APPENDIX.

Prof. Fred. R. Fairchild, Assistant Professor of Political Economy in Yale university, has probably made a more exhaustive study of forest taxation in the United States than has any other person. Prof. Fairchild’s views on the subject have been so well expressed in an article published in the Yale Review for February, 1909, that the article is here quoted almost in full.

THE ECONOMIC PROBLEM OF FOREST TAXATION.

The American general property tax has had most of its many shortcomings thoroughly exposed by this time. Recently, however, the discussion of forest taxation has called attention to a serious defect which has heretofore attracted little notice. The defect referred to is the necessary tendency of the general property tax to place an excessive burden of taxation upon invested wealth which is increasing in value. Suppose a man invests $10,000 in a perpetual annuity at 5 per cent., yielding an annual income of $500. Suppose an annual property tax of 1 per cent. is imposed. The tax will take $100, or 20 per cent. of the income, each year. Suppose now another man, having $10,000, puts it in trust for 14 years, after which time, the principal having doubled, he invests it in a perpetual annuity of $1,000 a year. Under the property tax he is taxed $100 the first year, but the second year, his capital having increased to $10,500, he pays a tax of $105. His tax increases each year until the fourteenth, after which it is $200 a year. The present value of all the taxes paid by the first man is $2,000, or 20 per cent. of his capital. The present value of all the taxes paid by the second man is $3,428, or 34 per cent. of his capital. That is, the man who does not use up his income, but reinvests it, is punished by an excessive tax.¹

Now the business of forestry is apt to be like the investment of the second man. The annual growth of the trees, instead of being taken each year as income, is left to increase the capital till many years later when the timber is cut and the income accrues. The general property tax provides for the assessment of all wealth (barring certain exemptions) at its full market value, the tax being then determined as a cer-

¹This criticism of the general property tax is parallel to Prof. Fisher's criticism of the income tax when savings are counted as income. Cf. The Nature of Capital and Income, pp. 249-255.
tain fraction of the assessed valuation. As applied to timber lands, this means the annual taxation, at their actual market value, of land and trees. Strictly enforced, according to the plain letter of the law, such taxation cannot fail to put an excessive burden upon forest investments.

As a matter of fact, forests are not taxed so heavily as this in the United States to-day. Indeed, up to the present time, it is not probable that forests have been taxed at all excessively in most parts of the country. It is true that in certain sections there is some evidence showing excessive taxation. But as a rule this does not seem to be the case. Timber lands, like other property in general, are as a rule greatly undervalued by the assessors. The assessment of timber lands is probably even more lenient than that of other kinds of real estate. It is only recently that assessors (to say nothing of the owners themselves) have awakened to the value of the forests. Underassessment and lax administration of the law thus far saved the forests from an excessive burden of taxes. Likewise the cry that taxation is causing the destruction of our forests and preventing the practice of forestry, of which we are lately hearing so much, is greatly exaggerated, to say the least. On these questions the writer has collected a large amount of evidence. For the present paper, however, we shall have to be content with the statement of conclusions just made.

These conclusions, however, are no mitigation of the charge against the general property tax. It is only because the general property tax has not been effectively administered that it has not yet been responsible for more serious results. It is only because the American lumbermen have so far had no particular desire to practice forestry that our tax system is not yet open to the charge of preventing the practice of forestry. So far we have been exploiting our forests with little regard for the future. But the present methods cannot last much longer. Before long we shall have to practice forestry. And whenever we are ready to seriously undertake it, we shall find our methods of taxation a heavy handicap.

