



TECHNICAL RELEASE

Vol. 1 No.6 1979

LIRA COPYRIGHT©1979

NEW ZEALAND

THINNING SYSTEMS IN SWEDEN

A REPORT BY BILL SEWELL, FORESTER, N.Z.F.P.. TOKOROA

In May 1978 the writer visited Sweden as part of a David Henry Scholarship tour to study production thinning systems and particularly the silvicultural basis of these systems. This Technical Release is an extract from the report on that tour. The writer acknowledges the assistance given by the David Henry Scholarship Board in making this study possible.

INTRODUCTION

Thinning produce, as a proportion of the total cut in Sweden, has fallen from 50% in 1955 to about 20% today. However, this still means an annual cut from production thinning of about 14 million m³ per year (nearly twice New Zealand's total removal of exotics). The Swedish forests are almost entirely natural regeneration, with the major species being Scots pine (*Pinus silvestris*), Norway spruce (*Picea excelsa*), and birch (*Betula* spp.). Topography is generally flat to rolling with few areas inaccessible to rubber-tyred machinery.

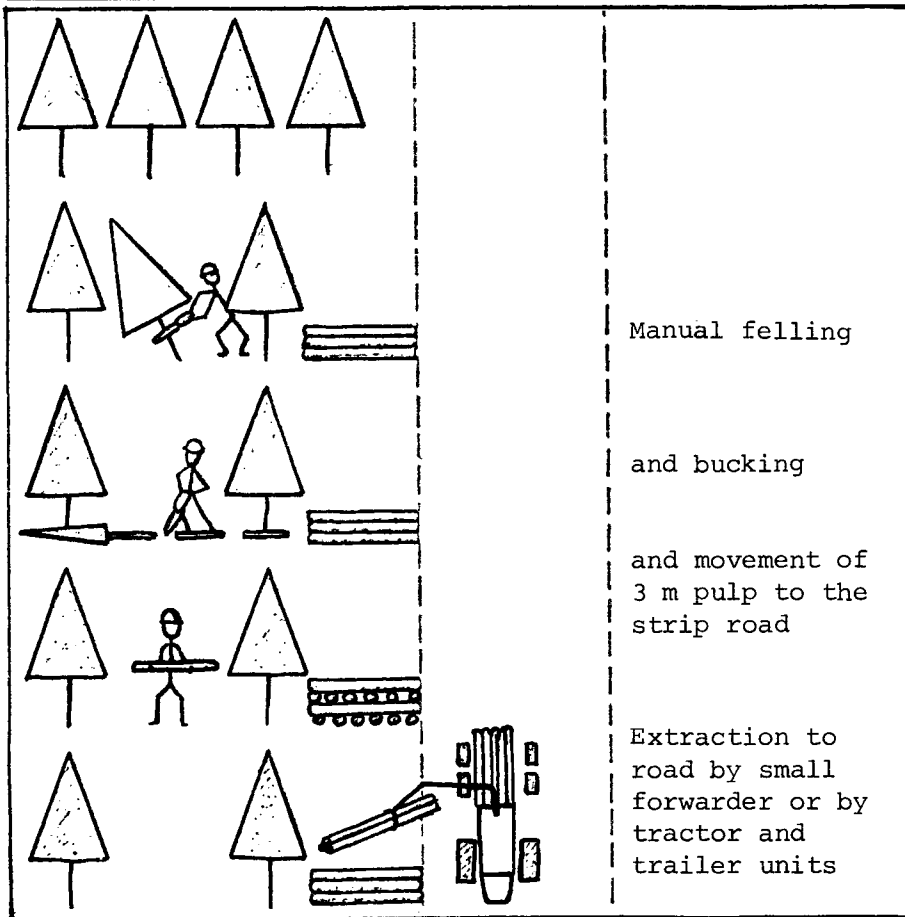
Some years ago a statement was made on the policy in wood harvesting development in Sweden: "no hand on the saw, no foot on the ground, by 1980". At least in the larger organisations this has been achieved now in most clearfelling operations, but thinning systems, as everywhere, remain very labour intensive, and the target is unlikely to be met. Whereas many countries are moving toward neutral thinning*, Sweden, influenced by foreseeable wood demands in 30-40 years time, is undertaking more selective thinning and increasing the distance between extraction rows, which makes it unlikely that fully mechanised operations will be possible, at least in the foreseeable future. However, at the same time the major developments are towards ways that the amount of labour used can be minimised. This is understandable where the average forest direct labour cost is about \$6 per hour. (In addition to this the employer would be required to pay an additional \$5-\$6 per hour to the Government for payroll tax and social costs.)

