

Valuing Tomorrow's Loblolly Pine Plantations

TODAY

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THE 2010 pine plantation establishment season will mark the sixth year that private forest landowners have had the option of planting mass-control pollinated (MCP, known mother tree and controlled pollen source) and varietal (cloned seedlings with identical DNA) loblolly pine seedlings. With this advanced genetic material now combined with the elite open-pollinated (OP, known mother tree, unknown pollen) seedling choices that have been derived from five decades of tree improvement, private forest landowners have more and better options than ever. In this article, we will look at the status of the planting of this elite genetic material, the operational gains pending, and current limitations to the planting and value recognition of these seedlings.

Volume and Sawtimber Potential Gains

After five decades of tree improvement, we are working with known pedigrees and a large amount of genetic variation. This historical effort and more recent use of MCP and varietals has produced steady improvement (Figure 1). Average gains from these genetic generational or improvement-level steps are estimated for MCP and OP in Figure 1. The volume improvement numbers shown are averages for the level of improvement, based on progeny test results and operational planting successes over time. Individual families, crosses, or lines planted on your land may be better or worse. In the field, in operational plantings, the tree we see is a direct result of the seedling's genotype (genetic make-up or its inherent potential), interacting

with the seedling's micro-site and climatic environment. Currently, with proper density, water, and nutrient management, we see estimates of exhibited productivity (height at age 25) of 75 to 90 plus feet for plantings of advanced genetics over a variety of sites. Compared to heights of 55 to 80 feet at age 25 in decades past, these are significant operational gains. Further improvement in early realized productivity could be gained through additional herbaceous weed control, a move toward fall planting with containers, and continued gains through genetic improvement.

True genetic and operational value is expressed through more than just total volume production. It is also heavily influenced by grade (or percent sawtimber potential). Percent grade incorporates and considers the gains in better

rust resistance, improved straightness, smaller branches and a lower frequency of forking or large, steep-angled branches. Many of the best volume producing families (OP) that have been used over time, have limited stem quality traits or combined percent sawtimber potential. Historically, average pre-thin percent grade estimates for OP seedling options ranged from 25 to 50 percent (i.e. if you planted 500 trees per acre, only 125 to 250 of them would be capable of making quality, higher-valued sawtimber).

Geneticists have since used controlled crosses of chosen parents to enhance genetic potential to improve sawtimber potential along with good volume production. Today, for mass controlled crosses or the best OP, an operational planting average of 60 percent sawtim-

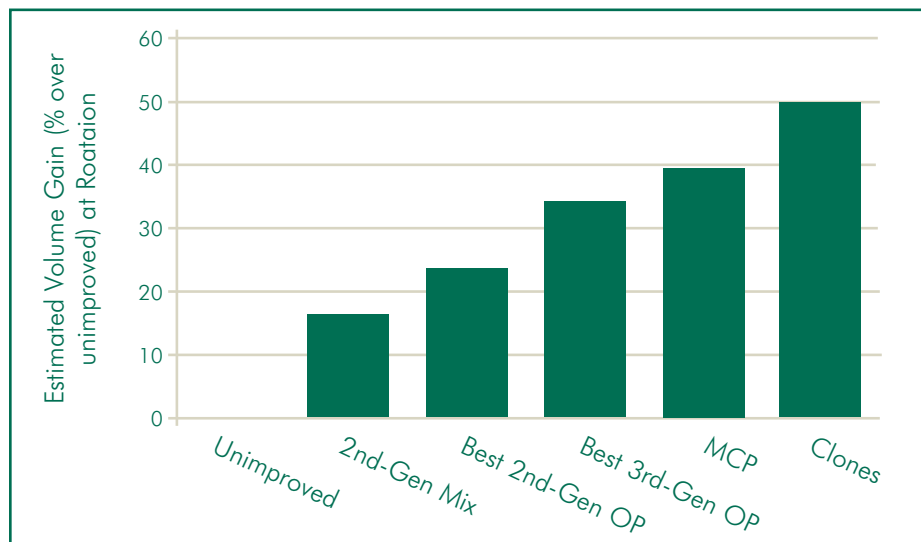


Figure 1 Estimates of gain over unimproved loblolly pine for different levels of genetically improved seedlings (from NCSU Cooperative Tree Improvement Program).

ber potential is realistic, and for some of the best crosses 60 to 85 percent sawtimber potential may be realized in the field. For varietal seedlings, 80 to nearly 100 percent sawtimber potential may be expected, depending on environmental events and effects.

