Working Trees for Livestock

Agroforestry: Silvopasture in the Southeast

What are "Working Trees"?

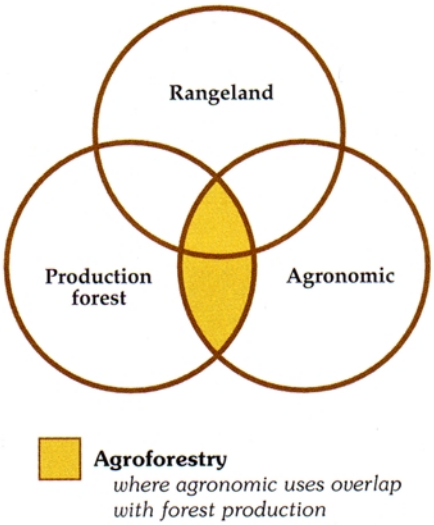
Working trees are trees used in conservation and production systems on farms and ranches. They have a job to do, whether it's increasing income, protecting natural resources, or making our lives a little more enjoyable. "Working Trees" is a theme title designed to promote the science and practice of "agroforestry." Agroforestry is a term that agriculturists and foresters have defined to include most practices where trees and shrubs are intentionally integrated into agricultural crop, forage, or livestock operations. Practices like windbreaks, riparian buffer strips, alley cropping, forest farming, and silvopasture use the same land to produce both forest and agricultural products, while at the same time conserve natural resources. Using working trees simply means planting the right trees, in the right place, at the right time, and in the right design to get a specific job done.

Silvopasture is the integration of trees with livestock operations. Silvopasture provides multiple benefits to landowners. If managed properly, trees in a livestock operation can reduce stress on livestock, while at the same time maintain forage production. Furthermore, by adding trees to forage systems, a landowner can receive additional income on the same land from timber products, Christmas trees, nut/fruit crops, or commercial wildlife or recreational opportunities.

What are Silvopastoral Systems?

Most people are accustomed to a single use of forest land or rangeland. Forest land and rangeland are basically used to produce crops, forage range, livestock, or forest products. Silvopasture applies where livestock uses overlap with forest production. Silvopasture has become an important tool to improve income opportunities on farms and ranches in the Southeastern United States. The concept of silvopasture provides both forest production and forage

or livestock production simultaneously. The trees are ultimately managed for high value sawlogs (intermediate harvesting may produce pulpwood or posts and poles) and at the same time provide shade and shelter for livestock and forage. Trees can be planted into current forage systems, or woodlands can be thinned to accommodate additional growth of forage.



Benefits of Incorporating a Silvopastoral System

Incorporating long-term timber production into pasture and livestock management operations will provide for both an annual income and a longer-term cash flow. Silvopasture can improve the overall economic performance of a farm enterprise through diversification. The benefits primarily involve those gained in forage production and timber production.

Forage production

Incorporating trees into an established forage production or grazing system can maintain normal forage production while adding a long-term tree crop. In a study done by Cliff Lewis, USDA Forest Service, pine trees were planted and bahiagrass was seeded the same year. The trees were planted in spacings of 10-feet by 48-feet and 16-feet by 30-feet. The site was cut for hay the first three years, and then grazed for three years. At the end of six years, hay production averaged seven tons per acre (normal for the region) and beef gains averaged 200 pounds per acre during spring and summer grazing periods. After six years the trees were 22 feet in height and averaged 5.2 inches in diameter. This example demonstrates that increased timber growth can be realized with the multiple benefits of silvopasture.

Timber production

Incorporating grazing or forage production into a forested area can provide added cash flow to the enterprise and may increase wood production as shown in the following example.

A research study done in South Central Georgia found slash pine trees grown in both grazed and fertilized silvopastoral systems grew more rapidly, both in height and diameter, than those planted in ungrazed and nonfertilized native vegetation. In this study, trees were planted on 12-foot by 12-foot spacings and 20-foot by 20-foot spacings. The site was kept weed-free for three years. Bahiagrass, Dallisgrass, and coastal bermudagrass were planted in year four, and grazing commenced the fifth year. Trees in this design produced about 30 percent more wood per acre than surrounding plantations in native vegetation (see charts 1 and 2).

