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*Newly germinated acorn. Photo courtesy of David J. Moorhead, The University of Georgia, [www.forestryimages.org](http://www.forestryimages.org).*

## Improving Southern Oak Seedling Survival Can Boost After-Tax Investment Returns

*Donald L. Grebner, Deborah A. Gaddis, Andrew W. Ezell, and Steven H. Bullard*

### Introduction

Private forest landowners have many reasons for managing their timberlands—from intensive timber production to wildlife habitat to family recreation. An exciting forestry development is the establishment of oak plantations on agricultural land. Both state and federal governmental assistance programs can provide part of the initial investment involved in forest establishment costs. Unfortunately, there are few existing studies to help landowners decide if the investment will be profitable.

Successful plantation establishment depends on biological, environmental, and operational factors. Biological elements include genetics and competition from other plants. Environmental elements include temperature, rainfall, and other weather conditions. Operational elements include planting quality, location, timing, vegetation control, and pest control. All of these factors influence the

final volumes, quality, and value of a hardwood plantation.

In this article, we will focus on one factor, competition control, and examine how it affects seedling survival and investment returns on southern oak plantations in Mississippi. Using Mississippi data, we compared five different management practices using an after-tax land expectation value. Land expectation value is the method recommended by economists for comparing land uses or management schemes. LEV assumes that the land will be managed in the same way for perpetuity. If the landowner selects the option with the best LEV, then he/she is selecting the method that will provide the highest return and best use (Bullard and Straka, 1998). For our comparison, we chose a base case where seedlings are planted on land with no site preparation treatment. This base case was compared with several different site preparation prescriptions, including disking only, sub-soiling

with rotary mowing (bush hogging), herbicides only, and a combination of herbicides, rotary mowing, and sub-soiling. Seedling survival information was obtained from various published and unpublished sources that apply to oak stands on abandoned agricultural fields in the South. Much of this work is based on a study by Grebner et al. (2003).

### Oak Seedling Survival and Competition Control

The three primary factors that determine initial survival of planted southern oak seedlings are planting stock quality, planting job quality, and competition control. Establishing a hardwood plantation can be expensive, and landowners should make sure to purchase high quality seedlings, store them properly until used, and closely supervise planting to ensure good survival. Our study assumes that good quality seedlings were planted in a high quality planting operation and evaluates various compe-

tition control regimes during the first year of establishment and growth.

The seedling survival information applied in this study comes from both published and unpublished sources. Drs. Andy Ezell, John Hodges, and others for Mississippi State University have an ongoing research study on hardwood plantation survival. Data from plots scattered across Mississippi and Alabama have been collected over the last ten years, including survival estimates for plots treated with herbicides and those not treated. We used the survival percentages from these plots as the basis for our economic analysis. In this research, Dr. Andy Ezell of Mississippi State University found that herbicides increased initial survival of hardwood plantings from 33% to 53% compared to plots with no competition control. In addition, research by Drs. Andrew Ezell and John Hodges showed that survival on sites receiving herbicide application had 70-80% survival after ten years compared to 8-27% survival on sites without competition control. The key result being that first year survival of planted oak seedlings in areas not receiving herbaceous competition control may not be indicative of "final establishment" survival.

In our analysis, seedling survival percentages following mechanical treatment are based on published and unpublished research reports. Various studies indicate that disking and sub-soiling reduce woody competition; however, the exposed mineral soil increases evaporation and provides a favorable environment for the establishment of herbaceous

weeds, which adversely affect oak survival (See end note). Information from these studies combined with unpublished research reports by Ezell was used to derive survival percentages by treatments used in this study.

### Taxation Assumptions

Taxes on timber sales and the tax breaks available for site preparation and reforestation are important factors for estimating a landowner's financial returns from plantation establishment. In this study, a landowner is assumed to be an "investor" according to IRS categories of timber ownership, and so, can expense annual management expendi-

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tures as a miscellaneous itemized deduction provided he/she is not limited to the standard deduction. Our definition of expensed cost is one where a cost is deducted in its entirety in the year in which the cost occurs. These costs include annual expenses such as property taxes and typical management activities.

The landowner's initial reforestation investment is assumed to be partially covered by a federal or state cost-share program such as the Forestry Land

Enhancement Program (FLEP) or a state program such as Mississippi's Forest Resource Development Program (FRDP). We assumed the landowner would receive 50% cost share from a government program to establish their oak plantations, although often landowners receive lower cost-share percentages or are limited in the number of acres covered due to a high demand for these financial resources. Under IRC § 126, cost-share payments such as the FLEP are excludable from income. The exclusion is not automatic and depends on the application of set formulas applied to the past three-year's income from the property. In this study, the landowner is assumed to exclude all cost-share payments from income, thereby avoiding payment of income tax on the cost-share payment. The analysis in this study does not apply to landowners ineligible for income exclusion. For details on excluding cost-share payments, consult Agricultural Handbook 718: *Forest Landowner's Guide to the Federal Income Tax*, downloadable from [www.timber-tax.org](http://www.timber-tax.org).

