Tree Size and Value Affects Pine Planting Density Decisions

Caulfield, J.P., D.B. South, and G.L. Somers. 1992. Tree size and value affects pine planting density decisions. Ala. Agr. Exp. Sta. Highlights Agr. Res. 39(3):8.

Planting densities for southern pine tree plantations range from 300 to 1,100 trees per acre (tpa), and average 700 tpa. While the correct planting density for a given situation requires input from individual landowners or managers, recent Alabama Agricultural Experiment Station research indicates lower planting densities than those traditionally used may be more economically sound.

The objectives of this study were to describe and analyze the types of price-size curves that can exist, and the situations to which they apply.

The shape and slope of a price-size curve depends on the value of the intended end-product of the harvested trees. The simplest case is a horizontal line of price per unit product volume over tree diameter, in which per unit volume does not vary with tree size. This relationship reflects a situation where landowners sell a single product, such as pulpwood. In figure 1, for the curve referred to as the Pulpwood price-size curve, price is a constant $25 per cunit of timber sold (1 cunit=100 cubic feet of wood).

A positively sloped price-size curve means that a market exists for trees to be sold for increasingly higher value products as tree diameter increases. For example, a 14-in. Diameter tree contains some volume in large saw-timber, chip-and-saw sawtimber, and pulpwood. Figure 1 shows two positively sloped price-size curves for loblolly pine: one using data from Timber Mart South, a timber price reporting service (the TMS curve)); and the other from a forestry consultant (the Consultant curve). Both curves recognize a price premium paid for larger, versus smaller diameter trees. Therefore, when landowners grow products such as sawtimber, the price-size curves can be used to help make planting density decisions.

Prices used to construct the TMS curve came from timber prices in southern Alabama and the consultant curve came from price date gathered in Georgia. Different product merchantability limits also were used to construct each curve. Each timber seller has a curve that applies to his situation, and this curve will influence planting density decisions.

The economically correct planting density can be determined for each price-size curve by calculating the Land Expectation Value (LEV) for different planting densities. LEV is a financial measure used to compare investments where cash outflows and inflows occur at different points in time. Densities ranging from 300 to 900 tpa were evaluated in this study. The density with the highest LEV is the most desirable.

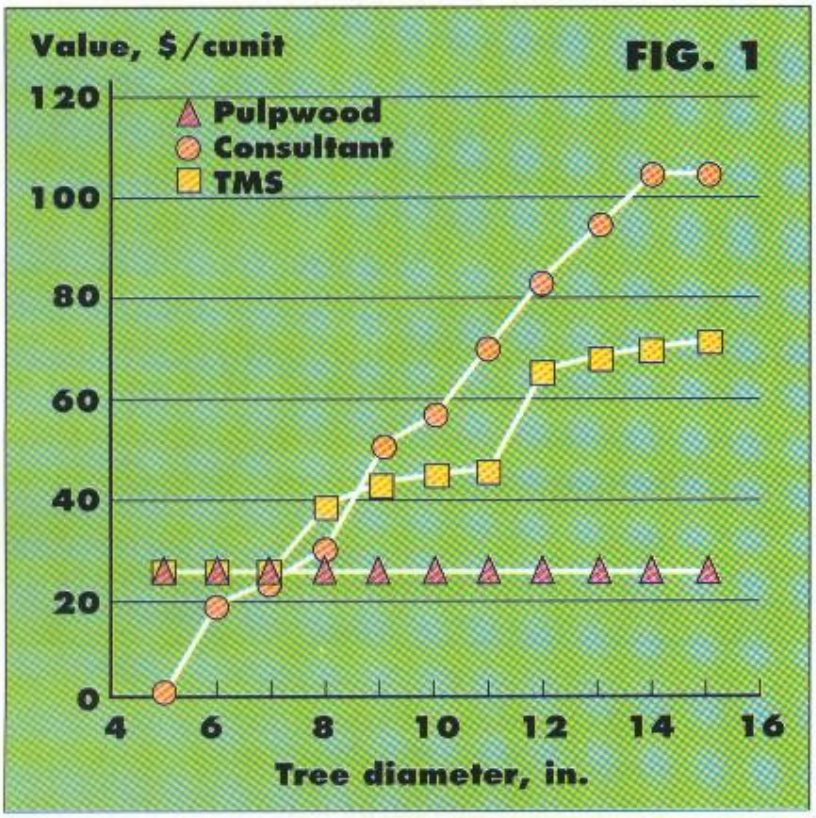
A large cash outflow occurs at the time of stand establishment (for site preparation, seedling purchase, and planting costs) and an inflow occurs from timber sales when the stand is eventually harvested. Because people value a dollar received today more highly than a dollar received in the future, these cashflows must be adjusted, or discounted at some interest rate, to a