What Should We Expect From These Improvements?

Our expectations of future value are often heavily impacted by our current or past experiences. However, once we make the step-change to planting advanced genetic material with appropriate management, the additional growth potential, improved stand uniformity, and increased percent grade greatly increases our expectations of production and stand value.

The question now that we have this advanced genetic material to use is, "How should we view future investment plantings?" In the southeastern U.S., we have relied heavily on growth and yield models to estimate future yields. But can the growth of plantations from these advanced genetic level seedlings be modeled with conventional individual-tree and stand-level growth and yield models? The simple answer is yes, but changes must first be made to account for the changes in exhibited traits. For instance, the shape of the productivity/age curves for advanced genetic material is generally the same as that of historical site index curves. After all, they are still the same species from known pedigrees. However, from an analysis of a clonal screening study in South Carolina, it was observed that there was as much as a 15-foot difference in estimated site productivity among clones that had received the same silvicultural regime (Burkhart 2009).

Currently, most operational varietal and controlled cross plantings are only one to five years old. How many years of growth observations do we need to be able to make accurate projections of their expected rotation yields with new models? Dr. Harold Burkhart, director of the Virginia Tech Growth and Yield Cooperative believes that we can make reasonably good estimates of age 25

heights for these plantations with an appropriately calibrated site index equation and two early end-of-year measurements (i.e. at age two and age five). Measurements of older plantings of clones show that the best clones do, in fact, exhibit high levels of height growth throughout the rotation.

What are They Worth?

The value of these advanced genetic options depends on many factors, including the realized operational productivity level, the stumpage prices, and the pine plantation establishment and maintenance cost and timing. Each user should make his or her own estimates of value using the preferred method of evaluation. Calculations of net present value (NPV; sum of the discounted future cash flows using a chosen discount rate) or internal rate of return (IRR; the discount rate where NPV=\$0) of management regimes are the most common methods of value estimation.

Multiple value estimates of this type have been completed over the last five years for advanced genetic management regimes. One of the authors estimated that NPV was conservatively increased by an average of \$50 to \$300 per acre, simply from planting elite material, using an eight percent discount rate under a variety of management regimes (McKeand and others, 2006, *Journal of Forestry*, vol. 104, pp. 352–358). Another showed positive NPVs for a 25-year rotation at moderate productivity levels and low-moderate historical pricings (\$6 per ton pulp, \$15 per ton cns, and \$35 per ton sawtimber) also using an eight percent discount rate: 2nd-Generation NPV of \$12 to \$33 per acre, 2.5-Generation NPV of \$117 per acre, 3rd-Generation NVPs of \$162 to \$192 per acre and a MCP NPV estimates of \$241 per acre (Bryant, 2009).

Yet another author showed NPV estimates over a range of higher operational productivity levels of \$323 to \$733 per acre (Dougherty 2009) at current, low historical pricing levels (using a 23-year rotation, initial stocking of 435 tpa, a seven percent discount rate, establishment costs of \$300 to \$435 per acre, pine pulp price of \$8 per ton and a

blended sawtimber price of \$25 per ton).

Current Use Status

After years of low-priced seedlings and limited access to the best material, a competitively priced market has emerged. The more advanced material is being marketed at higher prices per thousand and is being sold on a first-come, first-served basis. At the present time, the vast majority of seedlings planted are still open pollinated seedlings. For the 2008 to 09 plantation establishment season, estimates of annual deployment show around 31 million MCP seedlings and 5 to 10 million varietal seedlings being produced, in a total loblolly seedling market of around 800 million seedlings (McKeand 2009). Using these estimates, 95 percent of all seedlings planted are still from open pollinated stock, with approximately 4 percent of annual production being MCP material and about 1 percent being varietal stock.

Current Limitations to the Deployment of Elite OP, MCP and Varietal Stock

Factors limiting the deployment of the more advanced genetic material include seedling production potential, recognition of the value proposition (increased potential compared to increased cost) by seedling purchasers, and the recognition of the increased discounted plantation value in the land market. Production is currently on the rise, especially in the MCP area of improvement, and the discounted value increase is continually being recognized by more seedling purchasers. The lack of land market response to the value added due to intensive management practices may be the largest limiting factor; the purchase price of land should reflect the growth potential and quality of the established stands of timber. If the gains in NPV were recognized by the buyer of land with established plantations, and seen to affect the purchase price, it would be a large incentive to the planting and intensive management of advanced genetic material. Currently, there are limitations to this happening.

