

[370,000 hectares] of Northern Pacific land. He just wouldn't do it. Lousy investment.

*This company has always succeeded because of visionaries, and that still is the case, always will be.*"

(Rex McCullough,  
pers comm.)

The importance of vision cannot be overstressed.

There are risks in everything we do. Some see risks in everything about plantation forestry: some see little but optimism.

To answer the question that is posed by the title of this paper, I am confident that even though there are risks there are good reasons for confidence that there will be a future wood market for our radiata pine plantations. Furthermore, those opportunities can be enhanced by plantation owners themselves being more proactive.

#### Acknowledgments

Comments and suggestions by Mark Bogle, Peter Olsen and Paul Robinson are very much appreciated.

#### References

- F.A.O. (Food and Agricultural Organisation) 1997. Forest Products Yearbook 1991–1995. FAO Statistics Series 137.
- Sutton, W.R.J. 1995. The need for planted forests and the example of radiata pine. Presented at the symposium "Planted forests — contributions to sustainable societies", 28 June 1995, Portland, Oregon, USA (in print).
- Sutton, W.R.J. 1996. Long-term future of wood. Commonwealth Forestry Review 75(4): 267–269.

# Investment in Indigenous Forestry

Tim Thorpe<sup>1</sup>

## Introduction

The management of New Zealand's indigenous forests has to take account of broader considerations than in plantation forests. It must incorporate a wide spectrum of economic, ecological and social elements. It follows then that this paper reflects this wider perspective in considering where investment should be placed in indigenous forestry management.

## The world at large

The amount of destruction that is being carried out to the world's natural forests provides a useful backdrop against which to place the management of New Zealand's indigenous forests.

Between 1980 and 1995 the world's forest cover decreased by approximately 180 million ha, an area about the size of Indonesia or Mexico (FAO, 1997). Some 200 million ha of natural forest was lost in the developing world but around 20 million ha was gained in the developed world through the establishment of new forest plantations. The rate of loss is, however, slowing down. From 1980 to 1995 the rate of natural forest loss changed from 15.5 million hectares per annum through the first ten years of this period to 13.7 million ha per annum over the latter five.

The Food and Agriculture Organisation tips that plantations will play an increasingly important role in national forest programmes in the future (FAO,

1997). However it also notes that in developing countries, which account for the majority of the natural forest estate, the total net plantation estate in 1995 was only 81 million hectares out of a total forest area of 1961 million ha ie 4.1 percent. The distribution is not equal. Some 80 percent of plantations in the developing world are found in Asia/Oceania, and 40 percent in China alone.

Interestingly FAO note that the proportion of plantations established as large blocks in the tropics as a whole decreased from 40 percent to 35 percent between 1980 and 1990. It is community woodlots, farm forestry and agroforestry which has grown in importance, a similar situation to New Zealand.

Between 1970 and 1994 world consumption of wood expanded by some 36 percent reaching more than 3 400 million cubic metres in 1994. Of this industrial roundwood consumption rose by 15 percent to almost 1 500 million cubic metres. Fuelwood consumption rose however by 60 percent to almost 1 890 million cubic metres. Based on these figures fuelwood accounts for 55 percent of total world wood consumption.

According to FAO rural population growth (directly tied to fuelwood usage) coupled with agricultural expansion and economic development programmes are the major causes of changes in forest cover. They further note that the world's forests and forestry sector are shaped as much by external economic, political, demographic and social trends as they are by forces working within the sector.

Where then should be the best investment in natural forestry in the global con-

text. Population control, increases in agricultural production and improved distribution of food, economic and political reform are all factors that spring to mind. Forestry reform? Yes, sure we have our role to play and it will be obvious to all that the harvesting and other forestry practices of yesteryear cannot be used today. But, all in all, foresters are just one small component in a very wide picture.