SWEDISH THINNING SYSTEMS

All Swedish systems are similar in that reasonably parallel extraction rows (strip roads) are formed on which the produce from between the strip roads is accumulated for extraction to the truck roads. The systems differ in the method of felling, limbing, bucking, the method of movement to the strip road, and the method of extraction to the truck road. The main systems in use now and variations envisaged in the future, are as follows:

*Neutral thinning system: A systematic thinning pattern such as line thinning.

1. MOTOR MANUAL SYSTEM



Manual felling

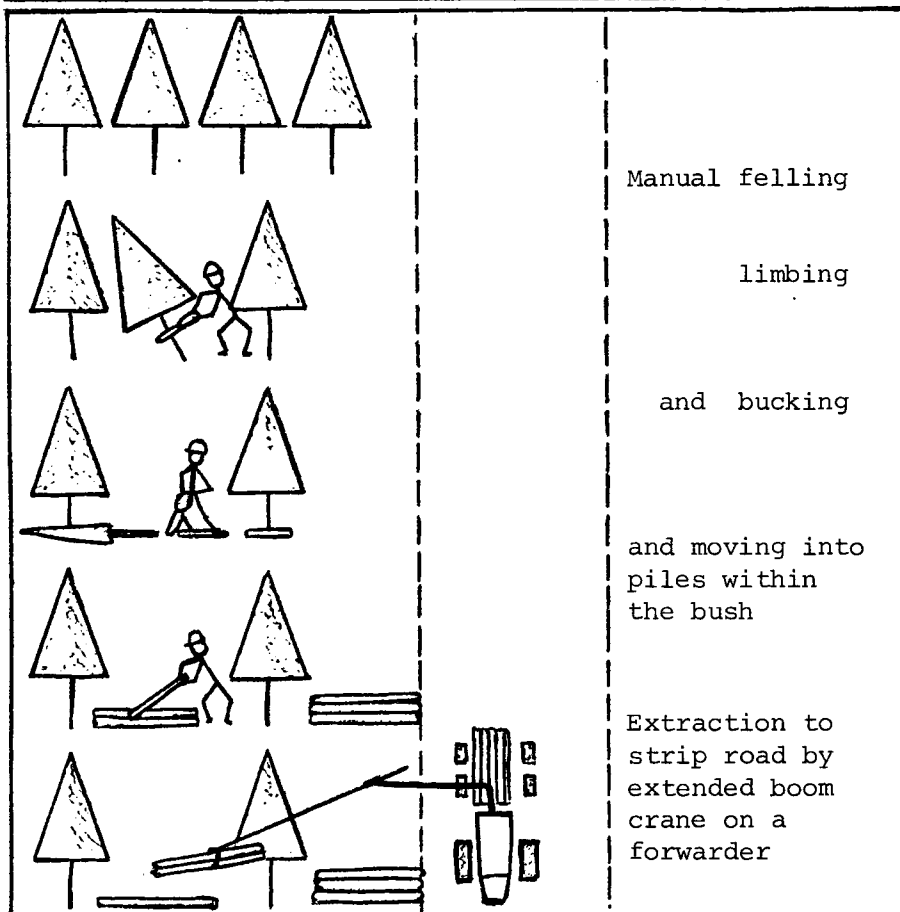
and bucking

and movement of
3 m pulp to the
strip road

Extraction to
road by small
forwarder or by
tractor and
trailer units

This is the standard method of thinning in Sweden, accounting for over 60% of the thinning volume. Strip roads are 20 metres apart, and 4 metres wide. Selective thinning of the area between the strip roads is by chainsaw and the produce (usually 3 metre pulp) is manually carried out to the outrow and stacked close enough to be picked up, usually by a forwarder in a large organisation, or in small farmer operations, a tractor and trailer unit is used.

