To borrow or not to borrow?

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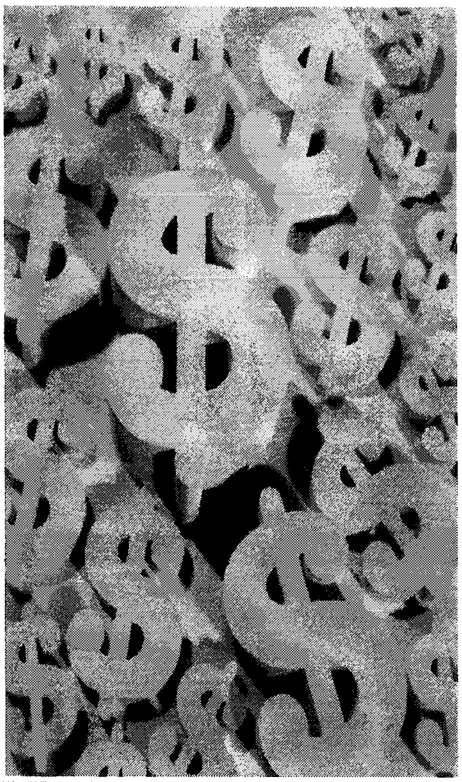
By Steve Bullard and Ron Honea



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To Borrow Or Not To Borrow?

The Financial Attractiveness of Borrowing Funds to Apply Herbicides for Hardwood Control in Establishing Loblolly Pine Stands on Cutover Sites in the South

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Abstract. Today there is an increased potential for using herbicides in loblolly pine stand establishment in the South. Nonindustrial private forest landowners' use of herbicides in pine stand establishment may be limited, however, by their inability or reluctance to invest "out-of-pocket" funds at the beginning of a timber rotation. Landowners may have funds available for the investment in a few years, but not immediately. By borrowing funds and regenerating cutover sites to pine without delay, landowners avoid the higher costs of hardwood control frequently incurred if regeneration is delayed and residual vegetation proliferates. We used American Cyanamid's Optimal Reforestation Manager computer program to analyze the financial attractiveness of borrowing funds for herbicide use in establishing loblolly pine stands. We estimated bare land values for loblolly pine plantations on a 30-year rotation, with and without the use of borrowed funds, before and after taxes, with and without cost share payments, for three levels of site quality, using two types of loan. Our basic finding is that borrowing *is* financially attractive – the effective costs of borrowing are negligible while the benefits of effective hardwood control are significant. If borrowing is necessary for landowners to pay for effective hardwood control after harvest, the added benefits outweigh the added costs on both a before-tax and an after-tax basis, and for a very broad range of initial conditions and assumptions. Our results are based on many assumptions, of course, including relatively high yield increases that are predicted for sites with effective hardwood control at stand establishment.

1. Introduction

The potential for using herbicides in loblolly pine stand establishment on cutover sites in the southern U.S. has increased significantly in recent years. Higher timber prices and improved harvesting methods and machines have resulted in more complete utilization in many areas of the South, and in general, cutover sites today have fewer residual hardwoods than in the past. Innovations have also been made in forest herbicides and their application, and combined with better site conditions, the overall cost effectiveness of herbicides for controlling hardwoods in pine stand establishment is significantly improved.

Another factor in the increased potential for using herbicides for stand establishment in the South is an increased awareness among nonindustrial private landowners of the need for and rates of return possible from intensive forest management practices. Over 70 percent of southern timberlands are in nonindustrial private ownership (Powell et al.

1993), and higher timber prices have increased landowners' motivation for active management. In today's market, many landowners are considering cultural practices that were not seriously considered when timber prices were significantly lower.

Although herbicide technologies, cutover site conditions, and landowner attitudes toward intensive management practices have improved in the South in recent years, increased herbicide use in stand establishment may be limited by private individuals' inability or reluctance to invest "out-of-pocket" funds at the beginning of a timber rotation. In some cases landowners will have funds available for the investment in two or three years, but not immediately. Postponing the investment, however, delays future stand revenues and also allows hardwood competition on the site to proliferate. By borrowing funds and acting immediately to regenerate the site to pines, landowners benefit by receiving future stand revenues sooner, and from lower stand establishment costs – without having to spend their own money immediately. Do these benefits outweigh the costs of paying interest on a loan? In the present paper, we address this question for various site conditions, economic assumptions, and loan scenarios that influence the financial attractiveness of borrowing funds.

