



Tax changes – how real are the incentives to forestry?

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Abstract

The effects of the current and proposed tax regimes on forestry were evaluated using discounted cash flow analysis. Results clearly show how the current tax shield on asset growth provides returns that are significantly higher than those subject to a neutral income tax. Benefits are further enhanced by allowing current year deductibility of costs. However such tax induced changes to profitability tend to be capitalised into the value of land, and so benefits of the proposed tax changes will accrue only to land already held for afforestation. For new areas, current year deductibility is offset by higher prices. Thus the proposed tax changes will provide little real financial incentive to increase planting rates.

The market for immature forests is an important mechanism by which risks arising from the long-term nature of forestry can be reduced. The buyer's and seller's offer prices for mid rotation forests under alternative taxation regimes are analysed, and results show the inhibitory nature of current forestry taxation on the development of this market. The proposed tax regime further disadvantages trading of immature forests. Better tax treatment of such transactions would promote investment in forestry.

Introduction

Forestry taxation was one of the issues debated during the 1990 general election, with the former opposition, the conservative (National) party promising to replace current taxation policy with one more closely matching industry's proposals. As a result of the election outcome this policy is likely to be implemented. One of the main differentiating features of the proposed tax is that planting and silvicultural costs would be able to be deducted against current income, while the present regime requires growers to carry these costs forward until such time as income is realised from the forest.

The proposed changes are in response to the ongoing debate that took place between the forest industry and the previous Government. Much of the discussions revolved around concepts of "neutrality" and "fairness", and how forest tax compared with taxation in other sectors. Some of the arguments advanced by industry to support their claim that forestry was disadvantaged were based on comparisons of the mechanical workings of the schedule, while others were based on the reduced rate of afforestation seen since 1986. The main focus has been on tax effects on afforestation as reforestation is largely ensured due to existing infrastructure and the cost of converting land to an alternative use. Whether the issue is the afforestation rate or profitability, no analysis has been

published that showed what the appropriate rates might be, or to what extent the proposed tax regime would rectify these problems. The lack of such analyses has unfortunately done little to correct some of the misconceptions and erroneous assessments that have been published with respect to forestry taxation.

Much of the confusion with forestry tax seems to have arisen because of an inadequate understanding of the evaluation of inter-temporal cash flows under different taxation regimes, and the use of less intuitive variables, such as the effective tax rate (see Bevin, 1985). Just as it is important for Government to quantify costs and benefits of alternative strategies for policy formulation, foresters need to understand the appropriate analytical tools to be able to contribute effectively to such discussions. The aim of this paper is to show how taxation effects in the forestry sector may be evaluated, based on a standard approach. Its purpose is not to suggest policy, but to show the procedures required to identify the effects of tax on forest values and management practices. This type of information contributes to policy development, but needs to be weighed up against other considerations before final policy is implemented.

In the first section the effects of taxation on forestry was evaluated using discounted cash flow analysis for a typical forest management situation. This approach is not only familiar to foresters and investment analysts alike, but also allows analysts to simultaneously identify and take account of changes in forest management as a result of tax changes. Forest management effects are not identified by the effective tax rate approach. Three taxation regimes were analysed: the current tax, the proposed tax, and for comparison, a tax that is neutral on asset values and investment. The second section considers the tax effects on the market for immature (mid rotation) forests, where tax implications for buyers and sellers differ, thus distorting each party's perception of fair market value.

I. Values of Forest Investments under Alternative Tax Regimes

Analytical Framework

The prime purpose behind all taxation is to fund government activities. However there may also be other objectives, such as encouragement of an industry or sector, generating fairer income distributions, or to correct for perceived economic and social imbalances where reliance on market forces alone are not considered to lead to the desired outcome. For example, the motivation behind a levy on tobacco and alcohol is to improve social health through a reduction in consumption.

