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A SURVEY OF THE LOGGING INDUSTRY - 1991

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ABSTRACT

A survey was undertaken in 1991 to update knowledge of the logging industry in New Zealand. Results are presented on crew characteristics, logging systems, production rates and machinery details of 283 crews in clearfelling, thinning and roadline/salvage operations.

INTRODUCTION

This report details the types of logging equipment owned and operated by contractors in New Zealand and logging crew size and production rates, based on the results of a postal survey of the logging industry undertaken in early 1991.

Of over 500 logging contractors on LIRO's mailing list, 283 contractors responded to the questionnaire. This response accounts for a volume production of approximately 8.0 million cubic metres or 59% of the volume harvested in the year to June 1991 (MOF, 1991). The survey covered 1427 workers (including prime contractors), which represents a coverage of approximately 59% of people employed in logging (NZFOA,1992).

The term "contractor" defines a logger who owns his own equipment, controls his own workers and is paid a price per unit for wood produced. The survey included mechanised logging contractors, but excluded transport and road-building contractors. Where appropriate, average figures have been supported with confidence limits (at the 95% level), expressed as $\pm$ values. Comparisons have been made with an earlier industry-wide survey in 1985 (Liley, 1985), and with the Logging Workforce Survey of the Bay of Plenty, Northland, and Otago-Southland regions in 1986/87 (Wilson et al, 1988).

CREW CHARACTERISTICS

Of the 283 crews who responded to the survey, 98% were operating on contract, the balance supplying sawlogs and posts and poles for small sawmill companies. This represents a further increase of crews on contract from 90% found in the 1986/87 Logging Workforce Survey (Wilson et al, 1988) and the figure of 55% employed on contract in 1974 (Fraser et al, 1976).

There were 247 responses to questions regarding type of operation. Of these, 147 (59.5%) were clearfelling operations, 65 (26.3%) were thinning crews, and 21 (8.5%) were involved in both thinning and clearfell. In comparison with the 1985 industry survey, this represents a small reduction in the proportion of thinning crews (26% versus 32%), and an increase in the proportion of crews working in both

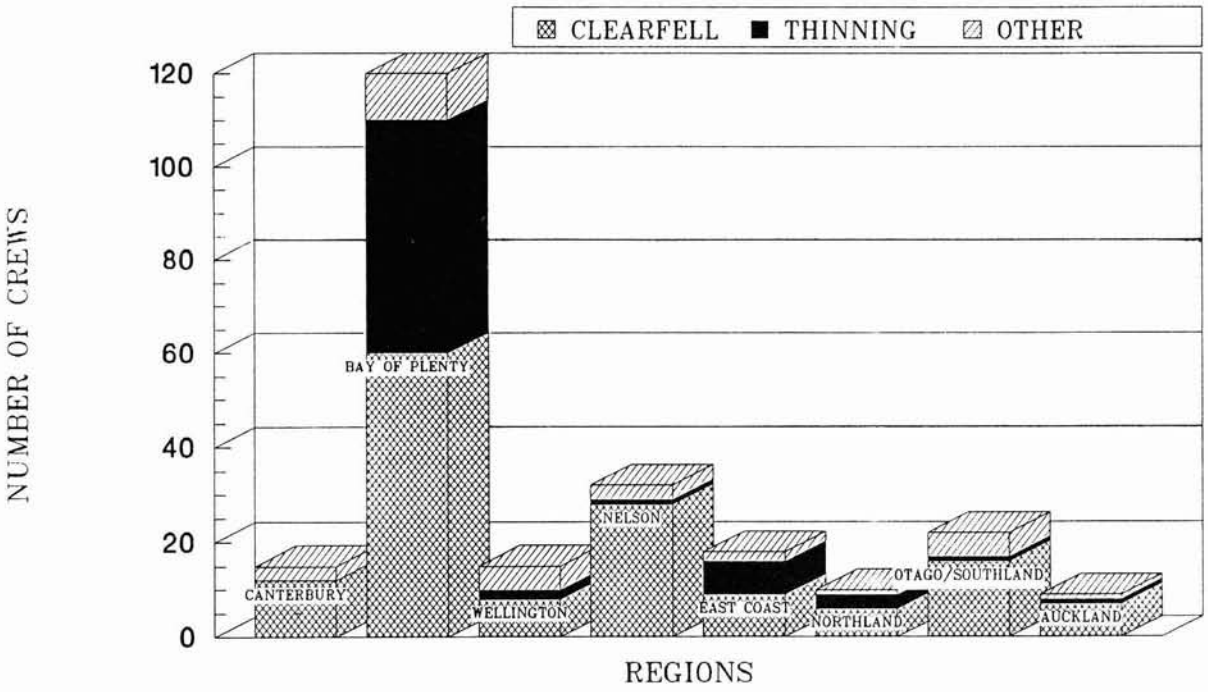

Figure 1 - Regional distribution of logging crews in the survey

clearfell and thinnings (up from 4%). The regional distribution of operations surveyed is shown in Figure 1.