2. Methods and Assumptions

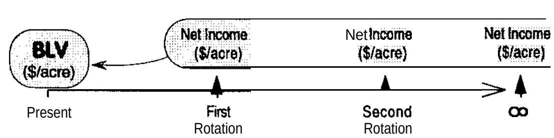
2.1. General Methods

Our basic approach to assess the financial attractiveness of borrowing for herbicide use was to use American Cyanamid's Optimal Reforestation Manager (ACORM) computer program to estimate bare land values (BLVs) for loblolly pine stands with and without the use of borrowed funds (Figure 1). We evaluated the use of borrowed funds before and after taxes, for three site quality levels, and with and without cost-share payments. With this approach, borrowing is financially attractive if:

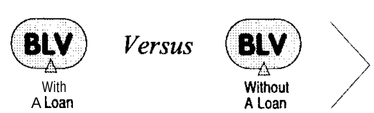
- using borrowed funds allows a higher cost, more intensive site preparation treatment, and that treatment has a higher estimated BLV than the lower-cost treatment; or if
- borrowing has little or no impact on BLV for the *same* site preparation treatment (as discussed in the Results section, some significant benefits of borrowing were not explicitly included in our approach to estimating BLVs with and without a loan).

Figure 1. Bare land values were compared with and without the use of borrowed funds.

► Using **ACORM,** we calculated BLV as the present value of all future net income, assuming identical future rotations of loblolly pine on cutover sites:



► We estimated **BLVs** with and without the use of borrowed funds:



Comparisons were made for three site quality levels, before and after taxes, and with and without cost shares.

Many assumptions were necessary, of course, and we therefore assessed the sensitivity of our initial results by including different price scenarios, and with more restrictive assumptions on borrowing and taxes. Because of the number of variables involved, however, we did not vary all factors in the analysis. Our methods and results indicate the potential attractiveness of borrowing in general, therefore, rather than for specific landowners.

2.2 Specific Methods and Assumptions

2.2.1. Decision criterion.

As shown in Figure 1, the benefits and costs of borrowing for herbicide application were evaluated by examining the impact of borrowing on estimated bare land value (BLV). Also called "soil expectation value" and "land expectation value," BLV is simply the discounted value of *all* net income from a tract of land (Bullard and Straka 1993). For the case of establishing a pine plantation on a cutover site, BLV is the net present value of an infinite series of timber rotations that are assumed to have identical costs and revenues.

2.2.2. Growth model assumptions.

American Cyanamid Optimal Reforestation Manager (ACORM) is a computer program that estimates yields and economic returns for slash pine and loblolly pine reforestation investments (American Cyanamid Corporation 1995). We used ACORM version 2.0 to estimate BLVs for cutover sites regenerated to loblolly pine. The yields obtained from ACORM were for unthinned loblolly pine plantations on Piedmont sites using a 30-year rotation[1]. We also assumed in ACORM that 600 trees per acre would be planted, and that the product diameter limits in Table 1 would apply. We assumed "high" sites to be SI 70_{25}, "medium" sites to be SI 60_{25}, and "low" sites to be SI 50_{25}. Within ACORM, residual competition characteristics were set for "normal" site preparation conditions.

Table 1. Product diameter limits assumed.

Product	Minimum Diameter at Breast Height	Minimum Top Diameter
Pulpwood	4.5"	2.0"
Chip-N-Saw	7.5"	6.0"
Sawtimber	11.5"	8.0"

1. ACORM does not explicitly account for income taxes, and we therefore calculated the effects on present value of various loan scenarios after-taxes outside the program. To do so, however, the rotation length had to be known, rather than a variable calculated by the program. Using a fixed rotation length of 30 years is conservative for our analysis of loan attractiveness – a 30-year rotation favors the lower intensity site preparation treatments since the high intensity treatments frequently have an optimal financial rotation shorter than 30 years.

