# INTENSIFYING TREE BREEDING PROGRAMS AND THE IMPACT ON FOREST PRODUCTIVITY AND PROFITABILITY FOR LANDOWNERS IN THE SOUTHERN US

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Maintaining progress in tree improvement has huge economic development implications for the South. Unlike other silvicultural inputs into plantations, the benefits from planting genetically improved seedlings are permanent and spread over millions of acres at minimal extra cost. The economic incentive to increase efforts in tree breeding is impressive. If the genetic gain per year is increased to any extent, the regional financial impacts are worth millions of dollars. For example, the present value (6% interest rate) of a series of continuously improved plantations (1% per year of genetic improvement) was estimated to be $12,255 per planted acre (e.g. a non-ending series of genetically better plantations of one acre being planted each year). If these same plantations were established with the seedlings of only slightly higher genetic quality each year (i.e. genetic gain is increased from 1% per year to 1.1% per year), the present value would be $240 per acre planted per year. For the South where about 1.2 million acres of loblolly pine are planted each year, the increased value to all landowners from this slight increase in genetic improvement would be $300 million.

The NCSU Cooperative Tree Improvement Program continuously works to discover innovative ways to accelerate tree breeding, while reducing costs and increasing efficiency. For example, our group has initiated tandem selection for fusiform rust resistance for elite breeding populations followed by clonal testing to select for growth and quality traits. We are testing new genomic tools for genome-wide estimated breeding values, and we are using markers to construct realized genomic relationship matrices to increase accuracies of breeding values to increase genetic gains. Our fourth cycle breeding strategy, now being developed, will incorporate opportunities to utilize genomic data.