GRAYCO TREE SEEDLING HARVESTER
USE AT THE COEUR d'ALENE NURSERY

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Abstract.--Mechanization of the tree lifting operation at the Coeur d'Alene nursery in 1973-1975 has reduced lifting costs 70 percent. This has been accomplished through use of a modified Grayco Tree Seedling Harvester.

Keywords: Seedling harvester, mechanical lifting

The last three years, the USDA-Forest Service Nursery at Coeur d'Alene, Idaho, has successfully used a modified Grayco Tree Seedling Harvester. The use of this machine has reduced labor costs for lifting tree seedlings about 70 percent and has drastically reduced the amount of root damage that takes place during the lifting process.

My purpose in being here today is to briefly discuss with you the nature of the modifications that made the machines operational at Coeur d'Alene. For your reference, I have already reported on the subject to the Western Nursery Council in 1974, the Intermountain Nurserymen's Association in 1975, and in Tree Planter's Notes in 1976.

The modifications can be broken into two major and several minor ones.

1. In common with most tree nurseries, Coeur d'Alene is using a relatively small "field" box to put seedlings into in the field and transport them to the packing shed. When the first lifter was purchased from Grayco with a "bulk handling" trailer for boxing seedlings, the design required the machine to be frequently stopped to unload full boxes and load empties. It was obvious as much, or more, time would be spent doing this than actually lifting. Consequently, we constructed a platform mounted on top of the lifter for a box supply with a "live" roller for delivering boxes to the people at the rear unit. This modification permits operation of the lifter with a minimum number of stops. At the rear of the lifter, the boxed seedlings are covered with wet burlap and the full boxes are set in the bed the trees were just removed from. The design of this arrangement has been diagramed and is available from the Coeur d'Alene Nursery, Rt 1, Box 245, Coeur d'Alene, Idaho 83814.

2. Another modification was made during the winter of 1974-1975. In western tree nurseries, trees often dry out enough to suffer root damage during the lifting process. This is due to low relative humidities and wind. Seedlings lifted with the modified Grayco are in the seedling box and covered with wet burlap in about 18 seconds or less, but even in this length of time the roots can become dry. Consequently, an arrangement was constructed to spray water on the seedlings at the rear of the lifter where they first become dirt-free and before they drop onto the bulk-handler. This consists of a 200-gallon water tank on the front of the hydrostatic tractor pulling the lifter, a sup-

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ply line to a pump installed on the agitator cam power shaft in the lifter, a regulator, pressure gauge and on-off lever on the lifter adjacent to the pump, supply hoses from the pump to the spray booms of the lifter, and two spray booms, about four feet long, mounted over the rear lifter chain (spraying down), and between the lifter chains (spraying up). This system has been very successful and assures the trees do not dry out prior to reaching the packing shed.

Now several modifications were made. These changes are of smaller scale but in some cases are very important.

3. A two inch diameter shaft, carried on heavy pillow block bearings and having steel discs welded onto it at three points, carries the front of the second lifter chain at the interchange between the first and second chains. This modification allows rocks to still "spring" out of the lifter chain links but limits the degree of link distortion and resultant damage.

4. In collaboration with Ralph Gray of Grayco, the second Coeur d'Alene machine was procured with one wheel that can be hydraulically "leveled." This allows the machine to be leveled where lifting a bed immediately adjacent to one just lifted. Prior to this change, the lifter would shift all trees to the "low" side like an unleveled combine, and the workers on the low side would have to handle all the trees. The result was a stoppage or slow down.

5. Small steel "ears" were welded in above the interchange of the front and rear lifter chains to keep large rocks out of the interchange. This prevented damage to sprockets and links.

6. The first camshaft that vibrates the lifter chains was strengthened. We observed this shaft broke more often than the others because it carried the heaviest loads. The size of the shaft was increased to 1.5 inch diameter, and the cam surfaces were widened to a 3 inch width. The result is a greatly extended life for the shaft.

Numerous other minor modifications were made. However, time will not permit going into them now. I will be glad to discuss them with you individually at a later time.

What are some of the problems we were unable to overcome or that you should be aware of? First, wet weather can make this machine unuseable when critical moisture contents are reached in many soils. The rhythmic agitation which sifts soil from the seedlings can form the soil into balls at this point and the operation must be stopped. This problem will vary from nursery to nursery. If only a few days of these conditions occur, you can usually make up for the delays.

Also, a large supply of spare parts (links, eccentric shafts, etc.,) should be stocked. Breakage is common especially if rocks are present and wear rates are high. If you have a large packing-shed crew, lifter "down" time can be expensive. At Coeur d'Alene a set of links and camshafts will endure from 8-10MM trees. Of course this will vary with nursery soil conditions, size of trees, etc.

I understand the Grayco Company is incorporating many of these hard-earned lessons into modification of their new machines.

In summary, the Grayco Lifter seems to work pretty well under most conditions. The economics of the machine, given today's labor rates, are very favorable even for relatively small operations. There is one last point I would like to make. The system described in this paper that uses field boxes does not fully use the potential lifting rate of the machine. This is because the speed is controlled by the ability of the people to keep up with it when boxing trees. I think the Grayco could lift trees about twice as fast as we could box them at Coeur d'Alene. If we can use large palletized boxes like some nurseries now do, the eleven people on the lifter will be eliminated, and the machine could possibly cover twice as much ground in a day. The question is: "Can or should we change our packing shed set-ups to do this?"

LITERATURE CITED

McDonald, S. E., 1974. Recent experience with the Grayco tree lifter. Proc. Western Forestry Nursery Council, Portland, Oregon.

McDonald, S. E., 1975. Grayco lifter modifications. Proc. Intermountain Nursery Association, Missoula, Montana.

McDonald, S. E., 1976. Mechanization reduces lifting costs 70 percent at the Coeur d'Alene Nursery. Tree Planter's Notes, USDA-Forest Service, Vol. 27, No. 2, Spring issue.