2.2.3. Economic assumptions.

Planting, site preparation, and chemical costs. Within ACORM we assumed planting costs of $65 per acre (including seedlings). We assumed that "chop and burn" site preparation would cost $85/acre, "chop, burn, and bed" would cost $115/acre, and that to "shear, rake, and disk" for site preparation would cost $175/acre. Chemical costs were assumed to be $3.13/ounce for Arsenal@ herbicide applicators concentrate (Arsenal@ AC) and $1.40/acre for surfactant, with an application cost of $20/acre. Using these costs, three Arsenal@ AC application rates were assumed. "Low Chemical" was 20 ounces of Arsenal@ AC applied per acre at a total cost of $149/acre; "medium chemical" was 24 ounces of Arsenal@ AC at a total cost of $161/acre; "high chemical" was an application of 28 ounces of Arsenal@ AC at a total cost of $174/acre.

Annual taxes and management. To simplify the analysis we assumed that annual property taxes and management costs would be offset on a per acre basis by annual hunting lease or other income. Annual taxes and management costs were therefore entered as $O/acre in ACORM.

Timber prices and inflation. Initial stumpage prices were $10/ton for pulpwood, $20/ton for chip-n-saw, and $40/ton for sawtimber. For projected prices, we initially assumed a 1% per year real price increase and a 4% annual rate of inflation. Prices at rotation age 30 were therefore $43.22/ton for pulpwood, $86.44/ton for chip-n-saw, and $172.88/ton for sawtimber. After the initial analysis, we lowered the price increase assumption to a rate of 2.5% per year.

Discount rate. The discount rate we assumed for before-tax analysis was 9%. For after-tax analysis we used 6.5%. These rates were assumed to include inflation.

Cost-shares payments. The cost-share payment amount was set at $30/acre. Since all or part of a cost-share payment may be excluded from gross income for income tax purposes (Gunter and Kessler 1988), in the after-tax analyses we assumed that cost share payments were excluded from gross income.

2.2.4. Tax assumptions.

Tax status. Initially we assumed that landowners qualified as "material participants," with timber held as part of a trade or business. With this assumption, all operating expenses related to timber are fully deductible from income from any source each year (Siegel et al. 1995). Interest paid on a timber-related loan would therefore be deducted from taxable income each year. We also examined the effects of more restrictive tax assumptions – that landowners would hold timber as "noncorporate investors," and that interest paid on a timber-related loan would be capitalized to the end of the rotation.

Tax rate. A marginal tax rate of 28% was used to calculate all after-tax revenues and also to calculate the after-tax or "effective" value of all costs. In cases where interest and other costs were expensed, i.e., fully deducted from taxable income in the year incurred, the effective cost on an after-tax basis was calculated as (1-.28)(cost). Reforestation costs were also converted to an after-tax basis -- by calculating the present value (the value discounted to year 0) of all tax savings and subtracting their sum from the initial expense. We also assumed that the alternative minimum tax would not apply, and would therefore not affect the actual tax rate on timber sale income.

Reforestation tax incentives. We assumed that an investment credit of 10% would be obtained for reforestation costs, and that 95% of the costs would be amortized over eight tax returns (Siegel et al. 1995). We therefore assumed reforestation costs would be below the $10,000 maximum allowed each year. In addition to the initial tax credit of 10% of reforestation costs, we assumed a deduction of (1/14)(95%)(Reforestation Cost) in the first year, (1/7)(95%)(Reforestation Cost) for each of the next six years, and (l/14)(95%) (Reforestation Cost) in the eighth year. The effective reforestation cost was calculated as the initial reforestation cost minus the tax credit and the present value of the series of eight deductions. It was assumed that reforestation costs occurred toward the end of the tax year, so the credit would occur immediately and the series of deductions would begin immediately. In cases that included cost-share payments, we assumed that the payments were excluded from gross income, and the amount ($30/acre) was therefore not included in the reforestation credit and amortization calculations.

