

SEED HARVESTING MACHINE TESTED IN THE SOUTH

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The Bowie Vac-U-Seed Harvester can be a useful tool for orchard managers.

Tests of the Bowie Vac-U-Seed Harvester, a machine designed to collect seeds from orchard floors, show that it improves the rate of seed recovery and lowers collection costs compared to manual harvesting, but that it operates well only on orchard floors that are dry, mowed, and free of debris. Although not the total answer to harvesting seed in southern orchards, the advantages of the vacuum seed harvester are that it:

1. Extends the harvesting season from about 2 weeks to 2 months.
2. Eliminates the need for ladders and lift trucks, permitting orchard managers to let their trees grow taller because no climbing is involved, therefore extending the useful life of the trees.
3. Reduces collection costs compared to hand collection.

The disadvantages of the harvester are that:

1. The orchard floor requires extensive preparation for the machine to operate well.
2. The harvester is noisy and produces large quantities of dust.
3. It does not operate well when the ground is wet.
4. The harvester has had a number of mechanical

problems that have been largely corrected, but minor design changes still need to be made.

The conclusion of the tests, which were conducted over a 4-year period, was that under ideal conditions, the Bowie harvester (fig. 1) will pick up 70 to 90 percent of the seed on the orchard floor. By refining orchard floor maintenance and operational techniques, the harvester can be a useful tool for orchard managers.

The Southern Region of the Forest Service is continuing to experiment with the harvester on various types of ground cover.

Background Information

Traditionally, seed collection has been done manually. However, increased emphasis on seed orchard production has made mechanized seed collection a necessity.

Tree seed is harvested from orchards in two ways: (1) Mature, unopened cones are gathered from the trees and later processed to extract the seed, or (2) fallen seed is collected on the ground while still viable. Mature cones must be collected quickly from the trees because it seldom takes longer than 30 days before they open and lose their seeds. Gathering



Figure 1.—The Bowie Vac-U-Seed Harvester undergoes testing at a Mississippi seed orchard.

fallen seeds allows more time for collection, but collecting must be accomplished in approximately 60 days during the fall before bad weather makes harvesting impractical.

In 1968, the North Carolina State-Industry Tree Improvement Cooperative formed a development group to find an efficient, economical way to collect seed in southern orchards. In 1973, after initial attempts at trapping fallen seeds proved unfeasible, the cooperative decided a vacuum-type harvester was the most promising way to collect fallen seed and began development.

Bowie Vac-U-Seed Harvester

The harvester is essentially a large vacuum cleaner combined with a seed separator. It is hydraulically powered by a pump driven by a gasoline engine. Material from the orchard floor is sucked into the vacuum chamber by a large high-speed vacuum fan. Fine particles are ejected through the exhaust and the seeds and litter fall to the bottom of the chamber and then pass through an airlock into the seed separator. The airlock is a paddle wheel with rubber blades. The seed separator is a straw-walker with rigid and flexible fingers attached to revolving shafts above a perforated screen floor (fig. 2).