Indeed, it is safe to say that we can never expect to see the general practice of forestry by private owners under our present system of taxation. It has been shown that the general property tax, strictly enforced, is capable of taking away a large part of the income of the forest. It may be objected that in practice the general property tax is not strictly enforced. Forests are actually not taxed on their true value, and this fact would have been recognized in the examples given above.
The answer is, first, that it has already been recognized by using a tax rate of one per cent., which is equivalent to the present rate on true value; and second, that even if such excessive taxation as has been illustrated is not likely to occur in all, or even in the majority of cases, this does not relieve the situation very much. The mere chance that it may occur in any given case would be enough to frighten the investor. Nothing more effectually discourages investment than uncertainty as to future costs. And whatever may be said of our present system of taxation, there can be no question of its arbitrariness and uncertainty. If to all the other risks of forestry, we add uncertainty as to what the taxes are going to be, we cannot blame investors for hesitating to embark on an enterprise which may have to pay taxes fifty years before the returns begin to come in.

Moreover, the investor cannot safely base his calculations on the continuance of the present generally lenient administration of the property tax. In many parts of the country there is to-day the feeling that timber lands are not paying their just share of taxes, and the tendency is unmistakable toward a stricter enforcement of the law and a heavier burden of taxation upon timber lands.

There has been a feeling for a long time that, in the interest of forestry, timber lands should be granted some relief from the burdens of the general property tax. This feeling has found expression in the tax laws of many of our states in the way of certain concessions to forest lands.

The important laws which give special concessions to timber lands are of three kinds, tax exemptions, rebates of part of the taxes, and bounties deducted from taxes. Such laws are in force at present in twelve states, including all of the New England states. The commonest form of law is exemption from all taxes on land and trees for a certain definite period of time, ranging from five to thirty years, twenty years being perhaps the average. Rebates and bounties are less common. These laws apply generally only to plantations and sometimes apply only to land not at the time woodland or sproutland or containing more than a certain number of trees per acre. The exemption may begin either immediately after the land is planted or set aside for tree cultivation, or after the trees have attained a certain age or a certain average size. These statutes generally contain various requirements. Usually the number of trees per acre is specified and the trees must be selected from a list of specified kinds. Directions regarding the care of the trees, thinning, and so forth, are frequently contained in the laws.
In some states the statute, of which the new Rhode Island law is an example, provides that the forest must be managed under a working plan drawn up by some state officer or board. In addition to the laws of the general character just described, a few states have laws providing for bounties or prizes, but without any reference to taxation. These laws are at present in force in six states. However, with the single exception of Minnesota's bounty law, these laws are of no practical importance and require no discussion here.

None of these schemes of exemptions, rebates, bounties, and prizes has touched the real problem of forest taxation. Obviously, laws giving occasional small prizes for the best examples of tree plantations, hedge fences, and so forth, can have no far-reaching effects on the burdens of taxation. The same is true of the bounty laws of Illinois, Kansas, and Wyoming, which merely permit the several counties to grant small bounties for a few years. The Minnesota bounty law is the only one that has produced any results. Up to 1906, $440,000 has been spent by the state for this purpose, as a result of which it is claimed that some 50,000 acres have been forested. If this result has indeed been accomplished it has been at a heavy cost. Evidently we shall not find a solution to the problem here.

Something more might perhaps be expected of those laws which really give some abatement of the burden of taxation by means of exemptions, rebates, and bounties. Yet here also we find that practically no results of importance have been produced. Massachusetts has had an exemption law in force since 1878. A legislative committee in 1906 reported that this law "has been a failure, as practically no planting has been done under it." One of the members of the committee reports that he could find only sixteen acres in the state that had been affected by the law since 1878. With regard to the rebate law of New Hampshire, the State Forestry commission reports that "This abatement provision, although three years old, is not widely known among land owners, and has so far been inoperative." In Connecticut, the exemption law has likewise been ineffective. Similar reports come from the other states where these schemes have been in operation long enough to have produced any results. The conclusion that these laws have produced no important results is confirmed by the testimony of all who have investigated the subject.