Silvopasture techniques can be convenient and effective. In some parts of the country, a typical timber management cycle involves site disturbance prior to replanting after a clearcut. This may be a good opportunity to seed grasses or even legumes. In the Coastal Plains region, a site-prepared area was seeded to pensacola bahiagrass. A year later, longleaf pine was established on the same site. The site was grazed year-long, and after nine years, there were 967 trees per acre. The longleaf pine trees that were grazed came out of the "grass" stage sooner than those ungrazed, and they grew significantly taller.

Chart 1-Tree height

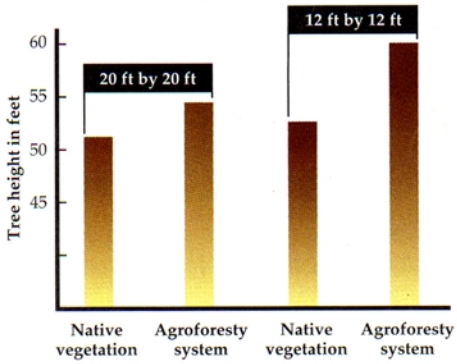
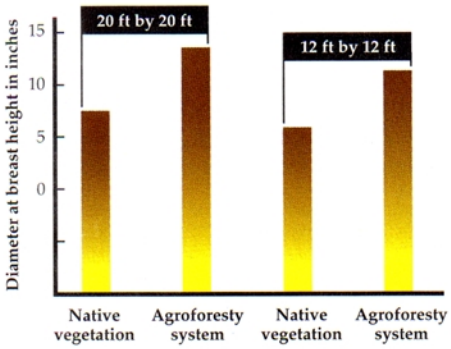


Chart 2-Tree diameter



Other benefits

Silvopasture practices can:

- Improve overall economic performance of a farm enterprise through diversification
- Maintain or increase tree growth
- Improve cool-season grass production
- Allow warm-season grass production with careful canopy management
- Provide shade for livestock
- Produce pine straw for landscaping and mulch
- Aid in erosion control
- Increase wildlife populations
- Improve water quality
- Increase opportunities for recreation
- Enhance aesthetics and property values

Tree spacing in silvopastoral systems provides for compatible forage and forest production.

Planning considerations

- **Inventory your resource base.** Begin planning with an inventory of existing resources. A local soil survey, which is available from your USDA Natural Resources Conservation Service office, can help you determine the suitability of different sites for different forage plants and trees. Your silvopastoral system will only be successful if you use plants adapted to your area.

- **Consider newer technologies.** Electrically powered fences may be the only way to afford a conservation grazing approach that matches livestock forage demand with forage production. Practical solar pumps may be used to provide water to previously unusable locations.

- **Analyze the economic implications.** Analyze the economic implications of pasture management, improvements required, and potential return. Then plan a grazing system using a conservative stocking rate. Intense grazing, overgrazing, and poor placement of supplemental troughs, water, or mineral feeders offer the highest potential for unacceptable levels of tree damage. Overstocking or improperly managed grazing can result in destruction of young pine seedlings. Consider a planting arrangement that would enhance self pruning, such as multiple row plantings, or higher density plantings that would require more frequent thinning. Wide-row, low-density planting increases limb retention and, depending upon species, decreases timber quality. For example, trees with large retained branches produce lower quality saw logs for lumber. Pruning is one method for assuring clear saw log production. A general guide is to prune trees when they reach four to six inches in diameter at breast height (dbh) and pruned to approximately where the trunk is four inches in diameter. Care should be taken to remove no more than about 30 percent of the live crown at any one time. (This is an accepted practice for wide spaced silvopastoral systems in other parts of the world.)