Three standard criteria are generally used for evaluating alternative taxes: efficiency, fairness and simplicity. The criterion of efficiency relates to taxation effects on economic activity, while fairness is used to accommodate society's values. Simplicity in taxation is important to reduce costs of compliance, auditing and collection. Unfortunately, there is no

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causal relationship between these three criteria, and development of taxation policy invariably leads to trading one set of objectives against another.

In a comparison of taxation policies it is useful to adopt a baseline against which new proposals can be compared, as a nation's well-being is an important concern. An appropriate baseline would be the taxation regime that maintains economic efficiency. An efficient tax regime is that which achieves the highest level of national welfare for a given level of government tax revenue. Thus its concern is with efficient allocation of resources rather than achieving a stated objective. Theoretical results show that a necessary condition for efficiency is a taxation regime that is neutral. Neutrality is the condition where taxation does not change signals to which resources respond (Lipsey 1971, p426), that is alter the ranking of investment opportunities. However, under this definition neutrality is difficult to test, and a more practical approach generally adopted is to consider neutrality as the condition where asset valuations are invariant to tax. This would ensure that investment behaviour remains unaffected by tax. By analysing forestry investments on a pre and post tax basis one can determine the degree to which tax affects financial returns, and thus forest values and management options.

The conditions for which an income tax does not affect asset valuations in long-lived production processes were first theorised by Samuelson (1964). His results are applicable to any income producing assets that both appreciate and depreciate. Applying his principles to forest assets allows costs to be deducted at the time they are incurred, and would also tax any real increases in forest value.¹ Any change in forest value would have immediate tax implications, whether this occurs through growth, tending, or even fire, windthrow, etc. Thus this type of tax is also known as an accrued income tax.

Chisholm (1977) analysed the effects of income tax in timber production. He compared Samuelson's neutral income tax with both realised and full expensing income tax regimes which at the time approximated federal income tax in the US and Australia respectively. In the US, growers claimed costs at the time income was realised from the forest, while in Australia costs were immediately deducted against other income.² These regimes therefore were similar to the current and proposed forestry tax in New Zealand.

An asset is valued by the discounted sum of future net earnings (see for example Brealey and Myers, 1988). For forestry assets this is expressed by the land expectation value (LEV), which for the proposed full expensing income tax is given by following equation:

$$LEV = \frac{V(1-Q) - \sum_{t=1}^n C_t(1-Q)(1+r)^{n-t} - A(1-Q)}{(1+r)^n - 1} - \frac{A(1-Q)}{r}$$

where \sum = "sum of"
 V = Value of harvest
 A = Annual administration or joint costs
 Q = Tax rate
 C_t = Establishment and Silvicultural Costs at time t
 r = post tax discount rate
 n = rotation length

This equation is simplified for expository purposes as it does not include items that can be depreciated, such as roading costs. The cash flow is discounted into perpetuity to capture the total effect of the tax policy on the investment as it applies

to current costs and returns. It does not imply any expectation on the permanency of policy. The rotation length chosen for the analysis is one that maximises the LEV, rather than that based on an outside imposed land value. On a national basis, it would be difficult to justify a land value that is different from LEV. The assumption is that the market for land is competitive, and the return under the forestry regime maximises return on the land. That is, forestry investors would only use land where forestry does not reduce its present value. Any other assumption would imply that in general forest growers are prepared to accept below average rates of return, or that the market for land is clearly uncompetitive.

An alternative case is where forest owners rent the land. However forest values and management practices would not change if the rental value is exactly related to the earning capacity of the land. Again, on a national basis, there is no evidence to indicate to the contrary, that is that forest managers are able to consistently and as a matter of course, extract above normal profit or below average rates of return. Hence under this assumption equation (1) is appropriate for both cases where the forest owner owns or rents the land.