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5 Report of the Massachusetts Legislative Committee of 1905 to Consider the Laws Relative to the Taxation of Forest Lands, p. 10.
6 Ibid., p. 17.
7 Akerman, Southern Woodlands, June, 1908, p. 39.
8 New Hampshire Forestry Commission, Report for 1905-6, p. 204.
This lack of results may be explained in part by certain very important defects in these laws. In the first place, the common restriction of the tax abatement to plantations, and the further restriction in many cases to land other than woodland, in large measure destroy the usefulness of the laws at the very beginning. The chief problem is in connection with not the planting of new forests on agricultural or other land but the protection and preservation of our present forests.

Moreover, the regulations regarding planting, thinning, etc., are not drawn in accordance with scientific forestry principles. Often the number of trees required per acre is too large. When the planting is restricted to certain specified kinds of trees, the list is not always well chosen, valuable species being often omitted. The proper thinning of the growing forest and the most profitable use of the forest are often interfered with by the requirements of the statutes.

Again, the burden of the tax reduction is not provided for or not properly placed. The justification of the concession to the timber owners lies in the advantage to the state in general. Yet the particular locality in which the land is located is called upon to bear the whole or the principal part of the burden of a diminished revenue. What the timber owner gains must be made up by heavier taxes on other local property. This point was apparently not considered at all in framing the laws. Certain local assessors have taken this matter into their own hands, and have adopted the custom of adding enough to the assessment of some other property of the timber owner to make up for the reduced taxes on his timber lands. In this way they protect the local revenue, and also defeat the whole purpose of the law.

The actual financial consideration in these laws is really not very great. Generally, the exemption is limited to a rather short period of time, after which the land and trees are again subject to the general property tax. Moreover, the abatement comes in the years when the trees are small and when the taxes would not be very heavy anyway. The remission of taxes resulting from these laws is small when compared with the expense of planting trees and holding them to maturity.

In short, these laws are based on no sound principles either of forestry or of finance. It is not to be inferred, however, that the failure of these laws to produce important results is wholly due to the defects just described. It is very doubtful whether any law of this character, no matter how scientifically drawn and administered, short of a com-

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9 Elliott, Forestry and Irrigation, April, 1906, p. 178.
10 Fernow, Forestry Quarterly, Feb., 1904, pp. 63-68
plete exemption of growing timber, can have any great influence on forests and forestry.

What are the principles on which a scientific system of forest taxation should be based? It may be assumed, without much danger of controversy, that taxation should be apportioned according to ability as measured by income. In applying this principle, taxes may be levied either on the actual income when it accrues or on the capital value of the income. If the rates of the income tax and the capital tax bear the proper relation to each other, the results will be identical. For example, if the interest rate is five per cent., an income tax of twenty per cent. is equivalent to an annual capital tax of one per cent., provided the business is earning a regular annual income.

In the case of forests, we may have either an income tax on the yield whenever any timber is cut or a capital tax on the "expectation value" of the forest based upon all its future expected incomes and expenditures. This proposition may be illustrated by the following examples: Suppose that a forest is so managed as to yield a net income of $150 per acre sixty years from today, and again every sixty years thereafter, without any cost for planting. If interest is at 5 per cent., a simple calculation will show that the present expectation value of the forest is $8.47 per acre. Suppose it is desired to tax this forest at the rate of 20 per cent. of its net income. This may be accomplished either by a tax of 20 per cent. of the net yield whenever it occurs or by an annual tax of 1 per cent. of the expectation value. The first would mean a tax of $30 paid every sixty years, when the timber is cut. The second would mean a tax of $\frac{1}{2}$ cents paid every year. The present value of these two taxes—that is, $30 paid sixty years from date and every sixty years thereafter, and $\frac{1}{2}$ cents paid every year beginning at once—is exactly the same.

This is an example of a forest managed to produce a sustained periodic yield; that is, the timber is cut at long intervals, the forest being renewed after each cutting so as to produce about the same yield after each rotation period forever. Forests may also be managed so as to produce a sustained annual yield. In this case timber is cut annually, about the same amount each year, and the forest is maintained without deterioration forever. And finally, forests may not be managed according to any system of forestry, the yield being purely irregular.

