

LOGGING-TRAM FORMATION BY CATERPILLAR TRACTOR

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Although caterpillar tractors have been in use in New Zealand for many years, it is only quite recently that they have been used at all extensively on logging operations and even more recently that they have been used for tram formation work. It takes only one very short demonstration to convince a person that a 20-ton tractor fitted with a bulldozer is 'fine' for shifting earth, but to convince him that it will be ideal for shifting just the right quantity of earth from the narrow, rather tortuous path of a surveyed bush tram, probably on a hill-side, is quite another matter. I don't think that there *can* be an ideal tool for such work but a tractor and bulldozer can be made to perform fairly well at it.

A 10 ft. formation width is all that is required for a bush tram but, as a suitable tractor has a 12 ft. bulldozer blade, it inevitably shifts much more earth than is necessary. In fact the final formation in cuttings and on fillings is usually nearer 14 ft. than 10ft.

A further disadvantage that tractors have is that they are no respecters of survey pegs and a lot of extra survey work has to be done offsetting pegs into safe places for future reference. In fact these offset pegs are nearly always required for the realigning of the curves and the re-establishment of levels on the formation after the leviathan has finished. It is almost impossible for a foreman, no matter how expert or how suitable the country, to leave a formation perfect for platelaying.

I say "the foreman leaves the line"—one might think the driver did, but no! It is essential that a foreman with real tram formation experience should direct the driver from the ground. He knows where the pegs are and what the distance to the centre of the tram and the depth of the cutting or filling are, and with a long rod and a carpenter's small level and a six-foot flexible rule he is able to check up quite accurately on the work of the machine as it progresses and to direct the driver accordingly. A driver working on his own can make a sort of a job of a tram but an intelligent foreman can save many pounds which would otherwise have to be spent on hand-finishing work.

A line has to be laid out in slightly different fashion for tractor formation. The machine cannot get across small steep gullies and it is often impracticable to take it round. Therefore it is no good having a large proportion of the filling required for that gully on the far side if it is impossible to get across to use it until the gully has been filled in. So this must be taken into account when balancing up cutting and filling.

Whereas, when forming a line with hand labour it is cheaper to grub out a big rimu than to move 40 yards of earth, it is cheaper to move 80 yards of earth with the tractor than to move the rimu by hand. This consideration also affects the alignment.

Disadvantages and indeterminate points having been considered, it is now time to search for any advantages the tractor may have.

The first and most spectacular to a visitor is that it does its own bush-clearing, or nearly all of it, and in the King Country bush that is worth from 25/- to 35/- a chain saved. Some of the largest trees it will not remove, but on easy country it can help a lot by digging round the bases and breaking out the roots. On a steep sidling, if it cannot push the tree over with the bulldozer or pull it over with the winch, it cannot help with that tree at all.

A hand-formed tram has to be gone over by the platelaying gang several times during the first year of use and lifted on the fillings which the weight of the locomotive has caused to sink. The weight of the tractor—20 tons or so—settles a filling very satisfactorily and most of this maintenance work is obviated.

A further advantage is that as a yard or two of earth is nothing to a tractor, it is possible to do without curves which would otherwise be put in or to ease those necessary and to make the grades a little easier. However, the man in charge should not let this idea run away with him as no work can be done for nothing.

And the crucial test of it all is—what does it cost ?

The following figures were compiled during tram formation work in the King Country.

In all cases the yardages are those that would have been moved for a hand-formed 10 ft. wide tram and the tractor formation cost is charged not against the amount of earth the machine did shift but against only what it was wanted to shift.

In this first case the country was very easy, as the “per chain” yardage shows, the spoil was mainly pumice and the scrub was all light, there being no big trees on the line. There was a 7 chain length of swamp to be filled across.

CASE 1.

Length formed	33 chains		
Total cubic yardage	1200		
Cubic yards per chain	36		
<i>Hand-formation cost—(estimated)</i>		£169	10 0
Cost per chain	5	2 8
Cost per yard		2 0
Bush clearing per chain	1	10 0
<i>Tractor-formation cost (actual) :</i>			
Levelling off behind tractor— handwork	£10	16 0
Foreman and driver	13	4 0
Depreciation 44 hrs. at 6/8	14	13 4
Fuels and lubricants	4	1 5
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	Total	£42	14 9
Cost per chain	1	5 11
Cost per yard		8½

The tractor-formation cost is therefore 25.2% of the hand-labour cost.

In the next case the work was heavier as the "per chain" yardage shows, but this gave the machine something to "bite at" without so much "messaging about." The spoil was nearly all clay but the work was all done in fine weather. Clay is much better left alone in wet weather as it becomes a pug and a filling cannot be built up because the weight of the machine merely settles it down and widens it out at the toe. The scrub was much the same as in the first case but one large rimu had to be grubbed out. There was no swamp. The driver—a new man—was becoming more accustomed to the work and to following the instructions of the foreman. These last two facts are quite sufficient to account for the improvement.

CASE 2 :

Length formed	39 chains		
Total cubic yardage	1992		
Cubic yards per chain	51		
<i>Hand-formation cost (estimated)</i>	...	£282	12 0
Cost per chain	7	4 11
Cost per yard		2 3
Bush clearing per chain	1	10 0
 <i>Tractor-formation cost (actual)</i>			
Levelling-off behind tractor and grubbing tree	£21	7 6
Foreman and Driver	17	12 0
Depreciation 53 hrs. at 6/8		17	13 4
Fuels and lubricants	7	13 9
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Total	£64	6 7
Cost per chain		1	13 0
Cost per yard			7 $\frac{3}{4}$

The tractor-formation cost is therefore 23% of the hand-labour cost.

More evidence is hardly needed to convince one that, to a firm that has sufficient work to keep it in use all the time, a caterpillar tractor can be a very profitable investment.