Capital Budgeting Analysis of Wood Fiber Self-Sufficiency Alternatives for Pulp Mills
By
Gary E. Mullaney

Abstract
The value of wood from company plantations is a function of the cost of the alternative wood sources that are displaced. If this view is accepted, then capital budgeting analyses can take the form of explicit comparisons of real options for growing fiber verses projections of the cost of open market sources in a particular region. Such analyses would be helpful in allocating forestry capital, but remain difficult to do because of the problem of projecting wood costs.

INTRODUCTION
I want to first thank the SOFEW organizers for this opportunity. I first caught the forest economics bug as an undergraduate at N.C. State in a course taught by a person I understand is one of SOFEWs founding fathers: Lester Holley. I’ve had the privilege of working with forestry investment analysis to some extent throughout the twenty years I have been with Westvaco, and now find myself a college student again, even receiving mail at home addressed “to the parents of” Gary Mullaney. The topic I will discuss for a few minutes this morning is the subject I hope to focus on in my dissertation.

The project will concern capital budgeting analysis of wood fiber self-sufficiency alternatives for pulp mills. The objective will be to develop and defend analytical techniques that could be used to assist in decision making for specific mills. Pulp mills inevitably must choose a level of wood fiber self-sufficiency. The levels chosen by U.S. firms range from zero to nearly 100%, with the majority well away from either extreme.

THE CONCEPT
Opportunities are nearly always present to either increase or decrease self-sufficiency. How much is enough? How can firms compare the returns from company lands devoted to tree growing (either current lands or potential acquisitions) to returns from other investment opportunities?

One way to approach this question is to evaluate the forest land operation as an independent enterprise, with its own revenue from the sale of standing timber and other sources. However, for firms with a strong focus on pulp and paper, the real concern is the long-term cost of obtaining the fiber raw material. Since transportation makes up a large proportion of the cost, pulpwood close to the mill has a value to the particular mill that would not be reflected in stumpage prices, particularly in regional average pulpwood stumpage prices.

An extreme example will serve to illustrate the concept. Suppose a pulp mill were located in the center of an agricultural area essentially devoid of timber for 75 miles in all directions. Granted, this is not where you would expect to find a pulp mill, but all mills pull some wood from distant sources, which is what I am trying to illustrate. The current wood supply system consists of wood buying points located 100 miles away that purchase open market pulpwood and concentrate it for reshipment to the mill. The forestry department makes a proposal to purchase agricultural land adjacent to the mill and plant trees. To justify their plan, the forestry department should summarize the expenditures (cash flows) required to grow, harvest, and deliver a certain quantity of wood from the plantations. The cash flows required to purchase, harvest, and deliver the same quantity of wood from the alternative sources with the same timing could also be estimated. Equipped with cash flow estimates from two mutually exclusive alternatives, any of the standard capital budgeting techniques (NPV, IRR, etc.) can be applied to measure the attractiveness of the forestry proposal. To grow, or not to grow, becomes the question. The focus is on the cost of growing pulpwood vs. the cost of purchasing it.

Consider a different pulp mill located near several large independent sawmills and abundant natural forests. Once again, the forestry department proposes to buy land and plant trees. No scheme of forestry would be likely to be more cost effective than the purchase of chips produced by the nearby sawmills, so 100% self-sufficiency could never be justified. The forestry department might be able to show adequate returns by replacing only the most

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costly of the mill’s current open market sources of wood. The more outside sources they replace, the lower the realized savings per ton, and hence the lower the financial attractiveness of the investment in land.

Wood cost is not a monolithic figure for mills. It is made up of a large number of sources of varying cost, with transportation cost, or distance, making up a large component. Although oversimplified (because geographic location is not the sole determinant of the cost) you might think in terms of wood cost isoquants like these.

![Wood Cost Isoquants](image)

The shape is irregular due to localized supply and demand effects, transportation cost differences, regulations, or other factors.