Obviously the tax on yield when cut may be applied to any forest, whatever the system of management, or even where no systematic management is employed. This method simply takes a certain part of the
yield whenever any timber is cut. On the other hand the tax on expectation value is more complicated. It requires the calculation of present value based on all future expected incomes and expenses. And in the case of the forest with irregular yield it is impossible to apply this method at all, for there is no way of calculating the expectation value.

A most important factor in the calculation of expectation value is the rate of interest. In the examples given so far, five per cent. has been assumed as the rate of interest, and this rate has served as well as any other for the illustration of theoretical principles. The selection of this particular rate, however, has not been meant to carry with it any assumption that five per cent. is in fact the correct rate at which to capitalize forest investments, nor that the selection of the rate of interest is a matter of slight importance. It is really of the most vital importance; indeed, it is hardly an exaggeration to say it is the crux of the whole theory of the tax on expectation value.

To show the importance of the rate of interest, it may be sufficient to remind the reader that if in the example given above the rate had been four per cent. instead of five, the annual tax would have been sixteen cents instead of eight and a half cents. Under other kinds of forest management the tax is still more dependent upon the rate of interest. When we consider that a change of one unit in the rate of interest may double or even treble the amount of the tax, we begin to realize that if our tax system is to be based on expectation value all our search after an equitable tax will be a farce unless means are taken to correctly determine this factor of the problem.

That this question has never received proper investigation is evident from the character of its discussion in the technical works on forestry. In working out problems of expectation value, these works use rates of interest which are almost certainly too low, if forestry is to be considered on a commercial basis. For example, Endres uses three per cent. in calculating expectation value.¹¹ Schlich, after a discussion covering three pages, decides on two and a half per cent., basing his decision mainly on the fact that, at the time he was writing, that was the rate paid by British consols.¹² Fernow argues in favor of a low rate of interest,¹³ on the grounds that interest rates are likely to fall in the future, that forests will generally be a safe investment, and

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¹¹ Endres, Die Besteuerung des Waldes, Forstwissenschaftliches Centralblatt, Sept.–Oct., 1899, p. 496, etc.
¹³ Fernow, Economics of Forestry, pp. 214–215.
that the price of wood is likely to rise. He concludes that, since trust companies and savings banks are making long time investments at three and three and a half per cent., we may safely use those rates or even lower ones in calculating the value of forest investments. In an example on another page, however, he uses five per cent.  

These examples will illustrate the reasoning commonly employed on this subject, the conclusion being that forest investments should be capitalized at a relatively low rate of interest, not higher than two and a half or three per cent. This conclusion may possibly be valid for the settled condition of forestry which prevails in certain parts of Europe, though even this is open to question. But for conditions such as prevail in America such reasoning and such a conclusion cannot be accepted.

Instead of being lower than the ordinary commercial rate, the writer is satisfied that the rate of interest for forest investments should be fully as high as for ordinary investments, or even considerably higher. Forestry is a business of a peculiar character. In the first place the risk is very great. The danger of fire is so great that no insurance company will take the risk. There is also the risk of injury by insects, wind, etc. These risks must be taken account of in the rate of interest, and it will require more than a slight increase in the rate to fully compensate for them. To put forest investments on a par with government bonds and the better class of trust company and savings bank investments is absurd under present American conditions.

But the circumstance which above all others makes forestry a business by itself is the very long period which must generally elapse before the investment begins to yield an income. The investment of $1,000 in a perpetual annuity of $30 or $40 a year is one thing. To put capital into an investment from which no income is to be expected for fifty or sixty or even one hundred years (very probably not till after the death of the investor) is a very different thing. Innumerable investments of the first kind are being made every day, and we can determine the prevailing rate of interest by a glance at the dealings on the stock exchange. Investments of the second kind are so rare that we are unable to say from actual dealings what the rate should be. The comparison of future with present goods, on which rates of interest depend, is a psychological process, and is influenced by a multitude of considerations. One of the most important of these is the remoteness of the future good, and it is certain that the rate at which men dis-

14 Ibid., p. 251.
count future events tends to increase with the remoteness of the event. Many a man who is satisfied with an investment which yields him three or four per cent. at once would not consider for a moment an investment at the same rate whose income was to commence sixty years from date. It is safe to say that, other things being equal, men will not be tempted by forest investments, unless the rate of interest is considerably higher than that of investments whose income begins at once. It is clear that we cannot put forestry on a par with the better investments of trust companies and savings banks.

