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RESEARCH NOTE 2004-1

Forest Biotechnology from the Perspective of a Timberland Investor

(Clark S. Binkley - 9 November 2004)

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Abstract. Structural change in the forest sector has made the development and implementation of forest biotechnologies more difficult. Timberland investment as an activity distinct from the forest products industry now amounts to about $24 billion, and is growing at about 20%/year. Dis-integration of the tree-growing function from processing and marketing functions makes great financial sense, both for the forest products industry and for institutional investors. However, information flows that once took place within a single firm are now relegated to market-based transactions. Much of the anticipated gain from biotechnology is apt to come from linking specialized molecular, fibre or engineering properties of trees to specific industrial processes or specific products. These complex issues are poorly mediated by markets and the price system. Obtaining the apparent social benefits and private gains from forest biotechnology requires new ways of organizing these information flows. Some possible solutions include the pricing R&D into such "technology products" as clonal regeneration material, enhancing forestry-based venture capital, and developing long-term growing contracts between timberland owners and manufacturing companies.

I. INTRODUCTION

Technical innovation has been increasing the yields of usable wood fibre from forest plantations at a rate of about 3%/year. These innovations have been developed within the context of an integrated timberland/wood processing

organizational structure, a structure that has been eroding over the past two decades. A new class of owners has emerged—endowments, foundations, pension funds, banks and insurance companies (collectively, "institutions"). Integrated forest products companies have transferred perhaps 20 million acres of prime timberland to these new owners. The forest sector has always scrimped on R&D, and the new owners have shown an even lower propensity to invest in technical innovation. Given the significant economic returns that may arise from technology in general, and forest biotechnologies in particular, how can we ensure that the rate of technical progress we have seen in the past continues into the future? How can we we ensure that society enjoys the benefits of technical progress in tree growing and its links to wood products and manufacturing?

Answering these questions requires digging deeper into the reasons for dis-integration of timberland. Financial and strategic considerations have led firms to sell timberland, and to organize fibre supply via markets and wood supply contracts. While disintegration has provided substantial financial benefits, it has also externalized information flows related to technical innovation in timber production. Placing these information flows outside the bounds of the firm has raised the cost of technical innovation.

The economist's theory of the firm is a useful starting point to understand these costs. This theory emphasizes the role of transactions costs in causing some activities to be amalgamated within a firm, and others to be handled through contracts and the price system. Given that timberlands have been divested, and that many of the benefits of forest biotechnology accrue to the manufacturer and not the timberland owner, the key issue is to find ways to reduce the transactions costs associated with linking timberland and manufacturing in the dis-integrated industry structure. Ideas for doing so are the focus of this paper.

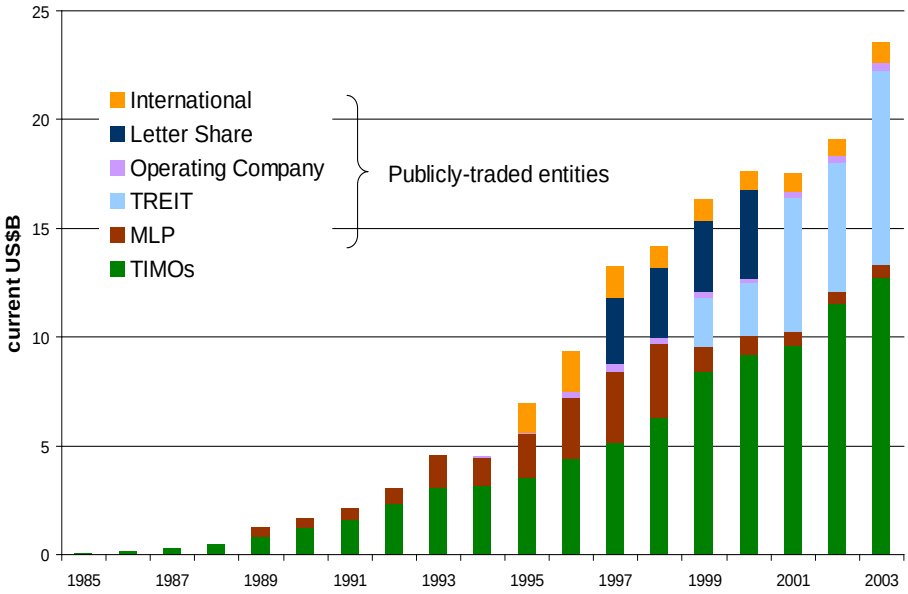
We begin with some background on structural change in the forest sector. We then take a short detour back through the theory of the firm as the basis for the concluding suggestions on how we might proceed.

II. STRUCTURAL CHANGE IN THE FOREST SECTOR

During the last two decades, the forest sector—particularly in the US—has dis-integrated its timberlands. The principle buyers have been institutional investors, including pension funds, endowments, foundations, insurance companies, and, increasingly, wealthy individuals.