2.2.5. Loan scenarios assumed.

For the cases where borrowed funds were used, we assumed that $40/acre would be -borrowed. Two loan scenarios specified by a lending institution in May of 1996 were used. For each scenario we assumed that the loan principal would be repaid in full at the end of the loan period, with interest (only) paid at the end of each year. We refer to the two loan scenarios as loan types "A" and "B:"

Loan type A: Borrow $40/acre. Pay interest of 8.8% per year for three years. Repay the loan principal in full at the end of the third year.
Loan type B: Borrow $40/acre. Pay interest of 9.25% per year for 15 years. Repay the loan principal in full at the end of year 15.

Later we assumed that more funds would be borrowed – $109/acre using loan types A and B. We also assumed a much higher rate of interest in a subsequent analysis – 14% on a three-year loan of $40/acre.

3. Results

3.1. Results Based on the Initial Assumptions

BLV estimates using the initial assumptions are presented in Table 2.

3.1.1. Borrowing is financially attractive.

The two loan scenarios we considered are financially attractive for hardwood control in pine stand establishment. Assuming the *same* site preparation intensity (high chemical), neither of the loan types had a significant impact on BLV (Table 2). With borrowed funds, BLV increased slightly, remained unchanged, or decreased slightly for all of the site classes, for each of the cost-share assumptions, and for both the before-tax and after-tax situations. Borrowing had a negligible impact on BLV because on a before-tax basis the interest rate paid in each loan scenario was very close to the 9% discount rate assumed

To compare BLVs with and without borrowing, compare columns of the same gray shade.
Values shown are estimated BLVs for a 30-year rotation.

		Without Borrowing		With Borrowing			
				Before Taxes[1]		After Taxes[2]	
		Before Taxes[1]	After Taxes[2]	Loan A[3]	Loan B[3]	Loan A[3]	Loan B[3]
		dollars per acre					
High Site Quality [SI = 70 25]	With Cost-share Payments of $30/acre	$1,326 High Chem $306 Low Mech	$2,214 High Chem $1,905 Low Chem	$1,326 High Chem $306 Low Mech	$1,325 High Chem $305 Low Mech	$2,214 High Chem $1,905 Low Chem	$2,213 High Chem $1,904 Low Chem
	Without Cost-share Payments	$1,293 High Chem $274 Low Mech	$2,190 High Chem $1,881 Low Chem $674 Plant Only[4]	$1,294 High Chem $274 Low Mech	$1,292 High Chem $273 Low Mech	$2,190 High Chem $1,881 Low Chem	$2,190 High Chem $1,880 Low Chem
Medium Site Quality [SI = 60 25]	With Cost-share Payments of $30/acre	$780 High Chem $127 Low Mech	$1,357 High Chem $1,124 Low Chem	$781 High Chem $127 Low Mech	$780 High Chem $126 Low Mech	$1,357 High Chem $1,124 Low Chem	$1,356 High Chem $1,123 Low Chem
	Without Cost-share Payments	$748 High Chem $94 Low Mech	$1,333 High Chem $1,100 Low Chem $392 Plant Only[4]	$748 High Chem $95 Low Mech	$747 High Chem $93 Low Mech	$1,333 High Chem $1,101 Low Chem	$1,332 High Chem $1,100 Low Chem
Low Site Quality [SI = 50 25]	With Cost-share Payments of $30/acre	$399 High Chem $6 Low Mech	$757 High Chem $608 Low Chem	$400 High Chem $6 Low Mech	$399 High Chem $5 Low Mech	$757 High Chem $604 Low Chem	$756 High Chem $603 Low Chem
	Without Cost-share Payments	$367 High Chem (neg.) Low Mech	$733 High Chem $580 Low Chem $202 Plant Only[4]	$367 High Chem (neg.) Low Mech	$366 High Chem (neg.) Low Mech	$733 High Chem $580 Low Chem	$732 High Chem $579 Low Chem

1 The BLVs shown in each of the before-tax cells are for low intensity mechanical site prep and high intensity chemical site prep. BLVs were estimated for other mechanical and chemical intensities using ACORM, but in every case the "high chemical" intensity resulted in the highest BLV and the "low mechanical" intensity resulted in the lowest BLV.