## Indigenous forest cover in New Zealand

### Forest database

The story of the decline in New Zealand's indigenous forest cover since the advent of human interference is only too clear. Suffice to say that when the Maori first visited New Zealand in approximately 900 A.D. indigenous forests covered some 20 million hectares in New Zealand. By the time of European settlement around 1800 A.D. about 14 million hectares remained and today the area under indigenous forest in New Zealand is thought to be between 6–9 million ha, usually assumed to be 6.4 million ha. About 24 percent of New Zealand's total land area of 27 million ha.

6–9 million hectares is a fairly wide estimate to place on the area of our indigenous forests. The vagary of the figure is a consequence of the work that Steve Thomson from the Ministry of Agriculture and Forestry and others are doing to update the area of New Zealand's forests. This work has so far shown, using modern satellite and computer technology, that the original 1950s estimate of tall forest-

<sup>1</sup> Tim Thorpe, Manager Strategic Planning for Timberlands West Coast Ltd, presented this paper to the NZIF Conference in Wan-ganui in April 1998

land cover of around 6.4 million ha is looking fairly robust. In effect any harvesting and land clearance that has taken place since has been balanced by the growth of regenerating forest.

The biggest change is occurring at the forest margin. The original National Forest Inventory work carried out in the 1950s did not include "scrubland", whereas the new survey does. When "scrubland" is included the figure of indigenous forest could jump another 2-3 million hectares (Steve Thompson, pers comm).

Most of this scrubland has originated from the removal of agricultural subsidies since the mid-1980s and the downturn in the agricultural sector which has led to significant areas of farmland reverting back to bush.

The sort of work that Steve and his team is undertaking is essential for us to understand the nature of the forest that we are dealing with today. If we don't know what resource we are dealing with, we don't know where we are going. Or indeed where we have been. This is the first area in which I would like to see more investment in indigenous forestry in New Zealand.

### Forest estate valuation

Eighty percent of New Zealand's indigenous forest cover (5.1 million ha) is in national parks and reserves, administered by the Department of Conservation. The DOC indigenous forests are valued by Treasury at approximately \$600 million which the NZIF Indigenous Forest Policy says seems low and equates to about \$120 per hectare. However based on the land valuations that apply to Timberlands estate this figure, from a market point of view, is realistic.

It's the old question of what is something worth versus what would somebody pay for it. And here I do agree with the Institute. The value of New Zealand's indigenous forest should not just be measured in terms of its market value, but its contribution to the economy of New Zealand as a whole. Some idea of the estates value can be measured directly in market terms, such as returns off the estate from tourism operators, user payers, sales of publications, and so on.

But the real value of indigenous forest is in its non-market values — soil and water, bio-diversity, amenity, spiritual and visual values. It is possible to put a value on these through various forest valuation models. It would not be an easy task and to quote FOA "there is inadequate information to say whether forestry is receiving any stronger policy support in countries where more comprehensive forest valuation has been undertaken" (p38,

FAO, 1997).

Nevertheless in terms of helping to understand the investment capital that is tied up in our indigenous forest estate I believe that such a valuation exercise is essential. This is my second area of much needed investment in New Zealand's indigenous forest estate.

### Predator control

Ministry of Agriculture and Forestry estimate that of the 1.3 million ha of indigenous forest cover not in DOC management, only 650 000 ha is actually potentially merchantable, around 10 percent of total indigenous forest cover. In theory there should be no impact from harvesting, because it is on a sustainable basis. Even if there is, the impact will be small and confined to a relatively small percentage of the indigenous forest estate.

Possums however number around 50-70 million and have no respect for any of the artificial boundaries — production forest versus conservation estate — that humans create.

On average a possum eats about half a kilogram of fresh foliage a night, a total of about 30 000 tonnes over the whole country or 4.7 kilos per hectare. This compares with average annual forest micro-biomass (leaves, buds, flowers) production of about 11 kg per hectare per night. Possums then are effectively eating about 40 percent of micro-biomass production. No wonder they have had such a major effect on certain areas of our indigenous forest as is mentioned in the NZIF Indigenous Forest Policy. They also eat eggs and young chicks in their nest. And above all they carry TB as do a number of other introduced fauna.

