

Financial returns and forestry planting rates

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Introduction

With forests and in particular the commercial plantation estate likely to play an important role in helping New Zealand meet its Kyoto Protocol commitments in Commitment Period 1, the decline since 1994 of the new planting rate and, in more recent time, the fall in the replanting rate and the issue of deforestation is important. Will declining planting rates continue into the future? And what might be done to halt and/or reverse the decline? The work outlined in this report was initially begun to see if it were possible to identify some generalised relationship between expected returns for commercial forestry and the new planting rate. With the rising concern about deforestation it was then extended to look at the question of the existing estate and the possible response to better returns both in terms of new planting rates and maintenance of the already existing estate.

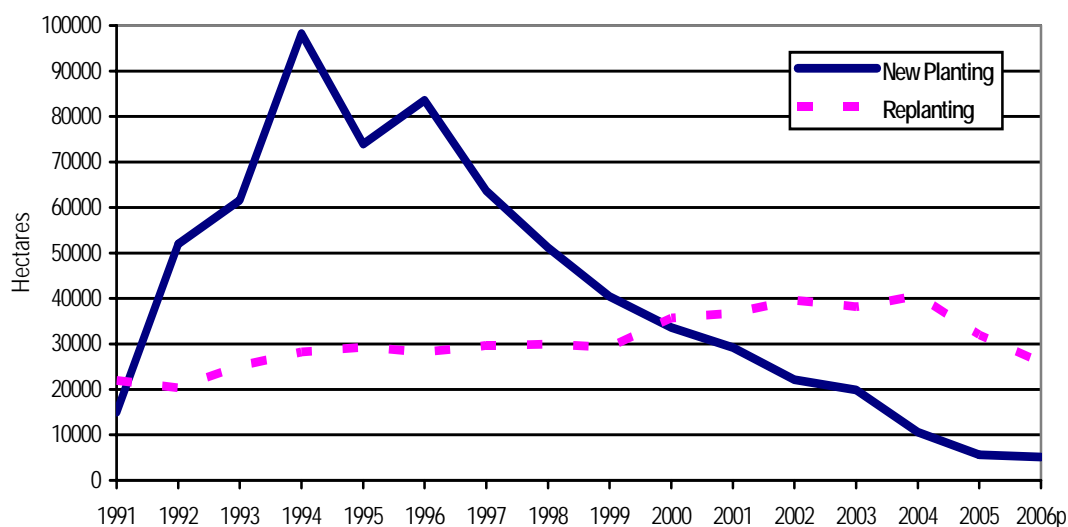
Returns and planting rates

Many factors affect the new commercial forest planting rate. Not only are direct revenue expectations for commercial forestry important but so is the relativity of these compared to expected returns for other possible uses of the land, how much knowledge there is about these options and their 'risk' as well as the rules and regulations governing land use and expectations about how these might change over time. Land prices, agricultural returns, the exchange rate, shipping costs and expectations about how environmental and land use rights might change over time as well as expectations about future log prices all need to be factored into the mix.

Over the last twelve years the annual rate of new plantings of commercial forestry has been trending downward - from a record high of 98 000 hectares in 1994 to a provisional estimate of 5,000 hectares in 2006 (see Graph 1). New planting rates today are significantly lower than for most of the last 50 years. In fact, prior to 2004 the last time the annual new planting rate for new commercial forest in New Zealand was less than 10 000 hectares per annum was 1962 - or 44 years ago.

In addition to the declining new planting rate, Graph 1 also shows that from 1991 until 2004, there was an increasing replanting rate. This increase was in line with increasing volumes of wood being harvested over this period. There are several reasons that may be advanced for the decrease in the estimated area of replanting after 2004 including:

- Improved returns available in other land uses.
- Concern that by re-planting trees investors may 'lock themselves and their land into trees' for all future time periods.
- A reduction in the actual harvest (in the order of 10%) as growers decided to lengthen their rotations to provide for better quality and more desirable product in future.

Graph 1: Estimated areas of new planting and replanting¹

Intuitively, rising rates of forestry return could be expected to raise new commercial forestry planting rates. To better understand how rates of new forest planting are affected by expected rates of return, officials have modelled ‘expected’ forestry returns over the past decade (using a three-year rolling average of log prices as a proxy for expected future earnings from forestry) and compared these with the actual new planting rates.

