

THE BELL LOGGER: AN UPDATE

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Fig. 1 - Bell Logger fitted with Sunnex boom

INTRODUCTION

The Bell logger has been used in New Zealand now for over three years. It was originally designed for sugar cane harvesting overseas but has since been modified for logging applications. There are currently more than a dozen machines operating in New Zealand. Since their introduction, a variety of modifications have been made to improve operational versatility, machine protection and operator safety. This evaluation looks at these modifications and the current uses of the machine to identify future potential applications.

ACKNOWLEDGEMENTS

LIRA wishes to thank the contractors operating Bells and the Bell representatives, Rod Talbot and Bill Gracie, for their co-operation and assistance.

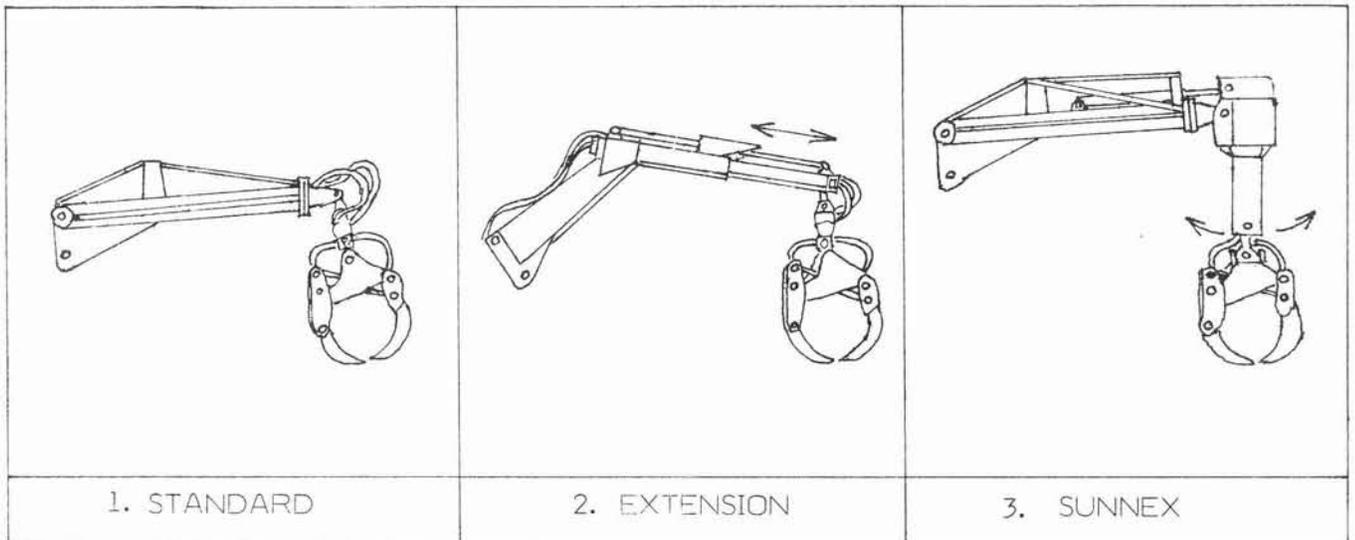
MACHINE LAYOUT

A key feature of this machine is its simplicity. The frame shape is triangular with the boom pivot mounted above the operator's cab. The frame doubles as the hydraulic oil reservoir. The operator sits directly ahead of the engine, separated by a sound dampening panel. The air cooled three cylinder diesel engine hydrostatically powers the two front driving wheels. An auxillary pump supplies hydraulic oil to power the boom lift and grapple functions.

Five controls operate the standard machine. Three manual valve levers control boom lift, grapple open - close and rotation. Drive control is through two foot pedals which control (through hydraulic wheel motors and reduction hubs) each driving wheel independently. The rear castor wheel is not powered and rotates freely. The hydrostatic drives provide infinitely variable speeds in both forward and reverse. Maximum speed is 12 km/hour.

The standard configuration has a fixed boom raised and lowered by one hydraulic cylinder. The grapple is attached to the boom by a rotator and universal joints. Alternate boom configurations are shown in Fig. 2. The extension boom is an option available from Bell while the boom shown in option 3 is locally manufactured by contractor, Harold Sunnex. For general bush work, the standard boom is sufficient. However, for skid work and loading, the extension or "Sunnex" boom gives added control of log movement. All booms may be fitted with the standard (series 20) or the larger (series 33) grapples.

Fig. 2 - Boom Options



MACHINE USES

The Bell logger is remarkably versatile, being able to perform the following functions - pre-bunching (for other extraction units), extraction, sorting and loading. Overseas it has been used successfully as a feller-buncher.

