash in-situ	1%	1
National forest policy	1%	1
Biofuel production from slash	1%	1
River management	1%	1
Total	**1%**	**70**

First, examining the visualisations (photos, videos etc) presented in the printed and online articles suggest they do not represent the 'full reality', but are a subjective interpretation of the photographer's reality (c.f. Emmel & Clark, 2011). Generally, these images need to be complemented with other material, e.g. statements, interviews. However, this does not necessarily make these representations effective, as it is still dependent on whether certain actors are given standing (or not) and the framing that is used by the journalist. (We have not examined the framing used by different journalists in this article.) Under the current framework in New Zealand, regional and district councils are key responders to environmental events, and this may help to explain media reporters' inclusion of a council voice in most of the reports.

Second, the New Zealand forest sector, despite being the second largest primary exporter after dairy, is often a poor cousin in terms of media standing behind agriculture. Agriculture has a strong media profile in comparison to forestry. There are many rural-based newsheets dedicated to farming, and farm-specific business pages, but no pages and news sheets dedicated to forestry. Agriculture could therefore have further to 'fall' in the public eye compared to forestry. Certainly, dairy's social licence to operate and standing has been impacted from the 'dirty dairy' practices. It is as yet uncertain what the impact of these debris flow events will be on forestry's standing in the long term.

Returning to the concept of standing, with 20% of the articles providing standing to the forest sector, we question what the drivers are of this low level of standing? Given our assertion that the forest sector is a relatively unobtrusive one in the media (sensu Zucker, 1978), it may be that when fairly rare occurrences such as these events happen media coverage may be higher for a short period of time. However, the low level of standing means forestry's voice is not heard as well as it could be due to a low level of connectivity between the media and the sector.

The finding that there was a seemingly sole focus on the forest sector as the primary causer of the problems was our initial conclusion, yet when examined in more detail it was found that climate change, natural causes, geology and Acts of God were the primary causes behind the events. In addition, it was interesting that there wasn't much mention of the combination of events and conditions that made this possible, i.e. the geology, weather events and 'human/industry factors'. We query whether this may feed into the media's need to anthropomorphise events, showing causers and victims, rather than attributing it to Acts of God or the landscape.

In light of these findings, foresters might consider their preparedness for addressing both the media interest and the concerns from the public when such an event occurs. Some questions to ponder could include:

- How well do we proactively communicate with others what is happening on our forested lands, and the likely outcomes, and how can we better engage with the media and communities to increase our standing?
- How aware are the public of the likely impacts and outcomes from storm events? What steps have we taken to communicate the level of risk from storm events, and possible outcomes in this region should an event occur?
- What can we learn from the concerns raised and what changes to forest practice might we consider?

Conclusions

While the forest sector was seen as a key causer of the problems experienced in the Tasman region and in Tolaga Bay, it was also reported and acknowledged as being a key actor involved in rectifying the damage through clean-up and recovery efforts in the affected communities. This suggests that there is an existing 'goodwill' relationship between the forest sector and its immediate communities. This needs to be maintained and the sector should look at ways to enhance and more actively publicise and leverage public goodwill.

Despite this evidence of close engagement with the public locally, in conjunction with a willingness by industry to proactively establish initiatives at a national level (e.g. the recent National Environmental Standard

for Plantation Forestry), communication from the forest sector to the wider public as a whole appears limited. There is a lack of a clear and strong forestry voice in the media. In the case of the recent debris flow events, this lack of a strong voice saw others providing comment ahead of forestry representatives, with forestry opinion under-represented in the reporting.

The forest sector needs to build relationships with the New Zealand media for two end goals: first, to help the sector gain standing in the media when future events come to media attention; and, second, to proactively feed news stories through in the calm periods – building a 'bank' of goodwill and understanding through these stories. Forestry might also learn from other sectors that broadly publish their own news sheets targeting a wider rural public audience, in order to disseminate forest sector-related stories without reliance solely on national mainstream media outlets to carry the forestry stories.

Our findings showed most of the attribution (35%) within the text and media reporting being due to a natural occurrence or Act of God because of extreme weather impacting on the composition of soils in the regions of concern, but our analysis also shows headlines that express the outcomes as a forestry issue and not at a landscape-level. In addition, the forest sector was attributed to be the main causer, far more than other groups such as regional councils or past governments.

Although there is a public lack of resilience to climate impacts like larger storm events, the response from forestry to these concerns has proved insufficient for the blame to be redirected away from industry inaction. This is particularly expressed in the concerns about legislation allowing the continued presence of forestry operations on erodible soils. Better engagement with media and the associated public understanding of forestry and extreme events will assist in forestry's standing. However, this should in no way diminish the need to respond to concerns from the public and make changes to forest practices as a result of such events.

Further, the additional primary causes (C) of the problems correlate well with proposed solutions (S), e.g. C1-->S1; C2-->S2. The forest sector can be a strong influencer with robust solutions to the causes through science. The sector, however, needs to take leadership around a consolidated and agreed forward plan that will provide appropriate solutions.

Many older reports and studies outlining the risks and potential solutions from improved or modified forest management practices have been raised to the surface as a result of these events. While many proposed solutions are available, and some have been subsequently adopted voluntarily, an industry-wide plan around agreed actions across the board to mitigate impacts from future events, appropriately communicated to the public, is required. This has been initiated through a series of national workshops organised by the NZFOA focusing on developing responses and changes to forest practices (NZFOA 2019).

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The use of mass timber – an update

John Stulen

Abstract

Outside of Europe, the recent rise in the application of a relatively new engineered wood product, cross-laminated timber (CLT), has come at a time when its sustainability properties make it an attractive choice for commercial and residential building construction. From the perspective of building industry professionals who have gained experience with this option, it brings considerable advantages. Internationally, the attributes of CLT and related products in mitigating climate change continue to broaden its appeal. Now a growing number of building professionals in New Zealand are using CLT positively in a range of building projects.

Introduction

The market for mass timber (or engineered wood) products in New Zealand is a small but growing part of residential, multi-residential and commercial building sectors, e.g. the new Nelson airport terminal described in the November 2018 issue of this Journal (Novak et al., 2018). Growth in this market has been constrained by material supply, wood design engineering capacity, the perceptions of developers, and to a lesser extent by misconceptions of material performance in commercial building.

Mass timber is currently a rapidly growing trend making headway for commercial construction in many countries. Cross-laminated timber (CLT) is the most often cited material for what some converts are calling a 'tall wood' revolution. However, it is only one of many engineered wood products helping bring positive change and environmental, construction phase and built-environment advantages to commercial building.

Mass timber describes a building material type characterised by the use of large solid wood panels for wall, floor and roof construction. It includes innovative building forms and non-building structures comprising solid wood panels or structural wood component framing systems of large dimensions. The basic elements of engineered wood products are most often common sizes of structural timber (e.g. 4 x 1 or 4 x 2) used to make CLT or plywood veneers for laminated veneer lumber (LVL). LVL is an engineered wood product that uses multiple layers of thin wood assembled with adhesives. CLT is layers of timber that are glued perpendicular to their adjacent layers – cross-lamination. Both LVL and CLT can be sawn to the desired dimensions. Large post and beam elements are also included, known as glue-laminated timber (GLT).