2 The BLVs shown in each of the after-tax cells do not represent a range. Each cost scenario results in a different after-tax present value of costs Specific values are presented for low chemical and high chemical intensity site prep. For these scenarios, the after-tax present value of costs were calculated first; ACORM was then used to estimate the BLVs shown. After-tax results in Table 2 reflect the assumption that landowners qualify as a "material participant" with timber held as part of a trade or business.

3 Both loan types assumed that $40/acre was borrowed and that interest only was paid annually. The loan principal was assumed to be repaid in full at the end of the loan period. "Loan A" was a 3-year period at 8.8% per year. "Loan B" was a 15-year period at 9.25% per year.

4 "Plant Only" scenarios represent planting on cutover sites without the use of mechanical or chemical site prep, and therefore without the use of borrowed funds or cost share payments.

Table 2. Estimated bare land values, with and without the use of borrowed funds for hardwood control.

for the landowner. Borrowing is financially attractive for these loan scenarios because the interest cost of the loan has little impact on BLV, yet two significant benefits of borrowing are not reflected by the values in Table 2. As stated earlier, if borrowing allows stand regeneration to occur immediately, future stand revenues occur earlier, and hardwood proliferation and higher site preparation costs are avoided. A potential factor also not reflected by the BLVs in Table 2 is that after three years following the year that income is received from timber harvest, cost-share payments cannot be excluded in their entirety from gross income -- they can only be partially excluded. These benefits aren't specifically incorporated into our analysis, but are relevant for many landowners.

Results in Table 2 also show that using borrowed funds to finance higher intensity site preparation is financially attractive. For each site quality and cost-share assumption, on a before-tax or an after-tax basis, BLV increases for both loan types when a higher intensity site preparation treatment with borrowing is compared to a lower intensity site preparation without borrowing.

3.1.2. Several factors in the analysis combine to produce high BLV estimates.

"Bare land value" is an estimate of the value of bare land for timber growing purposes. Estimated BLVs are influenced by the assumptions used to calculate them, of course, but they should generally correspond to values observed in market transactions of cutover timberland (for lands where timber is the highest and best use financially). Some of the bare land values in Table 2, however, are very high compared to published literature and markets for recently harvested timberland in the South. In our analysis, BLV estimates are affected greatly by tax assumptions, ACORM yields, and price projections.

a. Tax effects...

On an after-tax basis, BLVs in Table 2 are significantly higher than on a before-tax basis for two important reasons. First, tax incentives for reforestation lower the effective initial cost of site preparation and planting on an after-tax basis, and reductions in initial cost have a direct impact on bare land value. Also, however, a 6.5% discount rate was used for after-tax analysis, and this lower rate discounts future revenues less heavily than the 9% rate used for before-tax analysis. Income taxes will lower future timber revenues, but the lower discount rate and the tax incentives for reforestation more than offset the revenue reduction that occurs at the end of each 30-year rotation.

b. ACORM yield effects...

BLV estimates in our analyses are higher after taxes, as discussed above, but some of the BLV estimates using chemical site preparation treatments are also high on a before-tax basis. ACORM yields are based on current research findings that show significant yield increases from early competition control in pine stands. We note that without chemical treatment, and thus without the benefit of increased yields, ACORM BLV estimates correspond well with market prices for cutover timberland in the South in recent years. After-taxes and without cost share payments, for example, the BLV estimates for the "plant only" scenario (planting without mechanical or chemical site preparation) are $202/acre for "low" quality sites, $392/acre for "medium" quality sites, and $674/acre for "high" quality sites (Table 2).

c. Price effects...

Initially, prices of $10, $20, and $40/ton were assumed for pulpwood, chip-n-saw, and sawtimber, respectively, and these prices were assumed to increase at an average compound rate (including inflation) of 5% per year. When the rate of increase assumption was changed to 2.5% per year, after-tax BLV estimates for the "high chemical" treatment without cost-shares decreased from $2,190 to $1,43 l/acre for "high" sites, from $1,333 to $852/acre for "medium" sites, and from $733 to $448/acre for "low" sites.

