

TF: Notes for Statement by MG

Basic Outline.

1. If keep TF class
2. If elim. " "

Break down report, parcel out.

1. ~~Base~~ Handling ^{development rights} decertification. ^{or withdrawal} or other transition, to new use. - M.G.
2. aac basis of asset. vs. inventory basis. - TK.
Is it done correctly
3. Need for allowing multiple use - TK
4. Extension of taxation to Crown land - JOM
5. Administration of certifu. - JOM
6. ~~Case for~~ Land tax as alternative - M.G.
7. Yield tax as alt. - JOM
8. Forest Roads ^{and other capital} ~~to Capital~~. - TK
9. Distribn. of revs. JOM

10. Use of appraised values as basis for assmt. - TK
Procedure of accumulating & averaging. } JOM
Treatment of royalty reservations.

11. Effect of royalty reserves on property tax valuations

- is there an effect as Pennie says.

M.G.

(Effect of export permits, too)

12. Disposition of applications. New TFS, & additions to old TFS.

13. Split rates, tableau. Forest Ind. only - JOM

14. Assessment practices & patterns

E.g. Premerchandisable timber on wild land is not assd

15. Incentives to regenerate (subsidy)

16. Direct subsidies in lieu of tax rebates.

EIS will draft; all agree.

T 7 taxes

History needed:

1. Tax payments
2. Valuations
3. Effective rates

PMM T. 6 shows rate const. at ca. $1\frac{1}{2}\%$, 1966-72.

Both taxes and "taxable assets" rose 56%.

Probably these data apply mainly to mills. So they do,

T. 7 shows.

1972, \$20m of \$28m was for mills,

mostly pulp. Others were

Timberlands	\$ 2.1 m
T 7	1.3 m
Forest lands	.5 m
Logging improvements	1.1 m

Forest Income Taxes, Canada.

a substantial unit of income taxes are deferred.

(See PMM T.5, p.10.) About 75% are paid, & 25% deferred (but payments probably include some past deferrals, so more than 25% of current liability must be deferred.)

Ask Milton Moore.

Do property tax assess. really reflect current appraisals?

PMM, T. 4, p. 9, shows deep drop of inc. taxes,

1970 & 71, but no trace of this in trend of property taxes.

Ask JOM.

PMM = Peat, Marwick, & Mitchell Rpt. to CofI, Oct. 73.

PMM say "return on invt." have been low 1966-72.

Around 5%, jumping up & down. T. 3.

If so, these firms are inefficient. Probly internalize too much K.

Also, likely have ~~forwards~~ unrealized K-gains on Crown lands they have preempted, (or thought they did), by premature invt. This last is most likely.

Propty. taxes on big mills, where mills are used to nail down Crown land, are a kind of land tax, and one that cools off premature appropriative invt.

PRELIMINARY REPORT ON "TAXATION TREE FARMS"

Also known as "Certified Tree Farms"

Submitted to Property Tax Commission

12 September 1975, Penticton, B.C.
meeting.

INTRODUCTION

Taxation Tree Farms (TTF's) are not the same as Tree Farm licenses (TFL's). TTF's are found on privately held or Crown granted land. TFL's are a form of tenure over Crown land. A source of information about TTF's is "Tree farm land", Department of Finance, Surveyor of Taxes Office 1955. A more recent treatment may be found in "Taxes and Miscellaneous Levies on Forest Resources in British Columbia", policy background paper produced by the Royal Commission on Forest Resources, Victoria, July 1975, written by Hartley Lewis and Peter Pearse.

About 95% of the surface area of British Columbia is held by the Crown. TTF's are found on the remaining 5% which is Crown granted or privately owned.

Provincial property taxes, including taxes on Tree Farms, are levied under the Taxation Act, which applies to rural areas outside municipalities. Revenues generated accrue to the province's general fund.

Timber is considered part of the land legally rather than as an improvement, therefore no 75% factor is applied, as in the case of buildings. On the other hand standing timber is probably characteristically under-assessed, particularly immature timber. There is, however, no systematic study of this phenomenon in British Columbia.

