

# THE SILVICULTURE OF SILVOPASTURE

Rebecca J. Barlow, Seth Hunt, and John S. Kush<sup>1</sup>

**Abstract**—Silvopasture is an agroforestry practice where livestock, forage, and timber are managed on the same parcel of land. The most common form of agroforestry in the Southeastern US is silvopasture. According to the most recent USDA Census of Agriculture, six of the top ten states in the Nation that report that they practice alley cropping or silvopasture are southern. Southern pines are well suited for use in silvopasture systems because of their relative ease of establishment and shorter rotation length. Considerable work has been completed to examine the suitability of southern pines such as loblolly and slash for use in agroforestry systems; however few studies have included longleaf pine. Few studies have addressed the need for modified silvicultural management in these systems. Established in 2008, twelve (four loblolly and eight longleaf), approximately 6 acre double row silvopasture demonstration sites were established on an old field site on the EA Hauss Demonstration forest near Atmore, Alabama. Since establishment, blocks were sampled five times for seedling survival, trees per acre and seedling/tree height, growth, and form. Results from this study have shown that early management practices including the use of prescribed fire can benefit the growth and form of longleaf pine silvopastures in this area. Also, the timing of pruning of both longleaf and loblolly silvopastures is addressed. Through this work we are better able to understand what is needed for the successful establishment and growth of longleaf and loblolly pine silvopastures in Alabama.

## INTRODUCTION

Silvopasture is an agroforestry practice where livestock, forage, and timber are managed on the same parcel of land. It is the most common form of agroforestry in the Southeastern US, yet few landowners choose it as a land management option. Why is this? In recent memory, the industrial forest management style has dominated southern forestry. Therefore, professional land managers may hesitate to recommend practices that seem outside the norm. Landowners who are unfamiliar with agroforestry practices hesitate to adopt them for fear of making a costly mistake. However, most private landowners have varied objectives: high value products from their land, both traditional and non-traditional; wildlife; water; aesthetics; and more. Currently, timber markets are not what they were making timber management less attractive to many landowners. History has shown that woodland grazing can work in southern forests. The science of silvopasture can help landowners meet financial goals. But landowners and land managers need to also understand the silviculture of silvopasture to ensure that this land management model is its most productive.

## HISTORY

Southeastern United States longleaf-slash pine forests made up much of the historical range for southern cattle grazing. At the turn of the last century, Piney-

woods cattle were managed on open rangeland at a rate of about 5-10 acres per head depending on time of year and forage type. Wahlenberg (1946) noted “In accordance with age-old custom, southern landowners usually tolerate grazing on their forest lands by the livestock of numerous small famers. The typical forest range is open, no permits are required, no fees are charged, and usually no attempt is made to control fires set by stock owners”.

A cultural shift occurred that contributed greatly to an ecological change in the Southeast. Fencing laws were enforced in the 1930's and 40's. Longleaf pine forests were harvested and converted to pasture or agricultural land. In addition, the country was going through a period of fire suppression. Lack of fire on the landscape caused fallow agricultural land to be reforested with faster growing southern pine species such as loblolly and slash.

The U.S. Forest Service has a history of conducting research on native forage and woodland grazing (Campbell 1946, Lemon 1949), shaping many of the modern agroforestry techniques that take us beyond free-ranging cattle to science-based land management systems (Lewis and others 1985, Grado and Husak 2004, Oswald and others 2008, Cubbage and others 2012). Silvopasture is the agroforestry

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<sup>1</sup>Alabama Cooperative Extension Specialist and Associate Professor; Graduate Research Associate; and Research Fellow, Auburn University School of Forestry and Wildlife Sciences, Auburn University, AL 36849, respectively.

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practice of combining livestock and trees on the same management area with the goals of optimizing timber, livestock, and forage components; improve cash flow through annual income from forage and livestock; and long-term income from timber (National Agroforestry Center 2008). So, why not consider silvopasture? This paper will provide an overview of agroforestry in the South and discuss management considerations if silvopasture is going to be considered. Data from an ongoing silvopasture study in south Alabama will be used to elaborate on concerns with silvopasture.

