FIELD DAY REPORT - 1993

Texas A&M University Agricultural Research and Extension Center at Overton

Texas Agricultural Experiment Station
Texas Agricultural Extension Service

Overton, Texas

May 28, 1993

Research Center Technical Report 93-1

AGROFORESTRY SYSTEMS: INTERCROPPING LEGUMES WITH PINE SEEDLINGS

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Background. The Southern Pine forest covers more than 197 million acres in the southern and southeastern U.S. and is a major source of revenue in this region and raw materials for manufacturing nationwide. In East Texas, productive timberlands occupy approximately 12 million acres, and where found, serve as a major source of employment. Following clearcut harvest of pine timber, a popular method for site preparation for artificial regeneration of pine seedlings is the complete removal of vegetation. While this practice has been demonstrated to increase pine seedling survival and growth due to reduced competition, site integrity is disrupted which can result in significant loss of topsoil. Site fertility may be reduced and sustainability of the system is, therefore, questionable. Information is needed on alternative methods of pine seedling regeneration that will allow for sustainable use of our natural resources.

Intercropping cool-season legumes has been demonstrated to increase both height and diameter of temperate and tropical tree species. Improved survival and growth of the pine seedlings may reduce risk, improve yields, or shorten the length of time to harvest. Each of these factors may serve to improve the profitability of the system. At the same time, legumes provide excellent ground cover which aids in maintaining site integrity and improving soil moisture levels. Legumes also fix atmospheric nitrogen (N), and studies have indicated the potential for direct and indirect transfer of fixed N. This transferred N has resulted in increased yields and/or quality of the associated non-N-fixing species.

Research Findings. A field study was initiated in April 1991 at the Texas A&M University Agricultural Research and Extension Center at Overton to determine whether intercropping warm-season annual legumes would affect the growth of pine seedlings in a newly established plantation. 'Iron & Clay' cowpeas (*Vigna unguiculata*), common alyceclover (*Alysicarpus vaginalis*), and 'Comanche' partridge pea (*Cassia fasciculata*) were interplanted into a newly established loblolly pine (*Pinus taeda*) plantation. Cowpeas were planted at 50 lb/ac, alyceclover at 20 lb/ac, and partridge peas at 10 lb/ac in year 1. In year 2, cowpeas were planted at 100 lb/ac and alyceclover and partridge peas were allowed to reseed naturally from the previous year's planting. Additional treatments included the application of phosphorus (P) fertilizer and planting of crimson clover (*Trifolium incarnatum*) in year 1.

Following two years of growth, data obtained from the study indicated that pine seedlings grown with cowpeas were taller ($P<0.10$) than seedlings subjected to other treatments or grown as vegetative controls. Pine seedlings grown with cowpeas averaged 44.76" in height followed by seedlings grown as controls (41.99"), seedlings grown with alyceclover (41.80"), and seedlings grown with partridge peas (37.69"). Data also indicated that pine seedlings grown with cowpeas were greater ($P<0.10$) in basal stem diameter than other seedlings. Those seedlings grown with cowpeas had a mean stem diameter of 0.98" followed by seedlings grown with alyceclover (0.91"), seedlings grown as controls (0.86"), and seedlings grown with partridge peas (0.78"). There was no effect on pine seedling growth due to P fertilizer. However, pine seedlings grown with crimson clover were taller ($P<0.10$) than those seedlings that did not receive the cool-season treatment. Mortality of pine seedlings was less ($P<0.05$) for seedlings planted with cowpeas or grown alone as controls when compared to the other two warm-season legumes. Soil nitrate-N values were mathematically higher in plots planted to legumes when compared to control plots.

Application. Data collected thus far are preliminary for making planting recommendations for this type of agroforestry system. The data, however, do suggest positive impacts on pine seedlings grown with cowpeas at the early pine seedling stage. Cowpeas also provided a source of high quality nutrition for white-tailed deer during the summer stress months when quality forage or browse may be low. The data also suggest potential negative effects on pine seedling growth associated with planting partridge peas at 10 lb/ac. Thus, economic constraints notwithstanding, if site conditions and fertility warrant, legumes may offer opportunities for maintenance/enhancement of site fertility and improved growth of plantation loblolly pines.