First, adequate means of projecting the growth and product yields of these advanced-generation plantations are not readily available. Work is underway on developing more robust crop production forecasting capability for a full range of genotypes and silvicultural practices; these enhanced models will facilitate the proper valuation of plantations at various ages and stages of development. Second, and perhaps more importantly, many land purchases are conducted with borrowed money and require an appraisal. Land appraisals may take into account discounted cash flows, but generally rely heavily on the comparative sales approach. Timberland appraiser Michael Moorman of TerraSource Valuation notes, "Appraisers don't set the value, they reflect the value as shown in comparative sales."

There have been few documented land sales with advanced plantations in place to date. Michael also noted that many smaller land purchases by private landowners are now for higher and better use purposes or for recreational use versus pure timberland investment purposes. So, with only a limited history of establishment and a required period of performance proofing, a limited number of land sales with MCP or varietal plantations, along with the confusion of land use and limited experience with valuing highly productive plantations, it may still be a while yet before the enhanced NPVs are directly recognized in the land market.

Conclusions and Recommendations

The enhanced investment values of these new plantations are currently being evaluated in the field. The value added traits are clearly visible in the tests, but again, in the field we see the phenotype directly, not the genotype. Similar to the way the genotype is often hidden or diluted or confused by the effects of the environment or the timber manager's ability to ameliorate the limitations of the microsite, the total value of the enhanced genetic potential is limited by our ability to unleash, document, and measure these exhibited traits oper-

ationally. The following are actions items that should lead to further recognition of value and increase the operational deployment of advanced genetic seedling, along with application of appropriate silviculture, for increased productivity and profitability:

Progressively manage these plantations, correctly identifying site limitations and offsetting those limitations with the proper site amendments. Proper management limits site variability and allows the true and full expression of the improved genetics.

Document the genetics (even if just the nursery coded name) and the performance scores. For more privately-owned plantations than not, the family, cross, or variety is often not recorded or maintained well. Often, the purchaser of the seedlings is provided nothing regarding the performance level, or expected trait expression of the purchased seedlings. This lack of information and documentation can potentially be a limitation in the recognition of the value, as well as the potential enhanced appraisal in the future. We have made huge strides in this area over the last five years, an example being the Performance Rating System of the North Carolina State University Tree Improvement Cooperative and an improved disclosure of quality traits. Request and maintain information about the planting stock and its quality and production traits.

Consider sampling these intensively-managed plantations at an earlier age, and including percent grade as one of the measurements. The percent grade measurement is not really viable prior to the growth expression of the first full 16-foot log. At the advanced growth rates that are operationally possible now, age four to seven would be a realistic age for sampling. Historically, many management firms have taken initial measurements of survival in or at the end of the first growing season, and then measurements at age 10. At today's advanced growth rates, measurements earlier than age 10 are needed to insure that density adjustments and needed nutrient amendments are identified prior to crown and growth losses. Two measure-

ments, i.e. age 2 and 6 versus age 1 and 10, might also be useful to help identify the site index or growth production trajectories.

Share your operational data regarding the genetics deployed, the silviculture used, and the successes made or lessons learned. This would help satisfy the call for third party verification and many lessons could be learned collaboratively. Remember, that in the case of the varietal seedlings, with genetics fixed, exhibited differences in tree growth are basically telling us about the microsite, and indirectly, about our ability to manage site resources. There is much to be learned and much to be gained in true recognition of genetic value. While for some there is an incentive not to have the MCP or Varietal discounted value acknowledged in the market, for most of us, and certainly for our forestry sector as a whole, it will be beneficial to see better recognition of our improved asset value class performance.

The southeastern U.S. forestry sector is comprised of many different entities with different interests, including private non-institutional investors, TIMOs and REITs, sawmills, pulpmills, and now alternative energy markets. While we all have different objectives, we all work in the same wood basket and would benefit from a forest resource of improved productivity and quality. This improved resource is important to our efficiency and wood quality, and both impact our ability to compete in a global market. Furthermore, with potential new markets emerging, global demand expected to increase with increasing population, and lessening land available globally to produce our products, we may need the resource more than we know. Further deployment of advanced genetic material and application of intensive silvicultural practices should be encouraged and supported to make continued improvements in competitiveness and supply potential. Current efforts are underway to increase production of this genetic material. While much work has been completed to facilitate the recognition of the value, more work remains. ♦