Session I
Paper (a)

WHAT'S HAPPENED IN CABLE LOGGING
- Since LIRA'S 1978 Seminar

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INTRODUCTION

The title of this paper was meant to be "Progress in Cable Logging since LIRA's 1978 Seminar". It was that year that cable logging was last presented as a major LIRA seminar topic. Although many people have learnt much about cable logging and the planning requirements over the last decade, not all of what has happened is "progress".

This paper reviews the major issues raised in the '78 seminar and discusses what has (or hasn't) developed from the seminar's recommendations. Other matters have occurred in cable logging in New Zealand both in research and industry development and some of these are covered in this paper.

INDUSTRY OVERVIEW AND DIRECTIONS

As a keynote speaker at the '78 seminar G.M. O'Neill stated that he did not see that clearfell of the new forest would pose any problems. Technically he is probably right, but there has been increased concerns on environmental issues which has and will place greater restrictions on logging steep terrain than was probably envisaged 10 years go. Environmental guidelines and close co-operation between industry and soil and water boards have worked well to date.

O'Neill considered that logging planners needed to be involved during the initial forest layout. I agree. If this was heeded and a full economic analysis carried out, then forest owners may not have planted up certain areas that will be a logger's nightmare in the future. However, 10 years ago the industry did not have the means to do rapid terrain analysis planning. We do now have the techniques which should allow industry to do better and more accurate long term planning.

The fact that cable logging could limit high cost roading thereby reducing overall costs and also prevent soil compaction on clay soils were identified by O'Neill as significant.

As well as the matter of costs, FRI and others have recently done work on identifying ways of reducing sediment yields from steep terrain roading. With soil compaction the industry has tried other means (FMC, Wide Tyres) but so far cable still seems to be the best option. The reduction in site productivity because of harvesting and land (re) establishment techniques is starting to cause real concern to foresters and researchers and may require more work in the future.

O'Neill concluded his address with a reference to helicopters being an unlikely viable alternative to cable. To date, this has proved correct although there are some around still strongly advocating helicopter logging in certain places.

J.E. Henry's paper looked at the aspect of cable thinning and he considered that as an industry we could not dodge country over 25° slope on either environmental or cost arguments. He stated that average cost of logs at the mill was important (over several years) and not the specific cost of hauler thinnings alone.

NZFP adopted this approach for 9 or 10 years but what brought about the demise of cable thinning was a combination of factors. The cost of cable thinning became 6½ times greater than pulpwood from clearfell even though a lot of research work and work study attention was paid to these

operations, silvicultural regimes changed to include early thin-to-waste on steep country, levels of tree damage were unacceptably high and a surplus of wood was available from less costly sources. NZFP Forests are not planning a return to cable thinnings at this time.

CABLE LOGGING RESEARCH

(a) F.R.I. Harvest Planning

G.E. Murphy presented a paper which summarised a survey of the industry in 1974. At that time 14% of logging was by cable (60% high lead, 40% skyline). It is unfortunate that there is no recent survey data to compare but I suspect the volume logged by hauler in 1989 is less than in 1974.

F.R.I. studies reported on showed three key results:

(1) That haulers in New Zealand had low machine utilisation (less than 50%) although high machine availability (over 90%). The low utilisation was mostly lost time through rope shifts, moving the hauler, skid work and loader interference.

(2) Piece size has a big effect on productivity although there were many variables. The FRI studies did show that careful felling was required to reduce breakage and maximise the payload of each hauler cycle.

(3) Inexperienced or non-motivated crews were often low producers and cable logging training was required at all levels.

FRI have subsequently carried out studies which address some of these key points. Murphy (1983) reported that one contractor previously studied in 1977 and considered efficient had introduced method changes with his Madill 009 which increased daily production by 20-40% despite working in smaller trees. Another study looking at gravity return (Murphy and McConchie 1984) on a Madill 009 showed that the potential gains with the correct equipment could give a 40% gain in productivity over high lead.

A series of FRI Case Studies have looked at productivity with the Madill 071 with a MSP carriage system in radiata at Patanamu and four separate studies in Kaingaroa Douglas fir with the MSP carriage, North Bend, Shotgun and Slack Skyline systems. A productivity study was also carried out on a Dispatch with wooden spar operating in Maramarua Forest in 1979 and a comparative study on a Washington 88 and Madill 009 (Bell 1985).

Some of the results of these studies and other work such as the development of the cable hauler planning packages, tree breakage and value loss studies will be referred to by Murphy and McConchie in their papers presented at this seminar.

(b) Logging Industry Research Association

In 1978 LIRA's stated objectives in cable logging were to improve the current state of knowledge, guide machine and equipment selection, identify and overcome method and equipment problems, improve techniques, conduct an analysis of carriages and breaking out studies. Many of these objectives have been met in subsequent years although this is an ongoing process.

In the early 1980's LIRA assisted in a co-operative industry project on the testing and evaluation of the hydraulic transmission Lotus hauler. These tests lead to further developments in a machine which has mostly been sold offshore.

Cable logging courses were started in conjunction with FTC and these have continued. The cable logging handbook was produced and more

recently the planning course and handbook compiled.