There are four classes of forested land with different tax treatment on the Crown granted lands. These are timber land, Tree Farm land, wild land, improved land. In addition there is the class called "Forest Land", consisting of the old temporary tenures on Crown land where the timber is also subject to a property tax at a low level.

The acreages involved are as follows:

Timber land	616,000
Tree Farm land	1,337,000
Wild land	228,000
Improved land	114,000

Total forested land classes on private land
2,295,00 acres.

In addition there is the forest land class on Crown Land
833,000 acres.

The three large classes here are forest land, timber land and Tree Farm land. It is significant that most of the forest land is in mature timber, about half the timber land is in mature timber and only 19% of the Tree Farm land is in mature timber. Most of the remaining 81% is in "immature" timber, but a good deal of it is not satisfactorily restocked.

Classification of land as Tree Farm land is the result of a voluntary act on the owner's part. He applies for the class, he gets a registered professional forester to draw up a plan which the Forest Service will approve - a management plan, that is - and he sticks with the plan. Remaining in the class is also a continual voluntary act by the owner, since he may decertify his land at any time.

In the absence of the Tree Farm option land with timber would normally be "timber land" until clear cut. Then it would become "wild land" until the immature growth reached 8,000 feet per acre on the coast or 5,000 feet in the interior, at which time it would once again become timber. "Improved land" is a residual class, including lands that do not fall under any of the above categories. The definition is a little vague and the Surveyor of Taxes has commented on the difficulties of knowing the legislative intent.

Rural lands, including forested lands, are subject to two or more kinds of property taxes, that is, provincial taxes and school taxes as well as smaller items like hospital taxes and special taxes. The school tax is the greatest of these. There are 74 school districts which cover most of the province and they levy the tax at varying rates. The taxes are collected by the Surveyor of Taxes in conjunction with the provincial property tax. Provincial property taxes run around 1% or less of the legally defined tax base, while school taxes run around 3%.

I. Definition of Tree Farm Tax Base.

The advantage to the owner of going into a Tree Farm and subjecting himself to forest service regulations is the Tree Farm tax base, which is defined in such a way as to lower the base considerably. Timber land is assessed on the inventory basis. Following a court decision the previous practise of granting "wholesale" rates to larger holdings was discontinued. The whole-sale rate was conceived as a special discount based on the premise that larger holdings would be liquidated more slowly than smaller ones. It resulted in large holdings being assessed at substantially less per unit than smaller holdings adjacent thereto and, of course, this occasioned protests.

The Tree Farm base differs from the timber base in several respects.

- (a) Privately owned improvements that are designed to facilitate the management and the operation of and the growing and the harvesting of wood on TTF's are exempt from the base. This includes forest roads. This would be a very significant item except that it applies only to the 1% provincial property tax and not to

the 3% or more school tax.

- (b) The owner agrees with the forest service to harvest his timber very slowly, that is, to submit to the "allowable annual cut" concept as defined by the Forest Service. The value is then determined by "capitalizing" the annual income from this low allowable annual cut. The capitalization rate is currently 14% a year, a rate which includes property taxes as well as a rate of interest. That means that the value of the allowable annual cut is divided by .14 which is the same as multiplying it by about 7.

Stumpage values for this purpose are estimated from current Forest Service appraisals in the same region. This means that at the present time, with stumpage values being set at the statutory minimum of \$1.10 per CCF that the 1975 values for Tree Farm will be negligible. In 1974, on the other hand, they were higher and in general they bounce up and down each year with the current stumpage values.

It is worth noting in this connection that while stumpage values in British Columbia are close to zero this year similar stumpage in Washington and Oregon is selling for rather good prices under the auction system in use by the U. S. Forest Service. Under our system assessments on private land can be no better than the appraisals made for Crown land, and these appraisals are, in my opinion, not very accurate and probably generally too low.

- (c) There is no separate assessment of land possible under the TTF treatment. Thus land such as that on Galiano Island, which is partly a Tree Farm, which has very high non-forest alternative uses, is assessed strictly on its income from the forest use. The development values are totally exempt, just as in the case of farm land, which is also assessed on a use basis.
- (d) Values of forest land derived from the "allowable cut effect" or ACE are also unreflected in assessments for Tree Farm purpose. Under ACE land of little or no intrinsic value may have a substantial market value because by buying it and going through the motions of replanting it the owner may increase his allowable cut from mature timber. This is an anomaly of Forest Service practise which perhaps should not be allowed to continue but which does continue nevertheless and is reflected in market values.