Of the total number of workers in the survey, there were 919 loggers employed in contract clearfell crews (Table 1). This gave an average crew size of 6.71 (± 3.40), which is one worker more than the average clearfell crew size in the 1986/87 survey (5.7), and could be due to the "extra man" required for extra trimming and landing work in many current operations.

In the thinning crews, 304 loggers were employed, giving an average crew size of 4.68 (± 2.53). This is similar to the average thinnings crew size in 1986/87 of 4.6. The combined thinning/clearfell contract crews had a mean crew size of 6.62 (± 3.15). There were also 7 single owner-operator loading contractors included in the survey.

With regard to the continuity of work, 91.3 % of crews surveyed were full time operations. The balance of crews were either seasonal (6.6%), or part-time operations (2.1%), similar to the figure of 9% part-time and seasonal from the 1986/87 Logging Workforce Survey.

LOGGING SYSTEMS

Over 95% of the volume harvested in 1991 was produced by motor-manual systems. The balance of the volume was harvested by either manual felling/mechanical processing systems (1.7%); mechanical felling/manual processing systems (1.4%); or by fully mechanised systems (1.8%).

In total, 654 machines were used by the 279 contractors who responded to this question. This gives a mean number of machines per crew of 2.34, similar to the figure of 2.2 machines per crew from the 1986/87 survey. Of the 654 machines in the survey, 399 (61%) were extraction machines (skidders, farm tractors, crawler tractors, haulers, forwarders); 245 (37.5%) were loading/fleeting machines

Table 1 - Operation type and crew size

Type of Operation	No. of Crews	No. of Workers	Crew Size
Clearfell - Contract	137	919	6.71
Clearfell - Total	142	936	6.59
Thinning	65	304	4.68
Combined Clearfell & Thinning	21	139	6.62
Loading	7	7	1.0

(wheeled and tracked loaders and Bell Loggers), and only 10 (1.5%) were mechanical felling/processing machines (feller-bunchers, delimbers and harvesters).

Of the extraction machinery, 233 were skidders (58.4%). There were 110 crawler tractors, 4 farm tractors and 4 FMC/KMC tracked skidders (29.6%), and 47 haulers (11.8%). Only two forwarders were recorded in the survey (0.5% of total extraction machines).

In comparison with the 1985 industry survey, the proportion of skidders and tractors of all extraction machinery (88.0%), and the proportion of haulers (11.8%) has remained the same. Therefore little change has occurred in logging machine type since 1985.

There has been an increase in the ratio of skidders to tractors from 46% : 41% of extraction machines in 1985, up to 58% : 29% of extraction machines in 1991. This move was predicted in the early 1980s due to the skidder's superior production and fuel efficiency (Donovan, 1982).

The proportion of loading/fleeting machines in the industry has increased from 27.1% of all machines in 1985 to 37.5% in 1991. This probably reflects the increased amount of sorting required since the introduction of log grading in the mid-1980s. Of loaders surveyed, 209 were wheeled machines (85%), and 36 were tracked knuckleboom loaders (15%).

PRODUCTION DETAILS

The average merchantable piece size for the area in which each crew was working at the time of the survey was 1.81m^3 for clearfelling, and 0.42m^3 for thinnings. The thinnings piece size showed an increase from the average production thinning piece size of 0.2 - 0.3m^3 of five years ago (Vaughan, 1986)

From 283 replies, the average annual production for clearfell crews was 43,950 m^3 ($\pm$ 4418m^3), or 187 m^3/day ($\pm$ 19m^3). This ranged from 1000m^3 to 141,000m^3 per year and represents an overall increase of 11,750m^3 from the average annual volume production reported from the 1986/87 Logging Workforce Survey. Figure 2 shows the distribution of clearfell and thinning crews by annual production.

