Forestry's extra dimension

A simple forestry test: pass, and you should feel patronised and slightly insulted. Fail, and you should consider reimbursing the taxpayer for your expensive forestry education. Sadly, my experience is that most people will fail – including many so-called forestry professionals. Here goes:

1. What is the typical clearfell age of a New Zealand forest?
2. How much does the standing volume of a New Zealand forest increase in a typical year?

If you provided almost any numerical answer then – I'm sorry – you failed. Perhaps it might have helped if I had added an explanatory note: "in your answer, be careful to distinguish stands from forests". Even with this enormous hint, however, many readers would still fail the test. They would knit their brows and wonder, "whatever is he getting at?" Hang your heads in shame, those forestry-trained readers.

The distinction between 'stands' and 'forests' is critical and is far, far more important than just verbal pedantry. Stands and forests are different beasts. They behave differently. A typical New Zealand stand may be clearfelled at age 28, and grow about 21 cubic metres of wood per hectare per year, but a forest...? I am not aware of *any* New Zealand exotic forest that has yet been totally clearfelled, although there are declared intentions to do so. As for growth rates, the figure varies from a high of about 21 m^3/ha/year (i.e. comprising young stands prior to any harvest) to a low of minus several hundred. Kaingaroa Forest, for example, lost growing stock in the 1970s despite increasingly vigorous stands and an expanding forest area. The New Crop replaced the Old Crop.

An understanding of the complex interplay of stands of various crop-types and age classes is the essence of forestry. We are quick to grasp the expression "forest estate modelling", but often fail to appreciate that it adds a whole new dimension to decisions and calculations made on a single-hectare, or stand, basis. In a previous column, I have referred to the disaster that threatens New Zealand's forestry because of the 1995 peak in new-land planting, and the trough in which we currently wallow. Few people are going to invest in harvesting or processing machinery to cater for such a short-lived peak. If we were to restrict our considerations to a single-hectare model, we would be exaggerating the profitability of a 1995 "baby-boom" stand.

In my work on carbon sequestration, I have attended a number of high-level scientific conferences, and have sometimes felt quite lonely as the only forester present. What can a lowly forester (not commonly regarded as the most high-tech of scientific disciplines) add to a debate where the major protagonists have PhD's in atmospheric physics and chemistry, meteorology, or palaeoclimatology? You might be surprised.

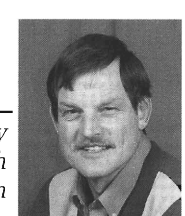
First, eco-physiologists hold the floor. Their understanding of wider issues makes even economists look broad-minded. They carefully select an ideal patch of trees, set up flux towers, and measure the inflows and outflows of various gases (Heaven knows why!). These highly qualified scientists use horrendously expensive, state-of-the-art equipment. Their results take the form of incomprehensible equations. They tell you that they are trying to determine whether "the forest" is a source or a sink of carbon. The mind boggles. Even if the best way to assess the weight gain of a pig were to examine the vapours that it emitted, rather than just weighing the damn thing twice, how can you possibly extrapolate the findings of a plot to a whole landscape? Is there not a small sampling difficulty here? What of deforestation, disease and fire occurring elsewhere? What about the age-class structure of the entire estate?

Second, a more sensible approach is presented by Pekka Kauppi, from Finland, and others, who used forest inventory data and satellite imagery to estimate that, in the 1980s and 1990s, forests in North America, Russia and Europe had been absorbing some 12% of annual global carbon emissions. They seem to have identified the mysterious "missing carbon sink" that explains (in part) why not all the carbon we put into the atmosphere stays there. But then Pekka blows it. He says that forests of constant area are probably net absorbers of carbon, because of nitrogen or CO_2 fertilisation, or some such. It is not at all clear to me why making *stands* grow more vigorously would result in a *forest* with more biomass. The simple, obvious explanation is in the age-class structure. The average stand may be getting older. How could this happen?

One possible reason is that all those Northern Hemisphere countries participated in World War II. Like any natural disaster – fire, disease or cyclone – stands were felled and not re-established during the 1940s. This perturbation resulted in an imbalanced age-class structure. A large trans-continental cohort of stands is now 50-60 years old and is at the peak of productivity. It is packing on the carbon.

What happens when that age-cohort is harvested or reaches senescence, just like Kaingaroa Forest in the 1970s? The "missing sink" will become a mysterious "missing source" and Northern Hemisphere forests will add to human emissions, not subtract from them. This has not been adequately factored into IPCC calculations.

So a small dose of forestry knowledge can have major scientific implications. Global warming could be far worse than predicted. If the IPCC don't understand this, they should ask a forester.



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