Of course, growing costs are not monolithic either, and can vary greatly with the cost of land and other inputs, the production rate, and any offsetting revenue generated from the forest land ownership.

It is the explicit comparison of real options for growing fiber with realistic projections of outside fiber availability that interests me.

I do not believe there is an optimum level, or that the question should be treated as an optimization problem. However, the capability to arrive at standard capital budgeting measures of financial performance for investments in tree growing which are specific to a particular mill’s environment, and are comparable to measures for other types of investments, would provide a significant piece of information to those who must make such decisions.

WESTVACO EXAMPLE
Let’s leave the simplistic examples and talk for a moment about a real company’s forestry investment decision environment. Westvaco owns four major U.S. pulp and paper mills. Each uses both pine and hardwood fiber to varying degrees, although hardwood predominates. Significant differences exist between mills with respect to the current and likely future cost of different levels of pine and hardwood open market sources. Each mill and species group has unique market price, transportation, and competition factors. There are also significant differences in growing costs for pine vs. hardwood, and for growing hardwood near the different mills, using currently available technology. There are two questions which have to be answered well to maximize the returns from the capital committed to land and growing timber: First, what is the proper total level of investment, and second, how should it be distributed among the eight basic needs (pine and hardwood at four mills)? This past year, we added the Internal Rate of Return of the grow vs. purchase analysis to the other analytical tools used to support strategic wood supply planning. We also evaluate proposed land exchanges and acquisitions using the same model.

EVIDENCE FROM FIRM BEHAVIOR
Westvaco operates a drip-irrigated fiber farm operation in Missouri. Similar operations on a much larger scale exist in the northwest, and plantation acreage in general continues to increase worldwide. It is possible without inside information to estimate the true cost of many of these systems, and to calculate the very low or negative returns based only on regional average pulpwood stumpage prices. I interpret the flow of capital into this kind of intensive tree growing as evidence of the kind of thinking which I make explicit in the capital budgeting model, that is, that the value of the plantation wood, when delivered to the mill, is a function of the cost of the wood sources which it displaces.

PROJECTING WOOD COSTS
Here is a simplified example of the kind of incremental cash flow analysis that looks at replacing purchased fiber with company-grown wood.
The cash flows for acquiring land and growing pulpwood, are relatively easy to estimate and relatively more certain than the future cost of open market sources. Predicting the cost of outside sources is more complex, difficult, and uncertain; yet the financial attractiveness of timber growing depends entirely, in my view, on how it compares to the available alternatives. At a minimum, the format of the analysis forces managers to be explicit about their beliefs concerning future wood availability, cost, transportation costs, environmental and social constraints, and other factors.

The starting point for future wood costs is the current outside wood cost curve for a particular mill. This is normally easy to generate from company wood purchase data. Much more could be done to develop tools to look ahead five, ten, or fifteen years at what the cost curve for a particular mill may look like. Are there reasonable, practical approaches to this part of the problem which have enough sophistication to capture the factors unique to a particular mill, and the basic beliefs and assumptions of managers concerning future pulpwood markets? This would likely involve resource data specific to the mill’s operating area. Forecasting timber supply and demand, and prices, is complex, difficult, usually controversial, and probably not attempted with much sophistication by individual firms or mills. Generic tools and data for timber resource analysis and forecasting in general have been improved and are more readily accessible to people who are not necessarily specialists. I wonder if a specific toolbox and methodology might be assembled which could be applied relatively easily for a particular mill? I will be spending quite a bit of time on this question, and, like most graduate students, would appreciate any suggestions.

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CONCLUSION
Smart investing in tree growing operations to support pulp mills means carefully targeting expenditures at the projects with the highest returns. Always true, it is even more so now that the pulp and paper industry as a whole is struggling to break out of a long period of less than adequate overall returns. If you can’t measure the returns, you can’t target the spending. Maybe it’s time we thought differently about how to measure the returns.