Many private lands are held subject to a royalty payment reserved to the Crown. Where such a royalty is due it is deducted from the calculated income before capitalization to determine assessed value.

- (e) The Tree Farm assessment base is a great deal lower than the same property would have if it were classed as timber land. This is partly compensated by failure of the legislation to apply the 50% discount which is applied to timber land, that is, the capitalized Tree Farm value is also the assessed value at 100%.

- (f) The Surveyor of Taxes estimates the net results is that taxes are about half of what they would be if the land were treated as timber land. This estimate, however, is made without taking account of the development value of land in places like Galiano Island.

The failure to assess development values is most graphically portrayed in the case of land which is not productive of timber but which may have a high value in other use. Since it adds nothing to the allowable annual cut the non productive land adds nothing to the assessed value and is therefore totally tax exempt. A rocky promontory on the shore of an island would be an example of land with a high recreational residential value and no timber value.

- (g) It is worth noting that 100% assessment of all property would result in reducing the burden on Tree Farms to about one-half of what it is now if no other corrections were made. That is because no 50% factor is presently applied to Tree Farm land, although it is to other land.
- (h) It is further worth noting that the removal of schools from the property tax would remove some three-quarters of all property taxes levied on forest lands and probably other rural lands as well.

II. Ownership of Tree Farms

- A. The ownership of Tree Farms is quite highly concentrated. The top three have 80% of the Tree Farm land. These are MacMillan Bloedel, Rayonier and B. C. Forest Products. The largest individual owner, MacMillan Bloedel has 65% of the area.

- B. As to location, Tree Farms are scattered around the province but most of them are in the south-west coastal area.
- C. Some of the large, individual Tree Farms are fragmented. One of the purposes of allowable annual cut is to assure communities of even flow to promote community stability. Where Tree Farms are fragmented this purpose is probably not being well served.

III. Major Issues for Examination

A. Decertification.

In order to use Tree Farm land for anything but growing timber under a Forest Service approved plan it must be decertified. There is no provision for multiple use. A substantial fringe of the Tree Farm land now would find its highest and best use in non-forest purposes such as residential and recreational. It is probably in the general interest that the resources be put to their current highest use. The original legislation was based on a static concept which did not evidently contemplate changes in demand for lands which were then finding their best use in forestry.

The issues surrounding decertification are

1. The neighbors frequently object for the usual reasons.
2. Should back taxes be collected.
3. On whose initiative should the land be decertified.

The problems posed are closely analogous to those involved in any rezoning, although this is not legally a "change of zone".

- B. Is allowable annual cut management of benefit to the province? Are forest service bureaucrats the best judge of the best use of land? Are they objective judges in the competition between forest and other uses?

It is my personal opinion that provincial needs require rapid reforestation after logging, that is, maintenance of green cover, and that this is a different objective from the slow cutting cycle objective and the even flow objective which the Forest Service administers. It should also be noted that there is nothing in the legislation to prevent the logging of steep slopes or to assure their reforestation, and indeed it frequently happens that steep slopes are logged and not reforested in Tree Farms.

- C. Multiple use is an issue. The present legislation stringently limits the Tree Farm class privilege to individuals who dedicate their land totally to the single use of sustained yield forestry.

- D. Supervision.

The legislation requires that Tree Farm land be supervised by the Chief Forester. In practise, however, the work of supervising the class has been left with the Surveyor of Taxes, who has designated an individual. At present this is Mr. Tony Sayles, who is now with the B. C. Assessment Authority, performing this same function.

IV. Suggested Reform.

The proper purpose of forest legislation, I suggest, is to encourage reforestation rather than to discourage logging. The Tree Farm class is based

on the second value judgement.

In order to accomplish the first I would suggest exempting standing timber from the property tax and raising the rate on the forest site to compensate for loss of revenue.