Pre-Bunching

Several units are being used in the bush to pre-bunch logs for skidder extraction. It has been used in thinning, clearfelling of small trees, and cutover salvage. In thinnings, slash or waste material is placed to support the butts of pre-bunched logs and ten to twenty delimbed stems can be arranged in each pile. This effectively reduces the accumulation and breakout cycle of the skidder. In this manner, system productivity can be greatly increased. The addition of a Bell to one skidder thinning operation increased productivity from 40 tonne to 60 tonne per day. In clearfell, the use of the Bell to pre-bunch increased productivity by 55% to 65% and had a corresponding reduction in cost per m³ between 8% to 16% (Ref. 1). The Bell can also be used to assist fallers in pushing down hangups and rolling logs over to ensure complete delimiting.

Extraction

When extracting on its own, the machine essentially works as a grapple skidder. It can rapidly accumulate its maximum payload. However, due to its limited load capacity, haul distances must be kept short, averaging no more than 100 metres. Although the machine is driven backwards during extraction, the small number of trees pulled and positive control afforded minimise residual tree damage in thinnings. Its small size and high manoeuvrability allow operation in tight situations. In favourable conditions, it can work slopes of up to 25%. However, ground conditions, particularly slash, mud and stumps, may limit its accessibility although tyre chains help overcome this problem.

Sorting

The more products being cut (e.g. posts, poles, sawlogs, pulp) in an operation, the greater the value of the Bell. Its fast movement and small turning circle allow for rapid product segregation and placement. The machine can also aid skid workers to shift logs for easier crosscutting. It works effectively on smaller skid sites than those required for conventional front end loaders.

Loading

The unit is capable of handling a variety of log sizes from short pulp to seven metre sawlogs. With the large grapple it can quickly load short pulp either on to set out cradles or directly on to trucks. When loading longer and larger diameter wood, the operator must first place one end on the truck, then lift the other end of the log into position. With certain piece sizes, less than .5 tonne, the Bell can effectively be used to heel boom load. For fast loading, two Bells can be used to load the same truck without getting in each other's way.

MODIFICATIONS

In learning from contractors' experiences, Bell Manufacturing have added a number of modifications to improve machine protection and service access. They include :

- (1) Relocation of precleaner and exhaust pipe
- (2) Sound dampening panels and plexiglas shields between engine and operator's cab.
- (3) Re-designed engine cover panels and screens.
- (4) Modified front body panel

The contractors themselves have done various modifications which improve overall versatility of the machine. These are divided into two categories : boom and cab.



Fig. 3 - Extensively modified machine with :

- pusher bar on boom end
- heel along boom
- extraction wings on frame
- tyre chains fitted

Boom

The standard design of the grapple head allows excessive swinging and swaying. This leads to problems with the universal joints. Also, hoses are exposed to chaffing and are vulnerable to damage from stems being handled. To overcome this, the "Sunnex" boom was developed. This incorporates an additional ram controlled by a one metre extension below the rotator. It eliminates one universal joint, reducing the swinging and gives added protection to the grapple and rotator hoses. This gives added reach, improves log control, and is useful for pulling down hang-ups.

Another modification to the standard boom is the addition of a .5 metre prong on the boom end. This was originally put on to push down hang-ups but can be used to align butts of loaded logs on a truck. Halfway along the boom, a heel has been added to permit heel boom loading of small sawlogs (refer Fig. 3).

Cab

To overcome the problem of slash entering the cab, several contractors have added running boards. They help to keep slash out of the cab and permit easier access. Normally, the operator's hands are exposed when using control levers. To overcome this, some machines have vertical protection shields.

Above the wheels, triangular plates have been welded so a log can be rested on them, allowing forward machine movement during extraction. In some cases, lights have been added to allow early morning and night operation.

The original seat supplied as standard was inadequate and uncomfortable for the average New Zealand operator. Many have replaced the standard seat with one having a higher back rest and more cushioning. Bell Manufacturing is currently examining ways of improving the seat.

POTENTIAL USES

One local Bell contractor is using a system similar to a South African one incorporating forwarding trailers. The system utilises manual processing to short lengths and stacking in small piles. The Bell then loads the trailers which are forwarded by either a crawler tractor or skidder. This type of system may well have wider potential here, especially for thinning on easy terrain.

Another application for the Bell is pulling away from a hauler. Cut to length logs are hauler extracted. The Bell removes them to small roadside landings. They can then be heel boom loaded on to trucks.

Using the Bell as a feller-buncher is an option which is popular in North America. A Hudlins felling head is available in New Zealand for this application.

CONCLUSION

The Bell logger, at a cost of \$45,000 (standard unit) is an extremely versatile logging machine, capable of performing many logging operations. Although it is limited by terrain and tree size when compared to alternative single function machines, its ability to do all jobs can often outweigh these problems. In New Zealand, the various modifications added have further increased the machine's potential.

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

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