

EARLY ATTEMPTS AT MECHANISED FELLING/DELIMBING
IN NEW ZEALAND

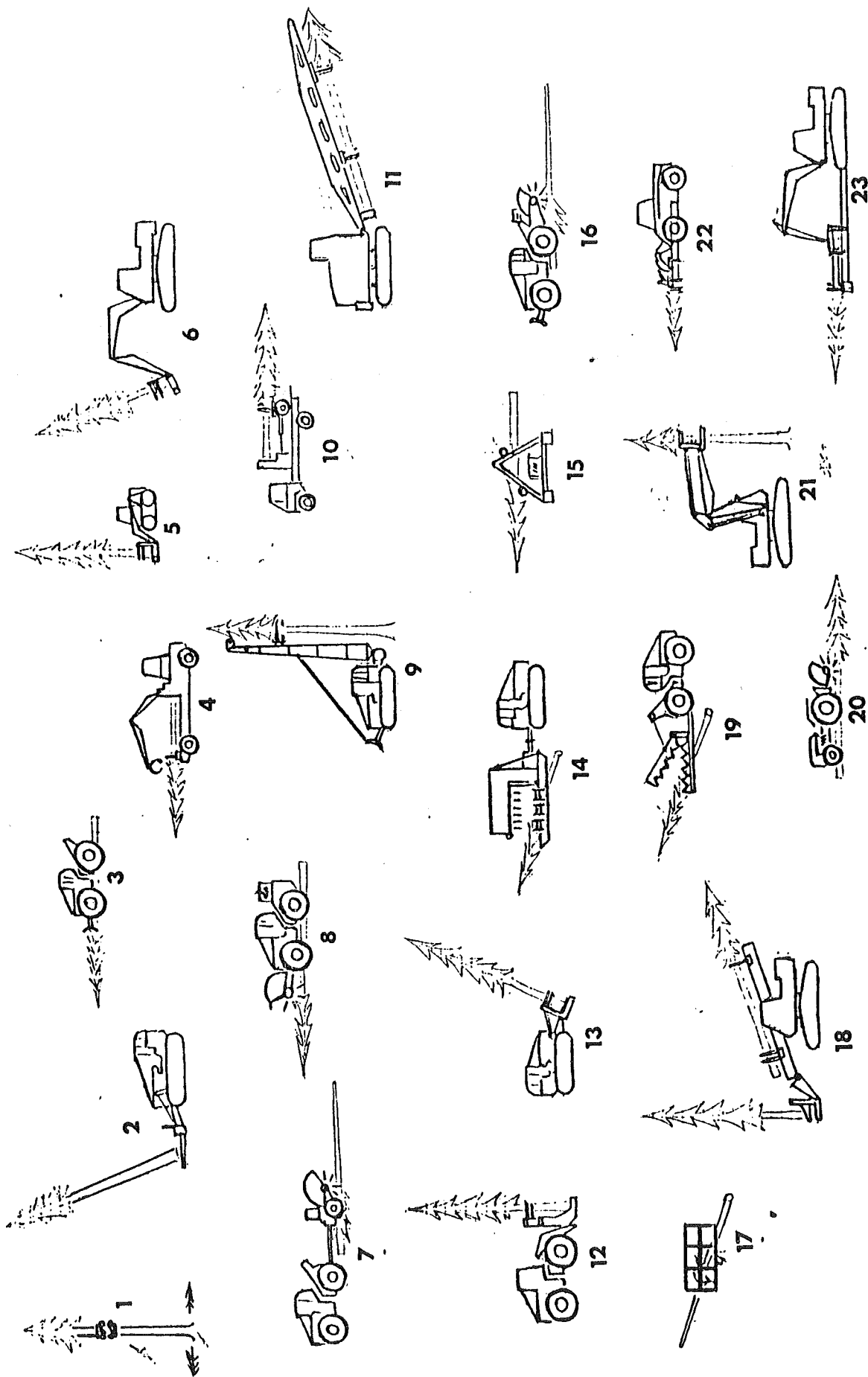
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Over the past 15 years there have been many dreams, attempts and applications of mechanised felling and/or delimiting in New Zealand. Initial attempts to mechanise these operations started during the early 1970's and applications plus interest peaked in the late 1970's. However today in the mid 1980's there are but a very small number of active mechanised felling/delimiting operations in New Zealand.

The brief for this paper is specifically to cover the N.Z. mechanisation activities of the 1970's, and reflect on the variations tested, features/problems encountered, and leads worth pursuing.

