SESSION 4

Reference Paper
(Tabled)

PLANNING FOR TRACTOR SKIDDER AND SIMPLE CABLE SYSTEMS

V.F. DONOVAN
Research Officer
LIRA

INTRODUCTION

One of the aims of this Seminar is to look at tactical planning for new systems and for specific sensitive areas in New Zealand and to identify future requirements. These aspects will be important in the years to come but a great deal of the current logging and even the future logging will be done with equipment that people have come to accept as part and parcel of the every day scene and often the principles of sound planning are overlooked because of their commonplace or simplicity. What are the tactical planning needs when using a skidder or tractor on flat ground? What are the limits of skidders on steep country? Where and when should a cable system be introduced and what determines the design of the setting or area? These are a few of the questions this paper will attempt to answer.

GENERAL REQUIREMENTS

A formal logging plan needs to be prepared for all logging operations regardless of terrain or the size of area. The logging plan enables the planner to identify any constraints that may be present (i.e. requirements for adjacent boundaries, etc) and stipulate the layout to ensure that unnecessary and expensive difficulties are avoided.

The logging plan should achieve the following.

1. Identify the constraints of the area to be logged, i.e. soil and water.

2. Prescribe the way the area will be logged and look at all alternatives. Planning to log at least cost must be strived for, within the constraints imposed.

3. Present detail on the roading and landing requirements.

4. Establish a time scale for the work to be done.

5. Ensure that the production commitments by the logger can be met from the plan that is produced, i.e. length of haul, landing size, adverse skidding, etc.

Before a logging plan can be prepared there is a large amount of information that must be gathered. This includes stand data, tree characteristics and terrain details, including soil types. These requirements have been covered in other sessions. The limitations of the machines to be used need to be known and clearly specified. There is little sense preparing a plan for a hauler with an external haul distance of 500 metres if the machine has only 300 metres of rope. Similarly, the size of wood to be extracted, the average haul distance, the influence of adverse hauling, must be considered when specifying a particular machine to meet a particular production target. Any logging plan must however be flexible as it is to cover a long time period and must allow revision for equipment or method changes. No plan should be started before the planner has done a thorough reconnaissance of the area involved.

TACTICAL PLANNING FOR TRACTOR AND SKIDDER

Topographic and soil constraints are the main limitations for ground based skidding systems. Generally these systems can be more flexible as the machine travels to the tree but it is here the problems can arise within settings for tractor and skidders.

If the area to be logged is predominantly clay soil and winter logging is proposed, the planner must allow for contingencies or have an alternative locality as it is inevitable that production will be affected by the conditions.

Skid trails for skidders should be marked in prior to logging so as to avoid undesirable and unnecessary tracking and to ensure grades, corners and their general location meets the accepted standards.

Tractors and skidder systems ideally operate downhill. Slope is one key variable which will affect their productivity. If skidding uphill the haul size should be lightened rather than constantly winching heavy loads. A general rule for grade resistance on adverse grades for skidders is a 10 kg loss of pull for every 1000 kg weight (skidder and load) for each 1% of adverse grade. Tractors can work slopes up to 26-30° but skidders should be restricted on slopes over 10° without tracks. Tracks on steeper country should only be considered if the soils are appropriate to allow stable tracking patterns to be established. A general guide for skidder-tractor operating ability on slopes is:

Ability to Operate	Tractor Slope	Skidder Slope
Good	Up to 18°	Up to 10°
Poor	Up to 26°	Up to 18°
Impractical	26°+	18°+

Although slopes in excess of 30° can be negotiated by tractors, it is not desirable because of likely environmental damage.

Optimum skidding distances vary with terrain and other physical conditions. Where topography isn't a factor, the roading spacing should be determined on skidding costs versus roading costs. Total cost is minimised when variable skidding costs and road construction costs are equal. Because roads are essential for forest management, restricting the landing densities is more important than restricting the roading density. Increased landing density on rough terrain is hard to dispute. Because logging costs are higher, shorter hauls become more desirable. It is difficult for the planner to mechanically calculate an ideal landing spacing and it usually ends up as a choice between say two 120 metre average hauls or one 240 metre average haul. In a situation where logging cost is particularly sensitive to distance, the shorter distance should be chosen. Combination tractor-skidder or double skidder operations allow flexibility when logging a setting so that close logs and distant logs can be hauled together. The average haul can be extended and the log loader still kept at its maximum production.

Individual landings within a tractor or skidder layout should be located to achieve maximum downhill extraction provided unsuitable soils, drainage and obvious wet localities are avoided. Similarly, side slopes where excessive cuts and fills are required, should also be avoided if possible. When working a contour tracking pattern the main track to the landing should be down a ridge, the climb off the landing onto this track can be the steepest adverse grade the skidder may have to climb and can in fact limit operations if the skidder is unable to obtain sufficient traction to negotiate the steep return track. Tree lean must be considered as butt hauling is more desirable than head pulling when using tractors or skidders.

Setting size can affect the unit cost of wood. Spur road and landing construction are fixed costs and must be absorbed regardless of the volume available. Large settings are preferable for this reason but how large or how small is not a matter of definition, but of economics.

