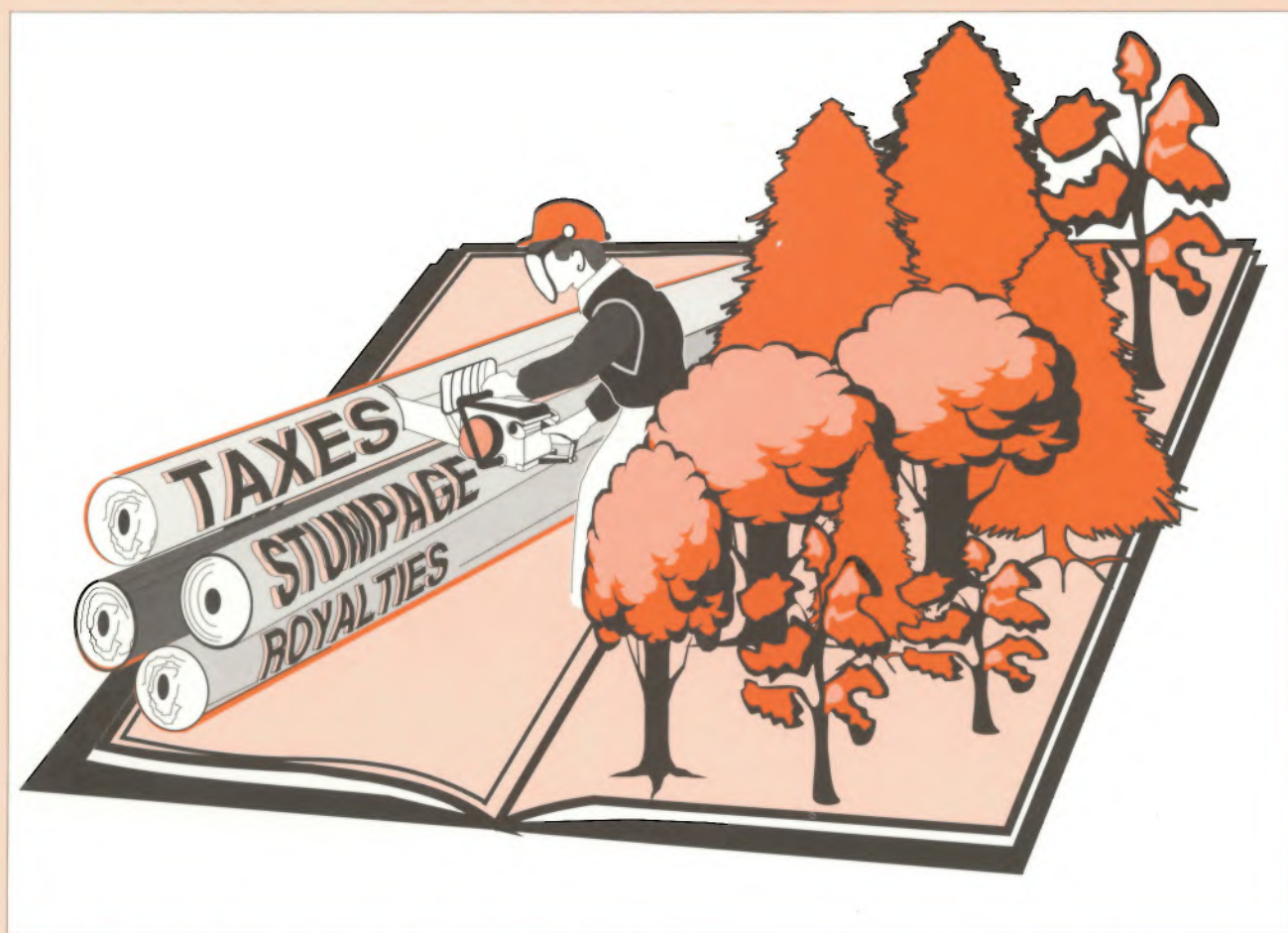




Taxation and other charges specific to forest resources: theory and New Brunswick's policy

By Derek MacFarlane
Forest Economics Group

Canadian Forest Service - Maritimes Region
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**TAXATION AND OTHER CHARGES SPECIFIC
TO FOREST RESOURCES:
THEORY AND NEW BRUNSWICK' S POLICY**

**Derek MacFarlane
Forest Economics Group**

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**Canadian Forest Service - Maritimes Region
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Abstract

Forest taxation and other charges are discussed in terms of common forms and their impacts on decision making. New Brunswick private forest landowners enjoy a relatively low tax and it can be considered neutral in terms of impacting decisions to harvest or manage. Opportunities for using forest land tax to influence management should be explored. Stumpage charges on woodlots promote highgrading if based on volume removed. Lump-sum stumpage charges do not impact decision making, as they are considered to be sunk costs. Crown land royalties are based on volume of wood removed and highgrading is prevented by strict utilization standards.

