

preferred deployment strategy within five to ten years.

In theory, clonal forestry with radiata pine could eventually focus on only one, or a few, clonal varieties, as is the established practice with many cereal and horticultural crops, with a dramatic concomitant reduction in genetic diversity. In practice, for reasons outlined earlier, forest managers are likely to follow deployment strategies that will distribute sets of genetically-variable clones both spatially, and over time, in a manner designed to reduce the risks of genetic monoculture. How this will be done will provide some interesting challenges for forest researchers!

### Conclusions

There is a need to manage the genetic diversity of New Zealand's forest species, along with a need to understand and better

manage biodiversity at levels of ecosystems and plant and animal species diversity. The appropriate gene resources, knowledge and availability of research tools are available for managing exotic forest trees. Markedly less available, however, are the resources and knowledge required to protect the biodiversity of our indigenous forest resources, and this is surely where the concerns of foresters should be largely directed.

### References

- Burdon, R.D. 1992. Introduced forest trees in New Zealand: Recognition, role and seed source. 12. Radiata pine – *Pinus radiata* D. Don. FRI Bulletin No. 124.
- Hutcheson, J. 1994. Monitoring biodiversity. N.Z. Research Directions No. 6, ISSN 1172-6466, Dec. 1994, p. 9.
- Menzies, M.I. and J. Halliday. 1997. Propagation options for clonal forestry with radiata pine. To be presented at the IUFRO

Conference on the Genetics of Radiata Pine. 1-4 December, Rotorua, New Zealand.

Richardson, T.E., S. Cato and S. Kumar. 1995. Analysis of population structure in *Podocarpus totara* using rapid markers. Proceedings 5th Queenstown Molecular Biology Meeting, Queenstown, NZ, 14-19 August 1995. Abstract 137.

UNEP 1997 Convention on biological diversity. Working document on forests and biological diversity (available on worldwide web at <http://www.biodiv.org/sbstta3-i22.htm1>).

### Acknowledgements

My sincere thanks to Paul McFarlane for providing background material, Ken Klitscher, Paul Jefferson and Mike Menzies for reviewing the draft paper, to Bill Dyck for his timely encouragement, and to Melanie Maika for her support in preparing the paper for publication.

# Biodiversity and Farm Forestry: A personal view

Bruce Treeby\*

When I was asked to do a piece on "biodiversity" for NZ Forestry, I thought, "Hell, that's a big ask, big topic, serious, could be rather dry", but then I thought, "Oh well, I will write about it generally as I see it, and try not to be too dry and serious". Some of it will be tongue in cheek but the reader will never be quite sure. But be assured, farm foresters are interested in issues concerning species diversity, ecosystem diversity and genetic diversity.

In the discussion of a perspective on biodiversity, it helps if the writer states their position. Grant Rosoman of Greenpeace sees biodiversity as being a focus on indigenous biodiversity.<sup>1</sup> While I'm supportive of maintaining and restoring indigenous biodiversity, for me it also includes exotic species. This involves how you grow the different species and the increased security of having a mix of different species, preferably in smaller monocultures, sometimes mixtures, forming a patchwork planted to best match sites with riparian strips of indigenous and high-value exotics and native remnant reserves. I also think that we are on the right track in setting up our Indigenous Forest Section within NZFFA, taking the view that without active management many native forests in private ownership will continue to lose their biodiversity and

degrade further. And finally, biodiversity includes people.

I support the view that the more biodiverse an ecosystem is, the more robust it is to changing circumstances. I do feel uneasy about the large-scale blanket planting of radiata pine over the New Zealand landscape if we reflect on some comparisons. Consider the biodiverse indigenous forest cover of podocarp mixed broadleaf trees and the series of strata of smaller trees and shrubs, epiphytes, climbers, and a rich floor of ferns and associated plants and animals and compare it with a monoculture of mainly radiata pine. When you walk into 20-year stands of 350s/ha, it is a dark, sombre, quiet place with a wall-to-wall carpet of dead pine needles that is relieved only by some fungal fruiting bodies which at least introduce some colour, often the poisonous fly agaric. Oh I know that some will say that there is more biodiversity in the pine forest compared to the exotic grass and weed farm land that it replaced, but I'm not even sure of that. But I do think that we have to find ways of getting more of our lowland indigenous flora back into our production landscapes.