Using a standard 8-hour day, 235-day year, and taking into account changes in crew size, man-hour productivity was derived. This averaged 3.55m^3/man-hour for all clearfell logging systems (ground-based and hauler), with a 95% confidence interval of 3.19 - 3.90m^3/man-hour. This compares with productivity of 3.0m^3/man-hour derived from the 1986/87 Logging Workforce Survey. Based on these data, man-hour productivity has increased by 18% in the last five years. Factors such as

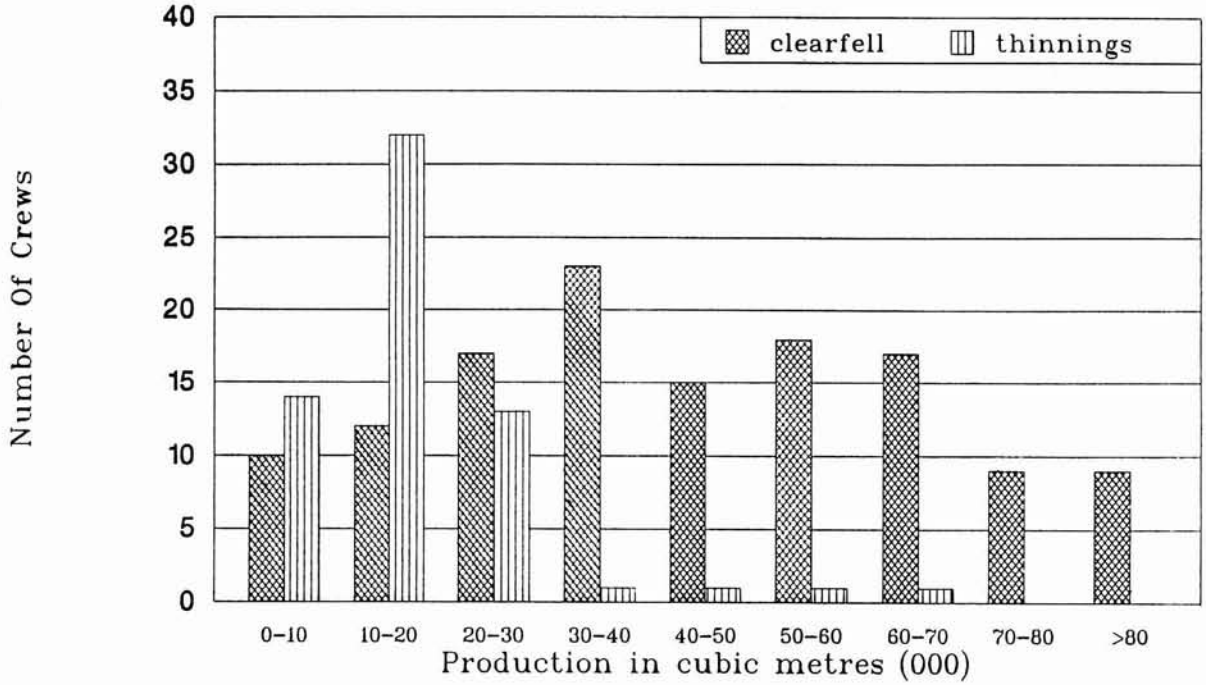

Figure 2 - Annual production of clearfell and thinning crews

the increased move to contract operations in the industry over the last few years, and the absence of production quotas at the time of the survey are likely to be partly responsible for this increase.

For thinnings operations, the average annual production figure was 15,900m^3 ($\pm$ 2,630m^3) or 68m^3/day ($\pm$ 11m^3/day). This ranged from a small operation of 300m^3/year to a large operation of twenty workers producing around 270m^3/day. These data represent an average increase of 16% in annual thinning production per crew from that reported from the 1986/87 survey (13,700m^3/year, or 58m^3/day). This increase may be partly related to the increase in the thinnings piece size, and a reduction in hauler thinning operations since 1986.

Average productivity of thinnings operations in 1991 was 1.81m^3/man-hour, with a range from 1.2 - 2.2m^3/man-hour. These results fall between the range reported for production in 0.2m^3 piece size with no fleeting machine, and that for 0.65 m^3 piece size with a fleeting machine, 1.22 - 2.48m^3/man-hour (Terlesk, 1990). It is apparent, therefore, that there has been no real improvement in thinnings productivity over recent years.