Résumé

La taxation et les autres formes d'imposition du secteur forestier sont analysées sous l'angle de leurs formes courantes et de leurs répercussions sur les décideurs. Les propriétaires de boisés privés au Nouveau-Brunswick jouissent de taux d'imposition relativement faibles et on peut considérer que ces taux n'ont aucune influence sur les décisions de coupe ou d'aménagement. Les possibilités de recourir à la taxation des terres forestières pour influencer les pratiques d'aménagement devront être évaluées. Les droits de coupe imposés au niveau des boisés favorisent les coupes d'écrémage lorsqu'ils sont basés sur le volume de coupe. Les droits de coupe forfaitaires du bois sur pied n'ont de répercussions sur la prise de décisions car on estime qu'il s'agit de coûts irrécupérables. Les redevances des terres de la couronne sont basées sur le volume de bois coupé et on évite les coupes d'écrémage en imposant des normes d'utilisation strictes.

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Introduction

This paper will focus on taxation and other charges specific to the forest resource in New Brunswick. That is, it will not deal with the general income taxes, sales taxes or other direct and indirect taxes on businesses, individuals or goods and services. These taxes affect forestry in the same way that they affect other economic activity. Instead, this paper examines the general attributes desired in taxation, common forms of forestry tax and other charges and the impact taxation and other charges have on forestry decision making. Finally, the type of forest taxation and other charges levied in New Brunswick (N.B.) and their impact on decision making will be presented.

Desirable Attributes of Taxation

Before discussing the desirable qualities of taxation, the question "Why tax?" needs to be addressed. As Nautiyal (1988) points out, in general, there are three purposes of taxation:

1. to raise revenue for public expenditure;
2. to move towards socially desirable redistribution of income; and
3. to control and regulate economic activity.

With most taxes, there are three qualities deemed desirable (Pearse, 1990):

1. **Neutrality:** The tax should not create incentives to change behavior. Therefore, it should not distort the allocation of resources nor the efficiency of resource use. However, few taxes are neutral and, consequently, they result in changing the economic behavior of those who must pay.
2. **Equity:** Although the concept of equity is subjective, it is not necessarily based on fairness. Instead, there are two principles of equity in taxation:
 - a. ability-to-pay principle - taxation according to wealth and income (*i.e.*, income taxes); and
 - b. benefit principle - taxation according to benefits received from public expenditures (*i.e.*, property taxes that pay for local services).
3. **Simplicity:** This refers to the complexity of administration, enforcement, etc.

Depending on the way taxes are charged, instability and risk can be shifted between payers and receivers. Therefore, taxes and other levies have important implications for efficiency in the way

resources are allocated and used, for the stability and distribution of income, and in terms of the complexity of administration. Forest taxes and other charges can be in the form of royalties, rentals, stumpage payments, taxes, etc., depending on who owns the land. These charges influence the way forests are managed and used.

Common Forms of Charges on Forest Resources and their Impacts on Decision Making

Taxes and other charges are an important consideration in forest management planning. For example, the optimum forest rotation is not only influenced by factors such as productivity of the land, the value of the timber produced, and the cost of harvesting, but by taxation and other management costs.

The forest resource charges to be discussed in this paper have been categorized into three groups (Table 1). The first two deal specifically with taxation and the last group is a "catch-all", dealing with other levies such as royalties. Unless indicated, the reference for this section is from Pearse (1990).

Ad valorem taxes are based on the assessed value of land or timber, excise taxes are based on the performance of an act (in this case, harvesting), and other levies are based on either the land, the harvest or the right to harvest. The various taxes and levies presented in Table 1 will be discussed in detail. The impacts that they have on output, rotation and quality of output are summarized in Appendix 1.

Ad valorem Taxes

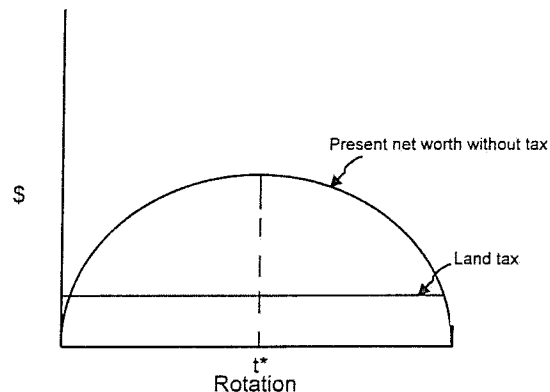
Land Tax

- Commonly levied by governments on freehold owners of land.
- Usually a fixed amount paid annually.
- Has the rare quality of neutrality because the amount payable does not depend on inventory. Therefore, land tax does not create incentives to alter management decisions and so does not distort efficient resource use or optimum rotation age. As shown in Figure 1, land tax has the effect of reducing profit but the tax itself is treated as an annual fixed cost.

