Corewood : docking the dog's tail

Part I, An alternative road map

"We also need disagreement, we need to be challenged, or our doctrines dry up and become mere 'received ideas' — ideas held without passion, without clarity or strength. He who knows only his own side of the case knows little of that. His reasons may be good, and no one may have been able to refute them. But if he is equally unable to refute the reasons on the opposite side, if he does not so much as know what they are, he has no ground for preferring either opinion. The rational position for him would be the suspension of judgement ... He must be able to hear them [contrary ideas] from persons who actually believe them, who defend them in earnest and do their very uttermost for them. He must know them in their most plausible and persuasive form; he must feel the whole force of the difficulty which the true view of the subject has to encounter and dispose of, else he will never really possess himself of the portion of truth which meets and removes that difficulty." (J.S. Mill On Liberty, p. 35)

Thinking on wood quality is as much a cultural as an intellectual exercise, whose outcomes are decided by mood, sympathy and fashion, rather than by the logic of the argument. One has only to reflect on the passion with which some foresters argued, in the early 1980s, for a final stocking of 200 s/ha to recognise that such an argument is never purely intellectual; indeed it is salutary to remember that when Fenton modelled such low stockings it was to test an extreme, not a mean.

It is legitimate to finger the bankruptcy of popular thinking which despairs of producing products from ever younger wood; which believes that product quality is irrevocably determined by the quality of wood being processed; which is so precious about its forests as to rail against their early felling. And, when cornered, and here I am being grotesquely unfair, has no solution but to plead for higher densities and longer rotations. It is absurd to describe fast growth as radiata pine's Achilles' heel (Macalister, 1997). Another particular absurdity is the determination to set rotation age (growing costs) and wood quality at each others' throats as totally incompatible; and when obliged to choose, to resent economic imperatives.

Profits and the money machine

There are always dreams/myths which need addressing, such as the hard-sell returns in forestry, that the world is short of timber and prices will inevitably rise. The same claim was made for oil. Why not then a period of falling timber prices? If we expect an inflation-free environment then prices in highly-skilled, value-adding sectors such as ocean yachts, boutique manufacturing, specialist consultant services, and resource management lawyers will rise while others must fall. We experienced the cost-plus mentality of State log sales in the 60s and 70s, at a time when poorly-focused, large organisations sought economies of scale, but at the cost of lost efficiencies as regimented production lines rewarded the skilled and unskilled equally and impartially. Today we have the price-minus dictate of the market, commending high production volumes and low unit costs. Further, modern "intelligent machines" capable of variable output require highly-skilled workers who are paid accordingly. In an inflation-free market price matters far more, as people are more price sensitive and the price signals are clearer. The alternatives to driving costs down in the broad market are a withdrawal into value-added processing — but, almost by definition, niche markets could take only a fraction of New Zealand's wood production — or to flee to low-cost producing countries, e.g. the foresight of CHH's COPEC investment in Chile.

Ponder the story from Chile (Cown, 1997) that "the processing industry (corporate) is dynamic and demonstrably ahead of New Zealand in investment with several large new ventures planned and under construction.... Sawmills and reman plants contain the very latest North American and Scandinavian sawing and optimising equipment and are built for market flexibility and economy of scale". Although labour costs are low, fierce competition and the need for processing equipment appropriate for the desired product market justifies investment in technology. Across many industries companies are undertaking aggressive productivity improvement programmes and cost reduction exercises simply to avoid deterioration in operating margins. Accordingly, Chilean companies will be better placed to seek profit through volume growth both at home and internationally. Associate membership of Mercosur provides access to, and competition within, a market of 200 million people; and Chile is the next in line to join NAFTA, opening the door to the whole of North America. This disturbance of local monopolies or oligopolies by new entrants — whether local or from Mercosur countries — and the 35% real appreciation in value of the peso against the dollar over the last six years, as measured by the wholesale price index, mean that in many sectors manufacturers are now price-takers.

Meanwhile New Zealand industry languishes, with our existing technologies no longer able to produce the return on capital that was possible when first introduced. Part of the reason for under-investment is psychological. Most New Zealanders, I suspect, are uncomfortable with intellectual assets which determine the maximum utilisation of our physical resources. Hence the attractions of farming, fishing and forestry, a reflection of the nation's dispossessed émigré history. One perceived attraction of forestry is that it is based on and generates physical assets which are harder for other people to pinch, and that appeals to the evicted Irish as much as to Maori. Further, there is a public perception that trees can be sold without much effort, guaranteeing a small fortune to dreamy-eyed, lazy investors. Paradoxically, the long-term investment in growing trees by overseas interests is ideal for a country which is short of capital. Our own savings should be recycling rapidly through the economy in more immediately productive ways — in wood processing, to generate the technology-driven surge in innovation and capital spending that lifts productivity and sustains economic growth. Paul Fowler, the new CEO of Fletcher Challenge Forests, has observed that none of FCF's plants "with the exception of the new Taupo moulding and Kawerau laminating plants are anywhere near world standard — either in their use of technology and optimising equipment...." (Macalister, 1997a), so there is much catching up to do.

Currently an enormous inflation risk premium is embedded in bond yields that will ultimately be squeezed out as low inflation persists. Until then, New Zealand is not ready for prosperity: the country lacks the confidence associated with an expansionary wave of investment. Witness the relative lack of enthusiasm for an application of FRI's brilliant wood hardening and green finger-jointing technologies which address crucial problems in short-rotation pine. If indeed the incremental costs of the new technologies are greater than the market will sustain then there are two options, to increase the economies of scale or determinedly target the highest value end-uses. Most likely we must hang around a while until a new entrant is willing to build a world-scale processing plant incorporating such technologies.

