

# Seed Collection From Loblolly Pine Cones After Tree Shaking

J. A. Vozzo, James L. McConnell, Jerry L. Edwards, and  
Eli Milodragovich

*Physiologist, USDA Forest Service, Starkville, MS;  
geneticist and engineer, USDA Forest Service, Atlanta,  
GA; and engineer, USDA Forest Service, Missoula, MT*

---

*Seed collection from loblolly pines (Pinus taeda L.) is compared in bagged cones from trees shaken mechanically or by the turbulence from a helicopter in flight. Seeds were collected from full unopened cones and then collected in bagged cones after a shaking treatment. Timing of the helicopter flight seriously affected the number of seeds loosened by the shaking. Tree Planters' Notes 39(2):19-21; 1988.*

---

Over half of the southern pine seedlings produced in 1984 were from seed-orchard seed. Demand for seed-orchard stock will continue to increase for the next 10 years, until all seedlings are grown from known parentage. These are expensive sources: a recent survey of southern nurseries found that seed cost was the largest single expense of seedling production (3).

If production efficiency of 115,000 pounds of seed collected could be increased by only 10%, another 92 million seedlings could be produced, enough to plant an additional 164,000 acres.

Lantz (1) projected potential losses of \$6,000 per acre from mistakes made in management of seed orchards and the collection and processing of cones. In this example, seed-orchard

seeds were valued at \$300 per pound, and about half of the losses were during cone collection.

The collection of loblolly pine seeds is complicated by the demand for larger annual harvests of seeds and by the increasing height of parent trees in seed orchards. Cones on the larger trees are now approaching or exceeding the reach of pickers on mechanical buckets and platforms. The net retrieval system (2) is an alternative to hand picking. However, this system relies on seeds falling onto the net. A tree-shaking apparatus is one means of increasing the number of seeds falling onto the net from the cones.

This report evaluates seed collection from loblolly pines (*Pinus taeda* L.) using four mechanical tree-shakers and helicopter turbulence to loosen seed.

## Materials And Methods

Four mechanical tree-shakers were brought to Arrowhead Seed Orchard, Georgia Forestry Commission, during November 1984. The shakers were manufactured by Food Machinery Corp. (FMC), Kilby, Westech, and Orchard Machinery Corp. (OMC).

Before trees were shaken, paper bags were placed over five cones of one ramet (i.e., individual tree) of three clones. Enough

ramets were selected and bagged to allow a control treatment (no shaking) and one treatment representing each of the four tree-shakers. The control cones were cut from the parent trees and taken to the laboratory where their seeds were extracted for a total seed count. After each tree had been shaken, the bagged cones were removed and taken to the laboratory, and the loose seeds in each bag were counted. Each treatment was then statistically compared with other treatments for significance.

Helicopter turbulence trials were conducted at the USDA Forest Service Francis Marion Seed Orchard in South Carolina. Cones were picked in October 1985 to determine the number of seeds in full, unopened cones (controls). In December 1985, the helicopter flew over selected clones that had cones bagged for collecting seed dispersals. Other trees in the same clones were shaken mechanically with a Savage 4200 tree shaker mounted on a tractor with a 3-point hitch. Seeds were collected from bagged cones immediately before and after tree-shaking for both aerial and ground treatments. A minimum of 10 cones from 2 ramets of each of 10 clones was collected (a total of 200 cones each treatment). The same clones were represented in each treatment.

## Results

None of the mechanical shakers showed a clear advantage over the others for shaking seeds from cones. Although each shaker clearly released seeds from cones, a standard t-test showed only one significant difference. The FMC showed a significant difference (0.05 level) over the OMC in the number of seeds shaken from cones. All shakers left seeds in the cones: the percentage of seeds ranged from 30 to 60%.

When the number of seeds remaining in cones before and after both ground-shaking and aerial-shaking by a helicopter are compared (table 1)--76 percent of seeds remaining in cones (24 percent shaken out) after aerial-shaking and 57 percent of seeds remaining (43 percent shaken out) after ground tree-shaking--the values are somewhat misleading. The tree-shaker (mechanical tree planter) was owned and operated by the seed orchard unit and was available on demand. Therefore, the trees were shaken when cones were open during opportune weather conditions (temperature and humidity). However, the helicopter was scheduled in advance and actually flew over the trees when cones were not completely open because of unfavorable temperature and humidity.

**Table 1**—Collection of seeds from cones of South Carolina Piedmont loblolly pines at Francis Marion Seed Orchard after shaking treatment

	Mechanical shake		Helicopter wash shake	
	Before	After	Before	After
Total number of seeds remaining in 10 cones of each sample tree (ramet)				
	1,259	737	1,323	931
	1,163	1,085	1,117	1,083
	812	663	515	1,130
	1,681	229	1,469	478
	1,287	976	1,786	966
	787	906	946	931
	1,319	735	1,188	NA
	1,344	200	1,252	627
	1,790	1,100	1,570	1,399
	1,704	1,293	1,713	1,675
	871	812	1,208	1,279
	1,423	690	1,207	1,324
	1,453	1,435	299	NA
	1,243	924	1,309	1,600
	1,655	243	1,505	735
	1,478	295	1,513	959
	1,232	500	1,221	1,137
	1,231	1,001	1,233	932
	1,012	154	1,398	338
	1,243	180	1,291	192
Average number of seeds per tree (10 cones)				
	1,249	711	1,253	984
Percentage of seeds remaining				
	100	57	100	76

Values for the two shaking treatments on the same line represent cones collected from different trees (i.e., ramets) of the same clone. Cones for before values were harvested on October 28, 1985, before any of them had opened; bagged cones for after values were harvested immediately after the shaking treatments on December 11, 1985. NA = not available.

## Conclusions and Recommendations

Comparison tests of tree shakers showed no clearly superior machine to disperse seeds from cones. Variable effects that must be considered for local application include the mechanical action of forces stressing the trees resulting from mechanical shaking; vibrations affecting ter-

minal shoots, limbs, and crowns; and cost of the equipment.

Shaking from the ground was better than helicopter-shaking, but it is recommended that additional helicopter aerial-shaking be tried in order to enhance seed dispersal from pine cones. This will require close cooperation between orchard managers and helicopter crews to use the

equipment during opportune weather conditions for open cones.

#### Literature Cited

1. Lantz, C.W. The cost of poor quality seed. In: Proceedings, small lot forest seed processing workshop. 1977 October 18-20; Macon, GA: U.S. Department of Agriculture, Forest Service, Southern Area, State and Private Forestry; 1978: 28-31.
2. McConnell, J.L.; Edwards, J.L. The net retrieval seed collection systems in southern region seed orchards, an economic study. In: Proceedings, third biennial southern silvicultural research conference. 1984 November 7, 8; Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station; 1985: 252254.
3. Mills, W.L., Jr.; South, D.B. Production costs in southern bareroot nurseries. *Tree Planters' Notes* 35(3):19-22; 1984.