MECHANISATION ACTIVITY DURING THE 1970'S

In searching through the LIRA information system, reference was found to some 20 arrangements aimed at mechanised felling/delimiting during the 1970's. A further small number have arisen in the 1980-85 period. The 1970's was thus a particularly active period with interest plus trials and applications widespread. The following figure 1, and subsequent table, illustrate and describe the arrangements identified. Some of these never got past the concept stage, but many had two or more similar units operating productively.



SKETCH NO.	APPROX. DATE	BRIEF DESCRIPTION	EXTENT OF USE	COMMENTS
1	1970	<u>Tree Climbing Chainsaw</u>	Brief trials only	Low tree rate Climbing height problems Cumbersome to move between trees
2	1973-78	<u>Tractor Mounted Felling Shear</u>	3 x QM shears and 1 x Roanoke shear used productively by KLC and contractors	Limited directional control, but successful in large diameter radiata
3	1973	<u>Skidder Blade Delimiting</u>	Contractor trials only - various	Inadequate standard of delimiting
4	1974-78	<u>Cancar Processors</u>	2 units used by KLC productively	Good trim and output rate. Hydraulic maintenance problems. Difficulties keeping wood supply up.
5	1976-77	<u>Bobcat Fellerbuncher</u>	1 unit extensively trialed and used by contractor productively	Very compact and manoeuvrable. Traction problem in loose scoria. Uncomfortable operator ride. Worked in radiata thinning.
6	1976-86	<u>Excavator Based Fellerbunchers</u>	1 x Drott and approx. 4 x Hitachi units used productively by Panpac contractors	Good operator comfort and very productive in all weather. Difficulty in following operations keeping up with production.
7	1976-77	<u>Towed Chain Flail Delimber</u>	1 unit used productively by contractor Cochrane	High rate of trim. Fixed operating height and problems with dirt hammered into stems.
8	1976-79	<u>Front Mounted Chain Flail on Skidder</u>	1 unit used productively by Panpacs	High rate of trim. Adjustable operating height. Chain wear problem.
9	1977	<u>Bolstad Prototype Delimber</u>	Prototype built and briefly trailed	Low cost and ingeniously operated. Fixed trim/prune height. Difficult to align with trees on sloping ground or if leaning.

SKETCH NO.	APPROX. DATE	BRIEF DESCRIPTION	EXTENT OF USE	COMMENTS
10	1977	<u>Puller Truck-mounted Processor</u>	Prototype partially built but not completed	No tree loading provision or slash removal system.
11	1977	<u>30RB Crane-mounted Processor</u>	Preliminary concept drawing only, by KLC	Aimed at performing cancar processor functions but without hydraulics.
12	1977-80	<u>Clark Front-end-loader Based Fellerbuncher</u>	1 unit trialed and used by contractor productively	Very low stumps and minimum butt splitting due to shear design. Good performance rate and mobility.
13	1977-	<u>Tractor-mounted Fellerbuncher</u>	Approx. 2 or 3 units locally built and used productively by contractors	Low cost, utilising common logging machine. Good tree control.
14	1978-79	<u>Cochrane Stationary Chain Flail Delimber</u>	1 unit used productively by contractor Cochrane	Overcomes problem of hammering dirt into stems.
15	1978	<u>Winstone Stationary Chain Flail Delimber</u>	Prototype partially built and partially tested	Tested on radiata thinnings.
16	1978-79	<u>Rear-mounted Chain Flail on Skidder</u>	1 unit used productively by contractor Paewai	Adjustable operating height. Unimpaired forward visibility. Used for partial trim only with chainsaw finish.
17	1978	<u>Gate Delimiting Frame</u>	Approx 2 units built for brief trials. Panpac and FRI.	Low cost. Don't perform well with N.Z. branching habitat.
18	1978	<u>Hitachi Harvester</u>	Design drawings by Cable Price, but not built	First local harvester proposal to combine felling and delimiting
19	1978	<u>Jaws Delimber</u>	Built and used productively for short period by contractor Keremete	Low cost concept for multistem delimiting. Reasonable trim standard.