3.2. Results with More Restrictive Assumptions

3.2.1. With more restrictive tax assumptions, borrowing is still financially attractive.

Next we assumed that cost-share payments were not available, that landowners would apply the high intensity chemical treatment, and that they would borrow all stand establishment costs except the $65/acre for seedlings and planting – since we assumed $174/acre as a total cost for stand establishment with high intensity chemical treatment, our new assumption was that $174 - $65 = $109/acre would be borrowed. BLV estimates are presented in Table 3 with and without borrowing using more restrictive assumptions. Table 3 includes BLV results for landowners who do not qualify as "material participants," and as "noncorporate investors" will capitalize or otherwise carry forward interest costs to the end of the 30-year rotation[2].

For landowners who qualify as "material participants" for income tax purposes, borrowing the full $109 would be financially attractive. Borrowing has a negligible impact on BLV for the same reasons discussed earlier when $40/acre was assumed to be borrowed. For landowners who do not qualify as material participants, however, but who will capitalize or otherwise carry forward interest on the loan to the end of the rotation, estimated BLVs for "high chemical" applications are lower than the estimated "high chemical" BLVs without borrowing by about $30/acre (Table 3). Noncorporate investors who have sufficient funds to apply the "high chemical" site preparation treatment may therefore choose not to borrow significant amounts unless they have other sources of net investment income from which to deduct the loan interest prior to the end of the rotation. For those without sufficient funds for the "high chemical" treatment, however, the loan is attractive – for all three site quality classes, the high chemical BLV for noncorporate investors is higher than the "low chemical" BLV without borrowing (Table 3).

3.2.2. With a 14% loan for three years, borrowing is still financially attractive.

As a final part of our analysis, we assessed the impact of a higher interest rate on the three-year loan. We assumed that landowners would borrow $40/acre, pay 14% interest for each of three years, and repay the $40 principal at the end of the third year. On a before-tax basis, this type of loan lowers the estimated BLVs by $5 to $6 per acre for the same level of site preparation treatment. As with the earlier example loan scenarios, this loan would be financially attractive considering the potentially significant benefits not included in our analysis. Also, as in the earlier discussion of loan types A and B, the 14% loan would be attractive if it allowed landowners to apply a higher level of site preparation treatment, thus increasing the land value by much more than the $5-$6/acre total net cost of the loan. On high sites, for example, BLVs for "low chemical" treatment were estimated as $1,1 1 l/acre (before-taxes, without borrowing). With a 14% loan for three years, the "high chemical" treatment estimated BLV is $1,288/acre – an increase of $177/acre per acre due to the loan. Similar results were obtained for "medium" and "low" quality sites.

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2. As "noncorporate investors," landowners would be able to deduct interest paid on a loan for chemical application up to the amount of their net investment income from all sources during the same time period in which the interest was paid (Siegel et al. 1995). Therefore, if there were in fact net investment income from other sources prior to the end of the rotation, they would not be required to capitalize the interest to the end of the rotation.

Table 3. After-tax bare land value estimates, with and without the use of borrowed funds for hardwood control. Restrictive assumptions for borrowing are:

- **With borrowing, high intensity chemical site prep is assumed and <u>all</u> funds for site prep are borrowed (the landowner pays $65 for seedlings and planting, and borrows $109/acre for site prep).**
- **The "noncorporate investor" column reflects a more restrictive tax assumption – interest on the loan is capitalized to the end of the 30-year rotation rather than deducted from income each year.**

	Without Borrowing	With Borrowing		
	After-tax Bare Land Values (From Table 2)	After-tax Bare Land Values		
		Material Participant[1]		Noncorporate Investor[1]
		Loan A[2]	Loan B[2]	Loan B[2]
	-$/acre-	-$/acre-		
High Site Quality [SI = 70 $_{25}$]	$2,190 High Chem $1,881 Low Chem $674 Plant Only[3]	$2,191 High Chem	$2,188 High Chem	$2,157 High Chem
Medium Site Quality [SI = 60 $_{25}$]	$1,333 High Chem $1,100 Low Chem $392 Plant Only[3]	$1,333 High Chem	$1,330 High Chem	$1,299 High Chem
Low Site Quality [SI = 50 $_{25}$]	$733 High Chem $580 Low Chem $202 Plant Only[3]	$734 High Chem	$731 High Chem	$700 High Chem

[1] Landowners qualifying as "material participants" in timber activities held as part of a trade or business were assumed to expense interest each year. Under the "noncorporate investor" assumptions, landowners were assumed to capitalize interest costs to the end of the rotation.