LVL has been around for some time but it is only in recent years that it has been sawn to specifications (e.g. 90 x 45 mm) to compete head on with sawn lumber, while CLT is relatively new to the New Zealand market. According to BRANZ, over the past 20 years there has been some remarkable progress in the technology using LVL and CLT in building structures (see https://nzier.org.nz/publication/plantation-forestry-statistics-contribution-of-forestry-to-new-zealand).

Internationally, timber for commercial building is undergoing a renaissance, as leading architects and individual developers begin to recognise the combined benefits of wood as a natural material for creating a user-friendly work environment and for decarbonising the building materials used.

Timber engineering specialists in New Zealand have built a long-standing reputation for designing and building uniquely exquisite buildings in wood. However, it is European manufacturers who have led the way with CLT globally. Germany, Austria and Switzerland have been the driving force in CLT development, not only as the originators of CLT products, but also as the leading CLT producers and exporters. As the biggest producer of CLT over the past 20 years, Austria leads the world in production and consumption.

The growth in the use of CLT in commercial buildings has also accelerated quickly in Canada and the US in the past five to 10 years. Both countries have been proactive in promoting the use of wood in building through local and federal governments offering grants and subsidies. This has boosted building starts with a focus on tall wood buildings. The most iconic of these has been Brock Commons, an 18-storey student apartment building on the campus of the University of British Columbia in Vancouver (Pilon et al., 2018). Similarly, in the US, the western states have been the area of greatest interest and activity for CLT buildings, with Portland in Oregon a hive of activity.

Both government and industry in North America have been proactive in promoting wood in commercial building through the use of subsidies, free design services and extensive wood promotion programmes. Timber-specific design software has been developed to nurture interest and expertise for all of the related disciplines of architecture, engineering, design, specification and quantity surveying.

Australian perspective

In Australia, the change to engineered wood in building has been driven by committed and focused companies in both the residential and commercial building areas. Worldwide developer, Lendlease, has been a leader in tall timber buildings in Australia, with a focus on commercial buildings that are attractive for their focus on sustainability and enhanced work environments from wood interiors.

A privately-held company, building contractor Strongbuild, has been leading the Australian building industry in the development of multi-residential wood buildings. They set a new paradigm:

- In Sydney, with Macarthur Gardens providing 101 apartments using 2,600 m^3 of CLT
- At Aveo Bella Vista Norwest in Sydney where they have completed a 10-storey retirement village complex comprising 131 luxury retirement units over two towers using 3,000 m^3 of CLT
- Phoenix Apartments, Rouse Hill, NSW has 134 apartments over six storeys. This build combined lightweight LVL timber-framed walls with CLT floors, the roof and core using 2,650 m^3 of CLT.

Strongbuild had an exclusive partnership with Austrian company Binderholz to bring its product into the Australasian market. The prefab components were built in Strongbuild's 8,000 m^2 manufacturing facility, an extremely precise, automated panelisation facility in Baulkham Hills. Keeping the entire design and build process in-house provides control over price, quality and timing, another advantage of prefabrication.

Architectural perspective

James Whetter, architect, leads the residential team at Jasmax, a New Zealand architecture and design firm. He has had a significant role to play in promoting the increased use of engineered timber in New Zealand, both through projects at Jasmax and in his role as the NZ Institute of Architect's representative in the Timber Design Society. Jasmax have led the way in multi-residential buildings in New Zealand with several large-scale CLT projects.

Whetter says there are three key reasons why he is an advocate for mass timber in buildings:

- The carbon capture is number one – the figures are powerful when you look at the science
- This technology supports local industry, providing local products and local jobs
- Finally, there is the undeniable speed of building on the site.

Jasmax designed one of Auckland's first CLT multi-storey buildings, the Merchant Quarter apartments in New Lynn. The project used CLT as the primary structure for the 25 apartment building. The building needed to be lightweight to sit on top of an existing concrete carpark, plus it had an accelerated building programme. Using CLT allowed it to achieve both requirements.

The Beatrice Tinsley Building at the University of Canterbury under construction. An academic support building in the new Rutherford Regional Science and Innovation Centre, it uses LVL and is a Jasmax large-scale timber project. Photo courtesy of Jasmax

Completed in 2018, and designed by Jasmax, Ara Institute of Canterbury's Kahukura building is one of the country's first built examples of a large-scale (three-storey and 6,500 m^2) timber construction building. Lightweight construction and a significant gesture to environmentally sustainable design, and the use of innovative wood technologies such as CLT in this building, positions New Zealand in line with countries worldwide who are using this design and construction method on a mass scale.

Engineering perspective

Andy Lind is a Director at Engco, Consulting Engineers (Christchurch, Queenstown and Auckland), where a team is passionately leading the way in the design of engineered timber structures. He says, 'We've been busy in the last few years writing the only New

Inside view of Arvida Living Well Park Lane retirement village in Christchurch. CLT panels make for a very natural look inside a building, emphasising the sustainability of the materials used. Photo courtesy of Jasmax

Bealey Lodge, Christchurch, under construction. The speed and accuracy of CLT buildings becomes very visually apparent when the buildings go up much faster than traditional materials in commercial buildings. Photo courtesy of Engco

Zealand design guide for the use of CLT and investing in the testing of timber products. This will assist the engineering and architectural community in the mainstream use of timber for larger and more ambitious projects.'

From the inception of Engco, the team have consistently looked to take a leading role in the structural use of engineered timber, evidenced in designing the Bealey Lodge Backpackers in Christchurch. This was recognised with a Timber NZ Award in 2017 for the first major commercial use of CLT. Engco provided the structural design for the Arvida retirement village where they worked closely with the architect, fire and acoustic engineers. The result has been a lightweight multi-storey structure, with reduced foundation costs, that exposes elements of the timber structure to enhance the quality of life for the residents and the community through the drive towards sustainability.

It is an exciting time of growth for the timber industry. While long being the staple construction material for residential construction, timber has only recently become generally recognised in New Zealand as an alternative material able to achieve the higher strength required for multi-storey and commercial structures. Its use is, however, still hindered by a deficiency in the codified engineering guidance available for practising engineers. With an in-house team of timber specialists, Engco are trying to redress this. The focus is very much on giving cost-effective designs, which means attention to connection detailing and maximising the efficiency of the structural layout during concept design.

Engineered timber provides a high level of robustness and accuracy in the product dimensions, but it remains a 'living' material and requires a greater understanding of durability, long-term creep and response to moisture than is demanded by more sterile materials. While these characteristics require more design thought, the reward is a lighter material that is easier to work with and which champions a greener and more sustainable construction industry.

Project manager and contractor perspectives

The project manager for our southern-most and largest volume CLT building, Otago Polytechnic Student Village (OPSV), was Logic Group. Director Sam Cadden summarised key advantages of working with CLT as:

- Improved collaboration in the early phases and better coordination
- Improved cost estimation
- The contractor takes more ownership
- Value engineering from the outset.

Through the experience of this large CLT building, Cadden confirmed that they expect to be able to deliver this type of project even more cost-effectively in the future through:

- More prefabrication
- Pre-nailed and pre-lined internal walls
- Panelised external walls
- Elimination of scaffolding
- Building the roof on the ground
- Better staging.

He adds that beyond the potential advantages of constructing buildings with CLT there are further intrinsic values, saying, 'We know that workers are less stressed and more productive, students learn better, patients heal faster, and people are generally happier and calmer in indoor areas which contain wooden elements.'

