resources to make real progress. If the changes we are seeing reflect global environmental change then they must surely send early warning signals to the plantation forestry sector. Similar changes in health and vigour can be expected to affect our exotic forest species. It may just take longer to become apparent.

Back in 1989 Geoff Sweet asked the challenging question: "Are our plantation forests less healthy than they were 20 years ago?" It was a big picture question, and we have yet to rise to the challenge.

Gordon Hosking

Juvenile wood, compression wood and the customer

I have been concerned for many years that combination of fast growth rate and short rotation age for radiata pine would have a detrimental effect on the overall quality of wood delivered to customers. Projects related to the promotion of New Zealand pine have over the past few years brought me into contact with individuals and groups of end users. Discussions with these people on the problems associated with wood quality in New Zealand pine have confirmed my concerns.

Most of the problems arise from an increasing proportion of juvenile wood in the harvest. Juvenile wood can be classed as all wood with immature tracheids in terms of cell wall thickness and cell length. For practical purposes in the solid wood product business, juvenile wood is all wood up to 13 years of age. This would include a column up the centre of the tree, up to and including the 12th latewood band.

The higher proportion of juvenile wood comes from a number of factors. One factor is fast growth arising both from genetic "improvement" and from much higher fertility sites than have hitherto been the norm. Utilisation practices also contribute as pruned and other butt logs are separated out for particular uses, leaving in many cases only the physiologically younger sawlogs available for domestic solid-wood processing and added-value export markets. Younger clearfell ages also have an effect on the proportion of juvenile wood.

The problems with juvenile wood are now being exacerbated by an increasing incidence of compression wood. Among a number of undesirable attributes, compression wood has very high longitudinal shrinkage properties. Compression wood is normally only found in leaning trees and in young trees subject to regular and severe wind "thrashing". On fertile sites though, many young, perfectly straight trees will have compression wood completely around the stem. The causes of this have not been thoroughly researched. One could probably attribute the compression wood formation in these cases to an inability of the thin walls and high microfibril angle of juvenile wood cells to support the heavy weight of the stem and crown of a very fast-growing tree. The microscopic structure of compression wood differs from normal juvenile wood. It is the basic cause of excessive longitudinal shrinkage and other distortions during processing, and produces very low strength.

The effects of juvenile and compression wood can be seen in both primary processing and end uses. Without any doubt, it is hampering the acceptance of radiata pine in export markets and is reducing its hard-won acceptance in domestic markets. Sawmillers complain, and justifiably I believe, about an inability to source a continuing supply of stable, mature wood suitable for framing production, particularly as there is a need to supply kiln-dried and often stress-graded framing timber. The percentage of degrade after high-quality kiln drying, particularly for appearance grades containing juvenile wood, seems to be more than double that of 10-15 years ago. Builders complain that they are increasingly unable to source an adequate volume of stable wood from sawmillers, and there is in-service distortion of components. Offshore, there are reports in the Japanese housing industry of the incidence of surface checking, grain lifting and variable moisture content in furniture and joinery components. There are also reports of severe distortion of internal lining attachment studs fixed to aluminium house frames.

Past experience as part of the industry's technology transfer "system", combined with semi-retirement, has led me to a role as a "non-aligned sounding board" for end users, architects and specifiers, both in New Zealand and overseas. I must say that I have been surprised at the depth of feeling about what is in effect a reduction in the quality of much of the radiata pine on the open market. It must also be said though, that the product quality from the relatively few large processors is generally very high. There are, however, many smaller processors whose only available raw material supply seems to be getting younger and it is consequently very difficult for those processors to compete in the quality stakes.

Suggestions

One can assume that the problem will be with us for a long time and will in fact increase as more and more raw material comes from small and farm woodlots whose owners want cash flow as soon as possible. The following suggestions are in the hope that both the decline in acceptability of radiata pine from an end-user point of view, and a likely reduction in financial optimisation from a grower point of view can be halted.

- Marketing mature wood and juvenile wood separately with a premium for mature wood. Technically this is very valid as juvenile wood really is a different "animal". It is more difficult to dry satisfactorily than mature wood, and it has many different properties.
- Funding an intensive and limited-time collaborative project with FRI to develop kiln-drying schedules for juvenile wood. The best end-result schedules may take considerably longer than current more or less mixed-quality radiata pine schedules but may well be cost effective.
- Funding a project to fully investigate the juvenile wood/compression wood association. There may be a "trigger point" beyond which unacceptable wood is produced. For example, this may be equivalent to a GF rating above 16 or 18 on a fertile site.
- Determining whether or not the current range of genetic "improvement" programmes actually increases the proportion of juvenile wood in mature trees. At the very least it is logical to request a very much higher emphasis on density as a most desirable attribute in all programmes.
- Exploring the potential for breeding from individual trees that may exhibit early maturity characteristics.
- Changing stand valuation criteria to

make quality more important than quantity and specifically to significantly decrease the value of all of the juvenile core component of all trees, and increase the value of the mature wood component, taking 12 years as the boundary. If the result of such a change becomes widespread, it would help small and farm woodlot owners to make up their minds to extend rotation ages and not to sell "as soon as it's big enough to saw".