2. MOTOR MANUAL SYSTEM PLUS BOOM CRANE EXTRACTION



Manual felling

limbing

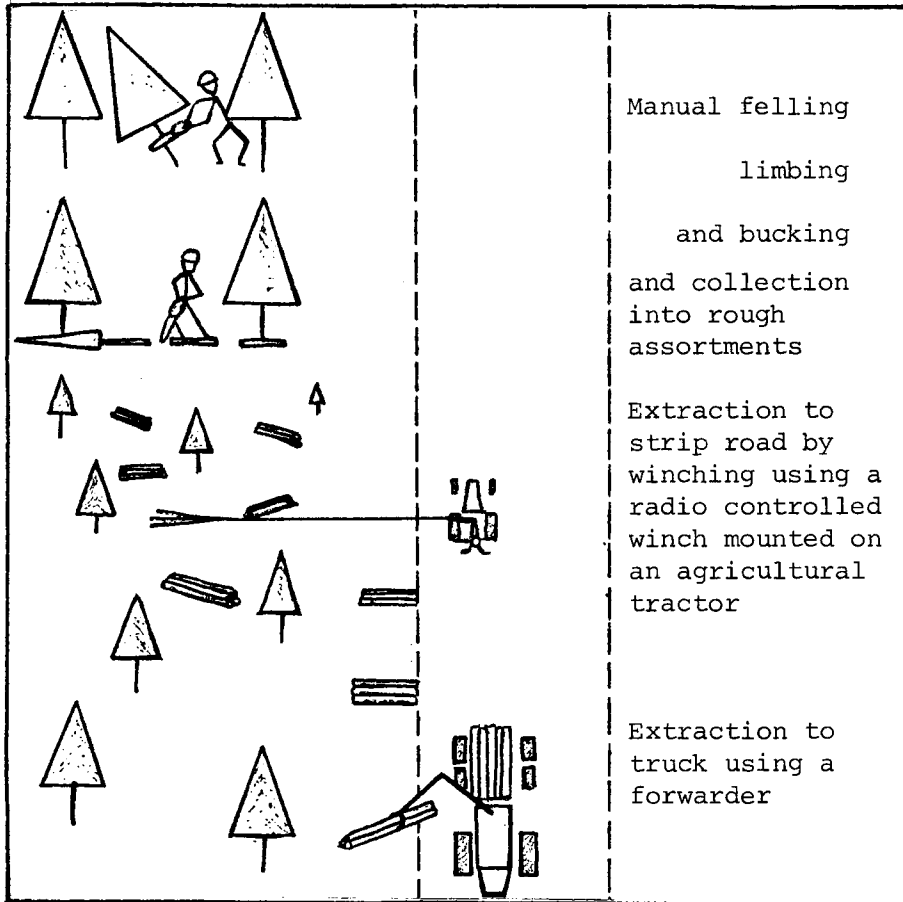
and bucking

and moving into
piles within
the bush

Extraction to
strip road by
extended boom
crane on a
forwarder

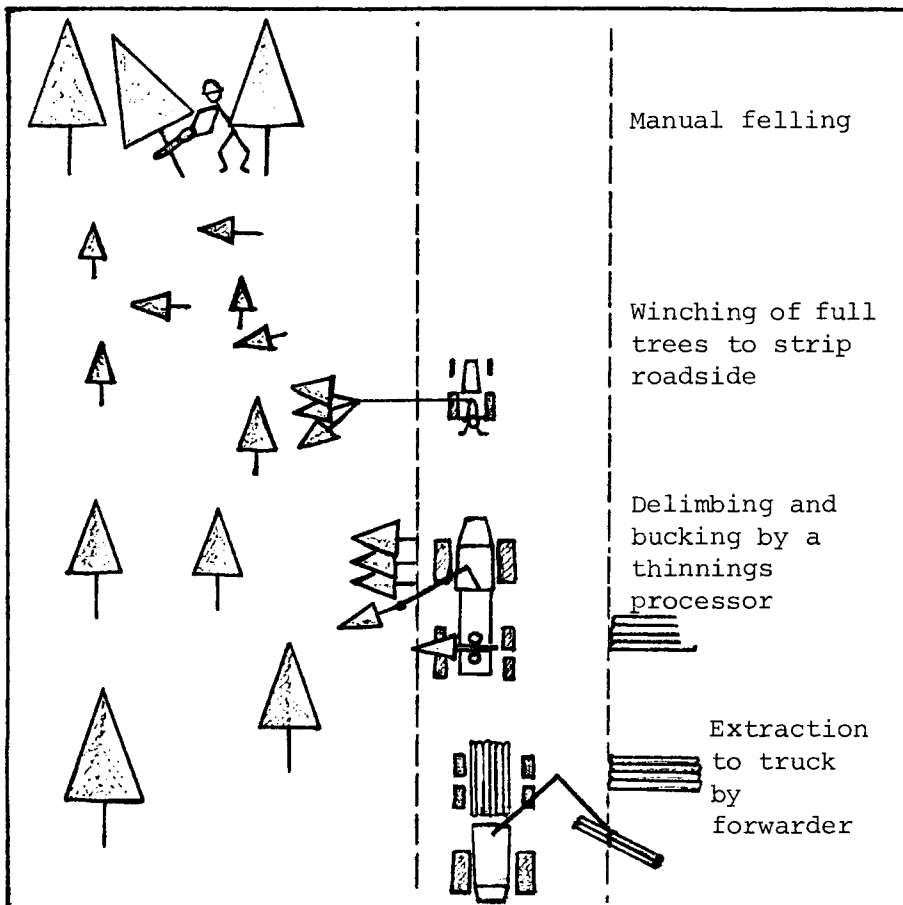
This system is similar to method 1, but the produce is not manually carried to the strip road. Instead it is accumulated into piles for extraction using a sliding boom crane mounted on the forwarder instead of a hydraulic knuckle-boom type. Ten metre long booms are in use. 15 metre booms are being developed. Thus strip roads can be 25-30 metres apart now, and 35-40 metres apart for the larger boom which requires a slightly wider extraction strip.