Table 1 Forest taxation and other charges (Pearse, 1990).

	Form	Base	Usual Method of Determination	Usual Method of Assessment
1. <i>Ad Valorem</i>	land tax	land	% rate of land value or productivity	annual
	property tax	timber	% rate on timber value	annual
2. Excise	severance tax	harvest	based on volume harvested	according to harvest
	yield tax	harvest	based on volume harvested	according to harvest
3. Other Levies	land rent	land	arbitrary	annual
	royalty and cutting fees	harvest	based on volume harvested	according to harvest
	stumpage	harvest	competitive bidding appraisal or residual	lump sum, annual or according to harvest
	license fee	rights	more-or-less arbitrary	lump sum or annual

- The only effect this tax has is one of equity because it shifts resource rent from forest owners to governments.
- These taxes tend to be fairly stable because they do not depend on the level of production or earnings and are, therefore, preferred by government.
- Land tax is also typically easy to calculate and simple to administer and collect. Data requirements are demanding only in more elaborate attempts to estimate land productivity.



Property Tax

- Often levied annually on standing timber.
- Typically, it's a percentage of the appraised timber value. Therefore, as timber grows in value, taxes increase (*ceteris paribus*).
- This tax often discourages owners from producing valuable forest crops and is, therefore, considered detrimental to forest management. Silviculture is discouraged because higher volumes are created by silviculture, which produces higher values, and translates into higher taxes.

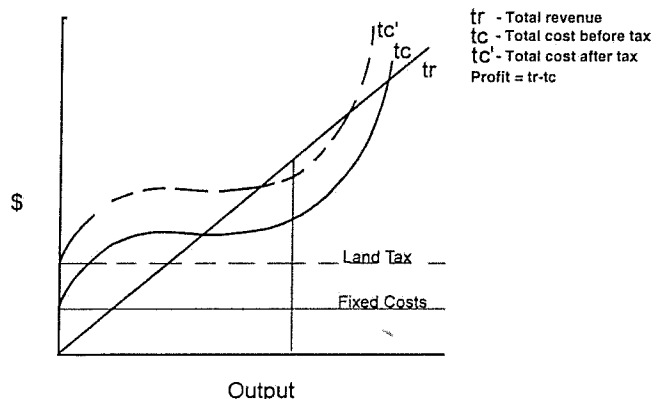


Figure 1. Land tax impact on decision making (Nautiyal, 1988)

Exise Taxes

Severance Tax

- These are not common in Canada, but have been used in the U.S.A.
- The amount of tax is based either on the volume harvested or a percentage of the timber value removed.
- They are most often applied to mineral or other non-renewable resources that, once removed, are gone forever (Gregory, 1987). This tax reflects the general notion that such resources are part of society's heritage and, as such, the tax is a payment to society for the privilege of depleting the resource.
- This has the same impact as a yield tax which is discussed next.

Yield Tax

- These are levied by government on timber cut from private land.
- This tax is either a percentage of the selling price or a percentage of the stumpage value.
- It is not widely used in North America.
- Applied to the selling price, it has the effect of lowering the selling price. Therefore, it has the effect of making marginal timber, sub-marginal (Figure 3). In other words, high-grading is encouraged because it is no longer feasible to harvest the lower quality products.
- Unlike property tax, yield tax increases the rotation (Chang, 1982).
- This tax also discourages silvicultural effort because silviculture increases the amount of tax due to larger volumes.
- This tax is more complicated to administer because it requires information on harvest volumes plus market values.
- Yield tax avoids the accumulation of taxes and interest that occurs with property tax and facilitates the payer's ability to pay at harvest time but, due to the cyclical nature of the forest industry, revenues to government are unstable. Government, therefore, finds it undesirable.