Possums are aided and abetted in their nefarious activities by other bush dwellers such as goats, deer, stoats, weasels, mice, rats, and cats. To this list you can wasps who, apparently, at certain times of the season and in certain forests can have a total biomass greater than all these other species combined. Wasps need protein as part of their diet late in the season and have been known to attack and kill young chicks. They also attack humans!

This is the third area in which I believe New Zealand should be investing money in indigenous forests. Research into the effects of introduced fauna, particularly mammalian predators, on our forest ecosystems and ways to combat them.

As it so happens there are some indications that possum numbers are going down as a result of intensive control activities over the last few years, currently costing around \$50 million per annum (National Possum Control Association, pers comm). The reasons for such a high

level of control however are not because of concerns about damage to the forest estate and to horticulture but largely because of concerns about the spread of bovine TB and its potential effect on our export trade in agricultural products. Right now AgResearch and others are carrying our research into a vaccine for bovine TB. What will happen to research into possum control if they find one?

This issue becomes more relevant when we take account of global warming. Carbon dioxide levels are measured with respect to activities of humans against a base year of 1990. For forestry this means that it is our plantation forests that are the focus of attention. At the moment New Zealand has argued that our indigenous forests should not be part of the equation. A moot point. Humans do influence the state of our indigenous forests, particularly with regard to control of introduced forest fauna such as possums.

The argument may in fact swing in our favour. Methane is a far greater contributor to global warming than carbon dioxide on a per unit basis. Possums produce methane, as do other forest dwellers. We could do much to enhance our image internationally and in fact may gain carbon credits if we put more effort into possum control.

### The production estate

#### Financial returns

Discounted cash flow analysis has traditionally been the major mechanism to determine financial returns in the plantation sector. Discounted cash flow is based on the premise that there are a number of costs over a relatively long period of time and then revenues. This does not, of course, apply to indigenous forests where trees are already mature and are harvested on a selection felling basis.<sup>2</sup> However with a certain amount of caution it is possible to use discounted cash flow to determine financial returns from indigenous production forests (see Table 1).

There are two points from Table 1:

1. Indigenous forest production is profitable.
2. Discounted cash flow analysis needs to be used carefully as a methodology in determining investment decisions. I have always felt that forestry investment is largely based on cash flow — and in this context indigenous forestry is a winner.

To put this in context I refer you to Carter Holt Harvey's *Environment Health*

<sup>2</sup> Timberlands West Coast Ltd harvests the equivalent of one tree every four years in its rimu estate.

**Table 1. Financial returns from indigenous harvesting by aerial extraction in Westland**

Item	Variables				
Cost of production using helicopter (per annum)	\$150 per ha	\$150 per ha	\$150 per ha	\$150 per ha	\$150 per ha
Returns (per annum)	\$250 per ha	\$250 per ha	\$250 per ha	\$250 per ha	\$250 per ha
Cost of Land		\$250 per ha	\$250 per ha	\$250 per ha	\$250 per ha
Cost of Forests Act			\$10 per ha	\$10 per ha	\$10 per ha
Time delay between purchase of land and production	Nil	Nil	1 year	2 years	2 years
IRR (pre tax)	N/A	67%	35%	30%	9%

NB: The above figures are real prices in 1998. The purchase price of indigenous forest is approximately \$250 per hectare as indicated above. A comparative figure of \$1000 per hectare has also been used in Table 1 as this is the current price for farmland on the West Coast.

Delays between land purchase and production are due to obtaining appropriate approvals under the indigenous provisions of the Forests Act 1949, and under the Resource Management Act 1991. Costs of obtaining RMA resource consents have been assumed to be nil.

**Table 2. Furniture manufacturers using predominantly rimu, by region**

	Jobs	Turnover (\$ ml)
Auckland	640	92
Central North Island	78	78
Wellington	316	34
Nelson	36	5
Canterbury	492	52
Otago/Southland	142	9

Source: Ministry of Forestry (1995)

and *Safety Annual Report* which was first published in 1997. Out of Carter Holt Harvey's total forest estate of 44 000 hectares 110 000 ha is "primarily indigenous forest". I have assumed that at least 50 per cent is harvestable. Using the assumptions above the potential net return to Carters from their indigenous estate is \$100 per hectare per annum over 55 000 ha or \$5.5 million dollars per annum.

