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SMALLWOOD HANDLING WITH THE BELL LOGGER

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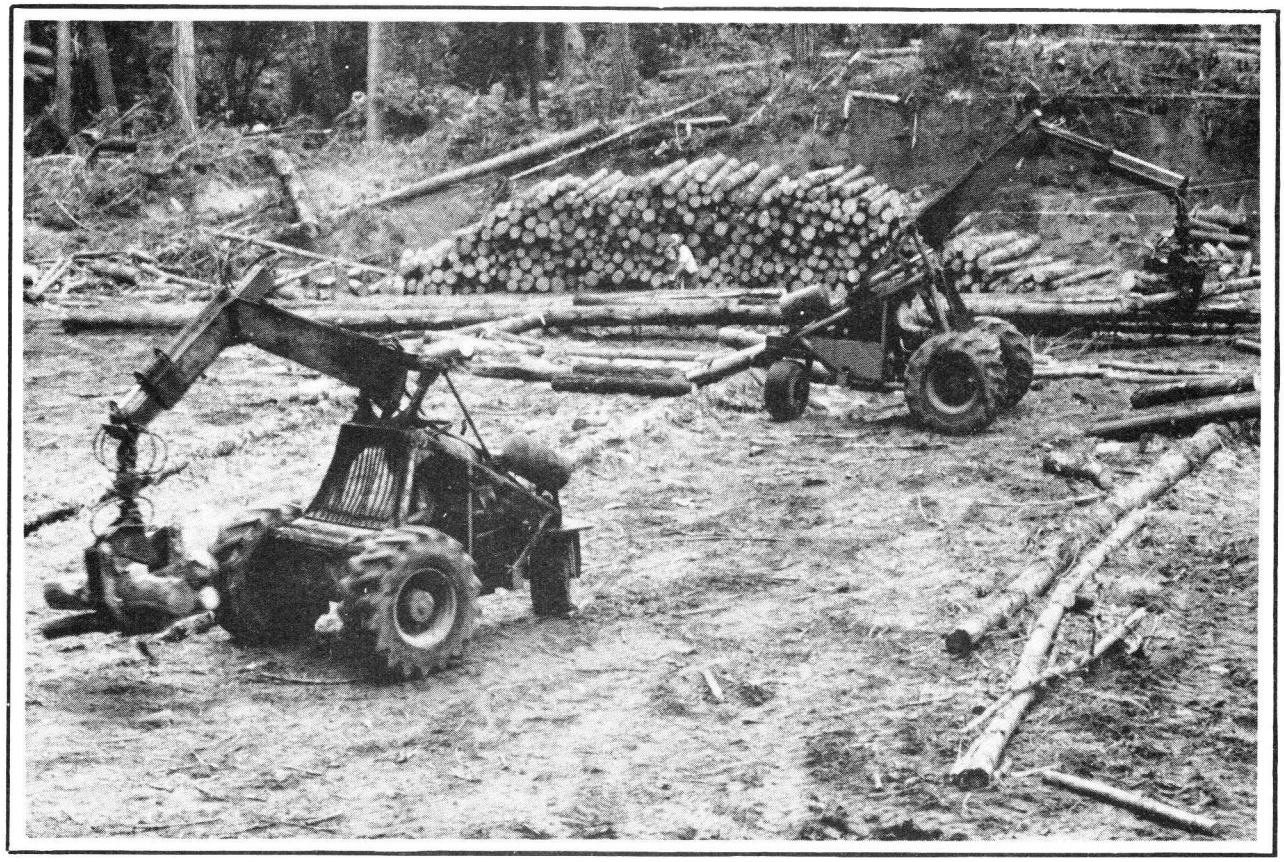

Fig. 1 - Two Bell Loggers sorting and stockpiling on the landing

INTRODUCTION

The products from thinning operations; posts, poles, pulpwood and small sawlogs, present handling and loading problems. The low volume per piece translates to high handling costs, compared with clearfellings. Conventional front-end loaders are not well suited to the excessive amount of manoeuvring required to assemble reasonable payloads of smallwood. Often manual effort is employed to assemble payloads for the loader.

An alternative is the use of smaller machinery with a payload capacity more suited to the piece size and daily volume handled. This report discusses the results of a production study on the use of a Bell Logger (a small, highly manoeuvrable machine) as a sorting and loading unit.

ACKNOWLEDGEMENT

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THE STUDY

The operation studied was a pre-clearfell post and pole removal operation in 37 year-old radiata pine, on rolling terrain. Tree size averaged 1.2 m^3. Three fallers prepared tree-length material for a Clark 664 skidder and a Cat D4 crawler tractor with a logging arch. The material was extracted tree-length to the landing and skidded on top of runner logs. The landing was a rectangular area, 60 m x 80 m, on pumice soils.

On the landing, two skiddies cut the wood to length for the following products :

1.8 m and 2.4 m posts, 1.8 m and 6.0 m pulpwood, and 6.4 m sawlogs

Two Bell Loggers were used for handling this material. One unit, with a fixed boom, cleared the skids and sorted material into temporary stacks, while the other, fitted with an extension boom, formed stockpiles and loaded out. Posts were loaded on to set-out cradles and pulp on to either cradles, set-out trailers or trucks. Sawlogs were loaded on to cradles or directly on to the truck. Daily production on-truck was 130m^3.

