

PACIFIC SOUTHWEST Forest and Range Experiment Station

DIRECT SEEDING TRIALS OF THREE MAJOR TIMBER SPECIES IN HAWAII

Gerald A. Walters Craig D. Whitesell

USDA Forest Service
Research Note PSW-234
1971

Sowing tree seeds rather than planting nursery grown seedlings could reduce the cost of reforestation and speed the conversion of non-productive forests on selected sites. Mann¹ has reported on the success of direct seeding southern pines in the Southern States. But will direct seeding work in Hawaii, where the number of species and sites is so large? Which species can be direct seeded, and on what sites?

Direct seeding research is underway in Hawaii with a number of timber species on several different sites. These trials are considered "first looks" to determine species adaptability to specific sites and to determine limiting factors present. If a species shows promise—as judged by greater than 60 percent stocking and early height growth—more extensive trials will be conducted.

Direct seeding three important timber species is now being tested on the Nanawale Forest Reserve on the island of Hawaii. The three species are West Indies mahogany (*Swietenia mahogani* [L.] Jacq.), monkey-pod (*Pithecellobium saman* Jacq. Benth.), and lemon-gum eucalyptus (*Eucalyptus citriodora* Hook.).

After 1 year, monkey-pod and West Indies mahogany appear to be well suited for direct seeding at Nanawale and on similar sites. Both had good stocking and made rapid height growth. Lemon-gum eucalyptus had poor stocking but good height growth.

SITE

The study site is at 100 feet elevation about 2 miles from a volcanic crater that erupted in 1960 and only about 1/2 mile from the edge of the concurrent lava flow. The eruption covered the site with 3 to 8 inches of cinders. The underlying soil, derived from cinders and ash of earlier eruptions, is classified as Hoopuloa extremely stony mucky silt loam. The soil has a shallow surface layer, about 10 inches deep,

ABSTRACT: Trials are underway to determine the feasibility of direct seeding timber species to specific sites. Three major timber species were direct seeded on a moist, cindery, low-elevation site on the island of Hawaii. After 1 year, West Indies mahogany and monkey-pod had acceptable stocking; stocking of lemon-gum eucalyptus was considered poor. All three species made rapid height growth. If more extensive trials result in similar stocking for West Indies mahogany and monkey-pod, direct seeding can be considered a feasible method for establishing forests of these two species.

OXFORD: 232.4(969)—232.33[+ 176.1 *Eucalyptus citriodora* + 176.1 *Pithecellobium saman* + 176.1 *Swietenia mahogani*].

RETRIEVAL TERMS: *Eucalyptus citriodora*; *Pithecellobium saman*; *Swietenia mahogani*; direct seeding; Hawaii; Nanawale Forest Reserve.

Table 1—Stocking and seedling height after 1 year of West Indies mahogany, monkey-pod, and lemon-gum eucalyptus direct seeded in the Nanawale Forest Reserve, Hawaii

Species	Stocked spots		No. of Seedlings per stocked spot	Height	
	Maximum	Final		Average	Range
	Percent		Range	Feet	
West Indies mahogany	98	86	1-11	4.6	1.2 - 7.2
Monkey-pod	100	88	1-12	6.7	1.2 - 9.7
Lemon-gum eucalyptus	48	42	1-4	8.8	3.2 - 14.3

overlying aa lava. The soil is well-drained and is slightly acid. Clearing the site with a bulldozer mixed the stones, soil, and new cinders. Annual rainfall varies greatly from year to year, and averages about 90 inches. About 105 inches of rain fell during the 1 year study period which began in September 1966. Aspect is east, with slopes from 0 to 35 percent.

METHODS

Seeds of the three tree species were sown in seed spots in separate rows in each of five blocks. Each row consisted of 10 seed spots. Seed spots were prepared by leveling an area about 15 inches in diameter. The number of seeds sown per spot was based on germination tests. We wanted at least five viable seeds in each spot. The seeds were placed on the ground and lightly covered with soil; no fertilizers or mulches were added.

Seed spots were checked for developing seedlings every 2 weeks for the first 2 months, then monthly for the remainder of the study period. Seedlings in a spot were tallied at each examination, and height of the tallest seedling in each spot was measured to the nearest inch during the final examination. A seed spot was considered stocked if it had at least one seedling. Overtopping weeds were removed from around the seedlings, but not all spots needed weeding at each examination. Height growth in some plots was retarded by edge effect of the adjacent forest and by aggressive vines.

RESULTS AND DISCUSSION

All three species—West Indies mahogany, monkey-pod, and lemon-gum eucalyptus—reached maximum stocking 1 month after sowing (table 1). Percent

stocking then declined until the tenth month. The stocking for both the West Indies mahogany and the monkey-pod declined 12 percent. But the final stocking of 86 percent for West Indies mahogany and 88 percent for monkey-pod is considered acceptable. Stocking for lemon-gum eucalyptus declined only 6 percent, but the maximum stocking of 48 percent is considered poor; therefore, the final stocking level was also rated poor.

Stocking for West Indies mahogany and monkey-pod was probably aided by the large number of viable seeds that were apparently sown. Germination tests had suggested that 16 West Indies mahogany and 15 monkey-pod seeds were needed in each spot to insure at least five viable seeds being present, but as many as 12 seedlings developed in some spots.

All three species grew rapidly. After 1 year, lemon-gum eucalyptus was the tallest, averaging 8.8 feet. One tree stood 14.3 feet tall. Monkey-pod averaged 6.7 feet, and West Indies mahogany averaged 4.6 feet.

The stocking and height growth of all three species indicate that more extensive trials should be held. If the results for the West Indies mahogany and monkey-pod are similar to these early findings, direct seeding can be considered a feasible method for establishing forests of these species. The stocking of lemon-gum eucalyptus probably can be increased by sowing more seed per spot and by using mulches or fertilizers or both.

NOTE

¹Mann, W. F. *Direct-seeding slash pine*. Southern Lumberman, 4 p. 1966.

U.S. Forest Service research in Hawaii
is conducted in cooperation with
Division of Forestry
Hawaii Department of Land and Natural Resources

The Authors

are doing silvicultural research and are headquartered at the Institute of Pacific Islands Forestry, Honolulu, Hawaii. GERALD A. WALTERS earned B.S. (1965) and M.S. (1966) degrees in forestry at the University of Missouri. He joined the Forest Service in 1966. CRAIG D. WHITESELL received his B.S. degree (1951) from West Virginia University, and his M.S. Degree (1954) from Duke University, both in forestry. He has been with the Station's Hawaii staff since 1962.