TACTICAL PLANNING FOR COMMON CABLE SYSTEMS

Logging organisations in New Zealand have tended to adopt a conservative approach to cable systems and generally for very valid reasons. Because of the equipment used, the range of system options that could be adopted are foregone. Some reason for this approach has been :

- Lack of knowledge and expertise by management and loggers;
- Restricted quotas and volumes available;
- High initial cost of suitable new machines;
- Wood values not conducive to high cost cable systems;

Because of production commitments a cable logging operator is prevented from phasing in a new development.

These features will still apply as newer steep areas come on stream and loggers undertake cable logging for the first time.

HIGHLEAD

With tractors and skidder systems, haul distance, tree size and volume per hectare are the three important variables which influenced productivity. These apply equally to a highlead system with the haul distance constrained by the height of the spar, the size of the hauler and the slope shape. Low volumes will mean a greater number of rope shifts thus lower production and higher unit costs. The haulers daily operating costs will not change regardless of volume per hectare or small volumes per tree. Slope shape can influence haul volume and to a lesser degree inhaul time. The direction of slope in relation to landing location is critical in highlead, particularly if no lift is available. Ideally, the highlead system works best uphill because of better log control and because soil disturbance or channelling caused by logs is in a radial pattern away from the landing rather than all converging on the landing as in downhill hauling. Side slopes should be avoided, particularly if no lift is available, because considerable times can be spent fighting hang-ups.

Maximum haul distance for highlead depends on the hauler selected. In N.Z. the older type haulers using wooden spars are in fact ground hauling until the drag is close (5 x height of spar) to the landing. These machines do not have the power or brakes to tightline thus achieve effective lift. Ideally, highlead distances should not exceed 300 metres, although commonly in this country they do. The optimum and recommended maximum hauling distance is often exceeded by necessity but it is important for planners to weigh up the alternatives before arriving at a decision.

Highlead landings must be located to complement the extraction and be large enough to safely carry out all processing and loading. Landing size is dependent on the following: tree size; type and size of hauler and loader; the lead; type of processing and number of log sorts; volume to be extracted; hauling direction in relation to trucking direction; the need for through traffic; the need to park caravan and other vehicles, and the need to have trucks turn around. Often good landing sites are available but the landing is formed in the wrong place because of a lack of understanding by planners. If excavation is expensive or the site unsuitable for one landing to be adequate to meet all requirements, a secondary processing landing may need to be formed, and a tractor or skidder used to pull to the secondary landing.

Landings need to be well drained and large enough to safely land the last log or tree length on the butt rigging in front of the spar or pole. There needs to be adequate guyline anchor stump which are located to allow the ideal angle for guylines. If logging is downhill there must be adequate area between the slope and the hauler so that loose logs or other debris do not create a safety hazard on the landing. The landings need to be located to avoid blind leads which not only cause slower extraction but result in excessive rope wear.

SKYLINE

The common standing skyline system used in N.Z. at this time is the North Bend. This rigging configuration usually requires a minimum three drum hauler with good power and tailrope brakes to achieve lift. The system works best in uphill logging. The "lift" to the skyline is achieved when the logs are under restraint, i.e. tailrope breaking force or incoming logs meeting some obstruction. The North Bend system also allows bridling (or lateral hauling to the skyline). In bridling the rigging and chokers are pulled to the side, depending on where and how the tailrope blocks are set. Bridling should be avoided if possible if a choice of landing site is possible. Excessive bridling limits productivity of the hauler. It cannot be carried out where the slope rolls away from the skyline and ideally there must be a clear pull and plenty of lift to the skyline when bridling. Machine power and rope capacity dictate maximum haul distance but the shorter the average haul, the better the machine production will be. Long distances when most of the rope has run off the drum, reduces line speeds. Skyline haulers using wooden spars have high set up time and require skilled people to operate them efficiently. They therefore tend to be used where a high volume is available to any one landing, or the absolute maximum area is logged before shifting to another landing. This does not always lead to sound environmental practice (landing size) or create a situation where the hauler is producing at its most economic level. The alternatives must be carefully weighed up during planning.

In most current skyline logging in N.Z. the planner does not have a choice of equipment available to him. Therefore he must plan areas to best suit both the terrain and economic constraints. With any skyline system, the deflection determines the maximum load that can be carried during inhaul. Planners must ensure there is adequate deflection available between the spar and backline. If the skyline is tightened to increase the clearance thereby reducing the deflection, then the load imposed on the system must also be reduced. Planners must be aware of critical locations in a setting by running profiles during planning and alterations made or allowed for accordingly by altering landing location, etc.

Landings for skyline logging have similar general requirements as highlead logging, although they must be sited to give adequate deflection and if possible to avoid bridling. Safety requirements and the means of handling logs from in front of the hauler are essential. Interference between the hauler, loader, processing and stockpiling logs and load-out on trucks, must be avoided. Planning the skyline landing must also take into account guyline anchor stumps and skyline anchors stumps for both strength and position.

No setting for skyline logging should be looked at in isolation. Adjacent areas must also be considered. Changes made to a plan must recognise possible effects on other areas.

CONCLUSION

This paper has covered very briefly some of the key requirements planners must consider when preparing a logging plan for common systems. Planning for logging is a complex requirement. The logging plan is the blueprint for a logging operation and must look at all constraints and alternatives, with the chosen proposal being the most practical, economic solution. Each setting must be judged specifically and decisions made based on conditions which apply to that area. Communication between planner, manager and logger are essential. Logging planners must also communicate with the public and environmental concerns. Often criticism aimed at the logger, or planner, is because people are not informed on what is proposed or why courses of action have been taken.