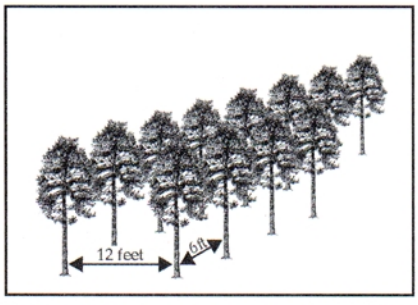
- **Special considerations.** To ensure an adequate stand of quality trees, consider the natural range of pests in your area. Cattle-induced injuries to lower limbs of trees may provide opportunities for insect or disease attacks. Stay in touch with others who have had experience with successful, local silvopastoral systems.

Closed canopy forest eliminates understory and the potential for grazing domestic livestock.

- **Select tree species, forage species, and a management option that assure compatibility.** Some forage plants are more shade tolerant than others. For example, in the Southeast bahiagrass has proven to be more shade tolerant than Dallisgrass or coastal bermudagrass. Nangeela subterrannean clover is more shade tolerant than some other varieties available. Selection of forage plants as well as trees that are conducive to silvopasture is important There appears to be a minor reduction in the digestibility of some forages growing in shade. This does not seem to be significant enough to affect livestock production or gains. There is evidence of increased palatability with some cool-season grasses.

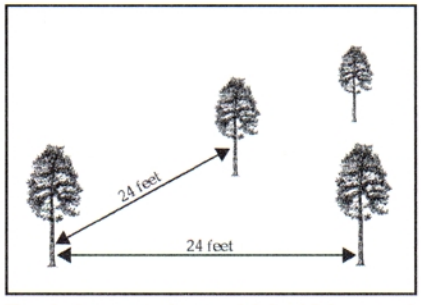
Management Options

Canopy closure reduces forage production as timber stands mature. In fact, in many ecosystems, when canopy cover exceeds 30 to 50 percent, forage production is curtailed to the point where grazing domestic livestock may not be economically feasible. One method of dealing with fluctuating forage production is through designed thinning (removal or harvest of some of the trees to maintain the desired canopy and competition level). Another method is planting fewer trees initially, which increases the period for canopy closure and completion to occur. Row arrangements significantly impact space and canopy closure, which affect forage production. With proper management, a silvopastoral system can benefit the landowner, the land, and livestock all at the same time.

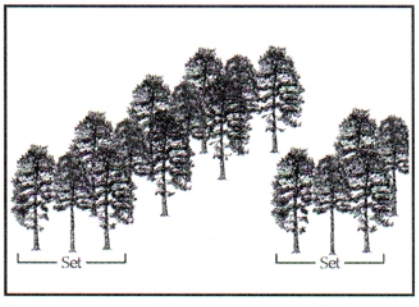


Self pruning will occur on a 6- by 12-foot planting arrangement. Periodic thinnings are needed to maintain forage production. However, forage production will fluctuate with tree density.

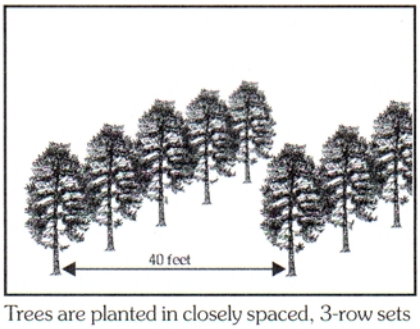
Thinned to →



Timely thinnings of original 6- by 12-foot stand to a final stand of 75 trees per acre ensures more consistent forage production.



Single rows are spaced 40 or more feet apart. Pruning is required to produce quality trees. Forage production is easier to maintain.



Trees are planted in closely spaced, 3-row sets with wide spacing between sets. Outside rows are "trainers" and help self prune inside rows. Outside rows are removed for pulp; inside rows are managed for higher quality saw logs.

National Agroforestry Center

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Sid Brantly, regional grazing lands coordinator, USDA-NRCS, Auburn, Alabama, assisted in the development of this brochure.

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Grazing Lands Technology Institute, USDA-NRCS, P.O. Box 6567, Fort Worth, Texas 76115. For a supply of brochures contact Dianne Johnson, (817) 334-5232 ext. 3620.

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