It is proposed that the question be considered of having the Provincial Government subsidize reforestation by a preferential tax treatment in standing timber. The method may perhaps be in the form of having standing timber exempt from property tax, taxing the timber site more heavily.

Exempting standing timber from property tax could be done at no cost to the Province and would create a greater incentive for reforestation and prevent capital from being drained out of the Province.

The benefits to reforestation would be:

1. aesthetic
2. watershed protection
3. maintaining a base for the lumber industry.

It is also proposed that Crown land, which is presently non-taxable, be treated in the same manner as privately held land, with a site tax.

A comparative study of the method of taxation on forest land in other countries is suggested as a project that would be worthwhile before recommendations are presented. Finland is outstanding.

Not same as TFLs.

I. Tax base defn.

- A. Now cut, to a.a.c. Idea is to encourage this. Close spacing is not required.
- B. Cap. inc. ~~to~~ (omits ACE inc.) (deducts royalty, where due.)
- C. Select hi cap. rate ... 14%
- D. But fail to equalize
- E. Net result, ~~but~~ taxes are about half.
- F. But, land not assd., so ripening land exempt.
- G. 100% asmt. wd. result in ~~to~~ reducing burden on T.F. to $\frac{1}{2}$ what it is now.

Exempt forest improvement - prov. tax only.

So are all non-productive areas.

II. Ownership of T.F.s.

A. Concu: Top 3 have 80%. M&B, Rayonier, ~~to~~ BC&P.

B. Areas: Scattered, but heavy on coast

C. Big M&B T.F. is fragmented, so no community gets E.F.

III. Alt. taxes

Wild land off. by Timber Class, basically.

Wild land 3% (60 mills on 50%) ?

Timberland ~~for~~ 1 1/2% (30 mills on 50%) ?

"Improved" land, 1/2%, but defn. unclear, (10 mills on 50%)

Rates are fixed, so taxes vary only w. assmt.

and values of the classes:

Timber land	\$105 m	@ 50% mkt
TF	56 m	@ 100% "
Wild	13 m	@ 50%
	<hr/> 174 m	

Is also Forest Land, Occupancy of Crown Land

IV. Issues

A. Decertify.

B. Is AAC mgmt. of benefit to Province?
(Maintaining cover is all province wants; & TF
don't replant steep slopes.)

C. Multi-use

D. Supervision - by BCAC, or Forest Service?

V. Proposal

Exempt timber from tax, raise rate on site.

Alienate more Crown Land

Might separate out dev. rts. Let owner
pay taxes, or forfeit to Crown.

1 decs, T.F.

1. Residence Requirement, as in Ont. law.

2. Loans to small forest raisers.

A balanced forest is simply a way to avoid having to borrow, or pump in ~~it~~ from other sources, etc. (Is also advanced as means to ~~an~~ even flow of output, but there may be a similar answer, i.e. in the off years the labor goes into other jobs, & the downstream labor does too.)

As far as smallholders go, loans ~~are good~~ solve the credit problem.

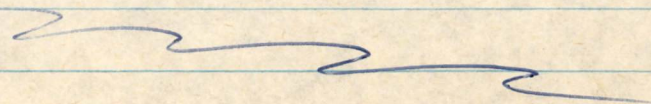
Loans are better than sharing costs, b/c. loans bear interest, which offsets deferral effect of tax on harvest.

3. Yield tax puts premium on nat. regen.

Regeneration loans, ~~offer~~ do the reverse, & may be non-neutral that way. But if non-neutrality is desired — as it seems to be — this is better.

4. Loans to carry taxes may be OK. Again, they do not slow harvest.

Rate charged shd. be high enough to screen out strong hands, but attract weak ones.



a reprint from

Journal of

FORESTRY

Society of American Foresters

Publishers

Suite 300

1010 Sixteenth Street, N.W.

Washington, D. C. 20036

The Importance of Land Opportunity Cost In the Determination of Financial Rotations¹

David Haley

Abstract. Alternative approaches to financial rotation determination are discussed. In the past, it has been assumed that the importance of land opportunity cost, in financial rotation determination, is proportional to the magnitude of this cost. From recent work on Douglas-fir in British Columbia it appears that the importance of land opportunity cost depends principally on prevailing market conditions, related to tree size and quality. It is not safe to ignore the opportunity cost of land, when calculating financial rotations, without first investigating the nature of the stand's value growth function.