- Changes to silviculture regimes which would result in a higher proportion of physiologically older and more stable wood for high-value processing could also be examined. Possible changes include pruning some stems to only three metres to provide for a single acceptable veneer bolt, pruning much higher to slow growth rates for the first 12 years, and increasing planted and final-crop stem numbers on fertile sites.

I know some of these points have been discussed in the past (and some rejected by growers), but the whole subject is very much in need of discussion again. I have a genuine and recently reinforced concern that the problem of juvenile wood will become a major barrier to the full acceptance of New Zealand pine – particularly in the export market.

Chas Kerr

Forestry in the age of Methuselah, or Blessed are the risk-takers

In ancient Greece one's lifespan was about 28 years, only rising rapidly to 49 years at the end of the 19th Century in Europe – due mainly to improved sanitation. Today, with modern medicine, better diet(!), improved health-care knowledge and facilities, as well as reduced infant mortality the figure is 76 years in the United States. Research concerned with altering the biology of ageing suggests that increased life expectancy will not be simply one of incremental extrapolation; instead some estimate one's lifespan at perhaps 115 by 2010; ... and such age need not be associated with decrepitude. Over 40% of the 10,000+ who completed the 1989 New York marathon were over 40, 56 were over 70 and the oldest was 91!

Longevity means retirement delayed and all will be obliged to work for longer than is anticipated generally. Current legislation prevents compulsory retirement at any statutory age – introduced no doubt because of the inability of Government to fund universal retirement benefits under *existing* circumstances. Life extension is not a prospect to be welcomed by politicians and possibly by the public, who may see it as a "stretching" of the present. Individuals often look forward to retirement because they are bored or tired with life to date (... *all of which past, the sorow onely staies,* Sir Walter Ralegh). For most the future is likely to be hardly any less disappointing. Will the retired remain content with a 50-year dismal diet of golf, a week on the Gold Coast and manicured lawns? ... and from where might one's retirement income come to enjoy old age? Young foresters could rely on the benefits of three rotations of radiata pine or even one of kauri. An alternative would be an annuity with a *strong* life-insurance company: strong because reserves will take a beating when actuarial assumptions are found wanting.

There is an ambivalent streak in modern geriatrics, enslaving all to a meaningless senility: doctors bound by an Oath; family to an altruistic duty; while the old, losing their independence and self-esteem, are denied even their death-wish (... *death after life does greatly please,* Edmund Spencer). However, the biotech hope is quite different; for an extended, active and productive life enriched by wisdom – and a swift end.

Prometheus, creator of mankind, stole fire (technology) from the Gods. In revenge Zeus forced Epimatheus, a fellow Titan, to marry Pandora. She opened the jar, that Prometheus had warned should be kept closed, and let loose the Spites – pitiless old age, labour, sickness, insanity, vice and passion together with Delusive Hope which discourages mankind from a general suicide (... *man never is, but always to be blest,* Alexander Pope). Biotechnology promises to put many of these Spites back in the jar again. Few appreciate the extent of recent progress, after the false dawns of the '70s and '80s; that over 350 US-listed biotech companies have raised some $10 billion from the public in the last 12 months; that after years of clinical trials these companies are filing increasing numbers of New Drug Applications with the FDA; that last year saw some 150 tie-in relationships with major pharmaceutical houses.

Civilisation would be impossible if we lived just a few years. Therefore, an interesting question is why we don't live 969 years like Methuselah or 6000 years like the bristle cone pine? Such longevity might encourage timidity: an individual with 900 years to live has as many years to lose. One might envisage an ossified society punctuated by wrenching and violent upheavals. After all, we barely tolerate ten years of any Government before being distracted by something new, c.f. Muldoonery and Rogernomics. Death is the primary mechanism by which species adapt to change. Death deferred will work profound changes through every avenue of life.

If life were a mere repetition of the past there would be advantages in asexual cloning. A minuscule amount of tissue can reproduce hundreds of thousands of identical trees, so that the entire pine estate of New Zealand might have only a few hundred healthy parents which are best able to produce the types of wood sought by markets. However, nature favours sexual reproduction, a consequence of which is that the benefit of any favourable characteristic or mutant is immediately diluted in the next generation through breeding. Asexual reproduction allows a species to mass produce individuals which are ideal for existing conditions; while sexual reproduction enforces diversity in the gene pool, thereby assuring the survival of traits which may have no present value but could well be crucial to survival should conditions change abruptly. Nature is betting on change and, likewise, the forest sector has retained a broad-based gene pool in reserve for the unexpected.

Change is a feature of life. Consider an analogy: the management of a natural forest. Since its inception, Yellowstone National Park had the policy of putting out every fire, whether a barbecue gone out of control or a lightning strike. In 1972 the policy changed and only natural fires were left to burn, intervening simply to protect life and property. However, forest litter had accumulated at a rate equivalent to 3000 litres of fuel/ha/yr during a hundred years of Smokey Bear short-sightedness – just waiting. In 1988 exceptionally dry weather resulted in a number of fires burning totally out of control for some three weeks, until heavy rain and snow fell on September 10. A third of the park had