LOGGING INDUSTRY RESEARCH ASSOCIATION

THE IGLAND HAULER

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INTRODUCTION

The Igland hauler is a small, relatively simple cable logging machine. LIRA studied the first such hauler in the country, with the intention of identifying planning and operational constraints.

THE MACHINE

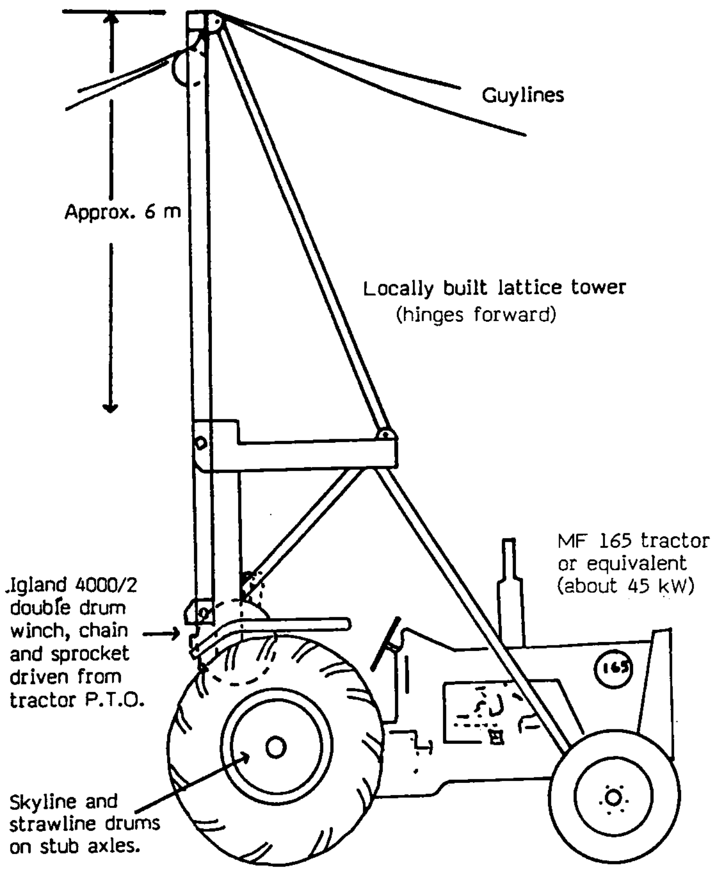


Fig. 1 - The Igland hauler

The machine's simplicity is reflected in a low price. The unit would cost between $20,000 and $30,000 fully rigged, depending on the quality of the tractor. A new tractor is not essential provided that the engine and PTO drive train are in good order. Although few demands are made on the tractor's mobility, traction and braking, it must have sufficient capacity in these respects for safe and productive operation.

The Igland 4000/2 double drum winch fits directly behind the tractor's seat and is powered by a chain and sprocket drive from the tractor PTO. Each of the drums has its own clutch and brake. The controls act directly through mechanical linkages which offer positive control and good operator "feel".

The lattice tower was locally built to specifications typical of those in Scotland. Its construction would be within the capabilities of a competent welder.

ACKNOWLEDGEMENTS

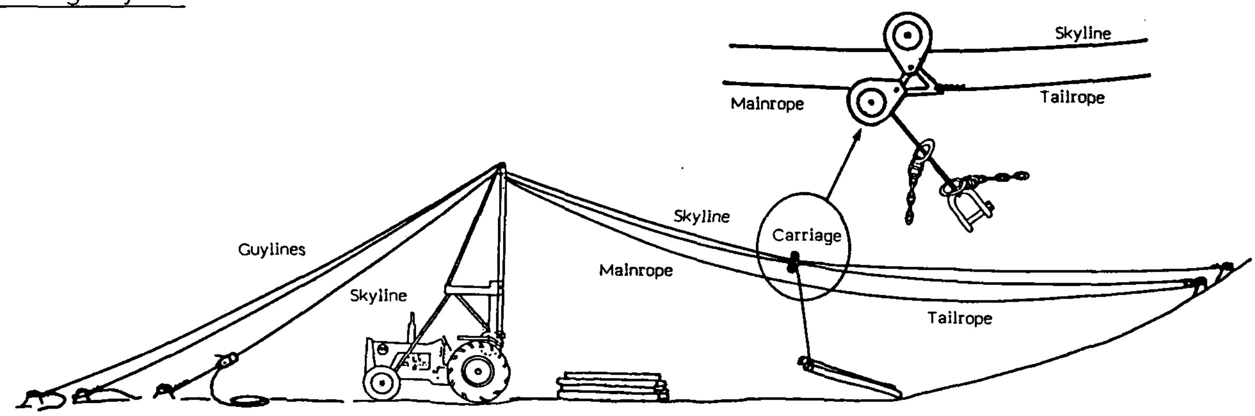
LIRA wishes to acknowledge the assistance of N.Z. Forest Products Limited and contractor, M. Brolly.