common point in time (the rate used here was 6%). The LEV measure discounts these cashflows to the present, the year when the stand is established.

Figure 2 shows the LEV in dollars per acre, plotted over planting density, for the three price-fixed curves. The type of curve bears directly on the density decision. For the pulpwood curve, maximum LEV occurs at a density of about 450 tpa. At lower and higher densities, LEV is somewhat lower.

For the TMS and consultant curves, LEV is at a maximum at the lowest planting density of 300 tpa. Trees put on diameter growth more rapidly at lower densities than at higher densities. Sine the TMS and consultant price-size curves place more value on larger diameter versus small diameter trees, they indicate lower planting densities are appropriate. It is seen in figure 2, that at densities higher that 300 tpa, LEV slowly drops off.

Although the results shown here should not be interpreted as a set of general guidelines, they do indicate that lower planting densities than those traditionally employed may be appropriate in many cases. Most important, the price-size relationship that exists for a specific situation, along with a knowledge of rotation age, site quality, and management costs, can be used to determine the appropriate planting density for almost any landowner.



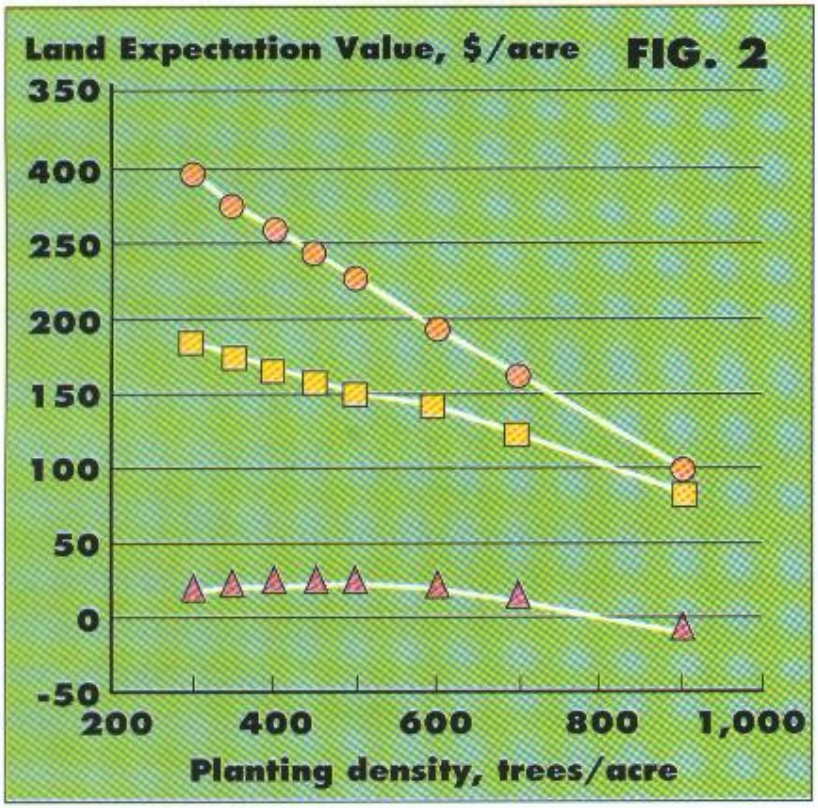


FIG.1. (top) Three different price-size curves. FIG.2. (bottom) Stand value over density for three price-size curves.