We assume that our landowner also takes advantage of the investment tax credit for reforestation expenses (IRC § 48 (b) (1986)), which is currently a 10% tax credit on a maximum investment of \$10,000 per year. He or she also chooses the accelerated amortization of reforestation expenses (IRC § 194 (1986)) of up to \$10,000 per year. Investor status allows the landowner to amortize regardless of whether deductions are itemized. The landowner is assumed to have total afforestation expenses under \$10,000 per year, which allows full recovery of the expenses not covered by the cost-share program. This program applies to costs incurred prior to 2005. The recent passage of the American Jobs Creation Act of 2004 has replaced this option with the ability to directly expense up to \$10,000 per year in costs and amortize the remainder. We will be examining hardwood investment with these new options for recovering costs in a future article.

Table 1. Percent Oak Seedling

Management Regime	Good Rainfall Year	Bad Rainfall Year
	Seedling Survival (%)	
No Site Preparation	60	30
Disking Only	62.5	35
Sub-soiling Only	70	50
Herbicide Only	85	70
Herbicides, Rotary Mowing, and Sub-soiling	90	80

Table 2. After-tax LEV Per Acre Results for Alternative Management Regimes.

	No site preparation (\$)	Disking only (\$)	Sub-soiling and rotary mowing (\$)	Herbicides only (\$)	Herbicides, rotary mowing and sub-soiling (\$)
Good rainfall year	203.18	221.13	231.37	279.91	268.86
Bad rainfall year	34.17	46.72	115.43	233.77	238.10

### Price, Cost, and Growth & Yield Data

Our models assumed that on a per acre basis, southern oaks will start to accumulate 350 bd ft Doyle per year at age 25 and final harvest will be at age 50 leading to the accumulation of 8,050 bd ft of volume per acre as estimated by Dr. John Hodges, hardwood silviculture expert at MSU. In addition, we assumed one thinning at age 35 will yield five cords and 2000 bd ft Doyle per acre, and that 10 cords per acre will be cut during final harvest along with the 8,050 bd ft. per acre of sawtimber. We could not determine optimal rotation age because there simply is not enough empirical growth and yield data available.

The price and cost information used in this study was collected through personal communication with Mississippi Forestry Commission personnel. In this analysis, a 6% real discount rate was used. The price data used to compute harvest values was taken from Mississippi State Extension Service Timber Price Reports. Price data on oak sawtimber and hardwood pulpwood was averaged for the last three quarters of 1999 and the first quarter of 2000.

### Alternative Management Regimes

Oak survival rates were compared under the five alternative management regimes. Each alternative was modeled by considering both good and bad rainfall years. For the Southern United States, good years, which occur 70% of the time, are defined as having normal rainfall conditions in the South during

the months of March, April, and May with intermittent showers during the summer months. Bad years, which occur 30% of the time, are defined as having below normal rainfall levels for the same time periods according to MSU meteorologist Dr. Charles Wax. Table 1 below illustrates our seedling survival assumptions by treatment and good and bad rainfall years.

### Comparison of Alternative Management Regimes

To compare the returns for competition control using alternative management regimes, land expectation value was calculated for each regime given the before-stated assumptions. Table 2 displays the results for no site preparation and alternative management regimes. When no site preparation is done during good rainfall years, expected stand establishment is better than in bad rainfall years, despite no control for competing competition. This results in a \$169.01 difference in after-tax LEV between good and bad rainfall years.

The after-tax land expectation values for diskings also show a marked difference in the effect of rainfall. The lower expected survival for bad rainfall years decreases the land expectation value estimates by \$174.41 per acre. When comparing diskings only to the base case, the after-tax LEV estimate increases by \$17.95 per acre. The after-tax values are higher for diskings due to the greater amount of initial seedling survival.

When comparing sub-soiling and rotary mowing to diskings, the after-tax land expectation value increased by \$10.24 per acre during good rainfall years and by \$68.71 per acre for bad rainfall years. Since more seedlings survive after sub-soiling, the greater seedling survival results in a greater return after-tax than from diskings.

The application of herbicides to control vegetative competition improves expected initial survival compared to the diskings or sub-soiling and mowing. The improved survival creates higher before-tax and after-tax land expectation values per acre for good and bad rainfall years. In good rainfall years, the after-tax LEV for using herbicides is \$76.73 more than the base case, \$58.78 more than diskings only, and \$48.54 per acre higher than sub-soiling with rotary mowing. In bad rainfall years, the after-tax LEV for this management regime is \$199.60 more than doing nothing, \$187.05 more than for diskings only, and \$118.34 per acre higher than sub-soiling with rotary mowing.

