ISSN 0111-4743

LOGGING INDUSTRY RESEARCH ASSOCIATION
NEW ZEALAND

TECHNICAL RELEASE

Vol. 7 No. 3 1985

SEMI-MECHANISED LOGGING IN PONDEROSA PINE

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INTRODUCTION

There is an estimated 25,000 ha of slow-growing exotic species scheduled for harvesting over the 1983/1992 period. Their volume is estimated at 6.4 million m^3 with an average piece size of 0.32 m^3 (Ref. 1). The main species are Corsican pine, ponderosa pine and Pinus contorta.

Two of the major problems in logging minor species in New Zealand are the high delimbing content and the long load accumulation times for conventional cable skidders. The net result of small piece size and varying stocking levels is under-utilised extraction machinery.

Bunching with the Bell Logger to increase skidder productivity is a well proven concept in production thinning operations (Ref. 2) and has been used in clearfelling Pinus contorta (Ref. 3). Tasman Forestry Limited's Logging Division at Murupara has adopted this concept in conjunction with a semi-mechanised clearfelling operation working in ponderosa pine.

"Gang 9" is a combination wages and contract crew. Tasman Forestry Limited provides a Clark 668 skidder, a Cat 966 loader, and twelve men, including a foreman. Two owner-operators, one with a Hitachi UH07 feller-buncher (Ref. 4) and one with a Bell Logger, make up the remainder of the crew.

TERRAIN AND STAND DETAILS

The system is limited by the shear size to 45 cm diameter timber and is restricted to relatively flat unbroken country because of the limited climbing ability of the Bell Logger and feller-buncher. Fortunately, most remaining ponderosa stands are on this type of terrain.

Piece size and stocking in remaining stands are quite variable. Piece size lies between .15 and .45 m^3 and stocking rates vary from 100 to 1200 sph. Extracted volumes range from 30 m^3 to 450 m^3/ha. The stand currently being logged has an average size of .30 m^3 and a maximum stocking of 1100 sph.

Ref. 1 Vaughan, L.W. "New Zealand's Exotic Smallwood Resource 1983-92" in Proceedings of a LIRA Seminar on Research and Development in Tree Harvesting and Transportation, held in Rotorua, June 1983.

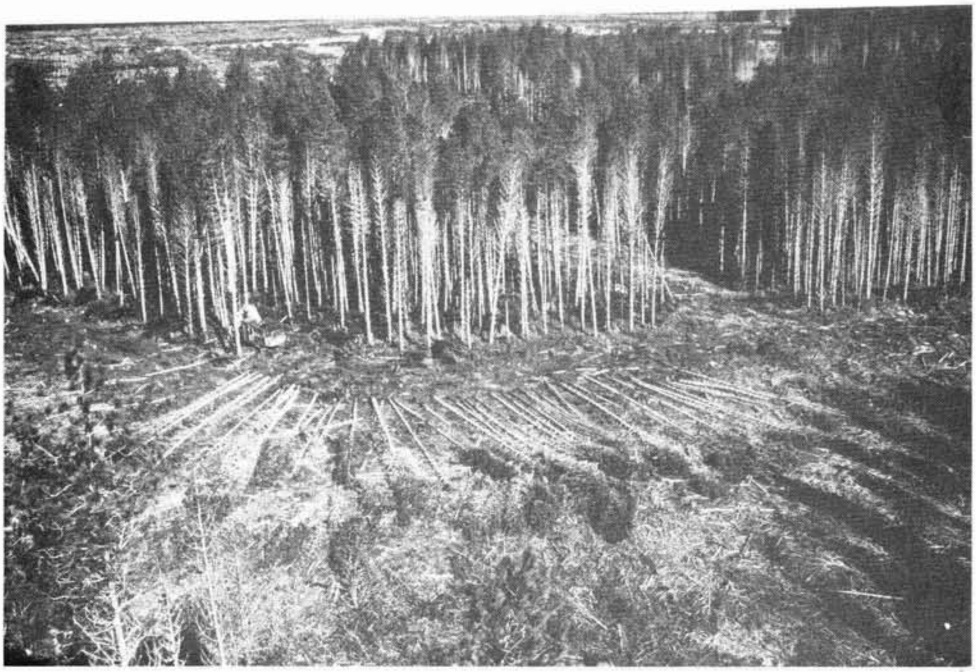
Ref. 2 Gleason, A.P. and Stulen, J.A. "Prebunching in Thinnings", LIRA Report, Vol. 9 No. 3, 1984.

Ref. 3 Nicolls, M. "Bunching to Increase Skidder Productivity", LIRA Technical Release, Vol. 3 No. 1, 1981.

Ref. 4 Ansley, J.R. "Hitachi Feller-Buncher Trial", LIRA Technical Release, Vol. 3 No. 3, 1981.

