

Plans for Hectoliter Boxes To Measure Pine Cones

LeRoy C. Johnson

USDA Forest Service, Northeastern Area State and Private Forestry, St. Paul, Minn.

The Albuquerque Tree Nursery has found the hectoliter to be a more convenient and accurate way to measure pine cones than the U.S. bushel.

Metrics has a place in forest tree nurseries in the United States. At the Forest Service Albuquerque Tree Nursery, Southwestern Region, we found the hectoliter to be a more convenient and accurate way to measure cones than the U.S. bushel. A hectoliter equals 2.84 U.S. bushels. The conversion to hectoliter boxes could help standardize cone collection data and cone volume measurements worldwide. For example, the Canadians have been using hectoliters since 1976.

We experimented with hectoliter boxes in 1979, using samples taken from eight ponderosa pine cone collections (table 1). We immediately discovered the standard gunny sacks (24 by 39 inches) used by the Southwestern Region did not hold two U.S. bushels as was commonly assumed. The cones per sack varied from 1.5 to 2.4 U.S. bushels. One Ranger District was buying cones by the U.S. bushel. District personnel measured the cones in a "bushel basket," then resacked them, placing two "bushels" in each

Table 1.—*Ponderosa pine cone volumes in hectoliters (hl) and U.S. bushels (bu) per sack of cones*

Accession number	Sacks of cones ¹	Hectoliters	Bushels	Hectoliters/sack	Bushels/sack	Remarks
79010	10	6.54	18.57	0.65	1.9	— ²
79010	10	5.80	16.47	.50	1.6	Loosely filled
79011	10	6.20	17.61	.62	1.8	—
79012	10	6.62	18.80	.66	1.9	—
79024	12	8.44	23.97	.70	2.0	—
79025	15	9.40	26.70	.63	1.8	—
79026	24	20.00	56.80	.83	2.4	Sacks filled and sewn shut
79027	10	5.24	14.88	.52	1.5	Small cones
79028	3	1.8	5.11	.60	1.7	—
Average				.64	1.84	

¹ All cones were in 24- by 39-inch gunny sacks.

² — = not applicable.

gunny sack. Our measurements at the nursery with the hectoliter box showed that there was actually less than 1.8 U.S. bushels per sack. Some cone expansion had occurred between the buying station and the nursery, so the discrepancy in measurements was actually greater than these data suggest.

When handling large volumes of cones, the 3-hectoliter box is a convenient measuring device. The cones can be dumped onto a sorting table or paved driveway, inspected, shoveled into the measuring box, vigorously shaken, and measured. The cones can then be resacked,

dumped into hoppers or into a truck depending on the method of transportation, and sent to the seed extractory.

The Southwestern Region, in cooperation with the Forest Service Missoula Equipment Development Center, Missoula, Mont. has drawn up construction plans for 1- and 3-hectoliter boxes. Detailed plans are available from the author without charge. Figure 1 is a drawing of the 3-hectoliter box. Materials needed to build the boxes are: $\frac{3}{8}$ -inch AC plywood, 2- by 2-inch boards, nails or screws, and glue.

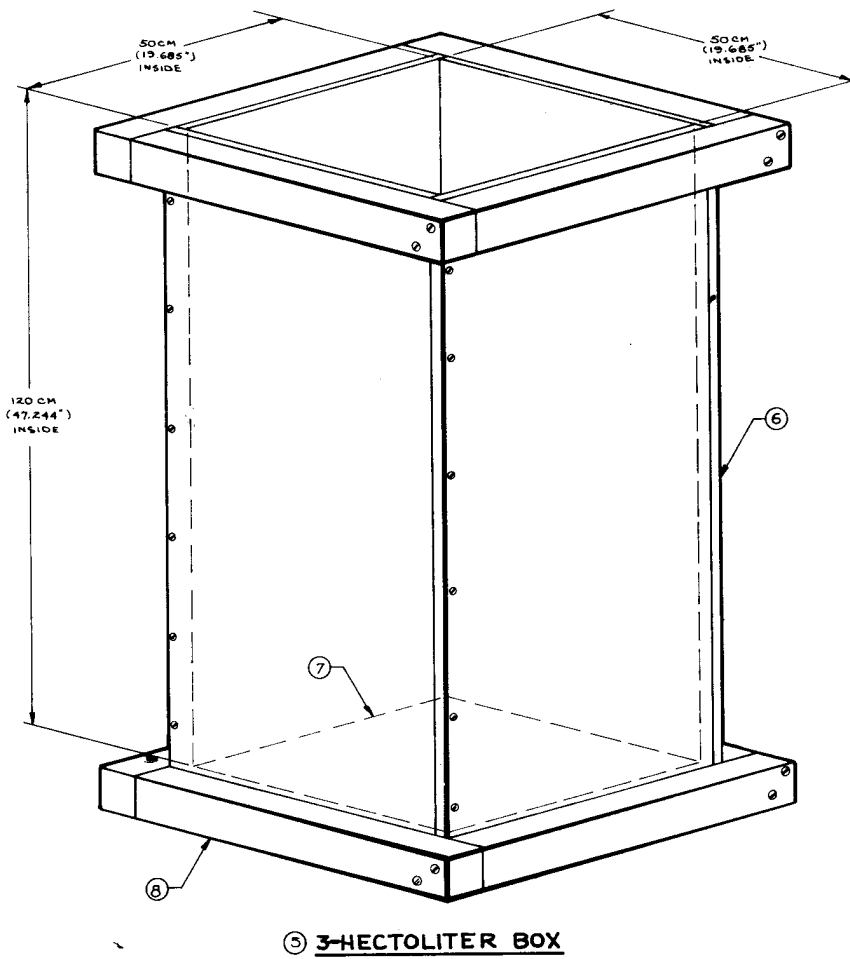


Figure 1.—Drawing of 3-hectoliter box.