

Value recovery project (1995-98) – what did we learn?

Dave Cown¹

The NZ Forest Research Institute (now Forest Research) has a unique position among international research organisations dealing with the forest industry in that it has continued to cover both forest growing and wood processing activities, periodically addressing topical “industry-wide” issues using research/industry task forces. This approach commenced in the 1970s with the Mensuration Project Team and the Radiata Pine Task Force. These initiatives demonstrated the benefits of combined teams of researchers and industry personnel, and continued in the 1980s with the Conversion Planning Project Team, which concentrated on integrated simulation models for planning & management.

During the 1990s, the tradition continued with the funding from a significant portion of the industry, for the 3-year Value Recovery Project. From the beginning, the concept behind Value Recovery was to provide the main players in the forest industry (forest owners, sawmillers, remanufacturers) with strategic information to maximise returns from the rapidly expanding harvest - tackling the issues of maximising returns from processing and marketing “new crop” products. Broadly, it was considered that New Zealand might be considered a world leader in plantation establishment and silviculture, but processing, marketing and product development lagged by comparison. A spectrum of activities was proposed, loosely grouped as:

1. Resource Assessment
2. Processing – both Primary and Secondary
3. Promotion and Market Access

The project concept was on such a scale (roughly \$1 million/year for three years) that the involvement of senior managers in industry was seen as essential, and from the beginning there was a concerted effort to communicate with CEOs of private companies and sector organisations. Following acceptance by a significant portion of the industry, a senior Liaison Committee was established comprising 2 industry and 2 research staff to administer policy and the establishment of Technical Project Committees around the specific topic areas above. While the research programmes were intended to span 3 years each, considerable changes occurred at the request of

industry members, some of which will be mentioned below. A strong theme was the need to document key issues regarding use of the current resource for the benefit of foresters and tree breeders so that the strategic knowledge could result in logical raw material improvements and improved future market acceptance.

The existence of such an industry-sponsored project enabled Forest Research to host several overseas expert researchers to work in their speciality area but with an unfamiliar species. The spin-off both ways was considerable.

1. Resource Characteristics

The intention was primarily to develop better methods of assessing stand quality features with the objective of developing a better understanding of the variation of “new crop” log quality parameters – how they varied within stands and regionally. Automated image capture and analysis of stem crowns was the main target in order to provide fine details about stem branch characteristics – the main drivers of radiata pine unpruned log grades. The research on camera systems to assess branch characteristics proved the feasibility, but highlighted some of the logistical issues.

A real need was also seen to incorporate some key wood properties into inventory, and wood density was the obvious first choice. Statistical analyses on large datasets confirmed that outerwood increment cores are suitable and a sample size of 30 individual stems gives an appropriate level of accuracy for estimating the stand average, as well as a good basis for prediction by log height classes. Exploratory work with IRL failed at the time to develop a useful hand-held electro-magnetic tool to replace the standard increment core method.

2. Processing

A real need was seen to improve both primary and secondary processing through selection of appropriate technology to produce the kinds of products required by international markets. This was planned as a very large and ambitious technical programme in several parts, dealing in the first instance with the selection of a “typical” new crop stand and detailed description of the wood quality of stems selected for processing studies. Since this was to be a “flagship” study, great effort went into stand and stem selection. Logistics indicated that a small number of “different” trees would be required (to give appropriate variation in log and wood properties) and several “duplicate” samples would be required to ensure good comparative studies.

Finally, a 27-year-old central North Island clonal stand (pruned) was identified which met many of the criteria and would allow the repeated selection of “identical”

¹ Dave Cown is Manager of Solid Wood Processing at Forest Research. He managed the Value Recovery Project from 1995 to 1998.



samples for comparative processing studies. An exhaustive study of the wood properties of 10 selected clones (selected on the basis of varying visual branching characteristics and wood density) was undertaken before processing began. Selection of 4 ramets from each of the clones for four different primary processing pathways allowed comprehensive analyses of the relationships between stem characteristics, processes and products. The data confirmed consistency within clones and significant variation in branching, log and wood properties between clones. Some analyses from this material are still on-going 5 years after the actual study (e.g. Silviscan analyses).