WORK ANALYSIS

The operation was run on a nominal nine hour shift. Over the five day study period, times were recorded for specific tasks and the corresponding number of pieces handled. The breakdown of an average shift is shown in Table 1.

Table 1 - DAILY WORK ANALYSIS

	Bell No. 1			Bell No. 2		
	mins/day	%	No.of pieces	mins/day	%	No.of pieces
Sort :						
Posts	118	57	523	23	19	104
Short pulp	84		316	18		73
Sawlogs	14		29	3		7
Assist skid functions	56		29	47		
Stockpile :						
Posts	15	7	78	51	25	243
Short pulp	13		69	41		183
Sawlogs	5		7	26		36
Load :						
Posts	35	24	156	91	41	554
Short pulp	41		127	64		271
Sawlogs	37		30	38		49
Production delay	36	8		50	10	
Personnel delay	21	4		24	5	
	475			475		
Total	7.9 hrs.	100 %		7.9 hrs.	100%	

The percentage of work done by each unit highlights the teamwork approach which was used. The first machine concentrated on removing wood from the processing area and feeding sorted products (57% of its time) to the second machine. This second unit spent 66% of its daily time either loading or stockpiling the sorted products.

During the study, delays accounted for 12-15% of scheduled machine hours. The causes of these delays were classified as either personal or production. Production delays comprised those due to operational problems and those due to machine downtime. The recorded figures for the 69.36 hour study are shown in Table 2.

Table 2 - DELAY TIME (Hours)

Personal		5.10
Production :		
Operational, e.g. wait for other machine, skiddy, talk supervisor		2.52
Downtime :		
Fuel and maintenance	1.27	
Repair (active)	1.65	
Repair (wait)	0.69	3.61

Using the downtime figures in the table, the combined mechanical availability (Ref.1) of both machines was 95%. The corresponding machine utilisation (Ref. 1) during the study period was 84%.

These figures reflect the results of short term study. To provide a better data base, a 24 hour Servis recorder (Ref. 2) was fitted to one of the machines. Interim results over a ten week period have shown mechanical availability to be 92% and machine utilisation to be 78%.

LOADING PRODUCTIVITY

The productivity figures shown below are classified by product type and receiver.

Table 3 - LOADING PRODUCTIVITY

Receiver/product type		Average productivity (m^3/hr)	Expected range* (m^3/hr)
Cradle :			
1.8 m post	(.06 m^3/post)	26	21 - 31
2.4 m post	(.09 m^3/post)	29	26 - 33
Short pulp	(.11 m^3/piece)	27	20 - 33
Sawlogs	(.61 m^3/piece)	39	32 - 49
Truck/trailer :			
Short pulp	(.11 m^3/piece)	24	17 - 28
Sawlogs/long pulp	(.61 m^3/piece)	31	27 - 36

* Confidence limits about the average at 95% level

The figures in Table 3 include unproductive activities associated with "cold loading" of cradles and trailers, such as shifting them on the landing. This system also required extensive travel to numerous stockpiles while loading. It is possible that "hot loading" could result in up to 20% higher productivity of the Bell Loggers through a reduction in these activities. However, these gains could be offset by reduced truck efficiency.

There was a reduction in productivity when loading trucks as opposed to cradles. This would be expected since the cradles are on the ground, making for quicker loading and log repositioning. The differences between cradle and truck-trailer loading are most evident with the larger sawlog/long pulp material. The increased weight per stem required logs to be loaded on to truck one end at a time in order to clear the stanchions.

The only differences in loading productivity amongst the products are between short and long material. Despite the fact that more time per piece is spent loading the long pulp and sawlogs, the higher volume per piece results in an increased productivity figure. The largest log handled during the study was 1.2^3m .

COSTS

Using the LIRA Costing Handbook (Ref.3), the estimated cost of the Bell Logger is $110 per day, plus $90 per day for the cost of an operator. The total cost of using the two Bell machines to sort, stack and load is $400 per day. With a daily production of 130 m^3, the estimated cost of handling the wood on the landing was $3.08 per m^3.

CONCLUSIONS

The manoeuvrability of the small three wheeled unit, and its ability to quickly change direction and speed, eases the task of sorting and stacking the numerous types of short and long products. In addition, when loading short pulpwood or posts, the machine configuration allows both side or end loading on to trucks.

It is doubtful that a Bell Logger could compete with a conventional front-end loader when handling large long length material. Its ability to handle a wide range of sizes and sorts efficiently offset its limitations, making it a viable option for smallwood operations.

For a complete definition of these terms and their application :

Ref. 1 Anon. "Standard Definition for Elements of Machine Time", Skogsarbeten, Stockholm, 1969.

Ref. 2 Terlesk, C.J. "The Use of Tachographs in Logging Operations", N.Z.F.S. Forest Research Institute, Economics of Silviculture, Report No. 56, 1972 (Unpublished).

Ref. 3 Wells, G.C. "Costing Handbook for Logging Contractors", New Zealand Logging Industry Research Association Inc., 1981

The costs stated in this Report have been derived using the procedure shown in the LIRA Costing Handbook. They are only an indicative estimate and do not necessarily represent the actual costs for this operation.

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