Evaluations on machines were carried out - Washington 88, Madill 071, Ecologger 2, Lotus Series 2, 3 and 4 and the Wyssen. Studies of thinning haulers included the Lotus Series 1 and the Igland Alp.

An evaluation of carriages in the USA was compiled by Hemphill and gravity return carriages were tested on a Skagit SJ4 and Washington 127. The recently imported Koller carriage has also been evaluated.

Tests have been carried out to establish the loadings applied to stumps, deadmen and guylines. A series of tests also looked at power outputs and line pulls of a locally developed hauler.

Technique improvements have included the procedures for rigging radiata tail trees and trials with intermediate supports.

Productivity studies by LIRA looked at the Washington 88 (Simpson 1986) comparing old crop tree length against partially processed logs. The latter showed a 9% increase in production was possible due to quicker breakout and in-haul. Prebble also published a study on this machine in 1988 comparing log length and tree length in transition crop however, this study showed no significant difference per productive machine hour but landing delays with the log length logging reduced overall productivity by about 10%. Kellogg (1987) studied a Madill 071 in conjunction with a hydraulic knuckleboom log loader on a restricted landing. The key to the success of this operation was the ability of the loader operator to schedule the trucks as required. Duggan has also studied a hydraulic loader with Madill 009 (not yet published) and has looked at the use of a Bell logger working under a Madill 071 with scab and high lead systems. Production with the Bell was up 20% which really indicates the need to eliminate skid interference.

(c) Overseas

At the '78 seminar Spiers suggested lighter less powerful and lower cost haulers are required to overcome the rapid escalating costs. He suggested interlocks and running skylines would reduce machine size. Without going into the range of yarders that have come and gone on the North American market various types of interlock are available. Although horsepower has not decreased it is being used more efficiently and more compact, flexible machines are available.

In May 1977 a Madill 071 cost approximately NZ$180,000. In May 1989 the Madill 171 cost NZ$660,000 or 367% increase in 12 years. Haulers deemed suitable for New Zealand in the future will be discussed in Session 3 of this seminar.

Spiers also suggested that radio control could offer advantages. LIRA is planning on evaluating radio (electronic) releasing chokers in 1991 but other forms of radio control have not eventuated in New Zealand. Radio controlled carriages are now well proven technology in North America.

CABLE LOGGING RESOURCE

H. Levack presented data in 1978 from the National Forestry Planning Model which showed a steady increase in cable logging from approximately 18% to 44% of the total volume logged in 2011-2015. What wasn't shown in the figures was the decline that has occurred in the short term in cable logging especially in the South Auckland, Central North Island. The number of haulers in plantation logging today is only 40-45% of those in 1978 and for a period afterwards. In the CNI/South Auckland the number is about 30%. (This number increases to 38% if thinning haulers are excluded).

The other uncertainty is Levack's figures is the classification of what is "hauler country".

Many forest owners have made deliberate decisions to push ground based systems onto steeper terrain. This move resulted from machines like FMC becoming available but has continued with tractors and skidders operating off carefully planned tracks where the soils can withstand these methods. The cost advantages between tractors over cable operations has consolidated this move in many places. The need to respond to the market has brought about a basic difference in the way stands are logged. Ground based systems offer more flexibility than cable therefore crews can be moved more readily and be more market responsive.

MANPOWER AND TRAINING

Directions considered appropriate for the industry to take beyond 1978 were set out in D. Bryan's paper. Unfortunately, many of the perceived appropriate training formats talked about at the time have not eventuated.

Bryan proposed that two levels of training were required, management and employee. Employee training for cable had been mostly on-job training but it was suggested a formal training combined with practical training was required in the future. It was anticipated that the Logging and Forest Industry Training Board would provide great benefits for cable logging systems training. (G.M. O'Neill also referred to this point). Bryan considered that management training was required to make people more aware of system limitations, planning, procedures etc.
A debate that was not resolved at the '78 seminar was "Who is the key person in a cable logging crew?". Bryan advocated that it was the breaker-out as he controlled production, others had strong views to the contrary.

Considerable advances have been made in cable logging training since 1978. LIRA and the Forestry Training Centre have run a highly successful cable logging course in Rotorua and occasionally in Nelson each year. A cable logging handbook has been produced, an annual harvest planning course has been designed and is now held each year, specific field day demonstrations on cable logging techniques or equipment have been run, and more recently a highly intensive Forest Engineering Institute in conjunction with the University of Canterbury School of Forestry was held.

The needs for training people in cable logging management and planning has been met very successfully but the logger setting the block or pulling the strawline is still mostly learning by the "seat of his pants".

An additional point about labour availability is that in 1978 Bryan considered that because New Zealand unemployment was 40,000 there were plenty of people available for the industry and that we needed good public relations to attract them. 10 years on unemployment is 150,000 and rising and there are still difficulties getting the right people to work in logging operations in most places around the country.

FINANCIAL CONSIDERATIONS

K. Walker of FRI identified that initial capital costs were approximately 100% greater than tractor although offset by longer life. Changes from tractor to cable increased system costs by 30-40% and with cable logging production levels about 30% less, overall unit costs were up to 100% greater.