The actual processing studies of clonal material covered a number of processing methods and products, the major being solid wood (random width and structural sawn timber) and veneer (plywood and LVL). Technical committees comprising both researchers and industry personnel ensured a sound technical approach and use of the best equipment available. The results confirmed that the significant differences in resource characteristics (log size, branching, pruning, density) resulted in measurable differences in both product yields and quality.

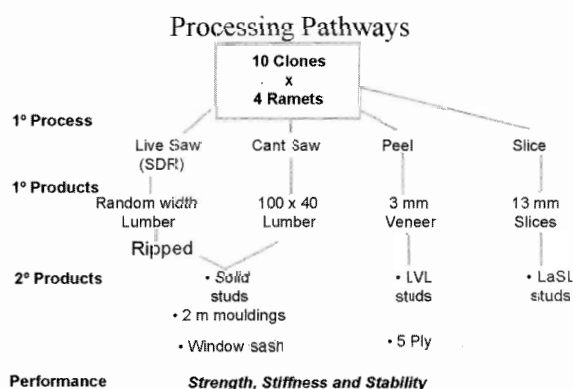


Fig. 1: The four ramets of each of the ten clones were evaluated using four different primary processing pathways.

Pruned and unpruned logs were dealt with differently to yield mixtures of structural and appearance grade products. A reassuring outcome was that the relationships underlying the selection of log grade criteria were confirmed as being important. The main wood properties measured – density and spiral grain – showed significant effects on structural lumber recoveries (MSG) and drying degrade (twist). Despite the selection of nominally straight stems, the presence of compression wood also had a measurable (negative) impact.

Alternative processing routes to sawing for the production of structural products (thick slicing, plywood, LVL), were compared using identical clonal material and were shown to offer more uniform performance in terms of stiffness, strength and stability, but at significant additional cost. While these processes delivered significantly improved **uniformity**, they did not affect the overall **average** level of performance (with the

exception of LVL where a portion of the juvenile wood remains in the peeler core).

Much work also went into the processing of random width boards to yield both actual and simulated recoveries of various mixes of product. Radiata pine was eminently suited to this process, but recoveries were highly dependent on branching characteristics.

A significant part of the programme dealt with “remanufacturing” issues. Several small, targeted studies examined such aspects as optimising machining, fingerjointing, gluing, and low environmental impact coatings, using modern finishing technology.

The overriding impression was of a resource very suited to the US approach of remanufacturing. The issues were shown to be mainly resource-related – wood quality, branching and defect occurrence.

3. Promotion and Market Access

This aspect initially addressed the issue of improving access to the Asian market. Samples of 6 Asian species (Jelutong, rubberwood, ramin, white seraya, Merkus pine, nyatoh) were obtained and put through a series of standard international machining tests to generate comparative data for use in promotional material. Overall, radiata pine performed very favourably, and indicated that Asian manufacturers should have little trouble adjusting machine settings to cater for pine. The results have been used many times since in generic industry promotions.

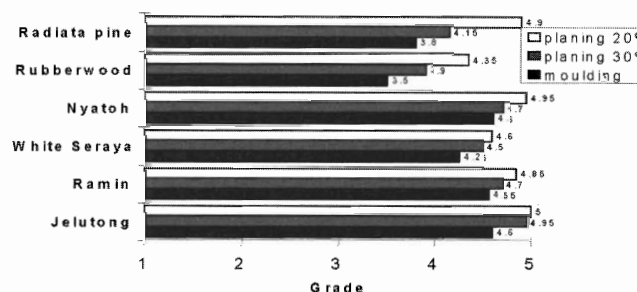


Fig. 2: Samples of Asian tree species were compared with radiata pine in a series of standard international machining tests.

Several projects were undertaken with the objective of addressing technical and trade barriers in Japan. Efforts to undertake more product-oriented research on the suitability of radiata pine in specific market segments e.g. window joinery, flooring systems, Japanese interior doors and house components, floundered due to lack of industry consensus on priority issues.