Director of the lead electrical contractor for the OPSV build was Paul Parsons of the Aotea Electrical Group. He noted these issues:

- Early engagement would have been advantageous due to scope and design changes
- Cable access and main routes would have been drilled off-site
- There was no internal scaffolding allowing for clear access
- Fixings for services into wood saved considerable time
- Penetrations through wood made it easier and more efficient
- The building is dry/warm/enjoyable/tidy
- There was pride and passion in the project due to the design and outcome.

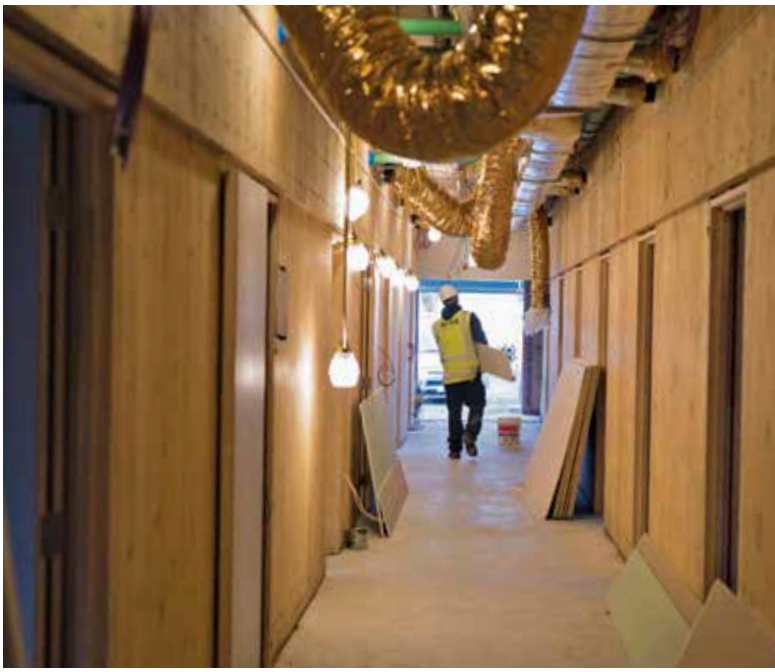
Furthermore, Parsons summarised what is possible when the project manager invites early contractor involvement and engagement: 'If this approach was used on the OPSV, it could potentially have saved 10-15% productivity as planning and coordination in the design phase would have resulted in all trades hitting the ground running.'

North American perspective

The process for mass-timber-construction permitting is about to become streamlined thanks to changes to the International Building Code (IBC) set to be released in 2021. In December 2018, the International Code Council passed 14 code changes relating to mass timber construction that would be included in the 2021 IBC. Among the changes is the creation of three types of construction that set new allowable heights and fire safety ratings for wood buildings.

The current code sees buildings in mass timber, including CLT, as outliers from existing categories, and requires performance-based design for permitting processes. The proposed changes would both define mass timber construction and create three new categories for it, dealing with mass timber that is protected with non-combustible materials, partially exposed, and unprotected, with maximum heights of 18, 12 and nine storeys, respectively.

Thomas Robinson, founder of Portland, Oregon based LEVER Architecture, explains the potential of these code changes from his office in a mass-timber building his firm designed, Albina Yard. He says, 'With this new code, you could say, "If I follow these guidelines, I'm pretty confident that I'll be able to get a permit." That has a huge impact on how owners will



Left: Construction of ground floor structural elements at Otago Polytechnic Student Village. Right: Under construction – many of the sub-contractors commented on the clean and quiet environment, which made their job more pleasant. Photos courtesy of Logic Group

think about investing in these types of buildings, and on strengthening the national supply chain, because people will be comfortable investing in technology and in building new [mass-timber] plants.'

Robinson and his team at LEVER are well versed in timber construction, as co-winners of the US Tall Wood Building Prize for their 12-storey project, Framework. The LEVER team conducted around 40 tests for fire safety, acoustic performance and structural performance to gain permitting for Framework, which was the first wooden high-rise to win such approval in the US. Robinson says his firm's work highlights the opportunity that code changes present to architects who will no longer face the same rigours of testing his team encountered.

What is clear is that the US demand for wood buildings is there. The country's largest producer of CLT, SmartLam, has experienced such rapid growth since opening six years ago that it is building a new headquarters in Columbia Falls, Montana. SmartLam is also planning a second facility in Maine to supply what the industry thinks will be an influx of mid-rise construction in New York and other cities along the Eastern Seaboard.

'The expansion here is simply driven by need,' says SmartLam CEO, Casey Malmquist. 'There's always been a grassroots support for CLT in the US and a recently increased interest in research and testing. But now we're no longer speculating about whether it will work – it's going mainstream.'

While similar Pacific Northwest companies like DR Johnson and Katerra, as well as firms such as LEVER Architecture and Michael Green Architecture, have long led the field, production is growing in uncharted territories across North America. Pioneering European companies, which have historically dominated the market and supplied American developers, are now putting down roots in the US. Austrian giant mass timber producer KLH is partnering with International Beams in Alabama, supplying it with glulam blanks.

Finished project showing exposed wood features and entrance into one of the many student accommodation rooms. Photo courtesy of Logic Group

Mass timber – an efficient solution

In addition to the structural, aesthetic, and environmental advantages, mass timber can be an efficient and practical solution to design challenges.

With prefabricated panels, mass timber construction is fast – approximately 25% faster than concrete. It also results in 90% less construction traffic and 75% fewer workers on the active deck, making it well-suited to urban infill sites.

Because mass timber is lighter than steel and concrete, it can be a good solution for sites where poor soil is an issue.

There is also a trend toward the integration of services into prefabricated elements, such as panels and trusses. The fact that the labour is done off-site means greater quality control and a less hectic job site.

These investments show that the race to build such production facilities is vital to the US market becoming competitive with other countries. However, many experts say we need to increase cultural acceptance of mass timber as well as get investors on board before the industry starts churning up a sizable profit.

'The real strategy is that the big manufacturers in Europe are focused on making franchises here,' says Alan Organschi, Principal of Gray Organschi Architecture in New Haven, Connecticut. 'They can produce higher quality products cheaper, even with overseas shipping, than manufacturers can in the US and Canada.'

The global climate change perspective

In 2015, world leaders meeting in Paris agreed to move towards zero net greenhouse gas emissions in the second half of this century. That is a tall order, and the building industry makes it even taller. Cement-making alone produces 6% of the world's carbon emissions. Steel, half of which goes into buildings, accounts for another 8%. If you factor in all of the energy that goes into lighting, heating and cooling homes and offices, the world's buildings start to look like a giant environmental problem.

Governments in the rich world are now trying to promote greener behaviour by obliging developers to build new projects to 'zero carbon' standards. From 1 January 2019, all new public sector buildings in the European Union must be built to 'nearly zero energy'

standards. All other types of buildings will follow in January 2021. Governments in eight further countries are being lobbied to introduce a similar policy.

These standards are less green than they seem. Wind turbines and solar panels on top of buildings look good but are much less productive than wind and solar farms. Also, the standards only count the emissions from running a building, not those belched out when it was made. These extra emissions are thought to account for between 30% and 60% of the total over a structure's lifetime.