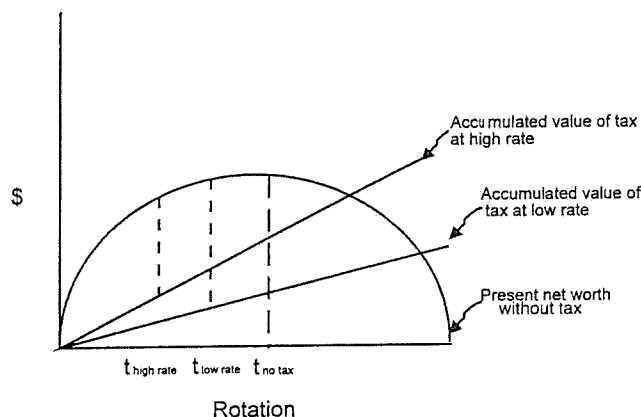


Figure 2. Property tax and optimal rotation (Nautiyal, 1988).

- Often property taxes can generate a tax bill (*i.e.*, payments plus interest) that represents a substantial portion of the value of the crop by the time it reaches harvest age. The result is that land is taken out of timber production altogether.
- In some jurisdictions such as developing countries trying to expand their forest industry, governments have used this tax to encourage harvesting. But, if left in place, it will discourage timber production in the long term.
- It is usually easy to administer because it is integrated with general property tax.
- This tax is not neutral because it leads to shorter rotations than is economically optimal as taxes increase (Nautiyal, 1988) (Figure 2).
- This tax has the same effect on the choice of rotation as an increase in the interest rate in Faustmann's formula¹. For example, higher interest rates result in discounting the future more, therefore, shorter rotations are preferred (Chang, 1982).

¹Faustmann's formula is the expression for the optimum economic rotation for continuous forestry. The formula is:

$$\frac{\Delta S}{S(A)} = \frac{i}{1-(1+i)^{-A}}$$

where: S = stumpage value
A = age of stand
i = interest rate

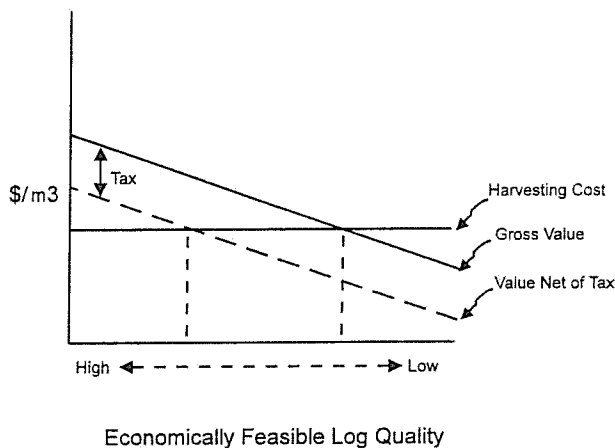


Figure 3. Yield tax applied to the selling price (Pearse, 1990)

A summary of forest taxation is shown in Figure 4. The per hectare tax on an annual basis as a forest stand ages is higher initially with a land tax than a property tax, but the land tax is constant over the rotation. A property tax starts low, but then rises over the rotation as the value of the asset (land and timber) rises. Finally, the yield tax comes due at rotation age. Since the timing of these taxes varies, the present value under each system differs (assuming an interest rate > 0). Generally, the higher the portion of tax dollars due towards rotation, the lower the present value. Therefore, the present value of future taxes will be least under the yield tax, greater with property tax, and greatest under the land tax.

Other Levies

Land Rent

- Commonly paid by holders of forest leases and licenses to public or private landlords.
- Usually, this is a fixed amount paid annually that is arbitrarily specified.
- This has the same neutral quality that land tax has; therefore, management decisions are not distorted.
- If the rental exceeds the entire economic rent², it will make the land unprofitable.
- This has essentially the same attributes as a land tax.

²Economic rent is a specialized economic concept that is defined as the surplus of income above the minimum supply price it takes to bring a factor into production (Barlowe, 1972).

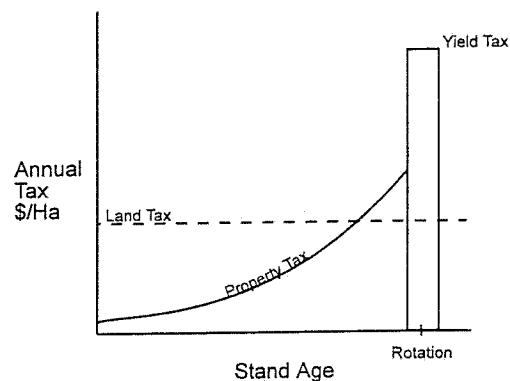


Figure 4. The tax per hectare as a stand matures under three forms of taxation. (Davis and Johnson, 1987).