Under the auspices of Value Recovery and Ministry of Forestry, several one-day seminars on “Wood Finishing in New Zealand” were held to pass information on to manufacturers and the furniture industry.

What did we learn?

Given the limitations of the sample size, the studies confirmed:

- Inventory systems should focus on improving the

measurement of branching characteristics, which have a strong impact on product yield and quality.

- Radiata pine is highly variable in stem, branching and wood properties
- Most wood properties are highly heritable – and can be changed relatively easily if clear directions are given to tree breeders.
- Radiata pine lumber is suitable for a wide range of processes and products, but limited by poor stiffness and stability of the juvenile wood. Microfibril angle (MFA) was not measured initially and there was no indication of its likely importance. Later work (with Silviscan) confirmed the low heritability of MFA and relatively small contribution to stiffness of in-grade products.
- Radiata pine can be used in a wide range of processes, but genetic variability is such that material segregation technology is required to ensure product quality. The raw material is compatible with the modern equipment tested, but the inherent variability of tree stems requires that uniformity must be “engineered” into products, often at added cost.

On completion of the 3-year project a user survey was undertaken with participating companies which revealed that the 3 most valuable aspects of the Value Recovery

Project were:

1. Results of the clonal wood processing studies, indicating consistent variations in quality and performance.
2. Networking between companies.
3. Contact with Forest Research researchers.

From a research point of view, the greatest challenges were:

1. Creating an initial case for the companies to invest and convincing corporate managers to “sign up”.
2. Agreeing on “marketing” studies that were generic and not in conflict with individual company activities.
3. Maintaining the interest of individual companies over 3 years with constantly changing industry personnel.

Forest Research has since gone on to repeat parts of these studies (e.g. the manufacture of trial LVL) for individual commercial clients using material from their own resource. Some study methods developed in the course of the project have become “standard methods” by which alternative resources and processing strategies can now be compared and benchmarked.

Radiata pine wood quality assessments in the 21st Century

Graeme Young¹

There is possibly as much knowledge about radiata pine wood quality as for any other timber species in the world. This is the result of the New Zealand forestry industry's concentration on radiata pine as the principal plantation species for the last 100 years. Back this intense focus with some world-renowned leaders in wood quality research and BINGO!; a wealth of knowledge waiting to be tapped by foresters interested in resource description. This doesn't mean that all the answers are available. Far from it. As we promote radiata pine into more and more demanding processing and utilisation options then difficulties, which previously were insignificant, can become far more important.

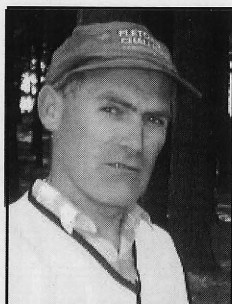
The need to grow wood rather than trees

However, it would be fair to say that in general, the

New Zealand industry has ignored the wood in their haste to grow bigger and straighter trees in increasingly shorter rotations. There is a very real need to understand the effects of the many contributing factors to the wide range of wood quality parameters that affect products and processing and then to apply this knowledge to log segregation and timber (or lumber) segregation.

This industry approach of growing trees rather than growing wood has resulted in an unfortunate dearth of industry-based wood quality knowledge and a glance through the CVs of forestry students looking for holiday work fails to find any with an interest in a career in this vital area of forest growing. This doesn't mean we are not producing good forestry graduates, but perhaps does signal the fact that we are not attracting people from as diverse a range of interests as we could. Wood quality spans breeding programmes, silvicultural operations, climatic and geographic effects, soil characteristics, log grading, processing options, marketing and product applications.

There is no quick route to wood quality resource description. The foundation is a reasonable understanding of the various contributing intrinsic wood properties and experience with the issues relating to processing and timber in use. Routine and ongoing measurements provide the data which, when combined with trial work to determine the effects of these properties



¹ Graeme Young is Manager of Resource Quality for Fletcher Challenge Forests.