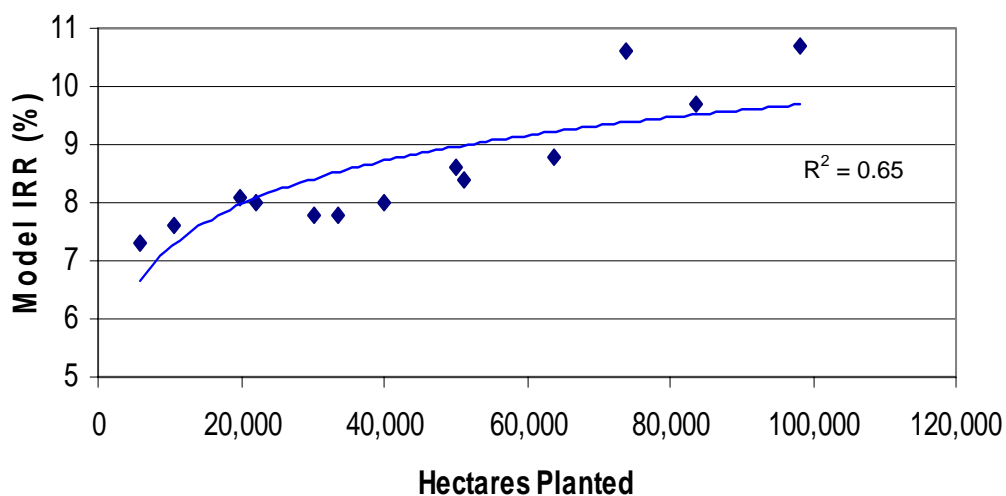
The results of this modelling are presented in Graph 2 (below). The model used in the analysis was set up in 2005 dollar terms and assumptions used are:

- Investors assume future prices are an arithmetic mean of the prices applying in the last three years
- Typical forest crop and management is that applied to a pruned radiata pine regime;
- Annual land rental is the decimalised IRR times a base capital value of \$2,000/ha;
- Logging costs are \$26/m³;
- Product transport is for 70 km at 16 cents per cubic metre per kilometre,
- Land preparation and planting costs average some \$645/ha and occur in year zero,
- Annual costs are \$100/ha/year,
- Pruning costs, in years 4,6 and 8 are between \$400 and \$450/ha,
- Releasing costs (year 1) are \$165/ha; and
- Thinning to waste occurs year 8 at a cost of \$200/ha.

While there clearly is considerable variation in actual new planting rates (due no doubt to those factors other than average log prices that influence the decision to plant and to the fact that the model used in the analysis is specific to Central North Island (CNI) pruned stands) the graph does indicate a clear positive correlation between the two factors (returns and new planting rate).

¹ Source: Novis 2007

Graph 2: New forest planting versus expected rates of return from forestry



The particular model used and the regression polynomial fitted to it suggest the new planting rate is likely to level out at a something approaching 90,000 ha per annum when the Internal Rate of Return (IRR) for forestry approaches 10%. At the other end the model also predicts that when forestry's expected IRR is below 4.7% new planting rates are likely to be less than 1,000 ha per annum.

Replanting

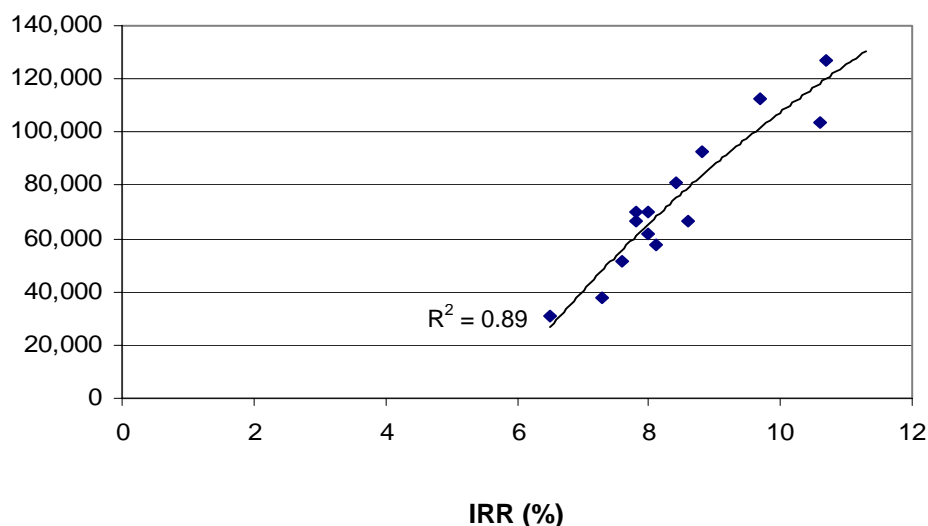
In addition to new planting there is also the question of whether or not already existing forests will be maintained. Determining how existing forest owners will respond to changing perceptions of longer term forestry profitability is not simple. There is a mix of different owners ranging from government departments through commercial entities with a longer term forestry focus to the single rotation investor where forestry is a part (or possibly the sole component) of an investment/superannuation portfolio. The factors that determine the decision of each of these investors to remain with forestry differs with the particular circumstances of the investment, e.g. rented land as opposed to freehold, and the role forests play in their investments.

Whatever the reasons for an individual or organisation deciding to invest in forests the most obvious time for any investor to review and make modification to a forest investment is clearly at harvest. However, it is also true that given a suitable set of perceptions about land use options and returns, a forest owner could rationally decide to remove a tree crop and exit from forestry at any stage from the time of establishment until commercial maturity.

Commercial maturity is not something that is absolutely fixed – such that a crop that is 28 years old is commercially mature and one that is 20 is not. So if a crop is less than some particular age when it is harvested doesn't necessarily mean that its owner has decided to quit forestry and do something else with the land. Additionally depending precisely on when within a year an existing tree crop is harvested, the time between that harvest and establishment of a new crop on the site can vary. Thus even where there is no question of a change in use the time from harvest to re-establishment of a new tree crop can vary from a few months to two or more years.