Royalty and Cutting Fees

- Before discussing royalties, the terms "tax" and "royalty" need to be distinguished. The basic distinction between a tax and a royalty or stumpage fee is (Pearse, 1990):
 "a tax is always a government levy which expropriates for the public purse a portion of private wealth or income."
 "a royalty or stumpage fee is a purchaser's payment for a commodity – timber."
- Royalties traditionally represented a value of the resource that the sovereign reserves when granting rights of ownerships or use to private individuals.
- Cutting fees are usually charges for public timber.
- A royalty of a fixed amount has the affect of lowering the net value of all timber by the amount of the royalty. Consequently, the range of quality that could profitably be harvested is reduced and "high-grading" is promoted. Therefore, only the best lumber is cut (refer to Figure 4). Similar to yield tax, this also has the effect of making marginal stands sub-marginal.
- Royalties or cutting fees are simple to administer because they require only volumes harvested, a figure that is usually kept for other reasons. Because both are based on volumes harvested, revenues may not be stable.

Stumpage

- These are payments made to a public or private forest owner for timber harvested by someone else, *i.e.*, harvesting contractor. Stumpage serves the same purpose as a royalty or severance tax, but is typically more discriminating and is intended to capture all (or a large percentage) of the value of the standing timber.
- It is determined in a number of ways:

Public Auctions - common in the U.S. and to a lesser degree in Canada as long as competition is vigorous.

Upset Price - if there is no competition among buyers of standing timber, the upset price becomes the stumpage price.

Appraisals - These vary in procedure, but have some common elements such as:

1. volume/species by grade is estimated from an inventory;
2. value or selling price is determined;
3. cost of harvesting and transportation is estimated and subtracted from selling price; and
4. the remainder (conversion return) is reduced by an allowance for profit and risk by the operator/contractor to yield the stumpage rate.

- Appraisals can be very complex; therefore, administration costs are high.
- Often owners use a "rule of thumb" to establish stumpage, *i.e.*, 20% of the selling price, which simplifies things.
- Harvesting contractors sometimes offer landowners a lump sum stumpage payment. Usually, the contractor has a good estimate of the volume of wood that can be removed.
- Economic behavior depends on how stumpage is determined and how it is assessed.

For example:

- Lump Sum - not influenced by actual harvest and, therefore, behavior is not influenced. These charges become sunk costs and do not affect marginal decisions.
- Based on harvest volume - these do affect the operator's decisions. Have the same effect as royalty or severance tax by rendering marginal timber sub-marginal, except these charges are usually higher; therefore, the effects are worse. "High-grading" can be significant.

In summary, stumpage based on the timber recovered promotes "high-grading". In contrast, stumpage based on standing timber is based more on the availability of harvestable timber. Standing timber stumpage estimates are more neutral, but basing the tax on wood removed ensures operators/contractors are paying for what they take. It is more common to base stumpage on what is removed because this information is used for other purposes, *i.e.*, mill scale.

License Fee

- This is a charge for the right to harvest and must be distinguished from charges for the timber.
- These are typically modest charges and are justified as payments by licensees to have resources reserved for their exclusive use. Their impact is usually negligible.

Forest Taxation and Other Charges in New Brunswick

To bring more focus to the discussion, a brief overview of New Brunswick's resource, its importance in terms of the economy, and the general management strategy is warranted.

The forest industry is very important to the economy of N.B. Almost 50% of the value of all exports comes from forest products (MacFarlane, 1991). Ownership of the resource can be divided into four classes - provincial Crown land, industrial freehold, private woodlots, and federal Crown land (Fig. 5).

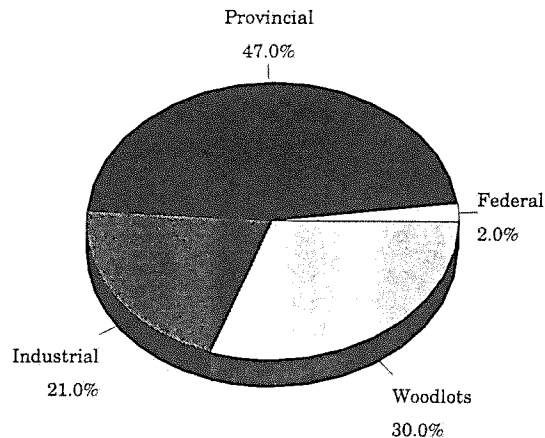


Figure 5. Forest land ownership in New Brunswick (MacFarlane, 1991).