Buildings can become greener. They can use more recycled steel and can be prefabricated in off-site factories, greatly reducing truck journeys. However, no other building material has environmental credentials as exciting and overlooked as wood.

The energy required to produce a laminated wooden beam is one-sixth of that required for a steel one of comparable strength. As trees take carbon out of the atmosphere when growing, wooden buildings contribute to negative emissions by storing the stuff. When a mature tree is cut down, a new one can be planted to replace it, capturing more carbon. After buildings are demolished, old beams and panels are easy to recycle into new structures. Also, for the retrofitting of older buildings to be more energy efficient, wood is a good insulator. A softwood window frame provides nearly 400 times as much insulation as a plain steel one of the same thickness and over 1,000 times as much as an aluminium equivalent.

A race is on to build the world's tallest fully wooden skyscraper. However, such edifices are still uncommon. Industry fragmentation, vicious competition for contracts and low profit margins mean that most building firms have little money to invest in greener construction methods beyond what regulation dictates.

Governments can help nudge the industry to use more wood, particularly in the public sector – the construction industry's biggest client. That would help wood-building specialists achieve greater scale and lower costs. Zero-carbon building regulations should be altered to take account of the emissions that are embodied in materials, which would favour wood as well as innovative ways of producing other materials.

Growing the market in NZ

Beyond the individual business-to-business marketing and information campaigns there are a number of industry-wide efforts that are building awareness among architects, engineers, specifiers, quantity surveyors and developers. These include:

- WPMA design guides – using groups of industry experts, a full set of engineered wood design guides are being created. The first one of these relates to the most sensitive area – fire design
- Red Stag Group – a combined industry/government-funded project to build apartments using CLT at Clearwater in Christchurch and a multi-storey commercial building in Auckland. The project is led by chairman Marty Verry, whose company also plans to build a CLT manufacturing plant in Rotorua. It has gained government funding through the Sustainable Food and Fibre Fund
- WoodWorks – this industry-funded technology transfer service started in 2016 with an annual technical conference entitled 'Changing Perceptions'. From 2019, the WoodWorks service will also provide monthly industry updates on mass timber projects and technical information. This service will gather information from a range of sources, including industry design guides and Red Stag's government-supported building development at Clearwater in Christchurch, amongst others.

Role of government

While not yet resulting in any confirmed policy, there are strong industry efforts to make a change in government policy akin to incentives and requirements implemented in British Columbia, Canada where it is know as a 'Wood First' encouragement policy. Industry leaders are working with the Labour Party and caucus members to gain acceptance for a set of 'Wood Preference' policies. As the previous government signed the Paris Agreement there could be a win-win result if future government-funded buildings were constructed using mass timber produced in New Zealand.

The last word – a tree-hugger's perspective

The last word on CLT timber at this early stage of its development goes to a popular blogger and self-titled 'tree-hugger', Lloyd Alter (www.treehugger.com), a leading Canadian commentator on mass timber trends. He says, 'If you write out the basic facts of trees, but framed as technology, it sounds like impossible sci-fi nonsense. Self-replicating, solar-powered machines that synthesise carbon dioxide and rainwater into oxygen and sturdy building materials on a planetary scale.'

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From seed to harvest – factors affecting genetic worth of a radiata pine stand over its rotation

Emily Telfer, Toby Stovold, Natalie Graham, Ahmed Ismael and Heidi Dungey

Nursery bed where seedlings of known genetic background can be raised to a planting age

Abstract

The genetic worth of radiata pine (*Pinus radiata*) seedlots in New Zealand can be described using the Growth & Form Plus (GF Plus™) rating system (Vincent, 1998). This rating system is issued for controlled-cross material based on the relative merit and relative parental contributions. This paper looks at how between the sowing in the nursery to the point of final harvest, the proportional representation of individual parents within the mix (and therefore the genetic worth) can change (Figure 1).

A seedlot's life-cycle affects its genetic make-up

The extent to which events in a seedlot's life-cycle affect the final genetic make-up of a stand and original rating is largely unknown. However, genetic analysis technologies are now at a point where the pedigree of individual trees can be determined using DNA markers if the potential parents are known (Telfer et al., 2015; Kess & El-Kassaby, 2015; Doerksen & Herbinger, 2008; Vidal et al., 2017).

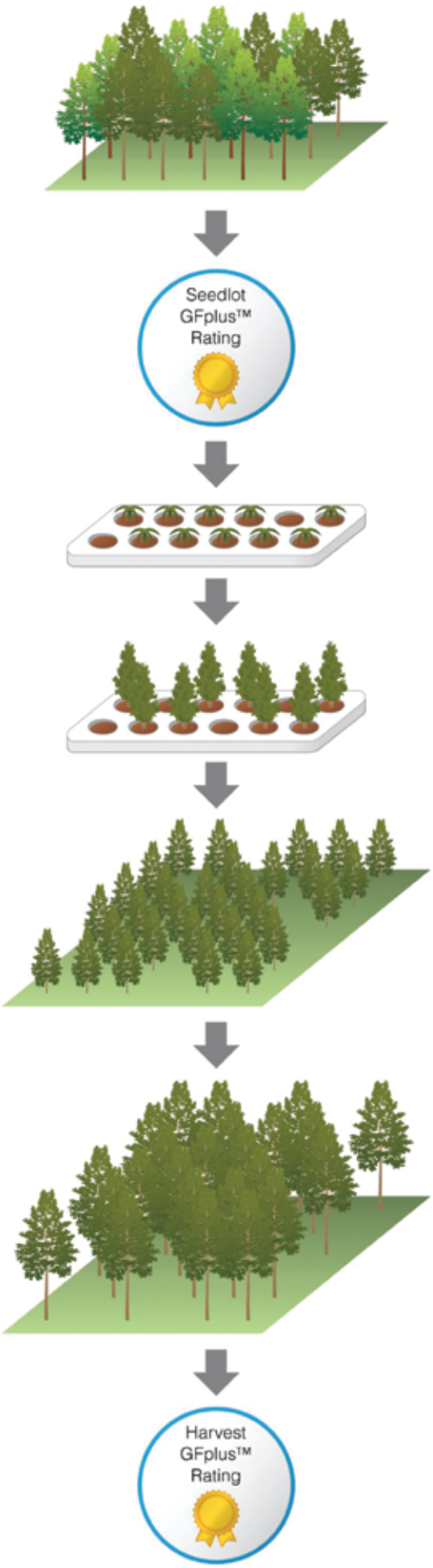
If the parentage of a harvested stand can be determined then it will be possible to recreate a GF

Table 1: Seedlot composition

ID	Seedlot no.	Name	GF rating	GF Plus™[1]	Female parents	Male parents	Total unique parents	Total progeny collected
A	6/3/86/46	Amberley '268'	21	20.9	9	21[2]	26	143
B	9/3/86/166	870	13	17.3	4	4	5	137

[1] GF Plus™ rating generated retrospectively as the system was not in place at the time these seedlots were compiled (Grattapaglia et al, 2004) as summarised below.

[2] 1984 equal contributions pollen mix.



What is a seedlot?

A seedlot can be formed from a single genetic cross of two known parents or up to as many as 80 crosses. The genetic variation within a seedlot can vary from low to high depending on number of parents. A seedlot with a wide mix of genotypes is seen as a countermeasure to the impact of genotype by environment (G x E) (Li et al., 2017). Genetic diversity is not yet included in the classification of a seedlot (Stoehr et al., 2004) in New Zealand, but it is in other countries.