RIGGING

The hauler is rigged with 300 m of 8 mm tailrope on one drum and 180 m of 10 mm mainrope on the other. Stub axles can be bolted into place on the rear wheels and in this way the machine carries two further drums, one with 300 m of strawline and the other with 200 m of 10 mm skyline. Either rope may be pulled out by freewheeling the drums on the stub axles. To reel in, the appropriate drum is locked on to the axle shaft with a pin, the wheel jacked clear of the ground, and the tractor is engaged in gear. For ease of setting up, 10 mm polypropylene rope is used as strawline. Two 10 mm guylines attached to either side of the top of the tower complete the rigging. These are tied off to stumps forward of the tractor and are tightened by backing the tractor away from them.

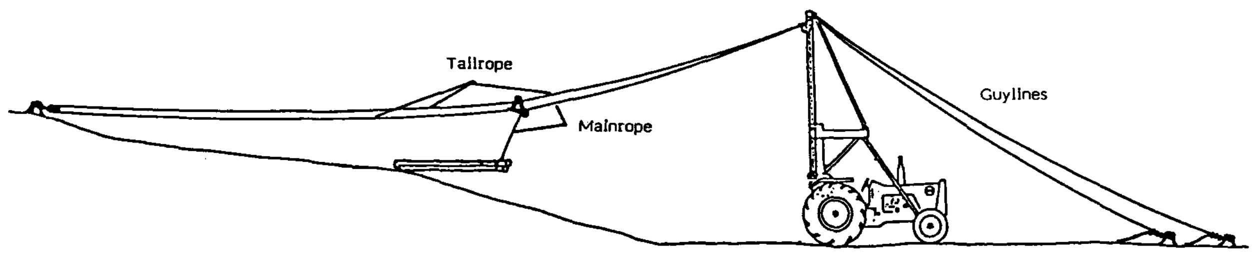
Two rigging configurations can be used :

Standing skyline



Because the mainrope passes over a sheave in the carriage, slack can be pulled. This enables logs from both the centre and the side of the extraction corridor to be attached.

Running skyline



This system of rigging dispenses with the standing skyline and instead employs the tailrope to provide lift. As shown, the carriage rides on the tailrope. Significant lift can be provided by "tightlining", i.e. tensioning the mainrope while braking the tailrope.

Of the two systems, the standing skyline provides more lift and is more suitable for longer spans. The running skyline is more quickly rigged and hence provides greater productivity when working slopes of suitable length and shape.

SYSTEM

Michael Brolly, the contractor who introduced the Igland hauler to New Zealand, has been using the machine to extract 12-16 year old radiata pine thinnings in N.Z. Forest Products Limited's forests, near Tokoroa. Three fallers, working on piece rate, fell and delimb the trees in preparation for extraction. The falling pattern is based around extraction corridors, 4-5 m wide and spaced at 15 m centres. They run straight up and down the slope wherever possible.

Two men work with the hauler; one as the breakerout and the other as the machine operator. The breakerout controls the bush end of the extraction cycle, determining carriage position and optimum drag size. The machine operator unhooks the drag and manually aligns the stack which accumulates in front of the machine. Keeping the stack tidy and as low as possible is important if it is not to become a major source of obstruction and delays. Once a corridor has been completed and the hauler shifted to a new location, the accumulated stack can be uplifted by a self-loading truck.

WOOD PRESENTATION

From the outset, the contractor required his fallers to delimb all felled trees and cut them to 5.5 m lengths in the bush. This was a departure from the usual New Zealand tree length hauling practice, but a technique which suited the machine. At the start of the LIRA study, felling was haphazard, delimbing incomplete, and the extraction corridors were cluttered with slash (branches and tops).