In N.B. over 50% of the forest resource is privately owned, whereas the average in Canada is 9%. The forest industry in N.B. relies on all land tenures for its supply of raw material. A major problem facing industry in the short term (10-15 years) is a predicted shortfall in available wood from these ownerships (CAFD, 1989). The strategy adopted by industry and government to overcome this supply shortfall is an intensive forest management program. This program includes protection, scheduled harvesting, and silvicultural activities aimed at accelerating tree growth to help fill in this supply gap. The questions to be addressed in the remainder of this paper will be:

1. What type or types of forest taxation or other charges are levied in N.B.?
2. What is their effect in terms of forest management decision making?

Charges levied in N.B. related to the forest resource differ depending on the ownership. For example, private land is taxed, but royalties are charged on Crown land. Private land will be discussed first.

The problem of devising an equitable method of taxing forest land is certainly not new or unique to N.B. For example, in 1819, the Governor of the State of Connecticut, in a message to the state legislature, warned that:

"Timber and woodland may also be considered as capital, of which the interest and profits are deferred for periods of from twenty to one hundred years. If taxed annually, the rates ought to have reference to the remote period at which the income will be received; it being certain that an excess taxation would accelerate the destruction of timber and wood, and occasion ruinous mischief." (J.D. Irving, Ltd. 1963).

In 1951, forest landowners in N.B. expressed their concern to a Royal Commission on the Rates and Taxes Act, that the tax system in place (assessed on the value of the trees on an annual basis) "reduces the supply of wood to industry because owners were compelled to cut their trees too soon" to reduce their tax burden (J.D. Irving, Ltd., 1963).

In 1957, the Report of the New Brunswick Forest Development Commission recommended that "municipal taxation be designed so that forest properties bear a fair share of the total tax burden, but it should encourage rather than discourage good forest management (Bates *et al.*, 1957). This view was shared in the United States by the Society of American Foresters in 1980.

New Brunswick continued the policy of taxing the land plus the standing trees until 1967. Since 1967, the value of the standing crop has not been taxed. Currently, private forest land in N.B. is classed as

"residential property" under the Assessments Act and is taxed at a lower rate compared to "non-residential." If the land is not classed as a "farm woodlot" or is not part of a municipality, then it is classed as "freehold timberland." Therefore, private forest owners are treated very favorably under the current tax system, which is currently assessed at \$80 per hectare.

For example:

(1992 Tax Bill: 40 ha x \$80/ha = \$3200 @ \$1.50 tax/\$100 assessed = \$48 (Provincial Tax)

\$3200 @ \$0.17 tax/\$100 assessed = \$5.44 (Municipal Tax) = \$53.44 (Total Tax).

If it is classed as a farm woodlot, it is assessed at a value that will realize a tax of 80¢/ha/year for a total tax of \$32. (Assessment Act, Chapter 1-14, 1978).

The only other charge levied on private woodlands is stumpage. Stumpage paid to owners for the value of the standing timber can be in a variety of forms. Owners have charged operators/contractors based on a "rule-of-thumb", *i.e.*, 15-20% of the selling price, a lump sum payment or based on an appraisal. It is rare that stumpage is charged based on a public auction, but occasionally stumpage sales have been advertized in local newspapers where, in theory, the owner would receive offers and choose the "best" one.

The provincial government charges a royalty for wood harvested on Crown land. Since 1982, under the Crown Lands and Forest Act, the province has set royalties based on the fair market value of the end products derived. These have been set at approximately 70-80% of the fair market value. Fair market value is based on the stumpage charged by private land owners³. Private woodlot owners have argued that the low Crown royalty rates, relative to private stumpage, have caused unfair competition. This is one reason why the Crown went to a fair market royalty rate. Table 2 and Figure 6 show the royalty rates charged since 1972.

The Crown, under the Crown Lands and Forests Act 1982 has contracted the management of their lands to ten major forest products companies in N.B. In return for this management, the Crown has waived any license fee it would have charged if the province was responsible for the management and, as noted above, reduced royalty rates by approximately 20%. Therefore, in theory, the licensees are paying a fair market rate to harvest Crown wood, *i.e.*, royalty + overhead cost for management (pers. comm., David MacFarlane,⁴ 1993). As mentioned, there are no license fees paid by the license holder but, for over 100 sub-licensees (*i.e.*, smaller wood-using facilities with a license), the "overhead charge" is a cost. This negotiated "overhead fee" is charged by the licensee in return for maintaining roads and developing operating and management plans, *i.e.*, managing the license. These "overhead fees" vary between licenses depending on the service provided to the sub-licensee.

On federal lands, the Canadian Forest Service accepts bids for the right to harvest. The tender is called with an upset price established at 90% of the fair market value, as determined by the provincial government. Successful bids have traditionally been at approximately the fair market value (pers. comm., Colin Rayworth,⁵ 1993).

