

A COMPARISON OF BOW, PADDLE AND CONVENTIONAL CHAINSAW BARS

N. MERCER*

SYNOPSIS

A limited trial of bow, paddle and straight chainsaw bars in Tarawera Forest strongly indicates that use of the bow, and in some cases the paddle bar, would lead to important economies in certain forestry operations. In felling to waste operations there were highly significant savings in work time using the bow saw, and a lesser saving with the paddle bar. Both types are safer to use than the straight bar.

INTRODUCTION

Forest operations such as thinning and scrub cutting involve the felling of small trees, often less than 12 in. diameter. The usual tool for this work is the chainsaw with straight bar. On similar operations in the U.S.A. different types of bar, descriptively called bow and paddle, are often used. Accordingly, a trial was carried out in the Tarawera Forest of Tasman Pulp and Paper Co. Ltd. to determine whether these alternative types of bar were applicable to conditions in New Zealand.

TRIAL CONDITIONS

The main purpose of the trial was a comparative evaluation of three types of bar — bow, paddle and straight — in early thinning operations in radiata pine plantations. The trial area was in two blocks with an aggregate area of a little more than two acres, on flat terrain with negligible undergrowth. Mean stocking was 750 s.p.a., of which approximately 400 s.p.a. had been pruned to 8 ft. Stand mean height was about 40 ft, and mean diameter at breast height was 5 in. with a range from 1 in. to 10 in. The stand was marked for thinning to about 450 s.p.a., the marked trees including some that had been pruned.

Three chainsaw operators, representative of a range of skill-levels, used the three bars, attached to Homelite XL 12 saws. The trial took place after a familiarization period of two days. The operators worked in rotation to minimize any effect of fatigue, and a time study was run continuously on each worker, using each bar type. In each case, the full time to fell a single tree was recorded; this included walking, preparation, cutting and getting the tree on to the ground.

*Forester, Tasman Pulp and Paper Co. Ltd., Kawerau.

RESULTS

The average time in minutes per tree, for each operator and bar type, and the mean for all operators, are given in Table 1. From this is derived Table 2, which shows the mean reduction in work time per tree, for each bar type, expressed as a percentage of the felling time using straight bars.

TABLE 1: CUTTING TIME IN MINUTES PER TREE

Bar Type	Operators			
	No. 1	No. 2	No. 3	All
Bow	0.50	0.48	0.37	0.46
Paddle	0.70	0.62	0.51	0.61
Straight	0.81	0.70	0.66	0.72

TABLE 2: PERCENTAGE REDUCTION IN FELLING TIME COMPARED WITH STRAIGHT BAR

Bar Type	Operators			
	No. 1	No. 2	No. 3	All
Bow	38.1	30.9	44.8	36.5
Paddle	13.3	11.1	22.9	15.0

Figure 1 shows smoothed frequency distributions of the recorded times of felling for each bar type. This indicates clearly that the times using the bow bar were much less than for the other two types.

DISCUSSION

Work Method

The variability of the times of felling for any bar type can be directly attributed to the shape of the bars and the size of the trees. The bow bar has a cutting face of about 12 in.; the paddle bar face is about 7 in.; and the straight bar has about 16 in. As the diameter of the tree at point of cutting exceeds 7 in. the efficiency of the paddle bar decreases. The efficiency of the bow and the straight bar is maintained up to about 12 in. diameter.

The major difference between the bar types is the way in which they are used. The paddle and bow saws are operated with the workers standing; they control the saw with one hand, and with the other may, if necessary, push the tree over; cutting is with the point of the bar. With a straight bar the operator is in a crouching position and must pause during cutting to push the tree past the point of balance.

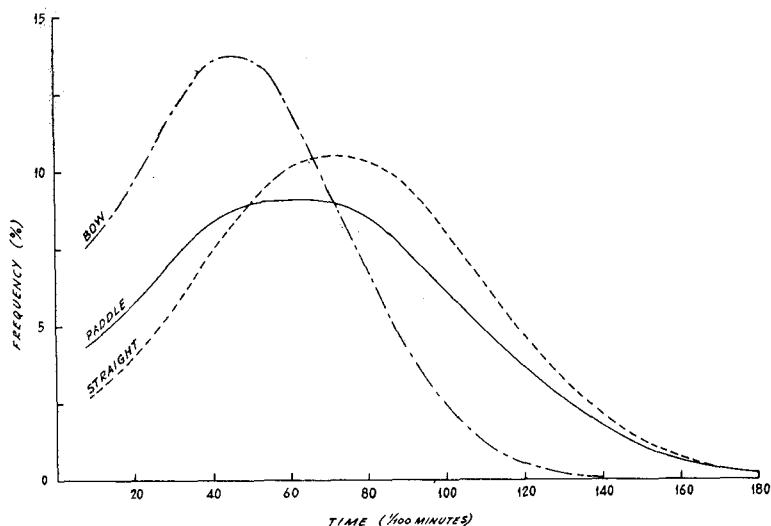


FIG. 1: Frequency distributions of felling times (819 observations).

Safety

Because the working area of the bow and paddle bars are at the tip, it is possible to guard the remainder of the chain. Unlike the straight bar, the cutting area for the bow and paddle is about 2 ft from the motor. Both these factors greatly reduce the risk of accidental injury to the workers.

Maintenance

As the chain on a straight bar has to make a relatively sharp turn around the nose of the blade, as opposed to a long smooth turn around the tips of the paddle and bow bars, there is reason to believe that there is less wear on the latter.

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