LIRA set out to improve the standard of wood presentation. This required; that the trees be felled towards the corridor (in a herringbone pattern), that delimbing be complete, and that all slash be removed from the extraction lane. With the felled wood clear and unobstructed, a surprising amount of manual bunching could be achieved by either the faller or breakerout.

Placing slash around the base of the residual trees can also reduce bark damage during extraction. An outline of the techniques for improving presentation is contained in a LIRA Report, "Organised Felling for Thinning Radiata Pine", Vol. 8 No. 12 1983.

STUDY OBJECTIVES

Ideally, the study was to have compared machine productivity before and after the introduction of the improved wood presentation. Unfortunately, difficulties in the experimental design meant that the "before" and "after" areas were not in all other respects comparable. Problems resulted from the roadside bank on which the stack had to be formed. This affected production by obstructing the operator's view and access, and reducing clearance beneath the lines. Within the study, the height of this bank was not constant, complicating the interpretation of results. The study results summarised below describe the machine's performance with the improved wood presentation.

STUDY RESULTS

Five extraction corridors were logged downhill over a period of five days with the machine rigged as a running skyline.

Site factors	:	*Maximum extraction distance - 150 m* *Average extraction distance - 75 m* *Smooth concave slope 0-85% with an average chord slope of 36%.*
Stand factors	:	*14 year radiata pine regeneration. Average dbh 20 cm* *Reduction in stocking from 1500 sph to 350 sph* *Average tree size .22 m^3, processed log size .12 m^3.*

The total study time was 2010 minutes (282 cycles) comprising the following :

Productive time (includes production delays such as stuck logs, tidying stack, etc.)	*1525 minutes*
Rigging time (rope set up and line shifting times)	*152*
Repairs and maintenance (including rope breakages)	*82*
Personal (predominantly meal breaks)	*251*

Machinery availability = 96 %   Machine utilisation = 76%

(Although the study was too short to determine the machine availability with confidence, longer term experience has indicated that it is in excess of 90%).

Average productive cycle time was 5.41 minutes with a standard deviation of 2.08 minutes. The average drag size was 3.7 pieces.

Using these study results, estimated daily production can be calculated :

On-site time : 8½ hours or 510 minutes

With a utilisation of 76%, the operation is involved in log extraction for 510 x .76 or 388 minutes

Daily cycles will be 388/5.41 or 72 cycles

Estimated daily production is, therefore, 72 cycles x 3.7 pieces per cycle x .12 m^3 per piece = 32 m^3.

Longer term production since the study has shown the production in similar settings to be approximately 27 tonnes per day. The difference between this actual production level and the calculated level of 32 m^3/day is probably due to lower actual machine utilisation, different piece sizes and haul distances. The 27 tonnes per day is still a substantial improvement over the average daily production before the study of 17 tonnes. The increase has been attributed mainly to the improvement in wood presentation.

CONCLUSION

The Igland hauler operation studied has successfully demonstrated several different concepts in New Zealand hauler thinning :

- the running skyline system of rigging
- full processing of trees to logs in the bush
- well organised felling, with the removal of slash from the extraction corridors to facilitate extraction

The machine's small size does affect its flexibility, but provided that planning recognises the machine's capabilities, it can work very effectively. This trial demonstrated that an ideal terrain type consists of short concave slopes of about 150 m length. The machine's low power suits it to an optimum haul size of 0.5 tonne and the logs within each drag should be well prepared to reduce the breakout forces necessary. A raised landing, such as results with a roadside bank, is an undesirable feature, and the hauler operator must be conscientious in keeping the stack height low.

DISCUSSION

The Igland hauler offers several advantages :

- it is inexpensive to own and operate. As such it offers a cheap avenue into the industry for new contractors. For organisations involved in small scale or intermittent logging, it would not be unduly expensive to stand the machine down when not required.
- line shifts can be performed very quickly, especially when rigged as a running skyline. Shifts of less than 20 minutes are possible in corridor lengths of 150 metres. The machine utilisation is correspondingly high and very few New Zealand hauler operations approach this level.
- the hauler can work in confined areas and most commonly is parked across the width of the road.
- the machine can be used as a mobile skidder with a double drum winch. The tower can be left raised or lowered for such work.

At its increased level of production the system has proven economically viable for its owner. Michael Brolly has recently built a second slightly larger machine which has maintained a production level of 22 tonnes per day pulling uphill.

LIRA intends to conduct further studies on Igland haulers to better identify the planning and operational constraints.

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