The Impact On Decision Making

On private forest land, the charges other than taxes (*i.e.*, stumpage) influence decisions depending on how they are charged.

For example:

Lump sum - Based on the theory, this form of stumpage does not affect behavior because it is viewed as a fixed or sunk cost to the operator/contractor.

Based on Harvest Volume - This form of stumpage does affect an operator/contractor's behavior by promoting high-grading.

³For more information on procedures to determine fair market value, see Fellows (1985) and Agfor Ltée (1989).

⁴Assistant Deputy Minister, Renewable Resources for the NBDNRE.

⁵Manager, Federal Lands for the Canadian Forest Service - Maritimes Region.

Table 2 N.B. Royalty Rates (DNRE, 1992).

YEAR	UNIT OF MEASURE	SP, FIR, JP SAWLOG	SP, FIR, JP PULPWOOD	HARDWOOD SAWLOG	HARDWOOD PULPWOOD
1991	m ³	\$7.21	\$6.39	\$7.21	\$3.77
1990	m ³	\$7.21	\$6.39	\$7.21	\$3.77
1989	m ³	\$6.93	\$6.20	\$6.89	\$3.71
1988	m ³	\$6.93	\$5.29	\$6.89	\$3.28
1987	m ³	\$4.98	\$4.65	\$5.05	\$2.55
1986	m ³	\$4.98	\$4.65	\$5.05	\$2.55
1985	m ³	\$3.95	\$3.78	\$4.51	\$2.39
1984	m ³	\$3.95	\$3.78	\$4.51	\$2.39
1983	m ³	\$3.62	\$3.15	\$3.62	\$2.39
1982	m ³	\$3.30	\$2.94	\$3.30	\$2.17
1981	m ³	\$2.40	\$2.15	\$2.85	\$1.89
1980	m ³	\$1.15	\$1.40	\$1.25	\$1.50
1979	m ³	\$1.15	\$1.40	\$1.25	\$0.68
1978	mfbm & crd	\$6.00/mfbm	\$3.00/cd	\$4.00/mfbm	\$1.00/cd
1977	"	"	"	"	"
1976	"	"	"	"	"
1975	"	"	"	"	"
1974	"	"	"	"	"
1973	"	"	"	"	"
1972	"	"	"	"	"

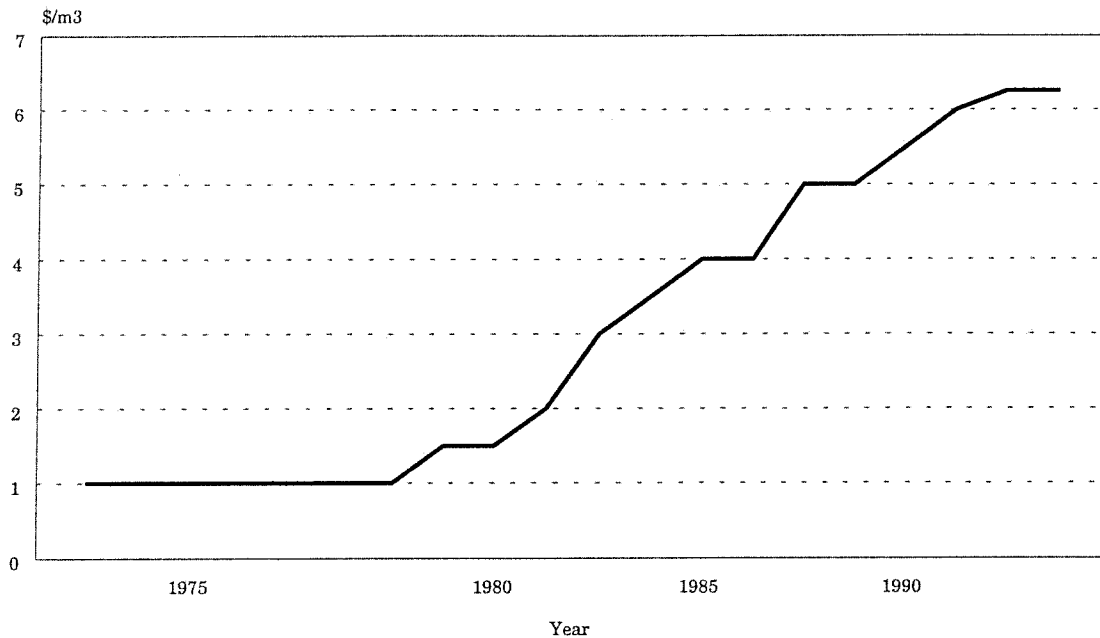
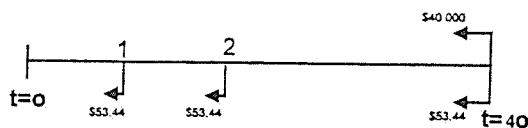


Figure 6. N.B. Royalty Rates for pulpwood (NMDNRE, 1992).