## SILVOPASTURE DEMONSTRATION

Few studies have addressed modified silvicultural management in southern pine silvopasture systems but instead address other key issues such as tree and forage establishment, or economic returns (Clason 1999, Grado and others 2001). In an effort to examine the silviculture of silvopasture, a loblolly and longleaf silvopasture demonstration was established on the EA Hauss Demonstration Forest. Owned and managed by the Alabama Forestry Commission, The EA Hauss Demonstration forest is located in Escambia County, AL, north of Atmore, AL. In 2008, a portion of this former tree nursery site was set up as a double row silvopasture demonstration. Six-acre old-field sites (blocks) were planted, four blocks with loblolly and eight blocks with longleaf pine. Measurements were taken at the time of establishment in 2008 and on the odd years thereafter.

The trees were planted at a spacing of 6 feet (within the rows) by 8 feet (between the rows) by 40 feet between the double row sets. This spacing resulted in approximately 300 trees per acre planted in 2008. In early 2009, some replanting occurred to replace dead tree. In the autumn of 2009, “alleys” between the double rows within each block were site prepped for forage establishment. Six blocks (2 loblolly and 4 longleaf) were planted in exotic pasture grasses and the other 6 blocks (2 loblolly and 4 longleaf) were planted in native warm season grasses in spring 2010. Half of the longleaf pine blocks were treated with prescribed fire in the spring of 2013.

### 2015 Measurements

A subset of the blocks was measured in early 2015. Overall survival was 81percent for loblolly pine and 61percent for longleaf. Loblolly pine density averaged 265 trees/acre with a basal area of 46.5 square feet/acre. The average height was 27 feet. The numbers were lower for longleaf pine. Its density was 182 trees/acre with a basal area of 17.5 square feet/acre. The average tree height was 22 feet. An interesting note about longleaf heights, those blocks that were prescribed burned in 2013 were 1-foot taller than those on the unburned blocks.

## SILVOPASTURE SILVICULTURE

The demonstration at Hauss has helped to provide some early rotation silviculture considerations. Scalping helps remove competition and is needed especially in old field plantings of longleaf pine. It is beneficial to herbicide rows to treat pasture grasses prior to planting. Keeping the ecology of longleaf pine in mind, prescribed fire early in longleaf plantings appears to help height growth. The USDA National Agroforestry Center (2008) recommends pruning trees when they are 15 to 20 feet tall and/or the diameter of the tree reaches 5-inches as a height of 6-inches above the ground. Thus, around ages 5-7 years, monitor for early pruning needs and consider stand stocking to schedule pre-commercial thinning, especially for loblolly pine. Unfortunately, trees at Hauss have not yet been pruned or thinned due to unforeseen limited access to contract labor. The resourceful landowner can conduct some silvicultural treatments such as pruning themselves, but future access to labor is something that should be considered during the planning process.

It is also important to remember, that young trees may be browsed or trampled by livestock. If the choice of livestock is cattle, it is beneficial to delay their introduction until the trees are 10 – 15 feet tall. Based on these heights, the loblolly pines at Hauss were considered “cattle resistant” by age 5. It took another year for the longleaf pine to reach that threshold.

## CONCLUSION

The time is right for a renaissance in southern pine agroforestry. Grazing in pine forests is an important part of southern land management history. As part of a silvopasture, cattle are a source of additional income and cash flow that can be important to a private landowner. Although it may not have the rapid early growth of loblolly pine, longleaf should not be dismissed as viable options for landowners interested in silvopasture. Pine straw produced from longleaf pine silvopasture can produce additional revenue in addition to timber and cattle.

It is a must to always consider objectives when planning a new forestry activity and planting the tree species that best meets those goals. It is important that landowners and land managers understand the silvics of southern pine species. Differences may impact their land management decisions such as when to introduce cattle, or amount and quality of pine straw produced.

Remember to weigh the options! Your objectives will determine what management approach is most appropriate. A silvopasture system is not a “plant-it and leave-it” system. It is important to consider the economics and the ability to complete future management activities. More demonstrations are

needed to provide landowners with a perspective on this wonderful opportunity.

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