Pollination

Controlled pollination is subject to both human error and environmental contamination. Mislabelled pollen or contamination from airborne pollen can result in seeds of uncertain paternal parentage (Grattapaglia et al., 2004). Levels of mislabelled seed in the forest industry are known to range from none detected (Hansen & Kjær, 2006), up to 15-35% mislabelled material (Gömöry et al., 2000).

Germination

Germination rates vary with the mechanism of pollination. Rates of 96% have been reported for open-pollinated seed, dropping to 90% in control-pollinated seed (Rimbawanto et al. 1988). There is also evidence of genetic variation in germination rate in conifers (Wahid & Bounoua 2013; Singh et al., 2015; Stoehr & Farmer, 1986), and environmental effects (Stoehr et al., 1998), which could affect the genetic makeup of a seedlot.

Nursery/uplifting

Post-germination, selection occurs in nurseries carrying out manual lifting, with malformed or small seedlings being left behind (Dun, 1956). Other environmental factors within a nursery, such as rain-splash, feeding rabbits or birds, the presence of diseases and the quality standards of individual nurseries will affect the makeup of a seedlot before it leaves the nursery. Commercial nurseries plan for 80-85% of germinated seedlings to leave their nursery gate (Paul Keech, Nursery Manager, Scion, pers comm.)

Planting/survival

Survival rates after establishment in the field are affected by genotypes and environments, particularly susceptibility to the foliar pathogens such as Dothistroma sp,(Bulman et al., 2016). Foliar diseases can impact trees with different genetics from establishment, and trees affected by the disease may be more likely to be culled during thinning operations (Bulman, 1994; Dungey et al., 2014; Suontama et al., 2018; Ganley et al., 2014). Inbreeding depression can also influence survival rates (Wu et al., 1998; Kumar, 2004).

Silviculture

The final genetic makeup of a harvested stand depends on the type of thinning operation undertaken. For example, wood density is a desirable trait where the target is solid wood. High wood density is unfortunately negatively correlated with growth (Gapare et al., 2009; Jayawickrama, 2001), so that seedlot mixes that have an average of good growth and good wood density may have a mix of faster growing, lower density trees mixed with slower growing, higher density trees. It is not hard to imagine that thinning may drastically change the average wood density, and therefore genetic worth of a stand.

At the point of harvest, considerable impacts to the genetic worth of a stand have occurred which have the potential to alter the GFplus™ rating of a stand.

Figure 1: Points where changes to the genetic make-up of a seedlot can happen

Plus™ rating for the final harvestable crop. Comparing the changes in GF Plus™ rating from seedlot to end rotation could have important implications for our understanding of how seed selection and forest management can be better applied to maintain the maximum genetic potential of any planted forest.

What is a seedlot?

A seedlot can be formed from a single genetic cross of two known parents or up to as many as 80 crosses (the largest number of contributing parents recorded in 2017). The genetic variation within a seedlot can vary from low to high depending on the number of parents. Those with less than 10 crosses tend to have the same proportion of each cross in the mix. Seedlots that have more than 20 crosses may have a wider variation in percentage contributions to the overall mix.

A seedlot with a wide mix of genotypes is seen as a counter-measure to the impact of genotype by environment (G x E) (Li et al., 2017). Genetic diversity is not yet included in the classification of a seedlot (Stoehr et al., 2004) in New Zealand, but it is in other countries. The breeding values of the parent trees are used to calculate the genetic worth of a seedlot. However, from the time a seedlot is formed, to the harvest of trees in a specific stand, there are many factors that can change the genetics and therefore the value of a seedlot.

Comparing the changes in GF Plus™ rating from seedlot to end rotation

To illustrate the differences between two seedlots, we compared one with low and one with high genetic diversity – either thinned to waste or unthinned – to understand how seedlot ratings might change between sowing and harvest.

Methods

Genetic material

The seedlots were planted at Glengarry in 1987 as part of a larger genetic gain trial (Grattapaglia et al., 2004). Seedlot A comprised known female parents fertilised with mixed pollen from known male parents. Seedlot B was control-pollinated with known female and male parents' tissue in storage at Scion (Table 1).

Silviculture treatments

Total height was measured at two years after establishment. Experimental plots were established within the trial and underwent thinning to waste at age five, reducing the stems per hectare from 250 to 100 (2.5 to 1 thinning ratio). The average mortality within Seedlot A up to thinning at five years after establishment was 7%, with additional losses between thinning and harvest at age 28 of 10%. Within Seedlot B, the average mortality up to thinning at age five was 6%, with additional losses between thinning and harvest at age 28 of 15%. The average loss from planting to harvest in all of the unthinned plots at age 28 year was 24%.

Who's your daddy (and your mummy)? Genotyping and parentage assignment

At age 30, actively growing cambium for DNA analysis was extracted from 5 cm diameter bark windows collected from all trees identified as height trees. Needle tissue was collected from Scion germplasm archives for the parents of trees in the Glengarry seedlots. One parent was no longer present in the archive, so we 'recreated' this genotype using the maternal megagametophyte tissue from stored seeds.

DNA was extracted, frozen and submitted to Rapid Genomics LLC in Gainesville, Florida for exome capture-based genotyping by sequencing. The resulting data was analysed using CERVUS software.

Parentage assignments were performed using sequential maternity and paternity assignments. However, where a reciprocal cross is also present in a seedlot, the markers are unable to distinguish between the two.

Results

In Seedlot A, new parentage results confidently identified 100% of the cone parents and 64% of the pollen parents. In Seedlot B, 66% of the parentage assignments were identified for both cone and pollen parents. The remaining progeny were assigned the most likely parent from within the parent trees sampled.

As only the height trees were DNA sampled, we chose to combine seedlot samples across plots within a treatment to estimate the average seedlot parental proportions. There is a chance with this approach that the estimates are slightly inflated, as generally sub-dominant and suppressed trees are not selected for height measurements.

Using identified parents from the parentage reconstruction representing a sample of the original seedlot, new end-of-rotation GF Plus™ ratings were generated for each given parent in the final ratios (Table 2).

Table 2: New end-of-rotation changes to GF Plus™ ratings for thinned and unthinned stands

Seedlot	GF Plus™* seedlot rating	GF Plus™ stand rating after 2.5 to 1 thinning ratio	GF Plus™ unthinned stand rating
A	Growth 21.1 Density 13.7	Growth 19.8 Density 12.6	Growth 20.1 Density 14.3
B[1]	Growth 17.3	Growth 15.5	Growth 15.5

[1] Not all parents in Seedlot B had GF Plus™ density values, so it was not possible to calculate a density value for Seedlot B

Male cones, or catkins, produce pollen which can be harvested and applied directly to female cones for a controlled-genetic cross

Implications for forest owners

We were able to assign two parents to each tree in the seedlots tested, but the assignments are very reliant on the accuracy of the candidate parental genotypes. However, there were low confidence scores for some parentage assignments, which suggests 'true' parents may not be present in the collection.

We also observed a number of predicted crosses in Seedlot B that were not in alignment with the documented crosses. The Partial Least Square values for Seedlot B were also lower than for Seedlot A, even though we had a smaller number of parents from which to select.