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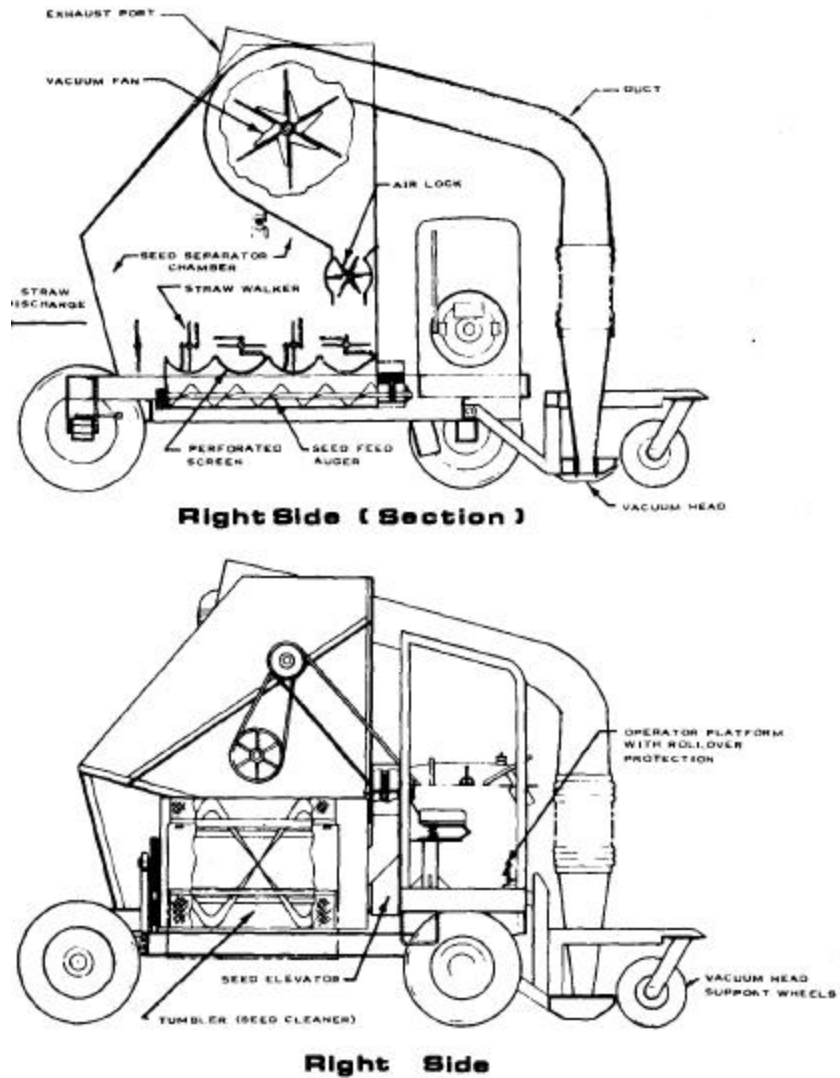


Figure 2.—Major parts of the Bowie harvester.

The seeds and seed-sized debris fall through the floor while the pine straw and large debris are moved to the rear of the harvester and discharged. An

auger located in the chamber beneath the straw-walker moves the seeds and small debris forward to the seed elevator where the material is lifted into a tum-

bler that removes most of the debris and dewings most of the seeds.

Testing

Because loblolly cones are difficult to harvest and commercially important, loblolly was selected for testing the Bowie harvester. Loblolly accounts for one-third of the total acreage of forest tree seed orchards in the United States. Because of its persistent cone, it is one of the most difficult to harvest mechanically.

The goals of the North Carolina State-Industry Cooperative for the harvester were:

1. Undamaged delivery of 80 percent of the seed on the orchard floor.
2. Seed recovery at a minimum rate of 1 acre per hour.
3. Delivered seed containing almost no pine straw and no more than 50 to 70 percent of fines.

Summary of Test Results

Early field testing of the harvester took place at Providence Forge, Va., and near Hodge, La., in April and May 1975. Results showed the harvester picked up seeds better when they were held above the ground by grass and grass litter than when they were lying directly on the ground. It worked best when traveling at a ground speed of 2

miles per hour and picked up winged seed better than de-winged seed.

In November 1975, personnel from the Missoula Equipment Development Center, Missoula, Mont., and the Southern Region conducted another evaluation of the harvester at test sites near Alexandria, La.; Hattiesburg, Miss.; and Macon, Ga. The best results were obtained on mowed and raked areas; 90 percent of the fallen seed was recovered and production rates of more than 2 acres per hour were achieved. However, the harvester's sustained production capability was not established due to frequent mechanical problems encountered during testing.

In November 1976, after modifications were made, the harvester was tested a third time in Mississippi. Due to the low seed production and frequent rains, a meaningful comparison of orchard turf treatments was not completed. However, it was apparent that a thick layer of dead grass could be troublesome in wet years because a heavy buildup of grass clippings clogged the harvester more frequently and necessitated emptying the seed hopper more often.

After additional modifications, the harvester was again field tested by Southern Region personnel in November and December 1977 in Mississippi.

During these tests, mechanical reliability was markedly improved. An attempt to evaluate the harvester's effectiveness was made by comparing seed yield from an adjacent orchard where cones were collected and seeds extracted by hand. Comparisons showed the total cost per acre collected by the harvester was \$174.50 compared to \$211.84 by hand. The cost of seed collection per pound was \$19.50 for the harvester compared to \$26.83 by hand. Included in the cost estimates for the harvester was \$155 per acre in additional turf management that was unnecessary for manual collection.

Literature Cited

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