

Heavy Duty Tree Planting Machine Developed in Nebraska

Walter T. Bagley ¹

Nebraska Agricultural Experiment Station

Job quality of machine tree planting depends on the size and shape of the seedling stock and site conditions as well as the equipment use. Topography, soil texture, vegetation, rocks, stumps, and site preparation are factors which determine the best planter design. No single machine meets the requirements for all situations (5,6).

Essentially, a tree planter should open a furrow large enough to allow the tree roots to hang down in a natural position and should pack the soil firmly and uniformly around the roots. Several researchers have shown that large planting stock results in better survival and growth (2,4,8,11), thus a machine capable of planting larger and more expensive trees properly is desirable.

Nearly all planting instructions say that a tree should be planted as deep or slightly deeper than it grew in the nursery. Some research has indicated that there may be value in planting conifer seedlings several inches deeper than their natural depth. Most data indicate poor survival and growth will result if a large part of the root is left exposed after planting (3,4,10,11,12,13).

Benefits of planting at the proper depth can be nullified by the roots being bent in an "L" shape along the planter trench (5,13). In this situation, the roots are actually near the surface and are subject to rapid drying, especially if the trench is poorly packed and rains are not timely. Also, it is difficult to ball and burlap trees which

have been lined out in a trench so shallow that most of the roots are growing on one side.

Most tree planting machines do not cut a trench deep enough for the roots of larger seedlings to assume a normal position and often the packing is not uniform throughout the root zone (fig. 1). The Hanson-Lowther tree planter

Figure 1.—This tree planting machine with a subsoiler trencher and two packing wheels opened a trench too shallow for most nursery stock and does not pack the soil uniformly about the roots.



¹ This paper originally published as Paper No. 3381, Journal Series, Nebraska Agricultural Experiment Station. Research reported was conducted under Project No. 20-28.

was developed in an attempt to assure a better job of packing on more difficult planting sites and to avoid "L" roots (9). Mr. Lowther in 1967 indicated that these machines were successful only in deep sandy soil. Consequently, only a few were built. Norbert Noecker built a planter incorporating some of the features of the Hanson-Lowther machine and used it successfully in his planting operations. (7).

The plowshare type trencher and a single packing wheel running on the loose soil (as on the two machines described above) appeared to be a good idea to build on. But neither of those machines opened a trench large enough to properly plant much of the stock recommended for use in the Great Plains.

The problem was presented to Hughes Brothers, Inc., of Seward, Neb., who agreed to assign Arnold Wied, a tool engineer, to work with me on the design and construction of a prototype of a tree planting machine incorporating the following features:

1. Trencher to construct a trench up to 20 inches deep, 5 inches wide, with an undisturbed vertical wall on one side.
2. A covering disc to return loose moist soil to the trench around the tree roots.
3. One large diameter rubber tired packing wheel to firmly and uniformly pack the soil.
4. The rolling coulter to run deep enough to cut surface trash.
5. A three-point hitch attachment.

Following construction, and after repeated field trials of the prototype, the tree planter evolved into a machine weighing about 1,200 lbs. (fig. 2). The floating top link of the three-point hitch is a two-way hydraulic cylinder which allows more uniform planting depth over hummocks or other sharp changes in slope. A 50 H.P. tractor, or larger, is required to lift the machine.

This model has been used successfully in our tree plantings at the Nebraska Agricultural Experiment Station and in a large tree planting at

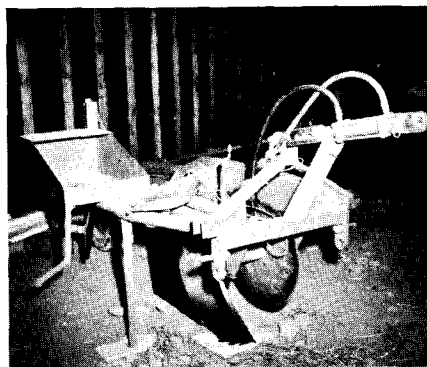


Figure 2 - This tree planter opens a furrow up to 20 inches deep. The single packing wheel works against the loose soil only and packs with reasonable uniformity from bottom to top of trench.

the Devil's Nest Recreation Area in northeastern Nebraska. A successful demonstration was conducted in the fall of 1971 by Mr. Wied for the annual meeting of the South Dakota Association of Soil Conservation Districts.

The machine has proved capable of opening the 20-inch trench specified under a variety of soil textures from sand to clay loam. Packing has been very good on all sites where the soil is of "good tilth," but uniform packing is not possible on undisturbed sod sites without prior scalping. Although its rugged construction would probably allow the machine to be used on sites containing stumps and rocks with little breakage, the quality of performance would undoubtedly suffer.

Literature Cited

1. Bagley, Walter T. and Arnold Wied. 1969. A new tree planter for the Great Plains. *Jour. of Soil and Water Conserv.* 25 (6): 236-7.
2. Clark, F. Bryan and Robert E. Phares. 1961. Graded stock means greater yields for shortleaf pine. *USDA For. Serv. Tech. Paper* 181, 5pp.
3. Dick, James. 1964. Depth for planting ponderosa pine. *Tree Planters' Notes* No. 66, pp 10-12.
4. Heidmann, L. J. 1963. Effects of rock mulch and scalping on survival of planted ponderosa pine in the southwest. *USDA For. Serv. Res. Note* RM-10, 7pp.
5. Limstrom, G. A. 1963. Forest planting practice in the Central States. *USDA Agr. Handbook* No. 247, 69pp Illus.
6. Meekins, Earle H. 1963. Some essentials of machine planting. *Tree Planters' Notes* No. 58, 12-15.
7. Noecker, Norbert. 1967. A critical analysis of machine planting. *Am. Christmas Tree Jour.* 11 (1): 5-6.
8. Read, R. A. 1955. Grading of transplants may improve initial survival of ponderosa pine in plains wind-breaks. *USDA For. Serv. Res. Note* RM-16, 2pp.
9. Ricker, Daniel L. 1961. The Hanson-Lowther tree planter. *Tree Planters' Notes* No. 46, pp 1-3.
10. Rotty, Ronald. 1958. Better survival with over size hole digging. *Tree Planters' Notes* No. 33, pp. 6-11.
11. Swearingen, J. W. 1963. Effects of seedlings size and depth of planting on early survival and growth of slash pine. *Tree Planters' Notes* 58, pp 16-19.
12. Slocum, G. K. and T. E. Maki. 1956. Some effects of depth of planting upon loblolly pine in North Carolina Piedmont. *Jour. Forestry* 54 (11): 21-25.
13. Ursic, S. J. Modifications of planting technique not recommended for loblolly on eroded soils. *Tree Planters' Notes* No. 57, pp, 13-17.