THE PROBLEM of rotation length has occupied the minds of forest economists for over a century. Today, most forest economists agree that a stand has reached its optimum age when the cost of holding it for another period, one year or one cutting cycle, is greater than the expected value increment of the stand during this period. Forest economists fail to agree, however, on the methods used in computing the optimum rotation.

One of the main sources of controversy is whether the opportunity cost of the land occupied by the forest should be included as a necessary cost of growing timber.

The opportunity cost of the land is the income which could be earned by the land in its next best alternative use. It is, therefore, the income which the landowner must be willing to forego in order to maintain his current forest crop. The Faustman formula, traditionally used by foresters for rotation determination, recognizes the importance of releasing the forest site for future use. It identifies the optimum financial rotation as the point of maximum land expectation value. (Land expectation value is the capitalized value of all future net revenues of the forest.) Movements away from the Faust-

man approach to rotation determination will be discussed further.

One group of economists disregards the opportunity cost of the land completely, and maximizes financial returns over the rotation by equating the marginal value growth percent of the forest crop with the alternative rate of return available to the forest owner. Symbolically, this approach may be expressed as follows:

$$\text{At the optimum rotation, } \frac{dg}{G} = p$$

Where:

dg = annual value growth of the stand (dollars per acre);

G = capital value of standing timber expressed as conversion return or stumpage (dollars per acre);

p = alternative rate of return expressed as a decimal fraction.

This solution deals with the cost of holding capital in the form of timber but fails to recognize the second important cost, namely the cost of occupying the land. As long as the land is occupied by the current crop of trees it cannot be put to any alternative use. Some forest economists maintain that if, as is often the case, the land is dedicated by law to perpetual forest production, no alternative land uses exist and the opportunity cost of holding the land may be ignored. Even when the land is dedicated to forestry, however, the forest manager is faced with an alternative use. His alternative is to terminate the current rotation and establish a new crop. The opportunity cost of the land in this case is the maximum revenue which would accrue

THE AUTHOR is a graduate student, University of British Columbia Faculty of Forestry. Advice of Dr. P. H. Pearse is gratefully acknowledged.

¹Research Note No. 48. Faculty of Forestry, University of British Columbia, Vancouver, Canada.

to the land under a new forest crop.

The marginal solution, expressed symbolically above, may be modified to include the opportunity cost of the land as follows:

At the optimum rotation, $dg = G(p) + a$.

dg , G , and p as defined above.

a = opportunity cost of holding the land under the current timber crop (dollars per acre per annum).

This is essentially the Faustman approach to the rotation problem. If the alternative use of the land is timber growing, the opportunity cost of the land (a) is the maximum annual income obtainable from forest crops on the land. That is the annual equivalent of the maximum land expectation value.

Figure 1 shows graphically how financial rotations are determined with and without the inclusion of the land opportunity cost (a). It can be clearly seen that the inclusion of (a) tends to shorten the financial rotation.

Many forest economists agree that, theoretically, the opportunity cost of land should be a factor in determining the financial rotation. However, they believe that, in practice, the effect of this cost is so small when compared to the other factors influencing the rotation that it may be ignored in the interests of simplicity. If the opportunity cost of the land is ignored, they argue, the financial rotation may be determined directly from the value growth function of the stand, or of the individual tree, and harvesting decisions may be made on a single tree basis (5). Guttenberg (4) stated that the financial rotation is the same whether the marginal opportunity cost of the land is considered or not.

Duerr, Fedkiw and Guttenberg (2) acknowledged the theoretical importance of land opportunity cost in financial rotation determinations but maintained that, in practice, it may safely be ignored except in certain circumstances when the opportunity cost of capital is very small or the rotation very short.