The last management regime examined involved the combined use of herbicides, rotary mowing, and sub-soiling procedures. Expected survival is higher than the previous regimes. After-tax LEV estimates reflect the greater stocking when compared to the first three management practices, but the expected return is actually 4% lower than using just herbicides during good rainfall years. In good rainfall years, the after-tax LEV for this management regime is \$65.68 higher than for doing nothing, \$47.73 higher than for diskings only, and



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\$37.49 higher for sub-soiling with rotary mowing. The LEV actually is \$11.05 less for these practices than for the option of using only herbicides. In bad rainfall years, the after-tax LEV for herbicides, rotary mowing, and sub-soiling is \$203.93 higher than doing nothing, \$191.38 higher for disking only, 122.67 higher than sub-soiling with rotary mowing, and \$4.33 higher for using only herbicides.

### Discussion

In general, greater vegetation control has an impact on after-tax land expectation values for the studied management regimes. Although, there are many factors that may affect the results of this study, including growth and yield information, re-planting, discount rates, timber prices, and costs, we focused our research on impacts generated by taxes and incentive programs.

Hardwood plantation returns are affected by taxes, federal and state incentive programs and state tax credits. State incentive programs, such as the Forest Resource Development Program in Mississippi, provide financial assistance and technical support to landowners. Not all states have state programs and unfortunately, given high demand for these monetary resources, not all programs can offer 50% cost share for site establishment. If the actual cost share percentage is less than the 50% rate assumed for this study, then hardwood investment returns will be lower when considering either before- or after-tax calculations. However, landowners who live in a state with a reforestation tax credit have another alternative for receiving financial assistance. For instance, in Mississippi, private landowners are eligible for a \$10,000 lifetime tax credit for reforestation. The use of the Mississippi credit has no effect on the federal tax breaks for reforestation and site preparation. Programs

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like this can greatly improve the investment return of investing in new forests, hardwood or pine.

Another program for which hardwood plantations are eligible is the Conservation Reserve Program (CRP). Although not incorporated in this study, the CRP has been extremely profitable for individuals engaged in the business of farming. Due to a recent revenue ruling (Rev. Rul. 2003-59), CRP cost-share payments may be excluded from income in the same way as other eligible cost-share programs although all rental payments must be treated as ordinary income. Alternatively, farmers are eligible to treat non-cost shared regeneration costs for CRP acres as expensed costs and to deduct them in the year in which they occur. The deduction is limited to 25% of the taxpayer's gross income in any one year. Therefore the overall benefits of enrolling in the CRP program to recover reforestation expenses would need to be evaluated on a case-by-case basis, but would generally be quite positive.

## Conclusions

The goal of this study was to examine the role competition control plays in seedling survival and whether or not it affects investment returns for southern oak plantations. The results suggest that for establishment of hardwood plantations, herbicides only or herbicides along with rotary mowing and sub-soiling generate positive returns despite good or bad rainfall years during the first year of initial plantation establishment.

Finally, two observations: Our study used conservative growth and yield estimates which serve as a possible worst-case scenario. Under better or optimal conditions, an individual may have even better returns. If intensive management techniques are added into the regime, the returns may be improved further. Using genetically improved seedlings, fertilization, and implementing pest control programs should also improve investment returns.

Second, the tax changes in the American Jobs Creation Act of 2004, which improves the ability to directly expense site preparation and reforestation costs, should make the establishment of hardwood plantations even more attractive. As the IRS issues regulations on the use of this new law, we will evaluate hardwood investment to make sure that our results hold true under this new law.

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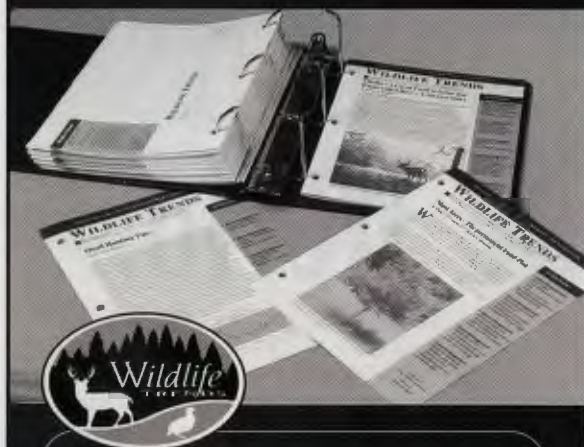
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End Note: Suggested reading list is available from authors upon request.

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