Under the realised income tax, where expenditures are carried in a cost of bush account, the forests LEV is given by:

$$LEV = \frac{V(1-Q) - \sum_{t=1}^n C_t[(1+r)^{n-t} - Q] - A(1-q)}{(1+r)^n - 1} - \frac{A(1-q)}{r} \quad (2)$$

and the formulation for an accrued income tax (adapted from Chisholm) is given by:

$$LEV = \frac{V + \sum_{t=1}^{n-1} Q[C_t + A - G_t][(1+r)^{n-t}] - G_n}{(1+r)^n - 1} \quad (3)$$

where G_t is the value of the increment for the t^{th} year

This type of tax is difficult to implement, in both a practical and an analytical sense, and it is only given here for illustrative purposes. Aside from the difficulty in valuing forests on an annual basis, there is also the problem of quantifying incremental values due to tending and other cultural activities (or decrement due to catastrophic events). Unless this is done accurately, asset values will not remain invariant with tax. As a forest's post-tax LEV is equivalent to its pre-tax valuation with an accrued income tax, the land values for the baseline case can be derived based on a pre-tax valuation. This is because under the accrued income tax, deductions and liabilities are exactly offset by the effect of tax on the discount rate. The degree to which the discount rate varies with tax is expressed by $(1-q)^*i$, where i is the before tax discount rate (Chisholm, 1977).

The discount rate as used here reflects the cost of capital, which may be an opportunity cost, or earnings foregone by investing in forestry, or simply its borrowing cost.³ Assuming perfect capital markets, the after-tax cost of investments the same for both borrowed and own capital, as interest on borrowings are tax deductible, while a firm's earnings from accumulated funds are taxed. Thus an increase in tax reduces the cost of capital, and hence the discount rate (Samuelson, 1976, p475).

¹ Note this is similar to the current tax treatment given to investments held overseas.

² The current tax schedule in the US allows forest establishment costs to be depreciated over an eight-year period.

³ At the project level the discount rate may reflect the opportunity cost of the best alternative investment available. For such cases the above formulation for the after-tax discount rate may be inappropriate (see Campbell and Colletti, 1990).

Evaluation

The effects of taxation on forest value were quantified using discounted cash flow analysis. The net present value of any subsidy or penalty due to tax is the difference between the LEV of the particular tax regime and that for a neutral (i.e. accrued income) tax. This method also shows the forest management implications of different tax treatments. Forest managers, as typical for any economic agent will wish to seek to minimise tax liability and maximise the value of benefits.

The effects of the proposed tax changes were evaluated for a hypothetical stand in the Central North Island, pruned in two lifts to 5.5 m, with two thinnings to waste and final crop stocking of 300 stems per hectare. This regime was chosen because it lies within the range of common forest management practice. A 33 per cent tax rate and a real post tax discount rate of 5 per cent (7 per cent pre tax) was used. Inflation was initially assumed to be zero.

The value of forest land was enhanced by applying a realised or full expensing tax in comparison to the accrued income tax as Figure 1 shows. Both latter tax regimes allow value increases to compound before they are liable for tax. Additionally, the full expensing income tax allows deductions of forest costs prior to the realisation of income. In the example used here, deductions for expenses in forest establishment and silviculture had a net discounted value of \$640 per hectare. This value changed little with the range of discount rates generally used in practice.

The value of forest land under a realised income tax regime was affected by inflation. Inflation reduced the real value of the cost of bush account, and hence in real terms the value of the tax deduction from income upon harvest. For the regime used here, an inflation rate of 5 per cent reduced the LEV by approximately 10 per cent.

Taxation can also have significant forest management implications. However, only its effect on rotation length was considered here. The neutral income tax optimised rotation length at 26 years, while both the current and proposed tax regimes had their optimum harvest age at 30 years. A change in tax from realised income to current year deductibility of forest expenses would promote more intensive management operations, and in marginal areas induce tending where this may not have been economic before. Thus tax can also have an impact on product mix.