Other forest economists believe that the land opportunity cost cannot be ignored because, although it is often insignificant, it may become very important under certain

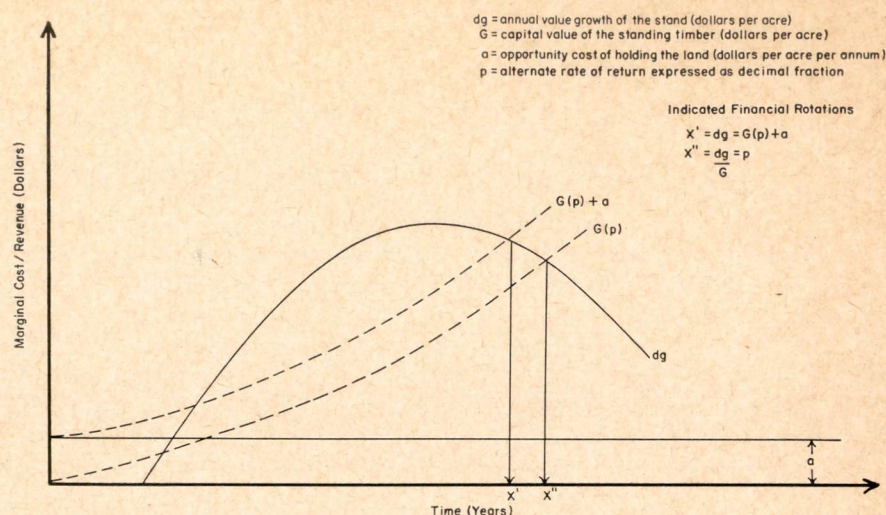


Figure 1: Rotation determination from marginal cost and revenue functions.

conditions. Gaffney (3) took this position and gave several examples to illustrate his case. In many of his examples the exclusion of the land opportunity cost led to errors of over one hundred percent in the length of the indicated financial rotation. In the most extreme example (Upland oak, site quality I) the financial rotation, at two percent discount rate is 10 years, if the opportunity cost of land is considered and 47 years if it is neglected. Gaffney came to the conclusion that the higher the land opportunity cost the greater is its effect on the financial rotation. This is true, of course, but does not completely explain the large discrepancies which can occur.

It would appear that the magnitude of the land opportunity cost is not as important in determining its effect on the financial rotation as are certain other factors. This became apparent in a study of the factors influencing the financial rotation of Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) in British Columbia (6).

In British Columbia, under present conditions, the maximum land expectation value for Douglas-fir on the best site (180 feet at 100 years) is approximately \$160 per acre at a three percent discount rate. That is an annual land opportunity cost ($[a]$ in Fig. 1) of \$4.80. This assumes current utilization standards and logging costs for the coastal region of British

Columbia, and normal stocking. The financial rotation calculated by marginal analysis of the stand value growth per acre, neglecting the opportunity cost of the land, is 73 years. With the inclusion of the land opportunity cost the financial rotation is 72 years. Clearly this is an insignificant difference.

As utilization standards improve and growth rates are increased by silvicultural measures, financial rotations are shortened and the opportunity cost of holding land under a single rotation is increased. It can be assumed that, in Coastal British Columbia, Douglas-fir trees of 8 inches d.b.h. can be logged at a profit (currently the marginal tree is about 12 inches d.b.h.) and that stands can be planted at a cost of 10 dollars per acre, and allowed to grow from the open condition initially to normal stocking at rotation d.b.h. (8). The maximum land expectation value on site 180 is then approximately \$595 per acre, assuming current timber values. This is an annual land opportunity cost, at three percent discount rate, of \$17.90 per acre. The financial rotation calculated with the inclusion of the opportunity cost of land is 54.5 years. Excluding the land cost the indicated financial rotation is 56 years, a difference of only 2 percent with a land opportunity cost of more than three times the maximum current value. Clearly, some factor other than the size of the land opportunity cost must be