Apparently the appointment of an oil executive as CEO of Fletcher Challenge Forests and his emphasis on the parallels between the two industries (Macalister, 1997a) have upset some growers. For example, Hocking (1997) would rather draw comparisons between forestry and other primary industries such as meat, wool and dairy. "All these have, to a greater or lesser extent, spent recent years trying to climb out of the low-cost commodity trap and into the business of custom-oriented, consistent, reliable, high-quality, higher-value products that will ensure customer satisfaction and repeat business. A key part of this is the supply of appropriate and consistent raw material and it is here primary industries differ so markedly from the oil industries. What is in the oil reservoir is fixed, what is supplied by primary producers can vary markedly and not least in response to market signals." It is nonsense to say an oil-well is "fixed"; it is a stream of potential, varied and differentiated products. Further, Cown's Chilean report (1997) notes that "enthusiasms for pruning has waned... with the result that three distinct regime types are now emerging: pulpwood (near pulpmills); sawlog (thinning, non pruning); pruned logs... restricted to the best sites". Some believe passionately that one ought to be rewarded for delivering maturer trees or well-pruned logs. Yet Fenton never argued that pruning produced a more profitable crop. More recently Bilek and Horgan (1992) came to the same general conclusion. If you ride the tiger of technological change — as New Zealand must — then pruned logs may look rather out of place in the wood factory. Maybe pruning retains its allure because we — unlike the Chileans — lack world-class, leading-edge technology and lack the determination to invest heavily and upskill. However you read the entrails — and there is no universally right or agreed approach — it is totally ludicrous to pretend that pruning a stand at age seven is in response to prospective market signals 20 years hence — the admission of which is only a first step on the path to concepticide, but it is a start. Such ideas only become old and frayed when people scrutinise them and start asking questions. It is more honest to admit that one hasn't a clue about future prices than to give the impression that one does. One must accept the principle first — that one cannot predict prices 20 years hence — and use that to justify the details of one's action. It is fatal to start with the detail — of lovely, well-pruned, regimented trees. Again, it is important to remember that the majority of existing stands have not been thinned or pruned according to some "optimal" clearwood regime. Most certainly there are alternative management strategies for these stands which are viable. The only people who cannot change their minds are incompetents in asylums and those in cemeteries.

Density and rotation age

It is not my intention to set up and parody a one-dimensional view of density, nor to dismiss the influence of density on wood quality. Rather one needs to appreciate the interactions of density, as measured at a particular point in the tree, with the underlying, fundamental characteristics of the cell wall. It would be naive to accuse scientists of believing that density actually determines wood properties in some fundamental way. However, it is important to recognise that there is a popular perception within the forest products industry of the dominant influence of density on wood and product quality. A change of perspective is needed to break an old mind-set.

"Density only increases by about 50% from pith to cambium in 30-year-old radiata pine and so should account for an equivalent increase in tensile strength and stiffness. Clearly, a modest increase in density, from pith to cambium, is not capable of providing the increased performance that is frequently attributed to it. One mistakes an accident of wood for the essence of its character who think that by merely adding to its substance one achieves the improved performance necessary for its acceptance as a quality product. The improved stiffness from pith to cambium is not due primarily to the increased mass of cell wall material (quantity) but to a profound change in its quality. Rather than focusing solely on the quantity of matter in a piece of wood (its density), one might consider also the quality of the material in the cell wall. What other industry would confuse increased production with improved quality?" Intrinsic quality is determined by the cellulose microfibril angle and tracheid length, by spiral grain, by compression wood (Walker & Butterfield, 1995).

The emphasis on density as the overriding determinant of wood quality is an historic legacy. This was justified in the 70s and 80s because density was cheap and simple to measure, and because it was effective. That approach has passed its "use-by" date. As a result industry knows a great deal about density — "Of all the wood properties commonly measured, wood basic density has received by far the most attention" (Cown, 1992) — but knowledge of the underlying characteristics affecting wood quality is incomplete. Naturally foresters are reluctant to entertain other strategies, principally because of uncertainty over the new opportunities and because they are unaware of the limitations in the old approach ("a blind man will not thank you for a looking glass", Thomas Fuller, Gnomologia). The alternative is to develop specific strategies for each product: correct log allocation and in the longer term to introduce designer trees that build on previous improvement programmes.

Variability and corewood

When 25-year-old unpruned stands in Canterbury and Nelson are sawn to only 90mm x 35mm machine stress graded timber, the mean stiffness of all the pieces coming from the least stiff 10% of the trees is about half of that from the stiffest 10% of the trees — and the ex-mill revenue is roughly $100/m^3$ lower (Addis Tsehaye *et al.*, 1998). Further the principal factor contributing to the price differential is the stiffness of the corewood. This acknowledges what every sawmiller knows, that some logs are processed at a loss. The same study found that the corewood of the stiffest trees is equivalent to the outerwood of the least stiff trees. Therefore, resist the temptation to generalise about wood quality — of say corewood — and develop the tools to particularise. A key to shorter rotations is correct wood allocation at the skids. If Paul Fowler's FCF team are able to identify the 10-20% of logs which will not provide good structural timber then many of the objections to short-rotations evaporate. Certainly FCF understands the technology which has the potential to do this. That should please everyone, with the appropriate wood delivered to the appropriate end-user at the lowest possible cost.

...to be continued

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