We noted that these parents are all long internode genotype selections, which represent around 10% of New Zealand's germplasm (Hansen & Kjær, 2006). It is possible that the lower confidence scores reflect some hidden relatedness within these individuals, which is compromising the ability of the software to make confident assignments. In the future, we will explore alternative software that can improve this.

We also considered the possibility that the presence of undocumented 'selfed' seed within the seedlot could contribute to a lowering of the phenotypic performance, but the CERVUS software was set to detect self-fertilisation events and none were seen.

The GF Plus™ rating for growth seems fairly stable, similar to the findings of Kimberly et al. (2015). The actual change in the subset of height trees sampled was only a slight, non-significant decrease in the GF Plus™ rating despite the potential for life-cycle events to affect the genetic worth of a seedlot. Of particular interest is the fact that the thinning to waste regime did not appear to change the end-of-rotation GF Plus™ rating.

Interestingly, the ability to identify elite trees within a stand is feasible and offers up the potential to turn any commercial control-pollinated stand into a quantitative genetics experimental site. Additional work to improve parental reconstruction through the inclusion of a wider pool of markers, and progress towards a more accurate and complete parental genotype database, will help New Zealand forestry move towards a goal of implementing operational genomics tools.

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Where to for Wood Councils?

Erica Kinder

What is a Wood Council?

This is a question I have answered many times in the last 12 months since I took over the role as CEO for the Southern North Island Wood Council. This question is usually followed quickly with the next, 'So what do you do?' I'm sure in our esteemed forestry circles I do not need to give the long answer to these questions, but I will provide the short one.

What is a Wood Council? There are five Wood Councils based around New Zealand, and the geographical areas they cover seem to roughly align with the old Forest Service boundaries of Northland, Gisborne, Hawke's Bay, Southern North Island, Marlborough/Nelson and Southland. The Marlborough Forest Industry Association is the oldest Wood Council, formed in 1971.

The Councils in no way cover all of New Zealand, and a glaring omission is that there are none in the Rotorua and Canterbury districts. All Councils have been formed and funded entirely by their own members from the forestry sector. We are all non-profit entities, and the purpose is entirely for 'industry good' activities, promotion and representation at local council or government level, and communication.

Each Council has a board that is voted from within its membership and they provide the direction and leadership for each Council. Wood Councils conduct their own activities based on what the members want in that region, and some are run by volunteers from within the membership. Others, such as ours, have employed a coordinator.

Careers Day stall and learning on a machine driving simulator

Southern North Island Wood Council

The Southern North Island Wood Council, geographically speaking, is the largest. We cover the entire bottom of the North Island, as far north as Ohakune, across to Waipukurau and down to Wellington. This makes our membership diverse, and also means a lot of travel for our board members to get to quarterly meetings.

We have members that include ports, sawmills, logging contractors, cartage contractors, forestry companies, forestry investment companies, forestry consultants and a seedling nursery. The NZ Farm Forestry Association is also a member of our Council, and I have enjoyed meeting their associates and attending a field day held in the Wairarapa this year.

What do I do? Well, that depends, is the answer. It depends on what our board places the most emphasis on for that year. At the moment that is a heavy dose of careers and training promotion, followed with a sprinkling of keeping up with local council policies, and a touch of organising our yearly training awards, along with the distribution of information from all the other associated groups in our industry.

Careers and training emphasis

The emphasis on careers and training promotion is for two main reasons, the first being that as we all know we are in a labour shortage for our sector. All of our members are struggling to hire qualified or, in some cases, just drug-free staff. This is a recurring theme at all our meetings, and by putting our resources into attracting and retaining staff we are actually reaching a large part of society who do not even seem to know we exist.

In the Palmerston North area, for instance, schools didn't even know that forestry was an industry in their region. I believe that by reaching out to schools and local employment groups we are actually reaching a whole wider part of the community. Parents, teachers and other local businesses are all made aware of 'the forest sector' and all that we have to offer. So far, I have been overwhelmed with the response to the point where the Southern North Island Wood Council has now also hired two regional coordinators based in Palmerston North and Taranaki to solely focus on the interaction with schools.

Second, it seems our industry has been very bad at promoting itself. I am not sure why. We seem to have all the key elements that would make for a great story: a growing industry, carbon storage (in an economy that has promised carbon neutrality), excellent rates of pay, diverse jobs to suit most skill sets, profitable businesses and a levy-funded nationwide organisation. There is also no shortage of associated groups all 'representing' our industry. The power point presentations are positively jostling with logos.

However, these elements have just not combined to produce the results our members want. There is no strategic and coordinated nationwide campaign that is current and attractive to new job entrants, and there is not enough communication in a modern way – only fragments of this that seem last minute and not what the market requires. So our Wood Council is attempting to fill a gap. I have seen some great online campaigns run by our forestry friends in the UK, the US and Canada, and I believe we have a lot to learn in providing open days, free events, local workshops and community-based projects.

Luckily, I have a background to suit this task. I grew up on a sheep farm in the Marlborough Sounds, I am a Forestry Science graduate from the School of Forestry at Canterbury University, and have worked across many areas of our industry, running log yards, loading ships and truck dispatching.

I am also married to a forester. We own plantation forests in their third rotation and have just completed logging some of it. Also, I have children currently suffering the careers departments at secondary school and trying to figure out what they want to do in life with very little guidance from their schools. Furthermore, I spent six years at Beef + Lamb NZ, coordinating regional events for farmers where true community spirit seems to live.

Women and Māori in forestry

Also, and some of you may have noticed this, I am a woman. This has always been, and I am not going to sugar coat this, a bit of a hindrance in the forestry sector. An example of this was having to interview and hire my (male) replacement and observing his salary package was double to my own. There is hope in this area, as there are many young women coming through now into our industry who simply will not put up with that and I can see a future where gender really won't matter.

I think our industry is starting to recognise this, especially with the latest round of scholarships offered from the Ministry for Primary Industries that are for women or Māori only to enter forestry-based tertiary training. (I'm still not sure how to take these scholarships. Are they recognition that these groups are not well represented, or are they hinting that somehow the only way these groups are going to get there is with incentives? By asking for equality, how are we gaining it, if only with such initiatives?)

Workplace danger

Some of the jobs I have had in the past have been in extremely dangerous workplaces. I know forestry suffers from a taint, particularly the fear of parents, of being a dangerous place to work. Stevedoring, or the loading of ships at wharf side, would have to be the most dangerous thing I have ever done. We had two workplace deaths, one that I witnessed, in the 10 years I was in this career, and many injuries and near misses. Too many to count.

Guy Farman from Farman Turkington Forestry shows students how to fly a drone

I myself was run over by a log loader, but it turns out that if you lie on the ground flat then the wheel base is high enough to run over you untouched. In this instance, the driver was reading paperwork on his lap and not looking ahead. If parents or students mention concerns about safety, they are completely valid to me. When you are the only woman in a workplace, you often have to provide support and sympathy to injured co-workers.

However, all workplaces are dangerous to differing degrees in my opinion. Try the mental stress of an office job in a big city, commuting in traffic, dealing with 'workplace bullying', sitting in an air-conditioned room all day, staring out the window. I would still take the fresh air, sunrises, frost on the ground and the simple physical activity of working outside any time.

