Using herbicides enabled us to plant smaller seedlings. The smaller seedlings are easier to pack, transport to the field, store prior to planting, and the field planters do a better job of correctly planting the seedlings which result in higher survival rates.

NURSERY CULTURE

Scott Paper Company has completed construction of a Forest tree nursery in Baldwin county, Alabama. This nursery's primary purpose is to supply seedlings for reforestation of the 550,000 acre woodland base Scott has located in southwest Alabama and Southeast Mississippi.

We began searching for a suitable nursery site in 1989. We looked extensively through soil maps of our land base and were unable to locate a large enough area with a uniform soil type with nearly flat topography.

After exhausting our efforts on company lands we started looking at suitable farm land that was for sale. A 350 acre tract was located that was primarily in cultivation or pasture land. There were also several large center pivot irrigation wells in operation in the adjoining property. We checked with geologist on water quality of surrounding community and municipal water systems.

One of the most important factors in selecting a nursery site is soil type. Our soil type is a Eustus which is a sandy loam. With this type of soil one has the ability to lift seedlings during the wet rainy months without having severe soil compaction and structure problems. Hardwood seedlings tend to grow best on sandy loam and loam soils because of the better balance between soil moisture retention and aeration. Soil nutrient levels are usually much higher in loamy soils than sandy soils.

Organic matter is very important to nursery soils. It influences both the chemical and physical properties of the soil. The organic matter levels in Forest tree nurseries is depleted more rapidly than most other crops because the entire plant is removed. Cover crops and bark amendments are two ways to improve or maintain proper levels of organic matter. Part of our nursery is on a one:one rotation and part is on a one:two rotation. We have tried various crops and sorghum sudan grass seems to work well for summer cover crops on our nursery. Winter cover crops consist of winter wheat, oats, and rye. No noticeable difference has been noticed in the performance of either crop.

The recommended amount of organic matter that should be maintained in soil depends upon soil texture, drainage, and climatic factors. Generally speaking sandy soils should contain from 1.5 to 2.0

percent and heavier soils from 2.0 to 3.0 percent. We also add 2 inches of hardwood bark to our fields that are in a two year rotation an add 150 pounds of ammonia nitrate per acre at plow down. We mow our cover crops twice during the growing season. We top dress if the crop shows deficiencies.

Hardwood seedlings require optimum and balanced fertility levels to grow balanced seedlings. These requirements have a direct influence on outplanting survival. There is no optimum nutrient level ratio suitable for all nursery soils or species. Like most other nursery practices you have to experiment and find the best nutrient ratio for your particular situation. The target nutrient ratios we are using this year are listed in table 1.

		POUNDS PER ACRE	
PH	TOTAL N%	P_2O_5	NH_4NO_3
5.5 - 6.0	.20	100	250

Source: Hardwood Nuseryman's Guide, USDA Forest Service Agricultural handbook No. 473, pg 6.

After our nutrient levels are at optimum levels we will put most of our fertilizer under cover crops and only top dress as required.

Seed handling is an important step in establishing a good hardwood crop. Hardwood seed varies in requirements for pregermination treatments as much as it does in seed size. Some species do well if fall sown. Others require soaking over winter in water of changing temperatures, acid bath treatments, boiling water treatments to normal stratification similar to pine seed.

We fall sow all of our oak, green ash, catalpa, and dogwood. This is usually in late November or early December. We have planted 28 different species of hardwood this year. Fall sowing as many species as possible gives us more time in the spring to plant our normal crop of pine seedlings.

Most of our hardwood seed is sown with a nursery seeder. An OYJord nursery seeder is used to plant our small seeded hardwood species. A nursery built seeder is used to plant our acorns and other larger seeded hardwood species. Utilizing mechanical seeders has cut our labor costs significantly for sowing hardwood.

Pole shavings from a local pole mill is used as mulch for all of our hardwood species. Fall sown species are mulched with 1 - 1 1/2 inches of shavings and firmed on the seedbeds with an hourglass roller immediately after sowing. Pole shavings are comprised of pieces of wood 2 - 3 inches long with some pine bark. This type of material is ideal for fall sown seedbeds, since we do not have trouble with mulch floating off the beds during heavy rains. Another plus for pole shavings is that you are adding additional organic material to your nursery fields.

Weed control is one of the largest expenditures we encounter in growing hardwoods. All compartments scheduled for hardwood production are fall fumigated. We have not seen any detrimental affects on seedling growth. Winter weeds have not given us any problems in our fall sowing.

Herbicide usage in hardwood is very limited due to the sensitivity of most of the species to herbicide damage. Most of the ornamental herbicides are not registered for nursery seedbeds. Devrinol is applied to all of our hardwood after full germination and gives good control of several of our problem weeds. Poast is used to control grasses in most of the hardwood species. Roundup is directly sprayed using backpack sprayers to spot spray areas with problem and hard to control weeds.

Insect and disease control in hardwood seedlings requires constant visual checks. Most of the time if you wait until a lot of visual damage is present, most of the damage has already occurred. Leaf rollers, defoliators, and twig girdlers are our prime insect pests. Damping-off, anthracnose, leaf spot, and powdery mildew are the prime disease problems we encounter. Generally if conditions exist where fungal problems occur we spray on a 2 week schedule.

Irrigation is critical to a good hardwood crop. Seedbeds must be kept moist during germination. Too much water leaches fertilizer and stunts seedling growth. Hardwood seedlings require more water than pine. We apply approximately 1 1/2 - 2 inches of irrigation per week depending on rainfall.

Top pruning is used to control the height growth of seedlings. A cycle-bar mower was modified to top clip seedlings at a height of 2 - 2.5 feet above the seedbeds. Top pruning is performed throughout the growing season to maintain even height growth and reduce the number of overtopped and cull seedlings. The tractor speed and blade sharpness is critical to make clean cuts and not tear seedlings. After mowing we apply a fungicidal spray to reduce infections on freshly cut surfaces.

Hardwood lifting season generally begins in January. This is weather dependent, with an early frost we can began lifting earlier. We like to wait until the seedlings have defoliated to reduce the transplanting shock. Seedlings are undercut at 8 to 10 inches using a Frobro seedling lifter, pulled by hand, and packed on trailers with the roots covered with wet burlap squares for transport to the packing building. Seedlings are graded and packed in KP bags using terra-sorb root dip. Normally we pack 150 seedlings in an open bag strapped at the top. Seedlings are placed in cold storage on racks until shipped to the field for planting.

Planting hardwood seedlings is labor intensive and we need to continue to develop new techniques to reduce production costs. Also, much research is needed to develop new methods of cultural practices for weed control and nursery planting techniques. Above all, we as nurserymen need to grow the best quality seedlings as possible so that they will survive and grow into a useful commodity.