II. Tax Effects on the Sale of Immature Forests

By definition, the seller's and buyer's valuation for standing timber during the rotation is the same under a neutral tax regime, as tax liabilities fall only on the value of annual increments and is therefore independent of any commercial transaction. Even when forests are sold at above or below the

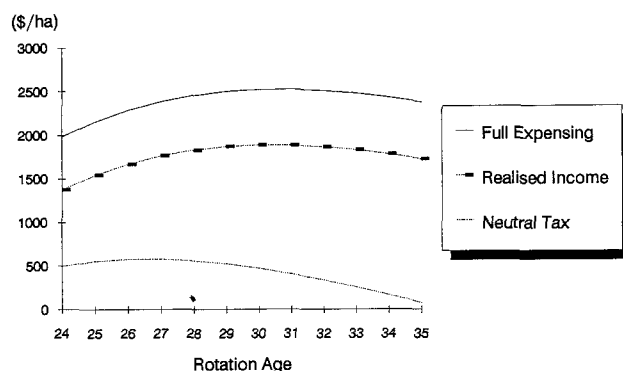


Figure 1: LEV for a Pruned Stand Under Alternative Income Tax Regimes, Evaluated at a Post Tax Discount Rate of 5%.

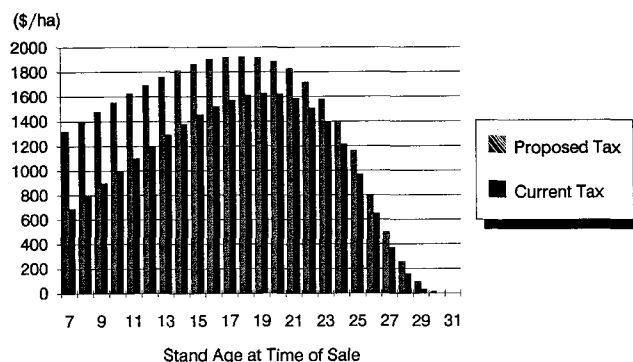


Figure 2: Buyer's Shortfall to Seller's Asking Price by Age of Stand (After Final Tending, 5% Discount Rate After Tax)

"market" price, the tax burden is shifted from the buyer or seller at the same rate as it is removed from the other party, and therefore the Government's tax revenue, and hence the value of the forest, remains unchanged. Investors would then remain indifferent between buying or selling, or growing forests to the end of the rotation.

The present and proposed tax regulations require the buyer to keep the timber component of forest purchase in a cost of bush account, which is deducted against income after harvest. While the seller can immediately claim all previous growing costs, tax is paid on the value of the timber sold. This reduces the tax shield effect by inflicting an early tax liability. Additionally, the buyer's cost of bush account is greater than it would have been had the forest remained with the seller, and this cost is carried to rotation age at the rate of interest. Thus the buyer is likely to offer less than the price at which the seller is indifferent to selling or holding the forest to maturity. Based on our previous example the buyer's shortfall for a given stand age for the two tax regimes is shown in Figure 2. The equations which generated these results are given in the appendix. Clearly the proposed tax regime further disadvantages the sale of immature forest.

Taking a specific case, a sale at age 12 under a full expensing income tax would result in a buyer valuing the standing timber at \$1690 per hectare which is 21 per cent below the seller's valuation. Under a realised income tax however, the seller's point of indifference is reduced as additional revenue is received from the cost of bush allowance. During a sale this can be claimed at an earlier date than if the forest was held to maturity, creating a benefit. In our example, the relative position between the two parties is accordingly reduced to \$1200, or 17 per cent of the seller's valuation. In all these cases, the tax effects have implications on rotation age.

If the purchase cost can be offset against other income, the buyer would offer exactly the seller's price (see appendix). The tax treatment would be neutral to the value of the asset. Although this may appear to give the fairest treatment to either party, it needs to be assessed against the intent of tax. The taxation benefits may have been intended as compensation for risks associated with long-term production, but with trading of immature forests, forestry is turned into a series of shorter-term production processes. Thus this treatment would allow associated parties to reap the tax benefits without incurring the risks for which these were to compensate.

