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Agroforestry Notes

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From Pine Forest to A Silvopasture System

Introduction

Agroforestry systems hold the potential for land users to realize diverse income-generating possibilities from the same acreage, as well as meet environmental goals. Silvopasture systems are agroforestry systems that incorporate the production of forage and/or livestock with the growing of trees for a timber product. The silvopasture system can be developed from a pasture system with the trees incorporated into the open fields or it can be developed from a forest plantation with the forage incorporated into the plantation following a thinning to reduce tree canopy.

Silvopasture combines trees with forage and livestock production. The trees are managed for high-value sawlogs and at the same time an annual income is generated from livestock grazing.

A Southeastern Example

This technical note describes one technique to convert a loblolly pine plantation to a silvopasture system. This Note also compares the production data for a typical pine plantation, a silvopasture system, and a pasture system starting from a 20-year-old pine plantation. This information is based on research from Louisiana State University, Hill Farm Research Station in Homer, Louisiana.

The loblolly pine plantation was originally planted in 10-foot rows with six-foot spacing within the rows for a planting density of 726 trees per acre. At age 20 the trees averaged 8.6 inches in diameter and were 58 feet tall. The stand was considered overstocked with 209 square feet of basal area and 520 trees per acre.

Silvopasture

To establish a silvopasture system to manage for timber, forage, and livestock production, the following steps should be taken:

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Table 1

Forage Yields of *Bahiagrass* Under Pasture and Silvopasture.				
Stand Age (Years)	Pasture (Tons/Acre)		Silvopasture (Tons/Acre)	
	Low Yield*	High Yield**	Low Yield*	High Yield*
21	0.7	0.7	0.5	0.5
22 to 35	1	1 to 2	1	1 to 2

*Low yield — Below average rainfall, 168-day grazing season.
**High yield — Average rainfall, 168-day grazing season.

Table 2

Coastal Bermudagrass Under Pasture and Silvopasture				
Stand Age (Years)	Pasture (Tons/Acre)		Silvopasture (Tons/Acre)	
	Low Yield*	High Yield**	Low Yield*	High Yield*
21	1	1	0.8	0.8
22 to 35	2	3 to 5	1.5	3 to 4

*Low yield — Below average rainfall, 168-day grazing season.
**High yield — Average rainfall, 168-day grazing season.

Table 3

Approximate Wood Yields of Loblolly Pine Under Silvopasture and Pine Plantation				
Stand Age (Years)	Silvopasture		Plantation	
	Cords/Acre	Board Feet Acre*	Cords/Acre	Board Feet Acre*
20	33	0	27	0
25	3	2000	3	1600
30	0	3000	1	2100
35	0	4000	1	3100

*Doyle Scale

Step 1.

Age 20. Conduct an initial thinning to reduce the pine density to 100 trees per acre. On severely overstocked stands or on some soils this density reduction may need to be done over a five-year period using two thinnings to limit windthrow or top breakage.

Step 2

Age 21. (if thinning is done over a five-year period, this would be age 26. Adjust all subsequent steps accordingly.) Establish a commercial forage crop. In this case study Bahiagrass and Coastal Bermudagrass were evaluated.

- **Bahiagrass:** Prepare the seed bed by prescribed burning and disking. Seed in March or April at a rate of 20 pounds per acre, then culti-pack and apply an initial fertilization of 36 pounds of nitrogen (N), 47 pounds of phosphorous (P) and 89 pounds of potassium (K) per acre. Top dress at 36 pounds of N per acre in June. The estimated cost for Bahiagrass establishment is $260/acre. See Table 1 for forage production data.
- **Coastal Bermudagrass:** Prepare the site by prescribed burning and disking. Distribute 35 bushels per acre of sprigs in March or April and incorporate with a second disking. The fertilizer procedure is the same as for Bahiagrass. The estimated cost for Coastal Bermudagrass establishment is $470/acre. See Table 2 for forage production data.

Step 3.

Age 22 to 35. Manage forage crop to optimize livestock production. The example case received an annual fertilizer application of 100 pounds of N, 39 pounds of P, 20 pounds of K and 17 pounds of sulfur (S) per acre, for a cost of $60/acre. Annual weed suppression was also conducted with herbicides at a cost of $24/acre.

Step 4

Age 25. Thin pine to a density of 50 trees per acre. Prune to 20 foot height.

Step 5

Age 30. Thin pine to a density of 25 trees per acre.

Step 6

Age 35. Harvest trees and replant. See Table 3 for timber yields. Seeding rates for forages and soil amendments used in this study provide some guidance, however, seeding rate

and soil amendments should be based on site-specific soil tests and recommendations of University Extension personnel or the USDA Natural Resources Conservation Service (NRCS).

Pine Plantation

A typical management regime for southern pine plantations was evaluated to provide a comparison of wood yield between plantation and silvopasture systems.

Age 20: thin plantation to 250 trees/acre.

Age 25: thin plantation to 100 trees/acre

Age 30: thin plantation to 50 trees/acre

Age 35: Harvest remaining trees and replant. For a comparison of timber yields from plantation and silvopasture see Table 3.

Converting a high density pine plantation to a silvopasture system starts with thinning the trees.

Additional Considerations

The technique discussed in this technical note is meant to provide a starting point for individuals who are considering establishing silvopasture systems in their loblolly pine plantations. Similar results could be expected when converting a well-stocked naturally regenerated pine stand. The timber yield and forage response will vary based on localized site conditions and species. Adjustments in management must be based on observations and desired production levels.

Cool season grasses may tolerate a higher tree density and still maintain their production levels. When seasonal rainfall quantity and distribution are sub-optimal, forage production in silvopastures may be 10 to 15 percent less than open pastures. If pine density is maintained at recommended levels, shading from the tree canopy should not limit warm season forage production.

Timber production in the silvopasture system versus the plantation system was approximately 30 percent greater. This increase was attributed to the fertilizer applied for forage production and reduced tree-to-tree competition.

For silvopasture systems to be successful there must be a commitment to intensive forage, livestock, and timber management. Planned tree harvests, and rotational or intensive grazing is a must. Continuous grazing is not recommended for silvopasture systems.

Based on results at the Louisiana State University, Hill Farm Research Station, silvopasture systems can provide a feasible opportunity to realize multiple products from the same acreage and an opportunity for landowners to diversify their management systems and economic strategies.

Additional Information

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