Do we all want to live forever? Or does it just feel that way sometimes? You are still more likely to be in car crash driving to get a pie than get an injury in a forestry-based job. What about driving to get a pie on the way to a stevedoring shift? What is that statistic?

For our members, it is the perfect storm of just enough knowledge and ideals to make for a frustratingly determined CEO.

Wood Councils essential

I believe, and this is just my personal and obviously biased opinion, that Wood Councils are essential in New Zealand. We are the regional voice for our sector providing a non-competitive platform for many discussions, and dedicating time and energy into areas that many of our members support but just do not have the time outside their day jobs to contribute to.

I am amazed that some of our members will drive four-and-a-half hours to attend a board meeting, eat a dry sandwich, and head home again, talking into their bluetooth speakers in their utes the whole way. Their dedication to industry good and a hope for the future of their workplaces is incredible, and this is what the Wood Councils are for – they are a direct link into our industry.

Career Expo's

I have also particularly enjoyed the interaction with young people this year at schools where I have held informal talks about 'forestry stuff' and at Careers Expo's where I have set up stalls and roped in some industry staff for the day to help out. Starting with zero in the way of banners or brochures, I have made my own, changed them, and am rethinking my approach all the time.

I think I have learnt as much from the students as they have learnt from me. First, around communication, I know we see young people wandering around with phones all the time but it turns out they love to talk. To read – not so much. I try and catch someone's eye, ask about what they are interested in, and then turn that into something they could use in our forest sector.

If a student is into computer systems, I ask them if they have heard about GIS and its applications with drones for forest mapping. If they like engineering subjects, I ask them if they know about soil stability and water movement in forest roading. Into economics? Then I ask if they have heard about forest investments, rates of return on different land uses and the marketing of logs overseas. There is no subject that a secondary school student is doing that does not relate to forestry somehow, except maybe sewing (that one stumped me) and sports studies.

Value of social media

What I have learned from these interactions can be brewed down pretty simply. Either we need to communicate face-to-face or with video. It is the only way forward if we want to promote ourselves with students, because if we cannot actually be there in person then we need to be there digitally. Emails, websites, booklets, brochures – all these we are doing to communicate with parents and teachers.

The only way to get videos seen is through social media and this is a huge, vague thing for most people over the age of 40. There are many different forms of social media, with Facebook being the largest (and the least used) by anyone under the age of 30. Increasingly popular now is YouTube, where a person or 'blogger' has a following, and I see some real promise with this approach. The trouble is we need a 'celebrity forester' or an 'All Black forester' to generate any real star power, and I am not sure that person is out there yet.

Another personal notion of mine would be a 'forestry mascot' for our vision. 'Bring back Bogor!' We need a relatable face for our industry, and while the pot-smoking hedgehog might not be PC these days, we still need a version of this. Someone recognisable and non-threatening for our campaigns. Maybe I will try a life-sized cut-out of this at our next Careers Day and let you know (perhaps we need a nationwide competition to develop a new mascot?).

One of the first tasks I set myself with the Southern North Island Wood Council was setting up a Facebook page, and then really starting to use it. I did search around but found very few other pages in New Zealand forestry at all, so I make my own videos, slide shows and posts, and share relevant newspaper articles and posts from other groups. There has started to be some real interaction, and it is great to be able to tell young

Forest interns from Makoura College in Masterton

people to look at our page, as I have found very few are interested in a website because they are just not interactive enough. We also have good success with our Instagram page and YouTube channel.

Intern Programme

Another initiative our Council started last year was the Intern Programme. Essentially this was a school holiday work experience scheme, but the difference was we paid our students for a week of their time. Over that week we got them to video and photograph their involvement in differing forestry workplaces. We chose two Year 9 students from Makoura College in Masterton and they visited five workplaces over a week, which included a day in a log truck, a visit to see log scaling and ship loading with C3 at Centre Port in Wellington, drone flying, quad bike riding in the forest, and laying out road lines.

At the end of the week they produced a video that our Wood Council has used for promotion and at other schools to explain how interesting the varied jobs can be. We have received great feedback from the local secondary schools around this scheme and this year we are rolling out the Intern Programme over three of our districts. We will have to handpick students as I think the word is out.

Big Day Out forestry field trips

Other projects for our careers promotion this year include three Big Day Out forestry field trips that we will be holding across our regions. This will involve all our members, and speakers will be required as well for full-day bus trips to visit sawmills, nurseries, log yards and logging sites.

Of high importance for city-based students is a picnic lunch in the forest with a biodiversity talk. Often many of these students would never have had the opportunity to sit in a forest and observe their surroundings. We are also planning a silviculture element to these trips, where students can have a go at pruning trees so they can understand why we do it. With our two new coordinators and myself, the only limit on these trips is the number of buses we can take.

Forestry training providers

I feel that some of these ideas have started to produce results, along with the extensive media coverage that forestry has had in the last year. The University of Canterbury's School of Forestry has received it largest intake for many years with 33 students enrolled from all over New Zealand. At Toi Ohomai in Rotorua, their machine driving courses are consistently filling, and we are now having to find workplaces to accommodate the students coming out of this course.

It is a large drain on a contractor to take on a young and only semi-trained individual when there is a high chance they will jump ship for an extra 50 cents as soon as they are qualified. But they do it anyway, and so far

Student on lunch break in forest

(as there are very few subsidies in place to help with this) all the risk and financial disadvantage has been with the contractors.

More events to come

I know that all our Wood Councils have many differing activities and projects that they are working on around New Zealand, and it is very refreshing to see such support from all our companies and associated groups. If anyone wishes to know more about what your Wood Council is doing, or wants to contribute, please get in touch with your local representative because I know they will be very happy to answer any questions.

I have thoroughly enjoyed the last year with the Southern North Island Wood Council, and as we have many plans and events in place I know they will keep me busy.

Next week we are off to park a fully loaded log truck in The Square in Palmerston North for the Hilux Rural Games and hold an information stall to prove that there is forestry in the region!

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Graham Will – the father of radiata pine nutrition

By Bill Dyck

Early life

Graham Melville Will (BSc, MSc, DSc) passed away aged 92 on 25 February 2019 in Rotorua, where he lived most of his life. Born in Hastings on 17 November 1927, he used to recount his early memories of living through the big Napier earthquake.

Graham completed his BSc and MSc over a four-year period in Wellington at what was then the University of New Zealand. One can only assume that jobs for chemistry graduates were few and far between in the late 1940s because after graduation he became a drain digger for the Hastings City Council. This was probably the time when he dug his first soil profile, although he probably had no inkling as to what it was about to lead to.

FRI years

The Forest Service beckoned and Graham started working at FRI in 1950. The FRI Soils Group was basically Graham and two young technicians. As a soils and nutrition scientist working in forestry he was mainly on his own, and one suspects he had not really thought about radiata pine all that much when he was working on his chemistry degrees. However, he was very strategic in his approach and teamed up with the best forest soil scientists from around the world, particularly from Scotland, Sweden and the US. He formed strong professional relationships with them and they also became lifelong friends.