SKETCH NO.	APPROX. DATE	BRIEF DESCRIPTION	EXTENT OF USE	COMMENTS
20	1979	<u>Agric. Tractor Mounted Chain Flail</u>	Built and tested by contractor O'Connor	Low cost. Not robust enough.
21	1979-80	<u>Maratah Delimber-Feller-Buncher</u>	3 units used productively in East Taupo. Numerous exported to Australia.	Successful performers in radiata thinning. All weather operation. Higher capital investment.
22	1982	<u>Sifer Delimber</u>	1 unit in brief trials	Problems with malformed trees. High capacity capability.
23	1982-86	<u>Hunt Delimber</u>	1 unit used productively by contractor Hunt	Good trim standard. Low cost attachment. In use on steep country operation.

VARIETY OF APPROACHES CONSIDERED

A fair spectrum of mechanisation alternatives were either thought about, tested or used productively.

Felling was performed with single knife/anvil shears, double acting shears and more recently by chainsaw felling head (Hultdin head on Bell logger). Limited-directional-control felling was widely used (especially on larger butt diameters), as was controlled felling and bunching. Accumulating numerous small diameter stems prior to bunching was also tested. Generally mechanised felling was found to present few problems, the major one possibly being that following operations (of delimiting and extraction) could not keep up with the highly productive felling machines available. Fellerbunchers were found to be ideal in bunching stems for a grapple skidder in a high output operation. They also produced very low stump heights.

Delimiting was achieved using various types of knives and chain flails. The approaches have delimited standing trees prior to felling, felled trees at the stump, and trees brought to the landing. All have worked satisfactorily and have been suited to specific logging situations. Low quality trimming/high quality trimming has also been tested on various tree species and knowledge gained. The mechanisation of delimiting identified many more problems than those encountered in mechanised felling, the major difficulties being :

- achieving a high output rate to offset costs;
- meeting required mill delimiting standards;
- reliability of equipment involved.

However, chain flails were found to be satisfactory in some operations involving small piece size minor species destined for pulp mills.

Combined felling/delimiting by single machine evolved towards the end of the 1970's with a New Zealand developed machine being locally applied and also exported in numbers.

Further analysis of the variety of mechanisation approaches indicates use on flat country, moderate slopes and even more recently in a very steep country operation (Hunt delimiting). Both clearfell and thinning operations have been well explored. The range has involved low capital cost alternatives (gate delimiting) through to high capital cost alternatives (cancar processors). All types of base machines (dozer, skidder, agric. tractor, front-end-loaders, excavators, rope cranes, sledges, truck chassis') have been utilised in the mechanisation considerations. Whilst different base machine types suit different situations, possibly the hydraulic excavator base was found to provide the best overall characteristics whether for felling or delimiting or both combined. Excavator base units provide good operator comfort, the best reach capability, good reliability and a capability on sloping terrain.

The industry's investment and effort in mechanisation development

during the 1970's was thus considerable. All sections including contractors, forestry producer companies and equipment suppliers, contributed/participated and this was a good healthy situation. Detailed considerations of mechanisation results were regularly monitored/highlighted by the industry's research and development teams (LIRA and FRI), and much information distributed. Relevant references that summarise this subject include the following earlier LIRA seminar papers :

1. "Mechanisation of Smallwood Harvesting in N.Z." by Gordon. Paper presented at Smallwood Harvesting seminar held by LIRA, June 1980.
2. "Mechanisation of Felling and Delimiting in New Zealand" by Gleason. Paper presented at Logging Machinery seminar held by LIRA, June 1982.
3. "The Future of Smallwood Mechanisation in New Zealand" by Cochrane, Gleason, Lawson, Twaddle. Paper presented at seminar on Research and Development in Tree Harvesting and Transportation held by LIRA, June 1983.

The trends and potential for mechanised felling and delimiting are well identified in these references.

CONCLUDING COMMENTS

Overall, mechanisation of felling/delimiting in New Zealand was given a concerted and positive consideration during the 1970's. Few alternatives were left unexplored. The situation today, with only a very small number of continuing mechanised operations, is I consider an accurate indication of the potential for mechanisation in the created logging environment. This environment in N.Z. is characterised by such factors as extensive industry use of small contractors, controlled operational output, the highly loaded cost of imported technology and traditional conservatism by controlling personnel.

The logging environment however is a changing one, particularly with respect to available equipment/technology, changes in workforce attitude/supply considerations, and economic considerations. For this very reason the industry must continually address and reconsider the place of mechanisation, as is now again being done at this 1986 LIRA seminar.

Mechanisation of felling/delimiting will eventually come, given the right industry conditions. One only has to reflect on history or to look at other industries, whether in N.Z. or abroad. It is possibly the only means of making a significant efficiency advance (output/cost/safety) in this phase of ground based logging.

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