



A Decade of Benchmarking Harvesting Cost and Productivity

Summary

The FGR harvesting cost and productivity benchmarking database was expanded by 97 new entries from harvesting operations in 2018. The average ground-based logging rate increased to \$28.35/t, up \$1.55 compared to 2017 data. Ground-based logging rates ranged from \$17.60/tonne for a highly mechanised grapple skidder operation, through to \$49.50/t for a mechanised felling/forwarder combination working in a difficult windthrow setting. For cable logging the average rate was \$41.25/t, which was \$1.85/t higher than the previous year. The level of mechanised felling has continued to increase for cable logging operations, now used in 40% of operations. An additional 17 entries were recorded where felling was supported by winch-assist, with all but four in cable yarder operations. Based on 2018 data the average logging rate for the winch-assist operations was \$1.25/t lower than other mechanised felling cable operations. This might in part reflect the increased productivity of winch-assist operations as the industry becomes more experienced with its implementation.

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INTRODUCTION

The collection of harvesting cost and productivity information for the benchmarking database continues to be well supported and now has 10 years of summarised data with 1503 unique entries. In 2018 only 97 entries were received from 9 different companies, compared to the target of over 100 entries each year from at least ten companies, in order to provide stable results reflective of the national harvesting picture, as there is invariably regional and company biases with fewer data entries.

While Radiata pine harvests accounted for 94% of all 2018 entries, there were five entries from Douglas fir and one from 'Other species'. Six entries were from road line operations.

In terms of where processing took place, 78% of operations were processing at a primary landing, which is relatively low compared to previous years' data. At ten operations processing was 'At Stump' (cut-to-length operations associated with forwarder operations), processing at secondary landings occurred in eight operations and three were log yard operations.

A rating of harvesting difficulty was subjectively entered by the company supplying the data, in three categories (Easy, Medium, and Hard) and this continues to be a significant factor influencing both productivity and logging rate. There was a good balance of difficulty ratings recorded, with

34% rated Easy, 44% as Medium and 22% as Hard. When a harvest area is rated 'Hard' the company is encouraged to enter a reason and these are described under each category. The main reasons for a rating of 'Hard' are detailed in the following sections.

GROUND BASED HARVESTING

There were 53 ground-based entries (55% of total operations), a slight increase from 2017 data (51%). Two-thirds of ground-based operations (n=35) used grapple skidders. There continues to be a steady increase in the number of entries for forwarder operations – now 23% of all ground-based operations. Forwarder crews have the highest level of mechanisation, with an average of 3.8 machines and 4.1 workers in the crew.

There were only four entries for shovel logging (7% of ground-based) and only two cable skidder entries (4%). Table 1 shows the average results for ground-based harvesting over the 10 year period from 2009-2018.

The overall average logging rate increased to \$28.35/t, which is up \$1.55 compared to 2017 data. This 5.8% increase follows on from a 10% increase from 2016 to 2017, which is well above the Consumer Price Index increases of 1.9 and 2.1% respectively for 2017 and 2018. This may be related to the very strong growth in demand for timber harvesting services with an increase of 10% year-on-year (NZFOA 2018).



Table 1: Ten years of ground-based harvesting data (n=736).

	2009*	2010	2011	2012	2013	2014	2015	2016	2017	2018
Scheduled Hours/day	8.3	8.4	8.4	8.5	8.4	8.5	8.4	8.4	8.3	8.2
Piece Size (tonnes)	1.9	2.3	1.8	1.8	1.8	2.2	2.3	1.9	2.1	1.7
Extraction Dist. (m)	200	210	219	193	194	214	234	209	246	255
Slope (%)	14	15	18	21	17	13.0	14.0	16.3	14.9	18.5
No. of Machines	3.5	3.7	4.3	4.3	4.1	4.9	5.6	4.4	4.9	4.5
No. of Workers	7.2	8.4	7.6	6.4	6.6	6.8	6.7	6.9	6.7	5.9
No. of Log Sorts	10.1	12.0	10.1	11.4	11.1	11.3	9.8	10.6	12.1	10.9
Harvest Area (ha)	12.5	15.0	13.4	15.1	9.5	14.4	9.8	14.1	13.1	14.2
Stand Vol. (t/ha)	478	526	478	535	518	571	597	545	575	543
Productivity (t/hour)	33.5	28.8	28.3	28.1	27.7	34.9	36.8	31.7	34.6	34.1
Logging Rate (\$/t)	20.90	24.10	24.40	25.30	26.90	24.30	23.6	24.20	26.80	28.35

*Note: the limited 2008 data has been aggregated with 2009 data.

Ground-based logging rates ranged from \$17.60/tonne for a highly mechanised grapple skidder operation, through to \$49.50/t for a mechanised felling/forwarder combination working in a difficult setting with wind-throw. While early benchmarking data showed a clear \$2.00/t difference between the average logging rates for forwarder versus grapple skidder, this gap has closed and for the last two years the differential has been less than \$0.50/tonne. The sample size for forwarder operations is however quite small with 9 entries in 2017 and 12 entries in 2018.