The growth has included both private-equity vehicles and publicly traded entities. Figure 1 shows the development of these trends in the United States.

The chart breaks out private-equity investments in green (labeled as “TIMOs” or, Timberland Investment Management Organizations, the investment



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Notes: MLP = master limited partnership; TREIT= timber real estate investment trust; Operating Company = “C” corporation.

Figure 1. Trends in Institutional Investment in US Timberland, 1985-2003.

advisors who support institutional investments in timberland). The various public-equity entities are also included, showing the rapid ascendancy of the real estate investment trust as the preferred public-equity investment vehicle.

Similar changes have occurred elsewhere in the world. For example, the large Swedish/Finnish firm StoraEnso spun out its timberland into two separate entities, Tornator in Finland and Bergvik in Sweden. These transactions, covering nearly 3 million hectares, are not included in Figure 1. Similarly, the Canadian firm TimberWest manages about $1 billion of timberland formerly held by integrated companies.

Why are integrated forest products companies selling their timberland? The reasons are many, and any one instance is likely to differ from all the others. But, several underlying factors may be identified. First, investors in most integrated forest products companies suffer two layers of taxation, one at the corporate level and a second at the personal level when profits are distributed in the form of dividends. Typically, neither the public nor private entities mentioned in Figure 1 pay taxes, with the burden being shifted directly to the investor.

Removing a layer of taxes allows better returns than integrated companies can provide.

Second, publicly traded companies in the United Stated are required to prepare their financial statements according to US "generally accepted accounting practices" (GAAP). US GAAP consistently understates the financial performance of timberland. For example, to calculate net income, US GAAP requires companies to deduct "depletion"—the depreciation of the timberland asset—from the value of timber harvested. However, in a sustained-yield forest, there is no economic depreciation of the asset, so US GAAP understates the net income produced. Many private investors and the newer timber REITs operate on a far more favorable cash basis for reporting the ongoing returns from operations. Furthermore, US GAAP does not permit forest products companies to increase the value of the timberland on their books as the trees grow. Private investors are able to "mark to market" the value of their timberland as the trees increase in value. Interestingly, some countries—Australia and New Zealand are two examples—require firms to revalue their forests each year, and to put this value on their balance sheets. The proposed International Accounting Standards also require this practice for forestry accounts. US GAAP will soon be the anomaly for timberland return reporting, but there is no sign of change.

Finally, while there are notable exceptions, integrated forest products companies have generally not provided good returns for their investors. There are many explanations for the consistently poor returns, but some analysts have suggested that the reason lies in using strong returns from timberland to subsidize poor returns from operating facilities. As a consequence, Wall Street has pressed firms to sell their timberland and use the proceeds to pay down debt, return capital to shareholders, or to make accretive acquisitions.

These financial factors are likely to remain important for the foreseeable future, so we can expect to see integrated firms shed more timberland.

While dis-integration of timberland makes a great deal of financial sense, particularly in the short term, it does raise problems for the implementation of forest biotechnology. Specifically, companies that no longer own timberland are unlikely to sponsor research on forest biotechnology, either within their own firm or extramurally. The new institutional owners have shown an even lower propensity to fund forestry R&D than have traditional forest products companies. For example, to the best of my knowledge, Hancock Timber Resource Group is the only private timberland investment advisor that is a member of the various regional tree-breeding research cooperatives. Firms that do not sponsor R&D are unlikely to have in place adequate technical resources to be sophisticated consumers of R&D. The lack of "technology receptors" among the new forest owners will impede technology transfer and will slow the diffusion of technical innovation.

The problems are compounded because much forest biotechnology focuses on improving wood qualities related to specific products or manufacturing processes. Lignin modification is a good example. Such traits may be valuable for manufacturers, but they confer no particular advantage to forestland owners unless markets can reliably deliver higher prices for such higher-valued trees. Genetic modifications related to almost any attribute of the molecular or fibre characteristics of wood fall into the same category.

III. A DIGRESSION ON THE NATURE OF THE FIRM

The Nobel-prize winning economist Ronald Coase wrote an article of this name in 1937. He pondered why economic activities coalesce into firms, or, as he put it "…like lumps of butter coagulating in a pail of buttermilk." Economists, of course, generally argue that markets are the best systems for coordinating productive activities. If markets work so well, why do firms exist at all? Why aren't we all independent contractors with constantly shifting business relationships, each one of which governed by separate prices and terms? Coase answered the question on the basis of transactions costs. That is, it is less costly to pull together related production activities into a single organization ("the firm") guided not by internal prices, but rather by the "entrepreneur co-ordinator". The cost of organizing a separate contract for each exchange activity arising within the firm exceeds the efficiency gains associated with using the using the price system to govern these relationships. Firms can be expected to extend their boundaries until the balance of the equation tips the other way, and the efficiencies of specialized production make outsourcing cheaper than internal co-ordination.