3. MOTOR-MANUAL SYSTEM WITH WINCHING



Again, the felling, limbing, and bucking is done manually and the produce is accumulated into small piles in the forest. These are extracted to the side of the strip road by a winch, either mounted on a farm tractor or skid mounted type carried by two men. The winch is radio controlled and was quoted as costing about \$8,000 in Sweden. The system is preferred by silviculturalists as the outcrops can be up to 80-100 metres apart, but does give rise to increased costs (probably 20% more expensive than method 1).

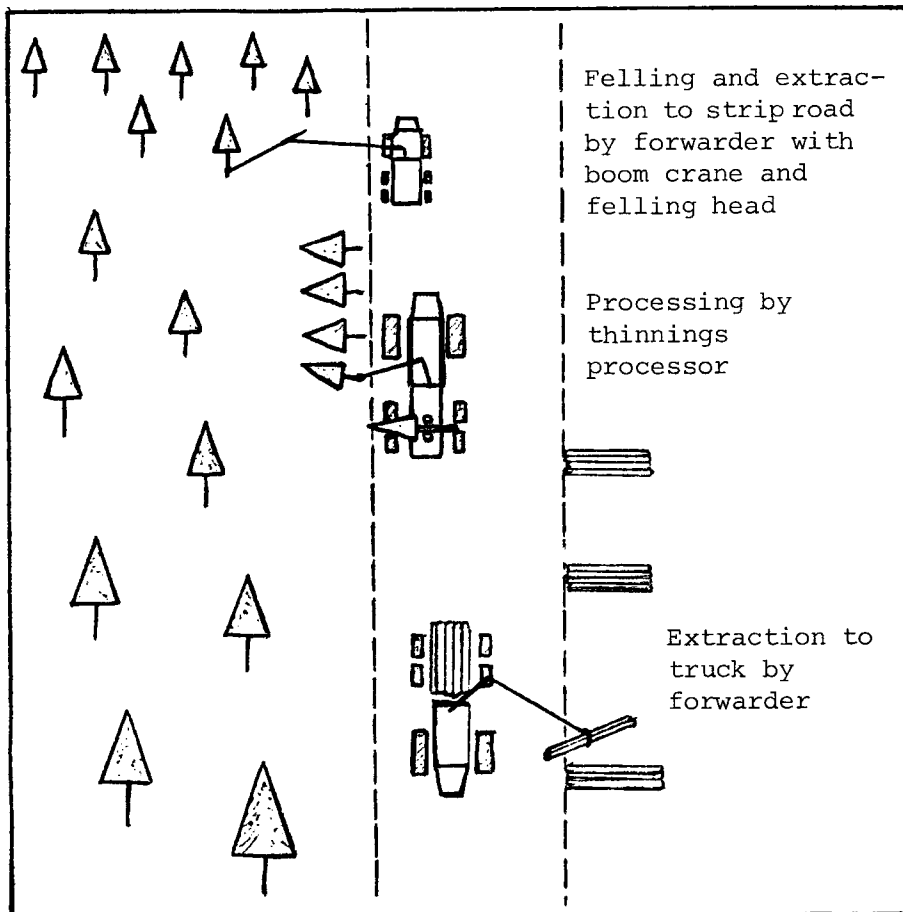
4. WINCHING TO A SMALL PROCESSOR



In order to decrease the amount of labour involved some systems are being used where whole trees are winched to the strip road where they are limbed and bucked by a processor. Processors for thinning have now been developed so strip roads no longer have to be 5-6 metres wide as was the early practice when clearfelling processors were used. The system has some problems in that all felling has to be away from the strip road and properly aligned, which requires extra skill and effort. The advantages are that strip roads can be 60-80 metres apart, no delimbing in the bush is required, and

slash is accumulated on the tracks thus providing protection for the roots. Machinery is still expensive - a forwarder mounted delimber/bucker costs around \$140,000 in Sweden.

5. MECHANISED SYSTEMS



In these systems a felling head is attached to the extended boom crane so that the tree is cut and then dragged to the strip road for limbing and bucking by a thinning processor. Although these mechanised systems are only being developed, problems foreseen are possible increases in areas lost to extraction strips and in crop damage.

6. OTHER SYSTEMS

The main work being carried out in machinery development is designed to decrease the proportion of labour involved. Some extensions of the fully mechanised system are:

- To combine all operations on one machine, i.e. felling, extraction to strip road, and processing.
- Winching or crane extraction of whole trees to the strip road and chain flail delimbing.
- Winching of whole trees to outrow and skidding to truck road for transport with branches.

APPLICABILITY TO NEW ZEALAND CONDITIONS

The applicability of Swedish thinning systems to New Zealand conditions is limited by a number of factors:

1. TOPOGRAPHY

The more mechanised systems require either flat terrain or an even slope where extraction rows run at right angles to the contour. Many of our forests are planted in areas with much more broken terrain.