Walker also identified difficulties of short term finance related to long term capital recovery particularly with high inflation, high FOREX rates and high interest charges. He concluded his paper by stating that cable logger's bear the brunt of increased volumes therefore will also have to wear the increased costs and it will be almost impossible for a sole owner to make a significant person investment.

The arguments put forward by Walker 10 years ago have been well proven and indicate one reason why there have been virtually no new haulers imported into New Zealand. Cable logging starting up in new areas are basically using older machines that have become surplus in other parts of the country.

Walker has recently completed a comparative analysis based on 1987 costs, interest rates, exchange rates and owner equity required by a borrower. These results show that the situation is clearly worse than 10 years earlier. This should be of considerable concern for forest owners who have an increasing proportion of cable

logging in the future and there may well have to be financial support from forest owners to get contractors into new haulers.

MACHINES AND SYSTEMS

R.J. Dally of C & R Equipment talked about carriages and rigging and considered that the costs of imported carriages was not in keeping with the technology involved but had a fair degree of development cost included. He considered New Zealand had the skills to build its own carriages especially with the practical experience available. C & R did subsequently develop a gravity return slack-pulling carriage (Christy Clone). Attempts at building other types of carriages have also occurred over the last few years while there has been a trickle of imported carriages (Christy, Koller, Young).

J.L. Wilson presented a paper on the forces that occur in ropes and suggested that cable loggers needed to understand the mathematical calculations of rope loadings when loads were applied. This is one area where good information has been made available. Considerable North American research has been picked up, metricated and modified by researchers to suit New Zealand's needs. There have been some towers fall over because of excessive guyline forces or stump failure so planners and operators need to know this detail.

A panel of "experts" were used at the '78 seminar to discuss the pros and cons of machines. The following conclusions were drawn:-

- Mobile haulers are required and they are cheaper on tracks.
- Self raising spars are essential.
- Engines with torque converters are required.
- Hydrostatic transmission for small haulers provided costs are acceptable.
- New Zealand should import good quality, high tech pre-owned machines.
- Sensitive controls are required and air seems to be the best type.

All of these points would seem to be relevant 10 years on.

DIRECTIONS FOR CABLE LOGGING IN NEW ZEALAND

Lessons Learnt

In summing up the 1978 seminar Spiers identified the areas where further work was required. How well have these been achieved?

1. Extend the Knowledge:- Short Course on Planning and Rigging.

   This goal has been met. The Cable Logging Course which was initially a theory orientated systems planning course is now aimed at the practical logger. The cable logging planning aspects are catered for in the Harvest Planning Course and the FEI.

2. Produce a Handbook.

   The LIRA Cable Logging Handbook was published in 1983. In addition LIRA have prepared the Skyline Carriage Survey (1985), Wire Rope Splicing Handbook (1984), and the Handbook for Harvest Planning. →

   FRI have produced a Cable Hauler Planning Package Users Guide (1984).

   LIRA's Information Centre has accumulated a wealth of information and books on cable logging.

3. Better Methods.

   Progress has been made on improving the way we cable log. Credit must go to innovative loggers, researchers and production managers who are willing to try new techniques. Some examples are:

   - the use of tail trees and intermediate supports on clearfell;

- the work being done by Timberlands on the East Coast;
- the introduction of the Wyssen and subsequent trials;
- the use of Bells and hydraulic loaders to improve hauler productivity;
- the MSP carriage;
- tree length or log length logging;
- using gravity return or other system changes when conditions permit;
- improved planning procedures;

plus many more.

4. Other Directions.

The need to cable log areas with extremely high environmental impacts has generated trials with the long span gravity systems such as the Wyssen. Soil and Water Authorities were rightly concerned that cable methods commonly being used would not meet the standards required. The trials funded by the Catchment Boards have been an important phase in cable logging learning. What must not be lost sight of however, is that other modern equipment, systems and ancillary machines (hydraulic loaders) can log highly sensitive areas provided the right approach is taken.

Long term multi-disciplinary indicative planning studies have been carried out by FRI in areas such as Mangatu, Marlborough Sounds and Coromandel. These plans are based on different levels of restriction and include likely visual impacts, sediment yields and costs. As well as the obvious benefits, these plans show that as an industry we have the means and determination to ensure that areas to be harvested are well planned but if society are to impose additional restrictions then there is a clear idea of the relative costs involved.

CONCLUSIONS

At the start of this paper I stated that maybe "progress" was the wrong word to show what had occurred in cable logging since 1978. This was because of the decline in the number of cable logging operations throughout New Zealand and that only three new haulers had been imported. Having reviewed the work that has gone on over the years I must conclude that there has been considerable progress. The technical knowledge available to those involved with planning is as good as anywhere in the world. Training programmes are in place. The ground work has and is being done to identify the equipment and methods required by New Zealand industry to tackle future cable logging areas.

The greatest concern must be the availability and training of practical skills for operators and the financial implications facing people seeking to get into new (imported) cable logging equipment.

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