[2] Both loan types assumed that $109/acre was borrowed and that interest only was paid annually. The loan principal was assumed to be repaid in full at the end of the loan period. "Loan A" was a 3-year period at 8.8% per year. "Loan B" was a 15-year period at 9.25% per year.

[3] "Plant Only" scenarios represent planting on cutover sites without the use of mechanical or chemical site prep, and therefore without the use of borrowed funds or cost share payments.

4. Conclusions

ACORM projects very significant benefits from chemical treatment for hardwood control in loblolly pine stand establishment. The basic finding of our analysis is that if a loan is necessary to obtain those benefits, the loan is financially attractive. This finding is "robust" in the sense that it holds for a wide range of assumptions and conditions.

Using our initial assumptions, BLV estimates were not lowered appreciably by borrowing for the same intensity of chemical treatment for site preparation. In these circumstances, borrowing is attractive because some significant benefits of borrowing were not explicitly included in our approach to estimating BLVs with and without a loan. If borrowing allows landowners to apply a more intensive chemical treatment, the loan types we evaluated were financially attractive because BLV increased significantly – the "high chemical" BLV estimate *with* a loan was significantly greater than the BLV estimate for "low chemical" or "mechanical" site preparation *without* a loan. These findings apply to analyses before and after taxes, with and without cost-shares, and for each of the three site quality levels evaluated.

Loan scenarios were also varied in the analysis, and loans of $40/acre were financially attractive even when paying 14% interest on a before-tax basis. The only loan scenario that affected BLV estimates appreciably was a 15-year loan for a landowner who did not qualify as a "material participant" for income tax purposes (we assumed that all of the interest on the loan would be capitalized to the end of the 30-year rotation). With this set of assumptions, borrowing all of the funds necessary to apply site preparation using the "high chemical" option (a total of $109/acre) lowered BLV by about $30/acre for each site quality level. We conclude, therefore, that "noncorporate investors" who have sufficient funds to apply the "high chemical" site preparation treatment may prefer not to borrow significant amounts unless they have other sources of net investment income from which to deduct the loan interest. For those without sufficient funds for the "high chemical" treatment, however, the loan is attractive – for all three site quality classes, the "high chemical" BLV estimate for noncorporate investors was higher with borrowing than the "low chemical" BLV estimate without borrowing.

Our results include some surprisingly high estimates of bare land value – over $2,000/acre in some cases. The high values are a result of price assumptions, tax assumptions, and the high yields projected by ACORM for stands with effective hardwood control. ACORM yield relationships, including the yield increases predicted with high intensity chemical control of hardwoods, are the most significant factor in these estimates. BLV estimates without mechanical or chemical hardwood control (after-taxes and without cost shares), for example, were $202/acre, $392/acre, and $674/acre for "low," "medium," and "high" quality sites respectively.

5. References Cited

American Cyanamid Corporation. 1995. ACORM Optimal Reforestation Manager, Version 2.0, User's Guide. Copyright American Cyanamid Corporation, 15p.

Bullard, S.H., and T.J. Straka. 1993. Basic Concepts in Forest Valuation and Investment Analysis. Copyright Bullard-Straka, 69p.

Gunter, J.E., and G.D. Kessler. 1988. Federal income tax incentives for reforestation. Coop. Ext. System/USDA Forest Service Circular, 2p.

Powell, D.S., J.L. Faulkner, D.R. Darr, Z. Zhu, and D.W. MacCleery. 1993. Forest Resources of the United States, 1992. USDA Forest Service, General Technical Report RM-234, 132p.

Siegel, W.C., W.L. Hoover, H.L. Haney, Jr., and K. Liu. 1995. Forest Owner's Guide to the Federal Income Tax. USDA Forest Service, Agriculture Handbook No. 708, U.S. Government Printing Office, Washington, D.C., 138p.