Carters have chosen not to harvest this estate quoting the NZ Forest Accord as their reasons for this. Interestingly, the NZ Forest Accord supports production from indigenous forest, provided it is on a sustainable basis. Be that as it may, Carter Holt Harvey are forgoing a significant net return off their indigenous estate, and in fact are presumably incurring a direct cost in the form of rates and maintenance.

The economic significance from production of indigenous forests is of course more than that generated to the individual forest owner. Using the NZIF's own figures in its Indigenous Forest Policy the value of partial indigenous forest process-

ing in the year ended 31 March 1997 was about \$120-130 million, a multiplier of 6.5 on log revenues. Our own figures, and those of the West Coast Regional Council, show that the figure is nearer 11 when taken to final processing. This compares with a multiplier of about 4 for radiata pine (G. Horgan, *pers. comm.*).

And it is not just confined to one or two specific areas of New Zealand. For example indigenous forest production is important to a broad geographic range within the furniture industry (see Table 2).

Ministry of Agriculture and Forestry approved permits for indigenous forestry production are steadily rising — currently around 50 000 cubic metres per hectare per annum, possibly up to 250 000 cubic metres over the next five years (which is equivalent to levels at the start of the 1990s) and at the top end over a million cubic metres per annum if all 650 000 ha of potential production indigenous forest is fully utilised. These figures exclude Timberlands production which is currently around 30 000 cubic metres per annum.

It is a far cry to suggest that production will reach over a million cubic metres per annum. But the forest industry and Government should be aware that indigenous forestry production has the potential to be a major contributor to the New Zealand economy, in both domestic and export markets. What's more, if the number of investors who have approached Timberlands West Coast is any indication, then it is the overseas companies who have realised the potential first.

### Funding for research

New Zealand has an interesting paradox in the management of our indigenous

resources. On the one hand the Resource Management Act is devoted to the sustainable management of natural and physical resources. On the other hand New Zealand has separated out conservation from production in terms of management of indigenous forests. Furthermore we state that because of the sustainable management of our production plantation forests we are able to "save" our indigenous forests.

The fallacy of this approach starts to become apparent when, despite having locked up our conservation estate and despite the fact that we have plantation forests, our indigenous forest is still being devastated. The causes of this, as described previously, are introduced fauna, and who knows what the effect of global warming will be.

What can we do to fund the research and other activities necessary to manage the indigenous estate? As discussed earlier eighty per cent of the nation's indigenous forest is managed by the Department of Conservation, which quite frankly has never been funded enough to carry out all the functions that are expected of it, nor I suspect will it ever be.

I can see two solutions to the problem — strictly introduce users pays including entry fees for users of the conservation estate or manage a proportion of these forests for production on a sustainable basis. A political minefield it may well be, but nevertheless I believe that the nature of the problems that we are facing will soon demand some fairly far-reaching remedies.

The nature of the sustainable management that foresters are now able to undertake in indigenous forests is able to cater for both conservation and production purposes. Harvesting at the rate of one tree per hectare every four years using helicopters is a far cry from yesteryear and indicative of the care and consideration that foresters must take in New Zealand's indigenous forests.

### The Forests Act and the RMA

Managers of indigenous forests for production are required to meet the indigenous provision of the Forests Act 1949, commonly referred to as the Forest Amendment Act 1993, in addition to the Resource Management Act 1991 (RMA). Unfortunately the two Acts are not directly compatible, so that the indigenous forest manager is hit with a double whammy.

The differences between the two Act is quite fundamental and can probably be summed up in two ways:

1. The RMA definition of sustainable management is different to the definition in the Forest Act. Both Acts state that they are about promoting sustainable management with except that the Forests Act

refers specifically to sustainable forest management of indigenous forest land.

2. The RMA is effects based, the Forests Act is prescriptive. For example beech management under the Forests Act is limited to coupes up to 0.5 ha in size, unless the Director General of Ministry of Agriculture and Forestry approves otherwise. Imagine if plantation managers were told that the largest size compartment that they could harvest was 0.5 ha unless MAF approved otherwise.

