ECONOMICS AND POLICY ENVIRONMENTS FOR FOREST REGENERATION

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MOST OF YOUR DAILY CONCERNS IN FOREST REGENERATION are biologic, technologic, and mechanical. But periodically, perhaps once a year, many of you must consider regeneration in a context that includes alternative uses for the financial resources you have.

To many of you, the notion is repugnant that your work—for which you have trained and in some cases committed whole careers—must compete against activities totally outside your ken. How can you justify regeneration as a more desirable activity than fire protection, roadbuilding, or expansion of your company's plant? Indeed, why should you? The tools of tree planting certainly can't be used for much else. The planting crews are not the same people who would build the veneer lathe. Yet, you're told you are competing with these other activities for money.

Actually, in a few months, forestry tools and crews can't be converted to other uses. They're immobile. So you needn't compete for them. But over a year or so, people can and do move to other places and occupations.

Of even greater significance to you is the mobility of money. Today's forestry dollar is tomorrow's Vietnam dollar, as Federal foresters know well. This year's budget for timber management may be a sales promotion budget next year.

THE MAN WHO CAN HELP YOU is, of course, your friendly neighborhood economist. Four economic formulations may interest those of you who compete with other uses for mobile financial resources.

Classical economic analysis of regeneration opportunities includes an estimate of the stumpage value of the stand when it is to be harvested and discounted back to the present at some rate of interest, and a comparison of the discounted value with the cost of establishing the stand. If the present value of the future stumpage exceeds costs of establishment, the investment is considered worthwhile. A variation of the method eliminates the arbitrary discount rate; instead, returns are related to costs as a rate of return on the investment.

For example, to plant an acre may cost $50. The stand with 25,000 board feet is scheduled for cutting 100 years hence at $30 per thousand. Suppose a discount rate is 5 percent. Then the present value of the $750 in ultimate stumpage income is $6, substantially less than $50, the cost for establishment of the stand. The rate of return on the $50 investment is less than 3 percent. Even for Federal agencies, that rate of return is inadequate to justify the expenditure. This is only an example, but it reveals why foresters have had a dour view of economists, purveyors of a science that is apparently dismal, indeed.

Numerous refinements can be added to this traditional system. Costs of cultural treatments and annual administrative costs can be recognized. Returns from thinnings can be built in. Even the relative likelihood of alternative biologic and economic events can be put into the calculation. The usual conclusion, however, does not change. With future incomes discounted over several decades, forest regeneration is usually economically unattractive.

Estimates of rates of return on timber-growing investments have been published. Here are some:

9 percent, Douglas-fir on high sites, with management
8 percent, Douglas-fir on site 4, with management
5 percent, Douglas-fir on site 3, with management
Less than 5 percent, Douglas-fir on site 2, without management
8 percent, ponderosa pine on site 1, with management
6 percent, ponderosa pine on sites 2 and 3, with management
2 percent, ponderosa pine in western Montana
6 percent, sugar pine
7½ percent, southern pines
5½ percent, loblolly pine plantations
7½ percent, red pine in the Lake states
4½ percent, red pine in the Lake states
3½ percent, red and white pines in the Lake states
2½ percent, northern hardwoods

Inconsistencies occur because of various assumptions used in different analyses. But the results are uniformly unimpressive.

A second kind of economic analysis, widely misunderstood, may interest those of you associated with organizations that have a sustained-yield policy and a substantial inventory of over-rotation-age timber. In this analysis, recognition is taken of the fact that in your reforestation program you expect an increased total yield on your holdings. This in turn raises your

allowable cut, with the increase actually realized through accelerated cutting in the overmature stands.

Suppose you have a simple, though unusual, kind of property with nonstocked land, 100 million board feet of old growth, no age classes in between, and a 100-year rotation planned. You apply one of the conventional allowable-cut formulas, such as Hanzlik's or the Austrian formula, which have two components to the allowable cut. The first is a growth factor. But on your property net growth is negligible. The second is a portion of the cut taken to reduce the inventory of over-age timber. If you plan to convert it evenly over the first rotation, you will cut 10 million board feet in each of 10 decades. That's your allowable cut.

Now suppose you decide to reforest a thousand acres. You anticipate producing 25,000 feet per acre over the rotation, which leads to a mean annual increment of 250 board feet per acre per year, or 2½ million board feet per decade on the 1,000 acres. Now, through reforestation, you have produced a growth component for the allowable cut. Obviously, if you had only young stands, you would have no place from which to take this additional 2½ million feet per decade. But we have assumed you have an old-growth inventory of 100 million board feet. Because of the increased allowable cut, your old-growth harvest will change from 10 to 12½ million feet per decade.

When you take the increase depends on whether your increased cutting starts when you plan to establish the stand, when you actually do establish it, or when a subsequent inventory confirms survival and growth of the seedlings. This decision is a measure of your prudent, experience-bred caution. Or your unreasonable conservatism—depending on your point of view!

Any practical economic analysis recognizes income when it is actually generated. And scheduling for evenflow harvest generates actual income early in the rotation. With incomes discounted over a shorter period, the rate of return on the regeneration investment rises. This happens even though you run out of old growth sooner. In the example, 100 million board feet of old growth was to be removed at the rate of 12½ million feet instead of 10 million feet per decade because of regeneration. Thus, instead of 10 decades of old-growth cutting there can be only 8. In rate-of-return analysis, however, a deficit of 20 million feet of timber 80 years in the future can't compete with an increase of 2½ million feet of timber in this decade. The return on investment becomes 15 percent instead of 3 percent.

If you are willing to forfeit old-growth harvests late in the conversion period for additional old-growth harvests in early years, and if in planning you use classical even-volume flow formulas, regeneration can be justified easily in many instances.

As with the allowable-cut-effect analysis, a third approach to the economics of regeneration is valid only in the context of a particular policy. This policy is that timber will not be cut unless the harvested acres are reforested within a reasonable time. Here, economics can answer two questions. One is simply whether or not the revenues from stumpage or log sales will cover the regeneration cost. This is an oversimplification, however, because of the statistical likelihood that some regeneration will fail and require additional expenditure. Those of you interested in lodgepole pine and contemplating type conversion to ponderosa pine certainly face the second question which is, "Given limited reforestation budgets, which stands on what sites should be harvested and regenerated first?"

I'm covering this third analysis briefly, not because it is less important, but because many of you do not countenance the harvest-regeneration linkage in your policy environments. Decisions in cutting and reforestation are too often made by different people, at different times, and are effected with different budgets.

The fourth approach to regeneration flows strongly from a policy in which society dictates regeneration on every forest acre, irrespective of whether or not income can be wrung from the acre to finance the new stand. I believe that this mandate will soon be binding on all forest managers, public and private. It's probably not economically rational, but in today's political atmosphere purely economic decisions are unacceptable. Whether or not the best method is profitable is irrelevant in this analysis. Economics does, however, in the choice of regeneration methods, provide a system for weighing cost of application, regeneration lag, and probability of success.

I have reviewed four different policy situations and the economic analyses they require for your regeneration decisions. The classical discount method is inapplicable to the allowable-cut effect from regeneration. If your policies provide for this effect and you have a reservoir of merchantable timber, the second kind of analysis is appropriate. If, in your policy, timber cutting and regeneration are joint ventures, the third analysis is relevent. And in areas where the timber is already gone, you may face a restoration mandate that requires the fourth approach to economics evaluation. In summary, first consider the policy environment in which you work, then consult your neighborhood economist.