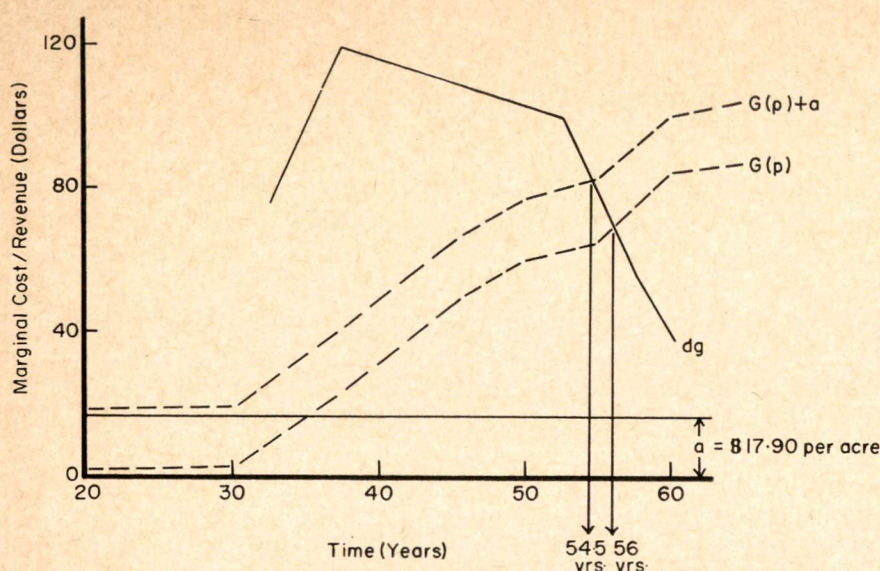


Figure 2a. Rotation determination from empirical marginal cost and value functions for Douglas fir in coastal British Columbia.

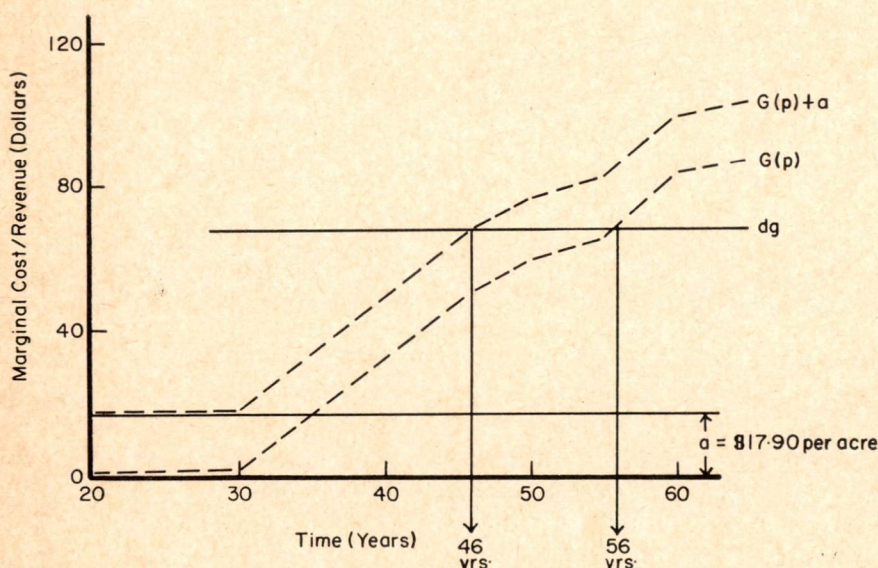


Figure 2b. Rotation determination for Douglas fir in coastal British Columbia, assuming constant marginal revenue.

taken into account if the large discrepancies discussed by Gaffney are valid.

The answer may be found in the graphical approach to the problem. The case for Douglas-fir, discussed above, is illustrated in Figure 2a. From this figure it can be seen that the reason why the discrepancy between the two rotations is so small is that the marginal value growth function (dg) has a steep negative

slope at the points of intersection with the marginal cost curves.

The marginal value growth is the first derivative of the value growth function of the stand. That is, it measures the rate of change of the value of the stand with time. The value growth function of the stand is a reflection of the market conditions for the raw material being produced. In the example being discussed, the value of the stand

during the critical period is increasing at a rapidly decreasing rate and therefore the marginal value growth function (dg) has a steep negative slope. If the value of the stand was increasing at a constant rate during the critical period, the marginal value growth function would have zero slope (Fig. 2b) and the land opportunity cost (a) would have much greater effect on the financial rotation. If, during the critical period, the value of the stand was increasing at an increasing rate, the marginal value growth function would have a positive slope (Fig. 2c), and the effect of the land opportunity cost (a) on the financial rotation would be even greater.