Integrated forest products companies have found ways to coordinate timber supply through the price system without having to own the land itself. In much of the US, timber markets are deep and active. In instances where they are not, companies can still divest timberland if they retain access to the wood through wood supply agreements—increasingly prominent in timberland divestitures. In short, changes in transportation infrastructure and information technology mean that the transactions costs of organizing timber supply through markets have fallen, and it is not longer necessary to keep the forestry function within the firm. But, as forest ownership has been outsourced, firms have lost the capacity to coordinate internally the integration of tree growing with wood products manufacturing.

IV. PRACTICAL IMPLICATIONS FOR FOREST BIOTECHNOLOGY

Traditionally forest biotechnologies have been organized via entrepreneurial coordination within individual firms. As the firms dis-integrate their timberland, new modes of coordinating the production of forest biotechnologies must be

developed. These will logically rely on the price system and contracts rather than the traditional "command and control" methods of the past.

Within this general premise, three specific approaches suggest themselves:

i. Sell forestland owners technology products, not R&D projects.
ii. Establish forestry venture capital activities.
iii. Establish growing contracts between forestland owners and manufacturing companies.

Let's examine each of these in more detail.

Begin with two assumptions: 1. technical innovation pays acceptable risk-adjusted returns, and 2. new institutional timberland owners are structurally discouraged from investing in R&D as a result of not owning integrated manufacturing facilities. Given these assumptions, one can imagine the emergence of a group of specialized forestry technology companies providing these innovations on the basis of either charging fees for services or by selling products with the technology embedded in them. We see the emergence of both models. In the former case, Westvaco spun out much of their forest management technology into the Forest Technology Group. International Paper offers similar services via their subsidiary Sustainable Forest Technologies. Specialty aspects of forest management planning—traditional forest inventory, remote sensing, geographic information systems, and computer-based forest planning—have long operated on the fee-for-service model, with the R&D expenditures coming outside the forest products industry itself. Cellfor, the private forest biotechnology company formed by combining Pacific Forest Biotechnologies and Silvagen, seeks to sell forest biotechnology innovation embedded in the planting material.

One can imagine the logical evolution of this business model, where a specialized firm takes on the full-cycle task of forest regeneration:

- identifying the most appropriate genotypes for a particular site and owner,
- arranging for the optimal level and kind of site preparation,
- hiring contractors to plant the best regeneration material for that particular site,
- handling post-planting herbicide and fertilizer treatments, and
- being paid at least in part on, say, the height of trees at age 5.

Such a model re-integrates one of the most important aspects of plantation forestry—regeneration—into a firm that can take a comprehensive, coherent view, and provides performance-based incentives for good outcomes. Contracts and the price system are used where they make the most sense, but entrepreneurial co-ordination is used where the site conditions and other details increase the transactions costs of market-based mediation.

This model would appear to work well where there is a stock of technical innovation that awaits application, but it begs the question of where the capital investment will come from to finance the innovation in the first place. Traditionally, integrated companies have diverted some fraction of the profits from forestland ownership to support R&D. Institutional owners are generally not similarly inclined, and this is logical: they are investing in timberland, not R&D (analogously, most do not want to own "higher and better use" land because that is speculation in rural real estate, and not timberland investment). Conceptualizing timberland investment this way suggests a solution: create a new capital investment opportunity in forest-based R&D, or, said another way, forestry venture capital. Indeed, it is an agricultural venture-capital firm, Agricultural Technology Partnerships, that catalyzed the creation of Cellfor. If the public sector is backing out of forestry R&D, and if integrated companies no longer subsidize this activity, there is now room for the private sector to invest profitably.

Finally, recall that the separation of timberlands and processing facilities demands that the interactions between these two activities be handled though the contracts and the price system. Following this logic suggests a way forward: processing firms can contract with timber growers to produce trees with desirable wood qualities which are poorly priced in markets. Already timber markets distinguish between the sizes of the trees and their straightness, and, to some degree, whether or not the trees have been pruned. It is a small step to have the market distinguish among, for example, lignin characteristics and levels. Until such markets exist, however, it would be exceedingly risky for an non-integrated forest grower to plant, at high cost, such trees in the hopes that the market would, some day, reward her for her prescient decision. Companies who want this kind of material can take some of the risk out of the transaction by agreeing to buy such material at an agreed-upon premium price. The price logically covers the added cost to the grower, and splits some of the full-system gains.

Separation of timberland from processing facilities clearly creates financial gains for the both the formerly integrated forest products companies and the new institutional owners. Offsetting these gains are losses associated with the reduced ability to integrate technical innovations in the forests with those in manufacturing processes and products. New methods of operation—R&D embodied in, and sold as a part of, technology services and products; forestry venture capital; and new kinds of contractual relations between forest growers and timber processors—will be required to continue to achieve these gains.