Dealing with wood quality variability in radiata pine

Keith Mackie

Radiata pine is the mainstay in New Zealand forestry. However, with rotations around 25 years its wood properties are nothing to crow about. Stiffness is poor in comparison with many other softwood forest species in the world, and issues with resin and compression wood make radiata appearance processing more of a challenge than we would like.

In New Zealand we have successfully adapted building systems to accommodate lower stiffness lumber and remanufacturing of pruned radiata into high value products, such as exterior weatherboards, and solid clear boards is a key export business. But consumers are demanding higher performing wood products and our industry must deliver these or forgo markets to steel and imported wood alternatives.

Dealing with variability

Radiata is a highly variable resource. The wood properties of trees within one stand can vary as much as the properties of trees from the tip of the North Island to Invercargill, as noted in John Moore and Dave Cown's paper. This variability arises due to genetic, silvicultural and site influences. So if you thought modern genetics is going to dramatically improve the variability issue then think again, as discussed in this paper.

Given the need to increase volumetric productivity, if we are to compete with other nations such as Chile or Brazil I fear that silvicultural practices will head in the wrong direction in terms of variability and there is probably not a lot we can do about site. Given that we have at least 25 years of radiata pine in the ground, for which there is no silvicultural 'fix' for wood property variability, we know now that dealing with variability is with us for a long time. Technology to the rescue?

Segregation technology

This type of technology is one option to reduce variability and it has come a long way in the last 10 years, right along the forestry value chain. Growers and wood processors have a wide range of options at their fingertips for assessing external and internal wood properties in stems, logs, cants, green boards and dry boards. For instance:

- Harvester head technology can provide stiffness data
- X-ray scanning at log and cant level can provide processors with valuable wood density distribution data
- Sophisticated multi-sensor grading platforms are now routinely being used in manufacturing.

However, segregation comes at a cost. Growers would prefer to see more simplicity in their businesses rather than head down the segregation route. On the other hand, processors want to process logs that all have the same properties, or at least have been segregated into piles for which processing can be better optimised. The cost of even technologically simple wood quality assessment can be significant. For example, one Wood Quality Initiative study in 2006 showed that using Hitman for log sonics at a skid site costs around $0.70 per log. More sophisticated assessments, for properties such as lumber warp in service, will require transport of stems/logs to a central processing site. The costs of segregation and adding complexity soon add up and can erode the benefits. Also, two issues always come up when the segregation debate gets going, as set out below.

Who pays the cost and who gets the benefit?

The earlier the properties of stems and logs can be determined the better, as once a log is delivered to a processing site it is there to stay. Processors have become adept at utilising logs, which meet existing log grading rules, of very variable quality and out of necessity have developed various product options for using low grade material. However, this comes at a cost.

If a mill could obtain logs with less variability then significant value can be obtained. For example, a recent Solid Wood Innovation study showed that if we could segregate out (not deliver) the worst 10 per cent of pruned butt logs based on their propensity to deliver warp-prone lumber, then a saving of around $6 per cube of log would result. For a mill processing say 400,000 cubic metres a year this amounts to a considerable sum, and logic would say that this benefit could be shared with the grower and everyone would be better off. Benefits of this scale drive research and development targets!

What are the options for utilising the poorer quality material?

Take the 10 per cent of logs 'rejected' by a New Zealand pruned log processor in the example above. At present there would be no problem exporting the logs with little impact on the grower? Whether it be pruned logs, structural logs or lower grade material the opportunity to export into less discerning markets will likely exist and offer a solution at the log level. As values for various wood products change due to market demand, such as wood chip demand for pulping or energy compared with low grade log prices, options for utilising lower grade logs must be reassessed. However, what will be very important if this is to happen is that the basis for the segregation is technologically sound, simple and inexpensive.

The New Zealand forestry and forest products sector must place a high priority on wood quality research and development. It must span both the existing crop and the future crop and focus on enabling producers to deliver better performing materials: higher yields, more consistent, and with properties targeting specific market needs. The pressure is on to increase the productivity of our forests, but wood quality should not be compromised along the way. For New Zealand grown radiata to be competitive in international markets we need to make a sustained effort on many fronts to more economically produce more wood of better quality.

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Back cover: (Top) Wide juvenile growth rings; (Bottom) Board sawn from juvenile wood exhibiting typical twist and warp. Source: Scion Digital Image Library


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