Just because, for example, a tui's nest is found in a pine tree, or the fact that kiwi do inhabit pine forests, doesn't convince me that all is well. Is the kiwi there by preference? Nor does the fact that pine trees result in a higher phosphorus level in the soil seem like a big plus. Then there

is the monotony of it all, and the cost, for at what point does the pine blanket landscape create an experience for the tourist that is not an essentially New Zealand one? At present 30% of all tourists spend some time in native forests, and tourism is a \$5 billion industry and growing. I think my concerns are those of scale and not enough visual biodiversity for the stimulation of the tourist, the New Zealand public and those who work in the rural landscape.

### Forest Health Risk

What about the increased forest health and biosecurity risk of having so much of our forest estate in one species? This is magnified by our trend to make more use of clonal material, where the genetic base of the forest is narrowed. We have had experience of the vulnerability of clonal material in poplars used for soil conservation and shelter. We know the forest health risk is increased when you go for monocultures. I know that the Australians are having more forest health problems with their eucalypts now that they are planting species in pure stands. I also appreciate that we grow monocultures because we want to simplify the silviculture, growing trees like a crop of wheat (crop or ecosystem?) and in the process get higher production or wood fibre. But with clones we do reduce the biodiversity and increase the forest health risk.

\* Open Polytechnic of New Zealand

Some recent trial work in the South Island by Dr Patrick Walsh of FRASS, looking at *Pineus* attack on radiata pine clones planted in separate compartments, has shown that initially only one clone was targeted by the pest. Once the population of the pest built up on the susceptible clone, the adjacent clones were then attacked, the "rotten apple in the pine barrel" if you like. The economic attraction of clonal performance is compelling, but we need to ensure that there is a mix of high-performing clones to give the forest a higher genetic biodiversity.<sup>2</sup>

Farm forestry has the ability to retain a much higher level of biodiversity within a catchment than blanket-planted radiata pine and the landowner often has had the advantage of experience with a greater range of other plants and animals. Farm foresters do use a lot of radiata pine, but the blocks are smaller and we also plant a range of other species. And we know this is a sound thing to do. Agriculturists are only too aware of the risk of fashion fads and having all your investments in one product. David Neal makes the comment on his return from the Russian Far East, that there is nothing special about radiata pine on the world market.<sup>3</sup> It is substitutable and there are a lot of competitors that are closer to markets. With good reason, farm foresters are increasing their interest and investment in cypresses, eucalypts, blackwoods and a range of other second-tier species.

The floors of the new Museum of New Zealand are formed from solid, chemical-free (no preservatives or hardeners required or in fact wanted) New Zealand-grown blackbutt (*Eucalyptus pilularis*) processed by farm foresters. These spectacular floors will, I have no doubt, promote the product, and it is part of a trend. It has been reported that in Japan there is a significant increased demand for solid wood flooring.<sup>4</sup> The reasons are that the consumer is increasingly wary of the chemicals in composite flooring boards and the "sick housing syndrome", and also sees solid wood as more durable.

I can at this point hear the cries of the high risk of growing eucalypts, and the recent spate of new pest introductions in the Auckland port environs and at the golf course at Mt Maunganui. Well, I'm not going to go into detail here about the failure of our port environs surveillance system that has left eucalypt growers feeling like victims of a failed biosecurity system that seems to lack any accountability. It is not surprising because the monitoring had a major flaw in it and the probability of detection since 1989 was not 80% but just under 20%. Such new pests, out of control, is biodiversity that we can do without. However, we are now faced with

the cost of biological control, which is possible, and is in the end the only longer-term ecological and economic solution. Mt Maunganui is an exception where the new infestation has been found early on, and we are lucky that *Uraba lugens* is a moth that disperses slowly. Eradication may be successful!