The RMA requires a great deal more scope than the Forests Act and meeting the latter does not necessarily mean meeting the former. Graining one approval does not necessarily mean gaining the other.

The intention of previous Governments in introducing the RMA was to simplify legislative requirements for natural resource managers. This has certainly not occurred for indigenous forest managers. Either the Forests Act needs modification to bring it into line with the RMA, and tidy up some loose ends in the legislation itself, or the RMA needs attention.

Some reconciliation between the two Acts would certainly be useful for indigenous forest managers.

### Summary

I am well aware that even within forestry circles in New Zealand there is a lot of debate, and indeed negativity, over continuing indigenous forest management for production. It's an interesting paradox that overseas, particularly in Europe and North America the debates are not over indigenous forest management but about plantation forest management. Here it is the reverse, although increasingly there are questions being asked about plantation management in New Zealand.

The investment needed in indigenous forest management today is not in the forest. It's in people. The "have nots" in the developing world who so desperately rely on the forest for so many of their needs; the politicians in New Zealand whose job it is to create order out of conflicting demands; and the landowner in New Zealand who wants to make a return as

best they may out of their patch of forest — whether that be for conservation or production purposes.

And what level of investment are we talking about. Internationally the amount needed to retain natural forests at some semblance of current levels is beyond mere monetary values. Domestically within New Zealand, the investment needed to maintain and indeed enhance our indigenous forest, may not be anything more than a broader vision of the role that our indigenous forests play in our economy.

### References

- Carter Holt Harvey. 1997. Environment, Health, and Safety Annual Report 1997. Auckland: CHH
- FAO. 1997. State of the World's Forests 1997. Rome: FAO
- MOF. 1995. Investment Opportunities in the New Zealand Forest Industry. Wellington: MOF
- NZIF. 1997. Draft Indigenous Forest Policy. Christchurch: NZIF.

## ARTICLES

# The Effects of the Burnt Pine Longhorn Beetle and Wood-staining Fungi on Fire Damaged *Pinus radiata* in Canterbury

Paul M. Bradbury<sup>1</sup>

### Abstract

*Decline of standing Pinus radiata burnt by fire was assessed over a six month period with particular reference to wood degrade caused by the burnt pine longhorn beetle Arhopalus tristis and wood-staining fungi. Wood-stain associated with subcortical destruction and wood boring by the larvae of A. tristis was the primary limiting factor for the salvage of fire damaged trees. Between forty and ninety days after adult insects had laid their eggs 67% of the trees had developed wood-stain. After approximately five and a half months over 90% of the trees had wood-stain and insect infestation, with an average maximum wood boring depth by the larvae of 20mm.*

### Introduction

In the event of a large pine plantation fire in Canterbury the burnt

pine longhorn beetle *Arhopalus tristis* (Mulsant) and wood-stain fungi may be a major limiting factor when attempting to maximise the recovery of logs. Adult beetles are strongly attracted to fire damaged pine and the wood boring activity of the larvae can severely limit recovery times to less than a year (Hosking and Bain 1977). *Arhopalus tristis* is believed to have been established in New Zealand since the mid-1950s (Hosking 1970) and was first recorded in Canterbury in 1979 (C. Barr pers comm., Ministry of Agriculture Forestry files). Establishment throughout Canterbury has been rapid and high incidental populations have been reported from many production forests (P. Bradbury pers comm., Ministry of Agriculture and Forestry files).

A study site was established in the Spencer Park Plantation north of Christchurch after a fire affecting about ten hectares in November 1995. Twenty-two year old *P. radiata* D. Don sustained varying degrees of main stem and crown damage. The unpruned stand had a stocking of approximately 500 stems/ha and a mean diameter at breast height (dbh) of twenty-four centimetres.

Insect activity in the bark, subcortical zone and wood and the

<sup>1</sup> Forest Health Advisor at the Ministry of Agriculture and Forestry, P.O. Box 25-022, Christchurch.