Discussion and Conclusions

This paper uses foresters' time-tested technique of discounted cash flow analysis to show the effect of the current and proposed income tax regimes on forestry values and returns. The results show that both the current (realised income tax) and

proposed (full expensing) regimes are favourable to forestry by allowing forest assets to grow untaxed. Moreover, the net benefits are significant even without an allowance for immediate deduction of expenditures.

A competitive market values land based on its expected future earning capacity. Changes in market prospects, economic environment or productive capacity will tend to be capitalised into the land value. While changes in taxation may provide a windfall to current forest owners, buyers of land for afforestation are likely to be faced with a proportional increase in price. This assumption on land valuation is embodied in the LEV formulation to assess taxation impacts. While there may be specific instances where this relationship may not hold exactly, there is no evidence that this assumption is violated, especially if it is considered over the long run and at the national level. The recent adjustments in agricultural land values as a result of withdrawal of price support schemes clearly show this effect.

Although the type of analysis shown here is useful for quantifying the effects of alternative tax regimes, it does not show the wider costs to the economy. For example, tax concessions require other sectors to shoulder a higher tax burden, while facing increased costs for financing and other resources demanded by the forest industry. Unfortunately these are less readily quantifiable, and although equally important, are given less attention. Theoretical models exist that can be used to quantify "welfare" losses and gains, but the results are generally imprecise, due to lack of data.

The purchase and sale of mid-rotation forests pose a special problem in the formulation of taxation policy. In the three cases analysed, only a full expensing income tax with purchase price fully expensed show buyers and sellers arriving at the same valuation. Where the purchase price is carried in a cost of bush account, the exchange value is indeterminable and the tax advantage on the forest parcel is reduced by each sale. More significantly, the proposed tax changes inadvertently exacerbate the current situation, as they remove the cost of bush allowance that currently can be claimed at the time of sale. The ability to readily sell forests at any stage during a rotation is important for reducing risk, and should improve debt funding prospects for afforestation. Thus an improvement in the tax treatment would promote forest investment.

The current problem of mid-rotation sales for tax treatment arises because current taxation policy is partly designed to compensate long-term production processes. Foresters have long felt that the costs incurred due to the long-term nature of forest production is not adequately compensated by the market, and therefore tax relief is necessarily required for forestry to continue as an economic enterprise (this argument is rejected in Samuelson, 1976). Promoting the development of markets for immature forests is one way that risks can be reduced. In essence, the potential exists for timber production to be broken into a sequence of shorter activities. As the market for this develops, one could argue that less tax support is required to provide the same incentive for investment to flow into what is essentially a long-term production process. In effect, the current tax system does this in an imperfect way by reducing the tax shield effect during each sale. But it does this at cost to the development of this market.

The examples given in this paper highlight some of the problems that can be encountered with using the tax system to provide forestry incentives. Firstly, the benefits may be dissipated through increased land prices. Secondly, difficulties may arise in achieving consistency and balance at all stages in the tax schedule, to the point where disincentives may be created in certain areas. Furthermore, as the tax benefits apply to all forest investments, public resources may be misspent on inefficiently managed or uneconomic activities. Therefore if there is an identified need for policy change, the search should be for initiatives that are focussed and efficient, and which can be

monitored for their effectiveness in achieving specified objectives.⁴ As a general rule however, this should not be done in isolation of a complete review of other land-based activities, as a piecemeal approach may only result in creating greater economic imbalances.

