

GRAVITY EXTRACTION OF THINNINGS

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This is the third of a series of descriptive reports on cable logging systems aimed at encouraging wider use of methods suited to specific New Zealand conditions.

This report describes a simple cable system for extracting first thinnings from steep country developed by the N.Z.Forest Service Experimental Logging Unit at Golden Downs Forest during the 1960s. Unfortunately this unique and practical method has not received the attention it deserves and thus LIRA is taking this opportunity to describe the essential elements of the system.

ACKNOWLEDGEMENTS: LIRA is grateful to the N.Z.Forest Service for permission to publish this summary. The full booklet "Gravity Extraction of Thinnings from Hill Country Woodlots" is available on loan from N.Z.F.S.Head Office or Conservancy libraries. It is a very valuable instruction booklet for anybody contemplating using this system.

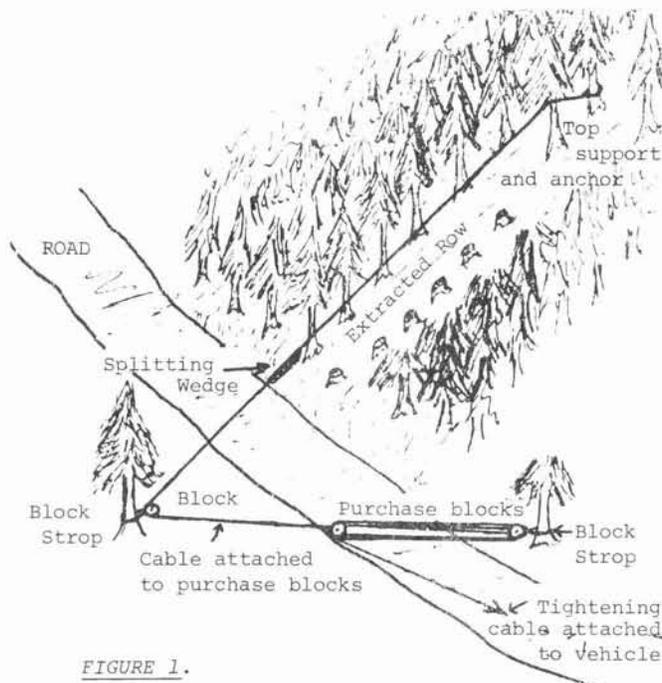


FIGURE 1.

SYSTEM DESCRIPTION:

The system is based on simple rigging, minimal power requirements and ingenious use of readily available material. Loads are moved from pre-stacked positions under a simple live skyline by attaching them to the slackened skyline. Tensioning the skyline causes the load to be lifted and slide freely down to the landing. Disposable skidding blocks are used to support bundles of short pulpwood or posts on their passage down the cable.

The system can be used on concave slopes where the chord slope is more than 20° and there is adequate clearance for unimpeded passage of loads.

EQUIPMENT REQUIRED:

Essential equipment for the system is a single 9 mm cable, a system (multi-sheave blocks) that enables the cable to be raised and lowered by a vehicle or agricultural tractor, a small logging block, mild steel tying wire, and a simply constructed splitting wedge.



Photo: courtesy G. Bonner.

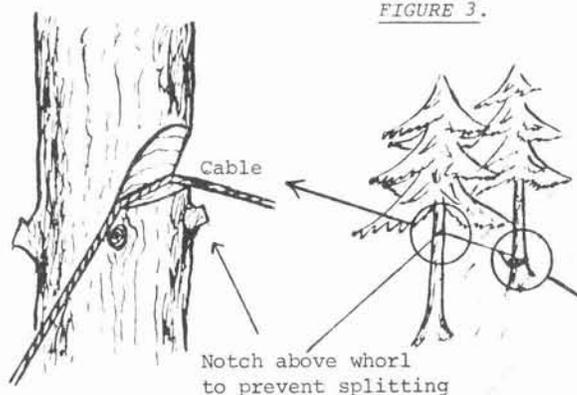
METHOD OF OPERATION:

Directional felling, and a planned procedure of felling, trimming and stacking of bundles are the essence of the system. A strip approximately 3-4 m wide and perpendicular to the contours is cleared up the slope. A herring-bone felling pattern working uphill from the bottom of the slope is employed to reduce the amount of walking to stack and to keep the walk track free of slash without making trimming more difficult.

Bundles of logs are stacked ready for extraction so that wire ties can be passed easily underneath. Care must be taken that the bundles are not too heavy (usually 200 kg is a maximum - 5 or 6 pieces). Careful stacking is important to ensure the success of the next phase.

* FIGURE 2. Stacked bundles on extraction track.

The rigging is simple. A cable is taken up the extraction track and shackled to a stump or tree butt at the top. A notch (above a whorl to prevent splitting) on a tree in line with the tie-back serves to raise the cable sufficiently to give clearance (*Fig.3*). The cable passes through a logging block at the bottom and then through two multiple sheave blocks to be attached to a vehicle or tractor which can then tighten or slacken the cable by forward or backward movement. The splitting wedge is clamped to the cable where the bundles are to be dropped.