One Swedish development which could find a use in our more broken country is the small radio controlled winch mounted on an agricultural tractor. This would enable prehauling from some of the shorter steep slopes to main tracks for later extraction using forwarders or grapple skidders.

2. COST OF MACHINERY AND LABOUR

In New Zealand, with labour still generally available and inexpensive (compared to Sweden) and machinery costs high, the present manually intensive thinning systems will probably still supply the cheapest wood. An increased need for mechanisation will only come when either the labour is not available or the labour/capital cost ratio changes in favour of machines.

The high cost of specialised logging machinery is also causing concern in Sweden. Over half of the forest area is owned by small forest owners and farmers, and except where management is controlled through a large co-operative, thinning is often carried out by the landowner using small agricultural tractors and trailers. These landowners do not have the resources to support expensive forwarders and processors. Some development work is being carried out in Sweden to develop more adaptable machines which can be used in both the agricultural and logging situations. Such machines could be applicable to New Zealand when a higher proportion of the future total cut comes from smaller forests and woodlots.

3. OBJECTIVES OF MANAGEMENT

The tendency in New Zealand is for greater stand management, with pruning and thinning at an early age down to a relatively low final crop stocking. Where practised, only one or sometimes two production thinnings are contemplated, with only pulpwood or posts as the produce. With residual stockings of less than 400 s/ha and merchantable tree lengths often under 15 metres, extraction in tree lengths is possible without removing valuable pruned stems in strip rows and with minimal damage to the final crop. This would suggest tractors rather than forwarders as the main extraction system. However, the small piece size from early thinnings and the low residual stockings, would lend themselves to greater processing in the stand than with longer rotation regimes using later thinnings and higher residual stockings.

This Technical Release is the work of the author and is not the result of LIRA project work. LIRA publishes it in the interests of wider dissemination of knowledge in the industry. LIRA takes no responsibility for accuracy of figures nor does it necessarily support or disagree with the opinions and conclusions shown.

For Further Information Contact:	N.Z. LOGGING INDUSTRY RESEARCH ASSOC. INC. P.O.Box 147, ROTORUA, NEW ZEALAND.	Phone 87-168
----------------------------------	-------------------------------------------------------------------------------------	--------------