Even a brief examination will show the weakness of some of the arguments cited above in favor of a low rate of interest. The assumption that the rate of interest tends to fall is belied by recent history. Schlich, writing in 1895, based his rate on British consols, which paid two and a half per cent., and he has made no change in this paragraph in his third edition, published in 1905. But today British consols yield three per cent. on their market price, and French and German government bonds yield even higher returns. Fernow's book was published in 1902, yet even this brief time has seen a considerable rise in interest rates, and many a savings bank today is paying four per cent. to depositors. On account of the depreciation of our monetary standard, resulting from the great production of gold, interest rates have been rising for the past decade, and the same influence is more than likely to cause a further rise in the future. So far as the future of the rate of interest is concerned, the effect should be to cause a higher rather than a lower rate on deferred incomes.

That the price of wood is likely to rise, and so increase the profits of forestry, cannot be denied. This circumstance, however, should not properly enter into the determination of the rate of interest. It should rather be taken account of in estimating the value of the future yield of the forest, in this way entering into the determination of expectation value. Any proper estimate of the value of future yield will take into account the probable increase in the price of timber. This factor being thus accounted for, there is no reason for lowering the rate of interest on its account.

We may conclude, then, that as compared with ordinary investments, the income of forestry should be capitalized at a relatively high rate of interest. Further study would probably show that, if the rate of five per cent. adopted for the examples above is not the correct one, it errs in being too low rather than too high. This question must be carefully considered in applying a tax on expectation value.
It has been shown that in theory a correct system of forest taxation may be applied either as an annual tax on the expectation value or as a tax on the yield when cut. The choice between these two methods must depend largely on practical considerations. It does not require an extended study of American forest conditions to convince any one that the tax on expectation value is not capable of general application in this country. This method of taxation depends on the general practice of forestry, whereas in America the practice of forestry is a rare exception. The calculation of expectation value requires accurate yield tables for the different species of trees, different kinds of soil, and different parts of the country. Such tables do not exist for America, and only the smallest beginning has been made toward their construction. Finally this method of taxation can not be applied to forests which produce an irregular yield. Yet nearly all the forests in the United States are of this kind.

The tax on yield, however, does not have to rest its claim to superiority on these negative arguments alone. It is supported also by some positive considerations of the utmost importance. We have seen that the crucial point in the determination of expectation value is the rate of interest, and that we have no principles which can guide us to the correct rate for forest investments. Even if we may suppose the correct rate to have been determined at any particular time, there is no guarantee that it will long remain the correct rate. Yet taxes for fifty or a hundred years to come may be based on a rate fixed today. To determine the whole burden of forest taxation in any such arbitrary fashion is not to be thought of. The tax on yield escapes this whole difficulty. When a forest is taxed on its yield the value of the yield and the value of the tax will bear the same relation to each other no matter what the rate of interest, since both are always discounted at the same rate.

Another advantage of the tax on yield is that it avoids the necessity of estimating future prices of timber. All such estimates are largely a matter of more or less skillful guess work, and this circumstance subjects calculations of expectation value to a wide margin of error. The objection to a tax system based so largely on guess work is obvious. In the case of the tax on yield, however, this matter presents no difficulty. The tax is a certain part of the yield at the time it is cut, and any change in prices affects both the tax and the yield in exactly the same way.

A third reason in favor of the tax on yield is that it eliminates the