THE SYSTEM

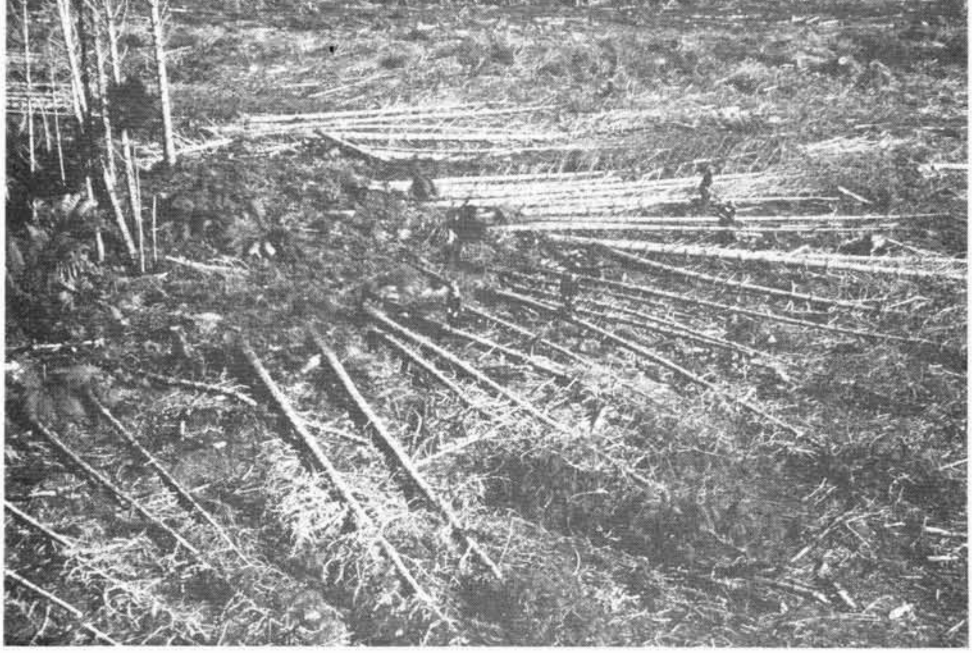
(a) Felling



Hitachi feller-buncher placing trees to assist delimbing

The Hitachi feller-buncher opens up a series of corridors and the back line connecting the corridors. This enables it to work in the open and eventually gain access to two felling faces in each corridor. The feller-buncher leaves very low stumps which assists Bell Logger mobility. It moves systematically from one end of the corridor to the other, felling a swathe of trees about five rows wide. The trees are placed close together at right angles to the corridor so there is sufficient room for men to trim each stem. Spacing between stems is important as the productivity and quality of delimbing and bunching can be severely affected.

(b) Delimbing



Manual delimbing

Delimbing takes place in two phases. In the first phase, the skidder moves in behind the feller-buncher and uses its blade to remove approximately 20% of the limbs.

In the second phase, eight trimmers using chainsaws remove as many other branches as possible before the logs are bunched for extraction. The trimmers also fell trees left behind by the feller-buncher that were too large for the shear size.

The decision on when to use the skidder for delimbing is left to the foreman. When the skidder is not used for delimbing, the rate of manual delimbing slows and the Bell bunching operation catches up to the trimmers. This reduces the Bell's productivity and the skidder eventually catches up to the Bell. The full capacity of the skidder could be utilised by providing extra manpower for trimming and eliminating the skidder trimming phase. This would lead to a 22% increase in production but with only a marginal saving in unit costs and extra organisational problems.

(c) Bell Bunching

Bunching with the Bell Logger

The Bell Logger follows behind the trimmers and assembles logs into bunches of approximately five tonnes (15 to 20 stems). Bunch ends are placed on a bench log to assist hooking on, with bunching time dependent on piece size and stocking. The Bell Logger has the advantage of being able to build the bunches with the butts facing the direction of pull, making the breakout and in-haul phases easier and quicker.

(d) Extraction.

The bundles are extracted by a Clark 668 skidder which uses the mainrope as a single strop looped around the whole bunch. Turnaround time is quite fast,with basic cycle times averaging 6.5 minutes for a 140 metre average haul distance. In this system, the fast payload accumulation time is the major reason for high production rates. Cycle times could be further reduced by using a grapple skidder. However, this would be at the expense of bunch size.

Bundles awaiting skidder extraction

PRODUCTION CAPACITY

Over a two month period,which included skidder and feller-buncher breakdowns, this crew has averaged 249 tonnes per day. The highest production rate during this period was an average of 387 tonnes per day over a one week period.

Work study standards have been established for this operation. A base target of 256 tonnes has been set in stands with a piece size of .30 m^3 and an average haul distance of 140 metres.

PRODUCTIVITY INCREASES AND COST SAVINGS

Productivity increases with this system are quite dramatic. Comparison of targets between conventional six man skidder crews and the semi-mechanised bunching system show a 30% productivity increase in tonnes per man day. Taking into account the extra cost of the mechanised system, this productivity gain translates into a 17% saving in logging costs.

There is further potential for streamlining this system by eliminating the Bell Logger and using the feller-buncher to bunch. A grapple skidder could then be used for extracting unlimbed bunched stems to feed a roadside delimber, with load out by a hydraulic crane.

DISCUSSION

The success of this high producing operation is dependent on a skilled foreman and supervisor, who must; ensure areas are opened up and worked correctly, and organise the operation to run in a dephased state so that interference between machinery and manpower is minimised. Other prerequisites are; reasonably flat terrain, a high level of mechanical availability, and minimal sorting. Activities such as post cutting would rapidly lead to skid bottlebecks.

SUMMARY

Development of a semi-mechanised bunching system for handling clearfelled ponderosa pine has led to considerable productivity gains and cost reduction over conventional systems.

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