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AGROFORESTRY SYSTEMS: INTERCROPPING LEGUMES WITH PINE SEEDLINGS

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Background. The Southern Pine forest covers more than 197 million acres in the southeastern U.S. and is a major source of revenue in this region. In East Texas, productive timberlands occupy about 12 million acres. Following clearcut harvest of pine timber, a popular method for site preparation is the complete removal of vegetation prior to replanting of pine seedlings. While this practice promotes increased seedling survival and growth due to reduced competition, site integrity is disrupted which can result in significant loss of topsoil.

Current Information. Information is needed on alternative methods for establishment of pine trees that will allow for management decisions that are compatible with a sustainable use of our natural resources. A field study was implemented in April 1991 at the Texas A&M University Agricultural Research and Extension Center at Overton to examine whether intercropping various warm-season annual legumes would have an effect on the growth of newly established pine seedlings. Intercropping legumes with trees has been shown to increase height and volume of temperate and tropical tree species. Improved survival and growth of the pine seedlings may aid to reduce risk, improve yields, or shorten the length of time to harvest. All of these factors may serve to improve the profitability of the agroforestry system. Legumes provide excellent ground cover that may be useful in preserving and enhancing site integrity and aiding in soil moisture retention. Legumes also fix atmospheric nitrogen, and studies have indicated the potential for direct and indirect transfer of N. The transferred N has resulted in increased yields and/or quality of the associative non-fixing species. 'Iron & Clay' cowpeas (*Vigna unguiculata*), common alyceclover (*Alysicarpus vaginalis*) and 'Comanche' partridge peas (*Cassia fasciculata*) were interplanted into a newly established loblolly pine plantation. Cowpeas were planted at 50 lb/ac, alyceclover at 20 lb/ac and partridge peas at 10 lb/ac. Additional treatments that were applied across the legume-pine seedling plots included an application of phosphorus fertilizer and a cool-season legume (crimson clover).

First year data from the cowpeas, alyceclover, and partridge pea plots indicated some positive effects on height and diameter characteristics of loblolly pine seedlings. Pine seedlings grown with cowpeas or alyceclover attained greater heights than those grown with partridge pea ($P<.10$). Pine seedlings grown with cowpeas had the greatest basal stem diameter; whereas, pine

seedlings grown with partridge peas had the smallest stem diameter of all treatments ($P<.10$). Partridge peas adversely affected both the height and diameter development of the pine seedlings due to competition for light and possibly for moisture and/or nutrients. Canopies of the partridge peas were dense and often 2 to 3 times taller than the pine seedlings. Phosphorus fertilizer has not yet affected pine seedling growth, however, growth of both cowpeas and crimson clover was positively impacted on sites that received the P fertilizer.

Recommendation. Data collected thus far are too preliminary to make recommendations concerning these agroforestry systems. However, the competitive nature of the partridge peas has restricted pine seedling growth and caused some mortality of pine seedlings. Thus, if this legume is to be functional as an N source, use of this legume should be delayed until trees are older or a reduced seeding rate should be used. Legumes that establish readily have a demonstrated ability to preserve site integrity and reduce the amount of potential loss of topsoil and moisture due to runoff. Economic constraints not withstanding, if site conditions and fertility warrant, legumes may offer many positive aspects for agroforestry systems.