Mechanised felling remained high at 80% of all ground-based operations (85% in 2017). Ground-based processing was 90% mechanised (88% in 2017). With the lower number of entries it is important not to rely on individual averages too heavily. Having said that, there was a big drop in

the average number of workers in ground-based crews (down to 5.9 from an average of 6.7 over the last 5 years). Other changes were:

- an increase in slope up to 18.5% (up from an average of 15% over the last 5 years)
- extraction distance continues to increase over the last three years

These changes may be the effects of more mechanisation, but more data is needed to confirm those trends.

In ground-based operations where difficulty was rated as 'Hard' for multiple entries the reasons included: small piece size, wind-throw salvage and young small trees, working around waterways, steep and long 'dead pull'. Unique answers included: felling between public road and power lines, presence of 'old crop' trees, back-pulling, proximity of neighbours, powerlines,



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areas of highly visibility to the public, strict health and safety constraints on public operation, kiwi habitat, and long narrow block or sand being slow to pull.

CABLE YARDER HARVESTING

Of the 44 cable yarder entries, just over half (23) were Swing Yarders and 21 Tower Yarders ('Haulers'). One trend over the last few years has been the decline in 'large' tower haulers. Large towers are defined as those having a tower height

of 85 feet (26 m) or greater. Only 3 entries were provided this year, and only 4 in 2017. In comparison, in 2009-2011 almost a third of all tower yarder entries were large towers.

Average productivity in cable yarding data eased slightly to 27.4 t/hour, compared to the previous two years' data at 29 tonnes/hour.

Table 2 shows the average results for cable yarder harvesting over the 10 year period from 2009-2018.

Table 2: Ten years of cable yarding data (total n=753).

	2009*	2010	2011	2012	2013	2014	2015	2016	2017	2018
Scheduled Hours/day	8.5	8.7	8.5	8.7	8.6	8.9	8.8	8.4	8.6	8.5
Piece Size (t)	2.2	2.3	2.0	1.8	2.2	2.2	2.6	2.1	2.2	1.9
Extraction Dist. (m)	212	193	216	189	190	222	220	212	243	233
Slope (%)	47	48	38	39	50	48	49	41	42	44
No. of Machines	3.9	4.1	4.8	4.4	4.4	4.9	5.0	4.8	5.3	5.8
No. of Workers	9.7	8.8	7.8	8.5	8.9	8.9	8.2	7.6	7.9	7.6
No. of Log Sorts	10.2	10.9	9.6	11.3	10.1	9.7	9.1	10.1	10.9	9.9
Harvest Area (ha)	12.2	14.9	14.7	13.8	9.5	12.9	11.6	13.4	13.8	14.1
Stand Vol. (t/ha)	514	505	487	528	502	531	561	545	615	570
Productivity (t/hour)	22.2	24.9	26.2	23.5	23.4	26.2	26.8	29.4	28.6	27.4
Logging Rate (\$/tonne)	32.20	32.80	31.50	35.10	35.90	36.60	37.50	37.3	39.40	41.25

*Note: the limited 2008 data has been aggregated with 2009

The average logging rates for cable logging increased to \$41.25/t, and ranged from \$25.50 up to just over \$60.00/t. Both the highest and lowest logging rates were associated with manually felled / small tower yarder operations. However the conditions for the lowest rates were easy and processing was undertaken at a central processing yard, whereas the highest cost

reflected a very steep harvest area with broken terrain and bluffs.

Mechanisation of felling was up slightly to 40% (from 35% in 2017 data, and 28% in 2016). Of all the hauler entries there was only one entry for manual processing (2% of operations), indicating the significant increase in mechanised



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processing in cable operations (from 75% of operations in 2009 to 98% in 2018).

In terms of difficulty rating for cable yarding operations the issues can often be more complex with multiple factors interacting. Harvest areas rated 'Hard' were characterised by steep, broken terrain, bluffs or drop-offs, limited deflection and wind-throw (all factors which were mentioned frequently). Single entry comments included: large area blind to landing; back-pull from all edges; internal native forest reserves, requirement for bridling; very steep incised gullies and major waterway in setting; erosion; large intermediate ridge; having to use tail spars; long extraction distances up to 500m; rough trees, heavy undergrowth, poor visibility, weak soils; shovelling blind areas.

WINCH-ASSIST

Winch-assist harvesting is transforming operations on steep slopes. By mid-2019 there were more than 110 operations working in New Zealand. Only four ground-based entries (of 28 entries with this category recorded) entries, or 14%, had winch-assist support for felling.

For cable logging, 13 of 32 yarder entries (41%) used winch-assist. All of the winch-assist entries resulted in mechanised felling. Based on only 9 entries in 2017 showing winch-assist increased the average logging rate, in 2018 this result was reversed with winch-assist now averaging \$1.25/t lower than other felling in 2018. This might in part reflect the industry becoming more confident and experienced with its implementation.

With only limited data, the introduction of winch-assist appears to have increased the average slope for ground-based operations, up to 18% (from 15% over the last 5 year average).

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