

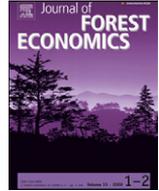


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# Financial analysis of intensive pine plantation establishment

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### ABSTRACT

We analyzed the financial impacts of intensive loblolly pine (*Pinus taeda*) plantation establishment in the southern United States using projected growth data. Optimized management yielded positive net present values (NPVs) at all combinations of management intensity and discount rate except for the most intensive management at the highest discount rate. Cost-share payments for site preparation improved the performance of higher intensity treatments relative to lower intensity treatments, and yielded positive NPVs in all combinations of management intensity and discount rate. Landowners can choose among a suite of management intensities covering a wide range of capital commitments. Monetary returns may be improved by additional management actions, and by taking advantage of additional cost-share programs and tax benefits.

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### Introduction

Because demand for wood product is projected to remain strong for the foreseeable future, intensively managed pine (*Pinus* spp.) plantations on private land will continue to be a significant component of the landscape in the southern US (Prestemon and Abt, 2002). Intensive management includes such actions as mechanical site preparation, herbicide application(s), fertilization, and use of genetically improved seedlings (Siry, 2002). Growth response to elements of intensive management have been incorporated into growth and yield models, allowing for financial analyses based on growth projections under varied scenarios. Such analyses have been performed for decisions

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regarding single elements of intensive management, such as chemical site preparation or herbaceous weed control (HWC) (Busby 1992; Busby et al., 1998), mid- to late-rotation fertilization (Stearns-Smith et al., 1992, Williams and Farrish, 2000), improved genetics (McKeand et al., 2006), and thinning (Huang and Kronrad, 2002). However, financial analyses involving the use of multiple management elements during the stand establishment phase are lacking.

Intensive management strategies have been shown to drastically increase pine growth (Miller et al., 1995, Borders and Bailey, 2001). Gains from separate management actions, such as fertilization and weed control, are often additive (Zutter and Miller, 1998, Jokela et al., 2000, Miller et al., 2003), making greater intensity management more economically feasible. Monetary returns for intensively managed plantations are consistently greater than those from unmanaged or lightly managed stands (Yin and Sedjo, 2001, Siry, 2002, Allen et al., 2005, Cubbage et al., 2007). In spite of greater potential returns, intensive pine plantation management is not widely practiced by non-industrial private forest (NIPF) landowners relative to forest industry and timber investment management organizations (Siry, 2002, Arano and Munn, 2006). Although NIPF landowners control 71% of the 81 million ha of timberland in the US South and are responsible for 67% of annual timber harvest (Conner and Hartsell, 2002), the relative lack of forest management may close off a potential income stream.

Greater regeneration costs reduce the likelihood that NIPF landowners will actively regenerate harvested stands (Kline et al., 2002, Beach et al., 2005). In Mississippi, USA, only half of NIPF landowners actively regenerated forest stands following harvest (Gunter et al., 2001) and <10% of Mississippi NIPF landowners incurred expenses for site preparation activities (mechanical, chemical, prescribed fire, or fertilization) during 1998–2000 (Arano and Munn, 2004). However, cost sharing tends to increase planting by NIPF landowners (Alig et al., 1990, Hardie and Parks, 1996, Kline et al., 2002). Establishment costs have the longest wait for return on investment of any stand management action, and cost-share programs reduce capital requirements and shift risk away from the landowner. Federal cost-share programs, such as the Forestry Incentive Program and the Stewardship Incentive Program, make cost-share funds available for reforestation, afforestation, or improved forest management; in addition, 8 of 13 southern states offer cost-share programs (Granskog et al., 2002). The monetary benefit associated with available cost-share programs is therefore an important consideration if NIPF landowners are to be fully informed of their management options for forest regeneration. The purpose of this study was to investigate the financial returns associated with investments in alternative management regimes commonly used to establish pine plantations in the southern United States. Given the high percentage of NIPF landowners eligible for cost-share programs, we included cash-flow analyses both with and without a cost-share payment for site preparation and planting costs.

## Data source

We measured loblolly pine (*Pinus taeda*) growth on 5-year-old stands established at 4 industrial forest sites owned by 3 timber companies in southern Mississippi, USA. Stands were harvested between June 2000 and February 2001, averaged 66 ha in size, and treatment plots were delineated such that each was uniformly influenced by topography and drainages. Residual vegetation communities in post-harvest stands were characterized by 39% coverage of herbaceous plants, 15% coverage of vines, and 19% coverage of woody plants (Edwards, 2004). Two soil associations common to the Mississippi Lower Coastal Plain (Pettry, 1977) occurred on the 4 stands (United States Department of Agriculture, 1995). The McLaurin–Heidel–Prentiss association was common to 2 stands and comprises gently sloping, moderately well-drained sandy and loamy soils. The Prentiss–Rossella–Benndale association occurred on 2 stands and was characterized by loamy and fine sandy loam soils.

Treatments were designed to reflect the range of operational intensities used by forest industry, and consisted of combinations of mechanical site preparation (MSP), chemical site preparation (CSP), and banded or broadcast herbaceous weed control (HWC). Intensive management is often associated with chemical competition control (McCullough et al., 2005), so we correlated treatment number with the amount of herbicide used during stand establishment to assign treatments ranging from

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