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SUMMER FALLOWING IMPROVES SURVIVAL AND GROWTH OF COTTONWOOD ON OLD FIELDS

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SOUTHERN FOREST EXPERIMENT STATION

Fallowing an old-field site during the summer prior to planting and applying a herbicide in September improved survival and growth of eastern cottonwood cuttings. Summer fallowing without applying herbicide also improved height growth of cottonwood through age 2. Deep plowing and cover cropping, alone or in combination, did not influence growth or survival during the first year after planting.

Additional keywords: *Populus deltoides*, site preparation, Johnson grass.

Survival and growth of planted eastern cottonwood (*Populus deltoides* Bartr.) are often poor on abandoned fields in the Mississippi Delta. These fields usually have compacted, nutrient-depleted surface soils and an abundance of grasses and other herbaceous vegetation. To improve establishment and growth of commercial hardwood species on these sites, intensive soil management appears essential. This note reports early results of tests of sev-

eral soil management techniques for rejuvenating old fields for cottonwood production.

METHODS

The study area was an abandoned old field on Crown Zellerbach Corporation property in Sharkey County, Mississippi. It had been previously cropped, pastured, and used as an airstrip. Soil is a Commerce silty clay loam. Soil management techniques applied prior to planting included separate and combined treatments of

1. Cover cropping: Winter rye and vetch seeded (25 lbs./acre of each) on disked plots in September 1969. The cover crop was incorporated into the soil by disking in January 1971.
2. Deep plowing: Plowing to a 16-inch depth with a moldboard plow in September 1970.
3. Summer fallowing plus herbicide: Plots disked four times between June and August 1970. One lb. of active trifluralin per acre was applied in September 1970 and incorporated into the soil by disking.
4. Control: No treatment.

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Treatments were replicated three times in a randomized complete-block design. Plots were 30 by 800 feet. Cottonwood cuttings were planted at 10- by 10-foot spacing in February 1971. All plots were disked in January 1971 to prepare for planting and were cultivated periodically during the first growing season.

In an exploratory trial 1 year prior to the main study, an adjacent area was deep-plowed with a disk panplow and a bullhead plow. Summer fallowing with and without deep plowing was also tested. Cottonwoods were planted as in the main study, and height and survival were observed 2 years after planting.

RESULTS AND DISCUSSIONS

Fallowing during the summer prior to planting and applying herbicide significantly (0.05 level) improved first-year survival and growth of planted cottonwood (table 1 and fig. 1). On fallowed plots, 85 percent of the cuttings survived, and heights averaged 9.7 feet after 1 year. On the unfallowed plots, survival was 67 percent, and trees averaged only 7.0 feet in height. Cover cropping and deep plowing, alone or in combination, improved neither growth nor survival. These treatments also failed to provide significant additional benefit when combined with fallowing-herbicide application.

Table 1.—Relation of first-year height and survival of cottonwood to soil management treatments

Treatment	Tree height ¹	Survival ²
	Feet	Percent
No fallow or herbicide		
Control	6.0 b ³	68 b
Cover crop	7.1 b	62 b
Deep plow	7.2 b	73 b
Cover crop + deep plow	7.7 b	66 b
Mean	7.0	67
Summer fallow and herbicide		
+ Cover crop	9.4 a	84 a
+ Deep plow	9.6 a	86 a
+ Cover crop + deep plow	9.8 a	85 a
Mean	10.0 a	85 a
Mean	9.7	85

¹ Each value is the mean of three replications, about 160 measured trees.

² Each value is the mean of three replications, about 240 planting spots.

³ Within columns, individual treatment means not followed by the same letter are significantly different at the 5-percent level according to a Duncan's test.

In the exploratory experiment, trees on summer-fallowed plots (to which no herbicide was applied) were significantly taller than trees on unfallowed plots (table 2 and fig. 2). Deep plowing in combination with summer fallowing failed to induce additional growth.

Figure 1.—Cottonwood on plots that had been summer-fallowed and treated with herbicide (right) had 20-percent better survival and averaged 3 feet taller after 1 year than did trees on the control plots (left).



Table 2.—Relation of second-year height and survival of cottonwood to deep plowing and summer fallowing

Treatment	Tree height ¹	Survival ²
	Feet	Percent
No summer fallow		
Disk panplow	18.3 b ³	80 a
Bullhead plow	17.7 b	67 b
Mean	18.0	74
Summer fallow	22.7 a	70 b
+ Disk panplow	22.7 a	78 a
+ Bullhead plow	22.3 a	65 b
Mean	22.6	71

¹ Each value is the mean of three replications, about 40 measured trees.

² Each value is the mean of three replications, about 60 planting spots.

³ Within columns, individual treatment means not followed by the same letter are significantly different at the 5-percent level according to a Duncan's test.

The increases attributable to fallowing were of about the same magnitude in the two experi-

ments, even though no herbicide was applied in the exploratory experiment. The lack of a pronounced herbicide effect may have been due to periodic cultivation of all plots throughout the growing season to control Johnson grass (*Sorghum halpense* (L.) Pers.). If the area had not been cultivated, the effects of herbicide might have been significant.

Why is fallowing of compacted old-field soils during the summer prior to planting beneficial? It probably temporarily improves soil structure and reduces competing vegetation, particularly Johnson grass. All fallowed plots on both study areas were relatively free of Johnson grass, the primary competitor to planted trees, during the 2 years after planting.

Summer fallowing is widely used in agriculture, especially in semiarid regions, for weed control and soil moisture conservation. Both benefits are also important for establishing hardwood plantations. The favorable results from summer fallowing reported here indicate that this technique may be useful in establishing hardwood plantations.



Figure 2.—Two-year-old cottonwood on plots that had been summer-fallowed (left) were 5 feet taller than trees on unfallowed plots (right).