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Appendix

After Tax Value of Immature Timber from Buyer's and Seller's Perspective

(1) Current tax

- a) The seller's after tax value S_1 of the standing timber if held to end of rotation is:

$$S_1 = \frac{V(1-Q) - \sum_{t=k}^n [C_t + A_t(1-Q)] (1+r)^{n-t} + \sum_{t=1}^n C_t Q}{(1+r)^{n-k}} + \frac{\text{LEV}}{(1+r)^{n-k}} - \text{LEV} \quad (4)$$

The value of the standing timber is the total discounted value of the current and future rotations minus the cost of the land (LEV). Note that the two terms containing the LEV variable is equivalent to the cost of renting the land from the time of sale to the end of the current rotation.

let

$$a = \sum_{t=k}^n A_t(1-Q)(1+r)^{n-t} \quad \text{the cost of bush account from } t=1 \text{ to } n$$

$$c = \sum_{t=1}^n C_t \quad \text{the cost of bush account from } t=1 \text{ to } n$$

⁴ An example of a more targeted policy initiative can be found in the US Forestry Incentives Program. Eligibility criteria apply based on owner group, forest size and productivity. This program has been credited to return taxpayers 8 per cent in real terms (Risbrudt and Ellefson, 1983).

and c_1 are the costs from $t = 1$ to $k-1$
and c_2 are the costs from $t = k$ to n
 $d = (1+r)^{n-t}$, the discount factor

$$-s = \frac{\text{LEV}}{(1+r)^{n-k}} - \text{LEV}$$

Thus s is equal to the holding (or rental costs) of land

Equation (4) can be written

$$= \frac{v(1-Q) - (c_2 + a) + cQ}{d} - s \quad (4a)$$

that is the seller's after tax value of the standing timber is the discounted after tax value of the harvest minus future cost of bush costs plus annual administration costs minus land holding (or rental) costs.

and the seller's after tax return from the sale is:

$$P(1-Q) + c_1Q \quad (5)$$

where P is the transaction price

The seller wants to be indifferent between selling now or holding timber to end of rotation. That is the seller wants equation (4a) to equal (5) to be indifferent to the sale.

Solving for P , which is the transaction price at which the seller is indifferent to the sale.

$$P = \frac{v(1-Q) - (c + a + ds)}{d-Q} + \frac{(c - dc_1)}{d-Q} Q \quad (6)$$

b) The buyer's after tax value of standing timber (B)

$$B = \frac{v(1-Q) - (c_2 + a) + cQ + BQ}{d-Q} - s \quad (7)$$

Simplifying,

$$\Rightarrow B = \frac{v(1-Q) - (c_2 + a + ds)}{d-Q} + \frac{c_2Q}{d-Q} \quad (8)$$

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(2) Proposed Tax

a) The seller's after tax value S_2 of the standing timber if held to end of rotation is:

$$S_2 = \frac{V(1-Q) - \sum_{t=k}^n C_t(1-Q)(1+r)^{n-t} - a}{d} - s \quad (9)$$

and the seller's after tax return from the sale is

$$P(1-Q) \quad (10)$$

Solving for P , which is the transaction price at which the seller is indifferent to the sale,

$$\Rightarrow \frac{V(1-Q) - \sum_{t=k}^n C_t(1-Q)(1+r)^{n-t} - a - ds}{d(1-Q)} \quad (11)$$

b) The buyer's after tax value of standing timber (B)

$$B = \frac{V(1-Q) - \sum_{t=k}^n C_t(1-Q)(1+r)^{n-t} - a + BQ}{d} - s \quad (12)$$

Simplifying,

$$B = \frac{V(1-Q) - \sum_{t=k}^n C_t(1-Q)(1+r)^{n-t} - a - ds}{d-Q} \quad (13)$$

Note: Equation (13) = Equation (11)* $\frac{d(1-Q)}{d-Q}$

Therefore Equation (13) is always less than Equation (11), that is the buyer always values the forest less.

(3) Purchase Price Expensed

$$B = \frac{V(1-Q) - \sum_{t=k}^n C_t(1-Q)(1+r)^{n-t} - a}{d} + BQ - s \quad (14)$$

Simplifying,

$$B = \frac{V(1-Q) - \sum_{t=k}^n C_t(1-Q)(1+r)^{n-t} - a - ds}{d(1-Q)} \quad (15)$$

Note: Equation (15) equals equation (11), and therefore under this taxation scheme the buyer and seller have the same perceived value.