Taxation of private forest land provides a stable revenue source for government, but it certainly does not influence the behavior of the landowner. For example, given an average farm woodlot of 40 hectares, the taxes paid annually would amount to only \$53.44. The net present value (NPV) example below underscores the fact that, even carrying the cost of current taxes for 40 years, there are still ample revenues to produce a positive NPV.

NPV Example:



$$*100 \text{ ac} \times \$20/\text{cd} \times 20 \text{ cd}/\text{ac} = \$40,000$$

- Assumptions:
- 40-ha woodlot
 - taxes remain at current level
 - no other costs (*i.e.*, adequate regen., etc)
 - stumpage remains at current \$20/cord
 - clearcut at 40 years
 - Discount rate (r) = 10%

$$\begin{aligned} \text{NPV} &= \text{PV}_{\text{REV}} - \text{PV}_{\text{Cost}} \\ &= \frac{\$40,000}{(1.1)^{40}} - \frac{53.44 (1.1) [(1.1)^{40} - 1]}{.1(1.1)^{40}} \\ &= \$884 - \$574 \\ &= \$310 \end{aligned}$$

[Note: Stumpage could be as low as \$13/cord in this example to break even, *i.e.*, NPV = 0]

This "reluctance" of woodlot owners to harvest has been evident over the past few years where operators/contractors having problems finding private forest land to harvest. Of course, the poor track record of some contractors has caused some of the problems, but the fact remains that property taxation in N.B. does not motivate owners to harvest. In fact, owners are generally too busy with other activities to harvest or manage their woodlots (Roy, 1983). The type of tax levied in N.B. can be classed as an *Ad valorem* land tax based on a relatively low valuation of the property and not on the timber. The inactivity of owners corresponds to the theory that a land tax has the rare quality of neutrality— their economic behavior is not changed.

On provincial Crown land, the royalty charged is based on the volume harvested and theory suggests that high-grading would be promoted. To counter this problem, the Crown enforces strict utilization standards; therefore, high-grading is not allowed.

The federal Crown also receives a royalty based on the amount harvested. Similar to the provincial Crown, utilization standards are enforced here as well to prevent high-grading.

Summary

Forest taxation and other charges can have an impact on the decision-making process depending on the type of tax or levy and the land ownership category.

Private woodlots in N.B. are subject to a very favorable tax (from an owner's perspective). The tax is relatively low and is neutral so it achieves the desired impact of any taxation policy. Although this tax may be favorable to woodlot owners, the question of whether it's good for society as a whole needs to be addressed. For example, the province is currently heading towards a wood supply shortage and the main strategy to overcome it is an intensive forest management program. The current tax policy on woodlots takes a laissez-faire approach to woodlot management. Alternatively, a different policy that possibly taxed non-managers and provided relief to managers could influence management and harvesting. Different options are beyond the scope of this paper, but there do appear to be some different approaches worthy of investigation.

Stumpage charges on woodlots influence the economic activity depending on how they are charged. According to theory, lump sum charges do not affect the activity whereas stumpage based on volume removed can promote high-grading unless action is taken by the owner to prevent it (*i.e.*, through contracts).

Provincial Crown land activities are subject to royalties based on volume of wood removed. Enforcement of utilization standards by government prevents high-grading. The situation is similar on Federal land.

Forest taxation and other charges can influence the decision of when and how cut. In N.B., this influence is minimal, but remains a tool that government could use to influence activity on the forest resource. Provided they are equitable and simple to administer, taxes can play a role in the management of a resource for the benefit of society as a whole.

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APPENDIX I

Impacts of Forest Taxation and Other Charges

Tax	Output	Rotation age	Quality
Land Tax	None	None	Increased highgrading, lower quality wood becomes unprofitable
Property Tax	Increases output to finance tax bill	Decreases	Discourages the production of quality timber because this will increase the tax bill.
Severence		Same impact as yield tax	
Yield Tax	Decreases	Decreases	Lower quality wood becomes unprofitable, the net selling price is lower.
Other			
Land Rent (same as Land Tax)	None	None	Promotes highgrading
Royalty/Cutting Fees (same as Yield Tax)	Decreases	Decreases	Promotes highgrading
Stumpage -Lump Sum	None	None	None
-based on harvest volume	Decreases	Decreases	Promotes highgrading
License Fee	None	None	None