It is clear, therefore, that the effect on the financial rotation of the land opportunity cost is not primarily dependent on the magnitude of this cost, that is on site value, but on the prevailing market conditions, related to tree size and quality, which determine the slope of the stand's value function. A very high land opportunity cost may have little effect on the indicated financial rotation when the stand value increases at a rapidly decreasing rate. On the other hand, a small land opportunity cost may have a significant effect on the financial rotation when stand value is increasing very rapidly.

It is not safe to ignore the opportunity cost of land when calculating the financial rotation without first investigating the nature of the stand's value growth function. It is wrong to assume that, because a stand occupies land of low quality, the effect of the land value in the financial rotation will be negligible.

Literature Cited

1. DUERR, WILLIAM A. 1960. Fundamentals of forestry economics. McGraw-Hill Book Co., New York. 578 pp.
2. ———, JOHN FEDKIW, and SAM GUTTENBERG. 1956. Financial maturity: a guide to profitable timber growing. U. S. Dept. Agric. Tech. Bul. No. 1146. 74 pp.
3. GAFFNEY, MASON M. 1960. Concepts of financial maturity of timber. Dept. of Agricultural Economics, North Carolina State College, Raleigh. Mimeo. 105 pp.
4. GUTTENBERG, SAM. 1953. Financial maturity versus soil rent. Jour. Forestry 51:714.

5. ———, and J. A. PUTMAN. 1951. Financial maturity of bottomland oaks and sweet gum. U. S. Forest Service, Southern Forest Expt. Sta. Occas. Paper 129. 18 pp.
6. HALEY, D. 1963. Factors influencing the financial rotation of Douglas-fir in coastal British Columbia. University of British Columbia, Faculty of Forestry. Mimeo. 47 pp.
7. HILEY, WILFRED E. 1956. Economics of plantations. Faber & Faber Ltd., London. 216 pp.
8. SMITH, J. H. G., J. W. KER, and J. CSIZMAZIA. 1961. Economics of reforestation of Douglas-fir, western hemlock and western redcedar in the Vancouver Forest District. Univ. of British Columbia, Faculty of Forestry. For. Bul. No. 3. 144 pp.
9. WORRELL, A. C. 1953. Financial maturity: a questionable concept in forest management. Jour. Forestry 51: 711-714.

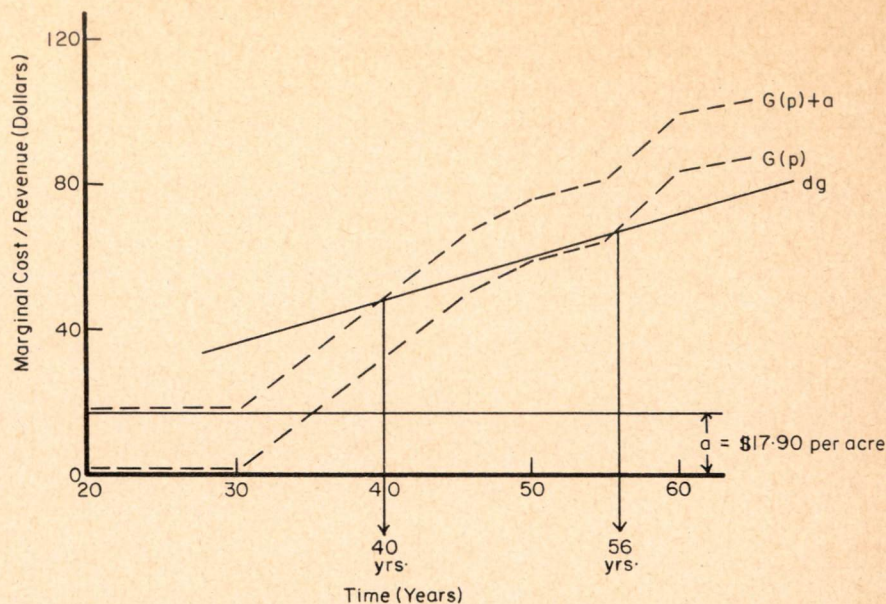


Figure 2c: Rotation determination for Douglas fir in coastal British Columbia, assuming rising marginal revenue.