Southern Pine Tree Improvement – A Living Success Story

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The U.S. South can boast of the productivity, quality, and value gains realized from plantation forestry that silviculturists and tree breeders have developed over the past 50+ years. From the beginning of tree improvement programs in the region, the focus has been on selecting, breeding, testing, and planting trees that provide landowners with the greatest return on their investments (e.g. Zobel 2005). The agrarian culture, available land, favorable political and social attitudes towards production forestry, productive soils, and a moderate climate all favor the growth of plantation forestry in the South. The trend in recent years has been for increasing intensity of forest management of these acres (Allen et al. 2005). With global demand for timber products increasing at the same time as the area of the world's forests is decreasing, increased productivity of southern plantations has local, regional, national, and global implications. These plantations help provide timber to meet increasing demands while simultaneously reducing the environmental footprint of industrial forestry by growing more wood on less area.

Foresters in the southern United States are responsible for over 75% of the nation's tree planting, and over 95% of these seedlings are genetically improved loblolly and slash pines (McKeand et al. 2003). Deployment practices such as planting only the best open-pollinated (OP) families to the best sites are resulting in dramatic increases in productivity. Increased resistance to fusiform rust disease, especially in slash pine, has also had major impacts on plantation yields (Vergara et al. 2004).

In the early 2000's, 59% of the loblolly and 43% of the slash were annually deployed as OP families by companies and small landowners (McKeand et al. 2003). Over the last 10 years, seed orchard managers have had great success in developing methods to mass produce full-sib families for operational planting. The gains from improved quality and yield are very impressive when both the female and male parents are selected (e.g. Bramlett 1997, Bridgwater et al. 1998, Jansson and Li 2004). In 2007, the companies that have been mass producing full-sib seedlings for operational planting were surveyed to determine how many Mass Control Pollinated (MCP or CMP) seedlings have been produced. Since 2000, Over 94 million full-sib family seedlings have been planted in the South (Figure 1). Propagation of selected clones has also become a reality via somatic embryogenesis (SE), and the gains to be realized from planting these outstanding genotypes are tremendous (e.g. Pait 2005). To date, almost 10 million seedlings of somatic embryogenic clones have been planted, and the numbers are increasing annually.

Over the last 50+ years, forest products companies, government agencies, landowners, and most recently institutional investment firms such as Timber Investment Management Organizations (TIMOs) and Real Estate Investment Trusts (REITs) have invested millions of dollars in tree breeding and seed orchard management. The value to landowners and the returns on these

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investments have been tremendous. We recently surveyed members in the three southern tree improvement cooperatives to determine the members' annual investment in breeding and seed production. Approximately $14 million is spent annually to breed and produce improved loblolly and slash pine seeds. Annual seedling production is about 1 billion seedlings or about 1.8 million acres at 566 trees per acre average for an annual investment of less than $8 per acre for genetically improved loblolly and slash pine seedlings. Some simple economic analyses using publicly available growth and yield models show that planting improved seedlings on site index 70 land ($SI_{25years}$ = 70') on a 30 year rotation with two thinnings and a mix of products will yield a PV of $15 per acre per percent improvement in growth. Assuming a conservative 30% value gain over unimproved, this is an astounding PV to the landowner of $450 per acre for planting better seedlings that can be obtained at very modest marginal costs.

There are many ways to evaluate the investments in southern tree improvement (e.g. Porterfield et al. 1975, van Buijtenen 1984, Talbert et al. 1985, McKeand et al. 2006). To date, every analysis we have seen shows that the returns on investment in breeding and planting genetically improved loblolly and slash pines are very high. Even with the changes in land ownership and the loss of the integrated forest products companies (Byram et al. 2005), we are optimistic that tree improvement and intensive silviculture will continue to be mainstays of forest management in the South. The challenges to the large tree improvement cooperatives are numerous, but support is still strong, and gains continue to be made.

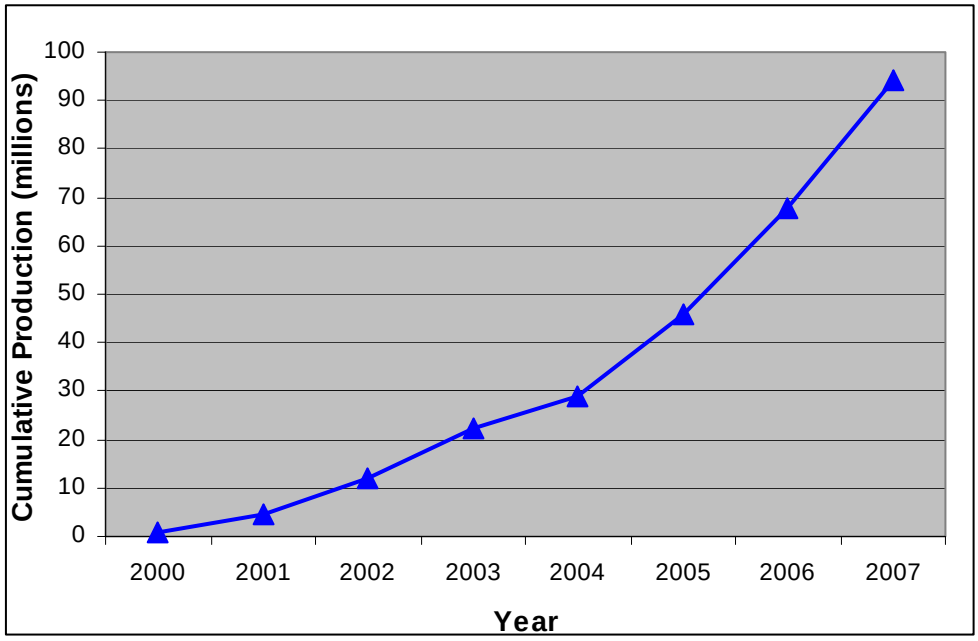

Figure 1. Operational planting of full-sib families of loblolly pine has become a reality. Since 2000, over 94 million full-sib family seedlings have been planted by landowners in the southern United States.

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