For those fortunate enough to still have remnants of native forest, there are a range of options if the area is protected by excluding stock and pests are controlled. If the native block is larger it may be managed for a range of outputs and one may be timber. It is interesting to do some figuring with a spread sheet on what you need to get from an existing native forest on a sustainable annual yield from year one to beat the 25-year wait for the radiata pine payout. Could it be that John Wardle at Oxford in Canterbury has got it right (and his customers pay top price for pin hole borer in their beech flooring)? Natural biodiversity is in demand!

Apart from the local foresters here who are using native tree species, I'm impressed by the mixed rainforest plantings near Babinda in Queensland, carried out by Errol Wiles, that I inspected in July. These forests are growing cabinet species that at present retail for \$7000/m<sup>3</sup>, sawn and dried. There is also the 10,000 ha Tronçais forest in central France which has an emphasis on its oaks grown on a 200-year rotation, and where individual trees are auctioned for high-value end uses. This is a forest that has been sustainably managed for hundreds of years. In the past it has supplied timber for boat building for the French navy, charcoal and wood for steel production and porcelain pottery, and is now an important supplier of barrel staves for the French wine industry and other high-value end uses. It is a forest that is also valued for its non-wood values, providing edible fungi that are gathered and deer and pigs that are hunted. It is a favourite recreational area as well.

### Farm Forestry Potential

This leads me to people. Farm forestry has the potential to make a much greater contribution to biodiversity than present large-scale corporate forestry. Farm forestry has a greater capacity to retain and increase the population of rural areas and to protect traditional rural values, the importance of place, the protection of local environment. Land-use decisions have a greater likelihood of being made locally and not at an office offsite. The land manager is the owner operator, and although there may be a use of contract labour, he or she owns the resource, has personal links to the local ecology and the profits will return to the district. An area

not planted in trees is not seen as a total lost-profit opportunity, as the area may be giving an annual return from animals. The farm forester is managing a more biologically diverse operation. Chris Perley is critical of forestry analysis in farm-forestry situations, where the forest analyst only looks at the forest and does not see it as an integral part of the whole economic unit.<sup>5</sup>

So what can be done to increase the biodiversity of New Zealand forestry? Within farm forestry there is a view that we need to look at high-value markets, where the customer will pay a premium for an authentic/intrinsically-high-performance, solid-wood product, that is naturally durable, is robust, and looks interesting too. Recently when some of the NZFFA national executive visited Wayne Coffey at his NZTIF building in Wellington, Denis Hocking commented on the absence of radiata pine in the decor which included furniture made of rimu. Wayne's reply was: "The right place for radiata pine was behind the GIB!" No doubt tongue in cheek, I hasten to add.

With more demand internationally for certification of forest production, farm foresters feel that they can demonstrate a higher level of biodiversity on a property basis, and if we can promote more riparian plantings that will certainly help. There would appear to be the opportunity for larger-scale corporate forestry to build in a much higher biodiversity on a catchment basis if there were more development of riparian strips encouraging native forest corridors with the scope for diversification into some other species. This would assist in the protection and restoration of the indigenous gene pool, and the abundance and variety of species and their ecosystems. This would be a logical extension of the Forest Accord intentions, and surely would help the forest industry present a greener image internationally. It might even assist branding. We should manage our land uses to maximise the conservation of biodiversity, and not feel that all is well because of the DOC estate and some reserves here and there. We need to do more in the lowland landscape and who knows, we may find that there are economic benefits from increasing biodiversity!

<sup>1</sup> NZ Forestry, August, 1997.

<sup>2</sup> At this point I draw the reader's attention to "Why Things Bite Back - Predicting the Problems of Progress, Technology and the Revenge Effect", by Edward Tenner, 4th Estate 1996. Described by the Financial Times as "A hymn to the law of unintended consequences".

<sup>3</sup> NZ Forestry, August, 1997.

<sup>4</sup> NZ Forest Industries, August, 1997, page 11.

<sup>5</sup> NZ Tree Grower, November 1997.