COMMENT

Editorial

An impertinent question – New Zealand's approach to forestry and research

"That is the essence of science: ask an impertinent question, and you are on your way to a pertinent answer." Jacob Bronowski (1908-1974). The Ascent of Man

Introduction

Do we have it right? Is the industry and science structure pushing forestry in a direction that is actually more risky and sensitive to an unforeseen biological or market change than our current and past position? Some of us have our suspicions, but few of us are really sure of whether that suspicion is warranted, or what the solution is, if there needs be one at all.

Whatever the case, I think the issue is worth debating, and I am prepared to express my prejudices. What follows accepts as a premise that there is a problem. In essence, that problem is this: forest growing is generally trending towards more intensive management, and with that trend we are losing some of the robustness of those forests established in an earlier, and, some would say, a less sophisticated age. With that trend there are uncertainties (as distinct from risks), perhaps even the potential for commercial or biological collapse. By more "intensive management" I am referring to the emphasis on ever more wood volume at ever younger ages with ever higher inputs of capital.

The Agricultural Parallel

There is an intensive management analogy in agriculture. The intensive model has as its focus, maximum production. There is, for example, a theoretical potential wheat production of 10 tonnes per hectare. To achieve this nirvana requires formidable expenditure in genetic improvement, irrigation and chemical inputs in the form of fertiliser, and the various "icides" (add your own prefix). The timing of inputs is important, sometimes critical, and in addition each input seems vital to ensure success: there is little room for sloppiness or a sudden resource constraint. This high-cost, high-return model is inherently risky, particularly if available capital is suddenly limited. The end result is often determined by the quality of the poorest decision or input.

What I think particularly characterises that paradigm is its extreme sensitivity, and with that, its instability. I can recall being lectured in the mid 80s on the merits of each new strain of lucerne, all new genetic advances in response to the latest new aphid that had arrived. When I asked the naive question (a forester amongst agriculturalists) about what was so bad about the original strains, the reply was that though they may have been robust little beasts in response to aphids, they weren't "productive enough", meaning the potential of the species hadn't been reached.

And so every few years the cycle of new pest and new genetic response continued, while the nuking of all aphids, and with them their ladybird predators, was a tragedy (comedy?) played out annually.

The "means" of this paradigm produces a multitude of Ph.Ds, while the "end" itself of intensive management and "maximising" a particular output of the ecosystem is scarcely, if ever, questioned.

A Low Input System (Integration)

At about the same time there was developing a new interest in the other management "extreme", although that word may reflect more on the position of the observer than on the alternative management paradigm to which I refer. This other "low input" paradigm – sometimes referred to as "organic" or "permaculture": words with an unfortunate "hippy" undertone – seems to emphasise the integrity of the ecosystem: working with it rather than against it. This usually involves a lot more knowledge of how the system works as a whole, rather than the narrower considerations required for the intensive paradigm.

Generally inputs and production for this low-input system are moderate: although I have read somewhere that the amount of "productivity" recorded depends upon whether you measure only that particular part of the system of immediate commercial interst (e.g., the wheat) or take the entire system of soils and biota into account.

Where ought forestry to position itself?

Forestry traditionally bears some similarity with this low-input approach; certainly we have more in common with that than with the intensive agricultural model. Much of a forest's inputs are provided by nature and aided by nutrient cycling; and, integration and the forester's concept of multiple-use are two sides of the same coin.

But for how long will relationship with the low-input system be maintained? And here's the first irony; whereas agriculture has arguably moved towards a more integrated ecosystem approach – with some practices now almost mainstream where once they were lunatic fringe, from the use of slow-release rock phosphate and the biological control of stock pests to even advocating other land uses such as forestry in areas where the farm system benefits as a whole – forestry in New Zealand is perhaps heading the other way.

Loving, as I do, all ironies, here's another one to throw into the debate. It could be argued that agriculture can sustain a high-cost, high-production system better than forestry because the industry can adapt over a time frame measured in months, perhaps in less than a year.

The agricultural investment payback cycle is often within four months. Should misfortune fall upon forestry the recovery phase might be decades. We cannot change our approach at a whim if something goes wrong.

Reductionism versus Integration

The two opposing paradigms are a reflection of two opposite approaches to systems: reductionism and integration. Science has a legacy going back to William of Occam and his razor to continually peel back the layers of the onion to discover the essential truths. The problem with this approach is that, if you are not careful, you concentrate so much on the layers that you forget it's actually an onion: not seeing the woods for the trees (apologies for the mixed metaphors, but I couldn't resist). Ivory towers and isolationism often results; an approach in which wider ignorance flourishes.

In New Zealand the approach has been

reinforced by recent political trends, including the science reforms, largely engineered by the accountancy and economic religions, and without much understanding of the synergies of integrated systems. Integrated systems are bad news for bean-counters because the discrete little boxes start to disappear.