Skidding blocks, notched by chainsaw as shown in *Figure 4*, are used to support the load. A skidding block is wired to the bundle and attached to the skyline cable.

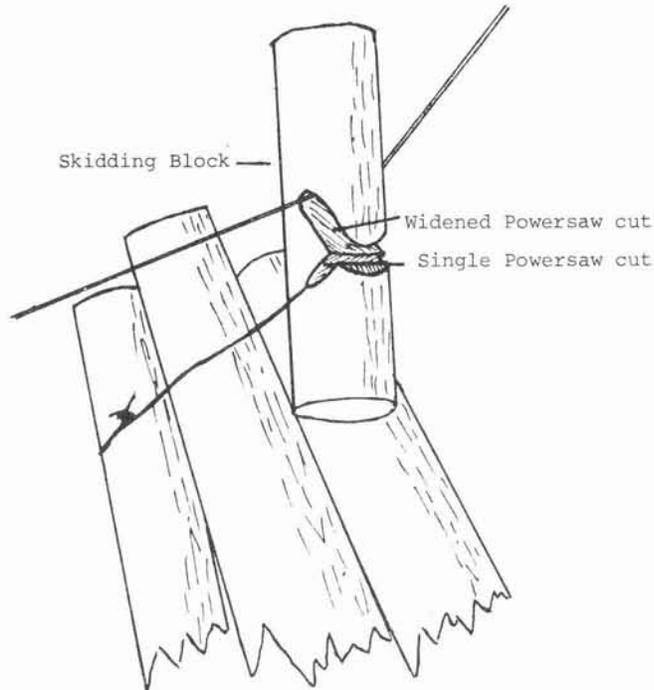
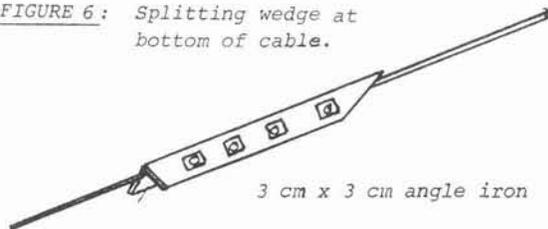


FIGURE 4

The strip is worked from the bottom up, and stacks are worked from the top down in each group.

At the lower end release point, little work can be done until the strip is completed. As the extraction distance increases the splitting wedge must be shifted to compensate for the extra velocity which may scatter the produce. Little time is available to handle the material if extraction is going smoothly. (Approximately 200-300 pieces an hour can be extracted.) In most cases the produce should only be handled when loading for transport. Stacking at roadside is time consuming and unnecessary, unless a front-end loader is used.

FIGURE 6: Splitting wedge at bottom of cable.



The lowered cable is positioned in the wide groove and held until there is sufficient strain on the skidding block to prevent premature release (Fig.5). The breaker-out should always stand on the top side. The load should be helped on its way while it is being raised as this guards against sudden jerks, which could release the load or result in a broken tie or block. This is most important if the load is against a stump.

Bundles should be tied off-centre, approximately two-thirds along their length. This means that the suspended load hangs almost vertically.

The cable is then tensioned to lift the load and it descends by gravity to the point where the skidding block hits the wedge (Fig.6) - splits - and drops its bundle. The cable is then slackened and the process repeated.



Photo: courtesy G. Bonner.

FIGURE 5: Positioning skidding block on cable.

LIMITATIONS OF THE SYSTEM:

1. Slope is the main limiting factor. Unless a chord slope of at least 20° can be maintained, gravity extraction is not possible using the system described in this report. Maximum slope is not known though excessive steepness could result in considerable breakage of material unless some means of slowing or catching the bundles were employed.
2. As loads move down the cable under their own weight, ground profiles must be such that they do not obstruct the passage of the load. It is possible to move the lower end of the cable out from the bottom of the slope providing chord slope is not reduced to less than 20°. The system cannot be applied on convex slopes.

ADVANTAGES OF GRAVITY EXTRACTION BY CABLE:

1. Wood is transported by harnessing the force of gravity. The weight of the load provides the extraction force.
2. The system is simple to rig and operate; no special skills are required.
3. The equipment is cheap and light. Low initial investment is combined with mobility.
4. Wood is discharged automatically.
5. It is a low cost method. Main cost is labour. It is possible to extract wood that could not otherwise be taken out profitably, e.g. first thinning from steep country.
6. The method is economical for extracting small quantities of wood at a time.
7. The system meets environmental requirements for protecting soils on steep slopes.
8. Tree damage in the residual stand is light.

SUMMARY:

This gravity extraction system has considerable potential for cheap extraction of small wood (particularly first thinnings) on steep country.

Because of the simplicity and low investment required, it is particularly suitable for extraction of thinnings from small woodlots. It also has potential for many areas where extraction of thinnings by other methods would not be economically feasible.

The full report, "*Gravity Extraction of Thinnings from Hill Country Woodlots*" (N.Z. Forest Service, 1969), details the layout and planning requirements, the rigging system and equipment, and the procedures to be adopted in carrying out each step. It warns users of the practical limitations and safety requirements within the system and is thus a very valuable instruction booklet to anybody contemplating using this system.

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