Graham was one of the individuals who had a chapter written about him in the book *Characters of FRI*. It describes him in this way:

> *It is probably fair to say that Graham Will is remembered by his erstwhile FRI colleagues as a man of high religious principle. It must have been hard going for a non-smoking, non-drinking, non-gambling vegetarian in the Forest Service of the 1950s, but Graham was always harder on himself than on other people, and good-natured tolerance always prevailed on both sides.*

Nutrients and radiata pine

Graham and those who he managed and often mentored discovered a great deal about how nutrients cycled in radiata pine forests, the exact nutritional levels needed to ensure optimum tree productivity, and forest management techniques to guarantee that radiata pine forestry was truly sustainable and could be continued on the same site for rotation after rotation.

Graham was not one to sit in his lab or office and do experiments and write papers. Although he did publish a great number of these, instead he preferred to get out in the forest and work with forest managers to spread the word about how best to manage forest sites to ensure long-term productivity at minimal input costs. He was a very practical scientist.

FRI Bulletin No. 97 'Nutrient Deficiencies and Fertiliser Use in New Zealand Exotic Forests', published in 1985, summarised much of his work and that of others in his group and is still used today to guide management.

Ground-breaking research

His DSc was awarded in 1969 in recognition of the scientific achievements in the first half of his career at FRI. He carried out some ground-breaking research, often without involving cumbersome statistics. Graham was well-known for saying that, 'If you need statistics to prove something then it probably wasn't all that significant.'

Graham thought long term in much of his research and one of his earlier ground-breaking studies involved installing a large lysimeter in Compartment 69 of Kaingaroa Forest. This involved excavating a huge hole in the ground a couple of metres deep, and pouring a large concrete pad that was equipped with a drainage outlet so that drainage water could be collected and analysed.

The soil layers were carefully repacked to resemble the natural soil profile and radiata pine seedlings were

Doug Graham, Pat Hodgkiss with Graham on the wagon – hence the 'Wills Fargo'

planted on top. Graham was interested in the fate of fertiliser, and once the trees were about 10 years old he fertilised them with radioactive nitrogen. Definitely pioneering work, and 25 years after planting the trees were harvested and analysed for their nutrient content, including traces of N^{15}.

As part of this long-term thinking Graham also established a litter-raking trial, also in Compartment 69, in which a large 400 m^2 plot was raked every year to remove the needle litter and a control plot was left unraked. No statistics required! Graham reckoned that if you could not confidently measure and also see differences in tree growth after a rotation of litter raking, then there weren't any effects on the soil nutrient status and tree growth worth worrying about. The best thing about this trial was it gave the two dozen or so staff of the Soils and Site Productivity Group an excuse to have a staff picnic in the forest every year and rake up the pine needles.

Retirement and legacy

Graham was hugely respected and loved by his staff and colleagues and was given a big send off on his retirement in 1987, with scientists coming from all over the world to wish him well in his next venture. At the event he was presented with a bound volume of his publications. A copy of the volume currently resides in the FRI (Scion) library and it provides a handy resource to see all the studies he did in one place.

New Zealand forestry (and indeed world forestry) owes a great deal to Graham, and the pioneering work he did investigating nutrient cycling in plantation forestry and developing the science and the techniques to manage site productivity and tree nutrition that are used today.

Graham did much more in his lifetime than just study soils and tree nutrition, but this short article cannot begin to describe that. Suffice to say that he dedicated his last three decades unselfishly working to establish the Tui Ridge Outdoor Centre near Rotorua. The amazing forests planted there are an everyday reminder of Graham.

Graham truly was the father of radiata pine soil and tree nutrition and his legacy will live on as foresters revisit the findings from his four decades of research, most of it published in journals, but now readily accessible on the internet for the current and future generations.

Evolutionary risks

John Purey-Cust

Watching from the sideline now, there are two things that still puzzle me about New Zealand's plantation forest industry. One is its total dependence on one species and the other is log exports. Both in their way threaten the public view of production forestry.

Only one winner?

I recently read something on the evolutionary development of giant pandas. Giant pandas are bears; bears belong to the order carnivora – predominantly meat eating – yet this one, taking another path, is now an obligate herbivore with a taste only for bamboo. It is now very rare and its habitat is threatened. Extinction looms.

Are we not in the same position as the giant panda? After an adult lifetime in forestry I find myself a member of an Institute of Forestry that, possibly unique in the world, devotes itself almost entirely to one species of tree.

We have arrived at this position in a perfectly logical way, as a result of many years of observation and trial whittled down, leaving radiata pine as simply the best general plantation tree we have. I admire radiata – it supported both my career and my fortune and I spent the last 25 years of my active life in a perfect house entirely constructed of radiata timber – but I do question its share (approximately 90%) of our production forest estate.

Is this wise? Adaptable, vigorous radiata pine ticks most of the boxes, but already it is susceptible in the warmer and wetter parts of its range to at least three fungal pests of its foliage (cyclaneusma, dothistroma and red needle cast) requiring aerial spraying for control. How will these react to the predicted general warming associated with climate change? The stem fungus nectria flute canker has affected management practice, reducing pruning and with it local industry, market opportunity and value.

In these times of wide travel and trade and shifting climate patterns, as always nothing is certain. Myrtle rust came to us on the wind. Mycoplasma bovis arrived in the dairy herd despite deep industry knowledge of known disease risks and intense biosecurity regulation, PSA on kiwifruit much the same. The epidemic death of Canadian lodgepole pine due to bark beetle infestations set free by warming winters, Dutch elm disease a worldwide total wipe-out – the list goes on and why should it stop?

Radiata has become our Golden Calf. We know our god, and as a consequence the need for thinking stops. We turn a blind eye to the possibility of failure, but what are the alternatives? Who is looking for them? Who measures the risk?

Who is interested? Well, some seem to be. The NZ Forest Owners Association, the NZ Farm Forestry Association and the Ministry for Primary Industries sponsored Scion's two recent reports, on cypress and eucalypts, looking at their long-term vulnerability to pest attacks and market future, finding cypress good but eucalypts risky. Douglas fir is suggested widely elsewhere and I have seen mention of redwood.

Do we still pin our faith on science – tree breeding and agricultural methods of pest control, and the watchful eye of Biosecurity NZ? Or is New Zealand forestry set to become the province of farm forestry, of species diversity, local markets for wood, and the source of local knowledge, while the corporate side becomes more and more the single diet vegan, ultimately to collapse entirely?

Log exports

We process about half our annual wood harvest and export the rest as logs. We long argued the case for plantation forests as a base for future industry. We proclaim their virtues in our publicity, but what people see and talk about is the endless stream of log trucks headed for the port.

We preach the virtues of wood the raw material. We have a big national housing need and a government priority to fill it. We have well-established skills in prefabricating warm and robust wooden houses (Fraemohs and Lockwood for example), but we do not push the case for wood very hard.

Peter Casey's paper in the February 2019 issue of this Journal makes forestry's case for counterbalancing our agricultural greenhouse debt, but doesn't mention wood's considerable potential role in the construction industry.

Others do. A leader in *The Economist* (5 January 2019) spoke for wood as the construction material par excellence of the future ('The house made of wood') and expounded at length on its greenhouse virtues further on ('Home truths about climate change'). The essence of the argument in both cases is that wood's virtue lies in more than just growing trees to soak up greenhouse gases, but goes far beyond that, to reduce the greenhouse debt owed by the construction industry's predominant use of the big emitters, concrete and steel.

In both areas – housing and greenhouse gas debt reduction – forestry has government support. Why do we not seek it? Is there not a contradiction here between national priorities and simplistic 'market forces'?

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