Integration is to some extent the opposite of reductionism. At its most integrated is the GAIA hypothesis, which suggests that the whole planet is a web of interrelationships, perhaps even an organism itself! But integration may be reliant upon reductionism in the first instance to provide its basis, suggesting that reductionism is a necessary prerequisite. Alvin Toffler, in his book "The Third Wave", seems to think so, believing that the world is trending from reductionism to integration in management and other systems. If that is really the case someone had better tell the forestry and science communities.

Some Specific Examples

It is not entirely fair to pick on one part of the science community, particularly when the argument is speculative and based on suspicion rather than hard evidence. That being said, research into genetic gains does provide an obvious target, some would say a tall poppy.

The genetic gain in every trait must adhere to the law of diminishing returns. That cannot be doubted. Whether research on a trait is worthwhile relates to where that trait currently sits on that curve, as this will determine whether returns are accelerating or diminishing.

Here there is disagreement. Those considering only the trait itself (for instance wood growth) may claim continuing exponential gains. However, if the whole integrated system is considered, including such things as marketability, practical environmental constraints, management risk, susceptibility to pests and diseases and so on, then the position of the trait on the law of diminishing returns curve must be placed differently, possibly even at a point where the gains match the losses to some other part of the system.

The problem will always be that many of these other parts of the system are intangible, and without clearly understood linkages. Therefore it comes down to whom you believe. Who ever said there is no art in science.

Risks and Decision Making

This is not the first time these editorials have argued against the simplistic and rigid application to decision criteria such as the internal rates of return (IRR). But it has to be said that one of the main culprits in this intensification trend is the use of such decision criteria. In desiring higher and higher IRRs, shorter rotations and greater productivity will always appear desirable. This is the production mentality apparent in our habit of allowing such decision criteria to **set** our strategies, instead of using them as tools for fine tuning **within** a strategy. A net present value or internal rate of return cannot give a marketing perspective and works against the innovator and entrepreneur, who use intuition as much as calculation.

The danger in following the IRR nose is that there is no judgement about the added risks and uncertainties that eventuate from such pressures to produce the "fustest with the mostest", to use a military analogy. It could well be that any additional gain in IRR is more than offset by gains in the premium for risk. A stand that yields 500 cubic metres per hectare on a rotation length of 18 years at an IRR of 15% real may actually be an inferior investment to the more conservative regimes in operation today when risk is taken into account. Taking an opposite tack, I am not totally convinced that our current regimes are superior to those of the past, nor that Douglas fir at 60 years isn't a superior investment, at least for a proportion of an estate.

Perhaps our approach to risk in New Zealand forestry is what most needs developing. We hardly ever hear of the application of concepts like portfolio theory or option value theory, yet they must have some application in diversifying species, regimes, forest locations and markets.

I am sure a more sophisticated approach to risk would necessitate a questioning of some of the trends in forestry and forest research. Many do not believe that more intensive management is necessarily better management. Nor is establishing isolated ivory towers within the walls of competitive ivory towers (read CRIs) necessarily a better means of managing research, irrespective of the personal satisfaction gained by accountants and economists.

I await the return salvo with anticipation.

Chris Perley

The Stratford power station decision

Simon Upton's decision to grant an emission permit for ECNZ's proposed power station with the proviso that the CO_2 emissions are fully mitigated has some interesting implications for the forest industry. In the case of the proposed Stratford gas-fired power station, the Minister ruled in March 1995 that the power station owner would have to offset emissions by either planting sufficient trees to absorb the carbon emissions (in this case about 4000 ha of plantation) or through arrangements with other businesses which would see the operators of Stratford power station receive credit for reductions in emissions from these other businesses.

Several commentators have correctly pointed out that contracting of forests by power companies to plant trees will amount to the consumers of electricity subsidising the forest industry's tree-planting activities. The establishment of "offset" plantations would probably benefit both the power companies and the forest industry through the sale of wood, but would do little to help provide electricity at a low cost to consumers.

At best, the planting of trees to mitigate CO_2 emissions will provide only a short-to-medium-term solution to reducing net emissions. A "one off" planting project will only provide benefits for perhaps 40 years. There will be a need to replant logged sites after harvesting if the mitigation is to be sustained. There will also be a need to extend the area of planting with time to balance the additional emissions associated with harvesting, transport and processing of wood. This is particularly important because CO_2 has a lifetime of 60 to 90 years in the atmosphere.

If New Zealand's energy (CO_2 emission management) policy is going to include the use of "carbon storage plantations" and the implementation of tradeable forestry carbon storage credits, then there may be a strong case in the future for developing plantations which maximise the rate of carbon immobilisation, the total amount of carbon stored and the total storage time. Such plantations would need to be managed differently and possibly consist of different species from the modern commercial radiata pine plantations which are designed to maximise wood product value. There is little doubt that if forestry carbon credits do become a reality, then the value of forest plantations will increase.

Although some research has been completed, there remains a need to accurately quantify the carbon stores and emissions provided by various types of forest plantations (including the soils) from the time of site preparation for planting through planting, forest growing, harvesting, wood