Still if expected return helps determine the rate of new commercial planting, expected return should also clearly influence the decision to replant commercial forests after harvest. Figure 3 is a graph of the recorded total plantings (new and re-planting) for the period from 1992 to the present against the modelled 'expected' forestry returns. The trendline fitted to this data clearly show the relationship that would be predicted – with higher expected returns associated with higher levels of forest establishment.

Graph 3: Planting Rate versus Expected Forestry Return



Projections

While one should be very cautious about using the results of the above analysis to project the future - there is large margin of error with the figures – the revealed relationship, if coupled with projections of future forestry returns, does provide a basis for indicating both the potential future total and new commercial forest planting rates. Once these estimates are made differencing the two gives an estimate of re-planting rates. The relationships indicated by the trend lines can be used to provide an indication of how both new and re-planting rates might be expected to change, other things remaining equal, should basic forestry returns improve.

Table 1 provides estimates of projected returns (as per the MAF model of Graphs 2 and 3) and of the area established broken down into new plantings and replanting for the period from 2006 to 2010. Table 1 also gives an estimate of the response (in terms of total and new planting areas) from a present value increase of \$1,000/ha to expected returns from forestry. In terms of the model used this increase in returns is equivalent to approximately a 1% increase on the IRRs shown.

Table 1: Model derived IRRs and projected planting levels

Year	Projected Base IRR	Projected Total Plantings (Ha)	Projected New Plantings (Ha)	Replanting (Ha) (Total – New)	Projected Plantings with \$1000/ha PV improvement to returns	
					Total (Ha)	New (Ha)
2006	6.5	26,650	5,140	21,510	-	-
2007	6.42	24,300	4,774	19,526	51,480	12,043
2008	6.53	27,500	5,285	22,215	54,244	13,333
2009	6.67	31,500	6,013	25,487	57,702	15,177
2010	6.75	33,700	6,480	27,220	59,649	16,343

The IRR base projections were derived using the forestry prices given in MAF's 2005 Situation and Outlook for New Zealand Agriculture and Forestry (SONZAF) publication and the July 2006 update to this (MAF, 2006).

MAF's official estimates of new planting and replanting are based on a nursery survey and the 2006 results represent a further decline compared to the estimates for 2005 (see Table 2). Provisionally, MAF's estimate of new forest land planted in 2006 is 5,000 hectares (compared to a 5,140 hectares projection from modelling with the system outlined above). Replanting of harvested areas in 2006 based on the nursery survey is estimated to have been 26,000 hectares. That figure is some 4,500 hectares greater than the figure produced by modelling – and perhaps serves to indicate the possible dangers of uncritical application of the model to determining what the future holds for commercial forestry.

Table 2: Estimates of New Planting and Replanting for 2005 and 2006

	New Planting (hectares)		Replanting (hectares)	
	2005	2006p	2005	2006p
Radiata pine	2,000	3,000	31,000	25,000
Douglas-fir	2,000	1,000	< 1,000	<1,000
Other exotic softwoods	1,000	1,000	< 1,000	< 1,000
All exotic hardwoods	< 1,000	< 1,000	< 1,000	< 1,000
TOTAL	6,000	5,000	32,000	26,000

p = provisional

Source: Novis (2007)

Conclusions

Over the last twelve years the annual rate of new plantings of commercial forestry has been trending downward. New planting rates today are significantly lower than for most of the last 50 years. In addition since 2004 there has been a decline in the replanting rate.

MAF officials modelled 'expected' forestry returns over the past decade (using a three-year rolling average of log prices as a proxy for expected future earnings from forestry) and then compared these returns with the recorded areas of new planting and total planting for each year. This modelling showed a clear positive correlation between returns and both the new planting and total planting rates – with higher expected returns associated with higher levels of forest establishment.

While it is a good idea to be a little sceptical about using any identified relationships to project future plantings, nevertheless, such relationships do provide a basis for determining a possible future. They also allow one to project the response to the sector's fortunes proving

to be somewhat better than projected. In this instance, using MAF's latest forecasts for harvest and log prices, the model has been used to (Table 1) to project commercial forest plantings from 2006 to 2010 and to identify the change to these that might be expected for an approximately one percent improvement in sector returns over those forecast.

References

Novis, J. 2007: 'Forestry Planting - 2006 (Provisional)' MAF Policy Information IL-43/ST-06-12-01. 4p.

MAF, 2005: 'Situation and Outlook for Forestry' pp 27-30 *in* Situation and Outlook for New Zealand Agriculture and Forestry (SONZAF) 2005 www.maf.govt.nz/mafnet/rural-nz/statistics-and-forecasts/sonzaf/index.htm

MAF, 2006: 'Forestry' pp 14-15 *in* Situation and Outlook for New Zealand Agriculture and Forestry – An Updated to the December 2005 SONZAF www.maf.govt.nz/mafnet/rural-nz/statistics-and-forecasts/sonzaf/index.htm