There were 21 crews that operated in both thinning and clearfell. These crews had an average annual production figure of 29,970m^3 ($\pm$ 7,010m^3) or 127m^3/day, ranging from 5,500m^3/year to 70,000m^3/year. Derived man-hour productivity for the combined thinning/clearfell crews was 2.41m^3/man-hour.

The proportion of crews producing the following log types is shown below :

- Pulp logs (70%)
- Domestic sawlogs (63%)
- Export logs (47%)
- Chip logs (31%)
- Veneer logs (10%)
- Posts and poles (9%)

Regarding the point of payment for wood, 41% of crews were paid for extraction of wood to the landing, and 53% were paid for wood loaded on truck. Six percent of operations were paid for delivery of wood to the mill. This last category comprised mainly post and pole operations, or crews supplying, or owned by, small sawmills.

MACHINE MAKE, MODEL AND AGE

Haulers

The survey included 47 haulers, which were predominantly older machines, with an average age of 19 years (± 4.5 years). The newest hauler in the survey was a Madill 171 built in 1990. The Madill range of haulers was the most common make in New Zealand representing 30% of haulers surveyed. This was followed by the local brands of Dispatch (17%), and Wilson (11%).

Skidders

The most common make of skidder was Valmet Ranger (Clark), which made up 44% of all skidders surveyed (similar to the 1986/87 figure of 41%). The balance of the skidder population comprised Caterpillar (27%), Treefarmer and John Deere (12% each), and Timberjack (4%). The average age for skidders was 7 years ± 0.5 years (with a range from brand new to 25 years old).

Tractors

The most common makes of tractor were Caterpillar (47%) and Komatsu (34%), together making up over 80% of the tractor population. The average age of tractors not owned by hauler crews was 9 years (± 2.5 years) ranging from brand new to 35 years old. Old tractors in hauler crews, whose sole use may be as mobile tailholds, were also included in the survey. These tractors averaged 15 years in age(± 2.5 years).

Loaders

Of the 245 pieces of loading/fleeting equipment in the sample, Caterpillar comprised 25.3% of the market and Bell 24.5%. This compares to market share figures of 20% and 17% respectively from the 1986/87 survey. The proportion of the Bell range of equipment has increased markedly from 17 to 60 units (6.2% to 24.5% of loaders) over the last six years.

Fiat Allis, Michigan, International and Hitachi loaders represented a further 27% of loading/fleeting machines combined. The average age of all the loaders in the survey was 6 years (± 1 year), and ranged from brand new to 26 years old. The age of excavator-type loaders was similar to that of wheeled loaders at 6 years (± 2 years).

CAPITAL VALUE OF LOGGING EQUIPMENT

There were 213 responses to the question regarding the cost of all extraction machinery at the time of purchase. This ranged from $5,000 to $1,065,000 giving an average value (at time of purchase) of $169,800 (± $20,500). If replaced new, the average cost of all extraction machinery per crew was $321,500 (± $42,700). This ranged from $100,000 to over $1.5 million dollars.

The value of loaders, at the time of purchase, ranged from $3,000 for second-hand equipment to $520,000 for two new knuckleboom log loaders, producing an average purchase value of $124,300 (± $14,850). If replaced new, the cost of loading/fleeting equipment averaged $193,400 (± $22,000) per crew, ranging from $80,000 to $860,000 per crew.

For crew transport, there was an average of 1.6 vehicles per crew, and the average cost of vehicles at the time of purchase was $29,500 (± $2,940). This ranged from $1,200 to $37,500. From 121 responses, the average replacement cost for crew transport (if purchased new) would be $46,010 (± $3,670) per crew.

Overall, the total capital invested in logging equipment in New Zealand based on new or replacement value, averaged $560,900 (± $68,500) per crew.

DISCUSSION

Despite the fact that this survey achieved only a partial coverage (about 59% of the logging workforce), it has identified some interesting longer term trends. These trends include :

Change to contract operations

As shown in Figure 2, most of New Zealand's logging is undertaken by medium-sized contract operations (30,000 - 70,000m^3/year). From the survey results, only five operations are now run by companies (predominantly small sawmill companies).

Log grading

The increased amount of sorting involved in logging over the last five years has seen a corresponding increase in the number of loading/fleeting machines. The necessity to develop systems for high multiple logsort operations has contributed to the increase of Bell Loggers on the landing in recent years.

Reducing clearfell piece size

The predicted reduction in clearfell piece size has occurred as crews move into the transition and young crop stands. The average clearfell piece size throughout New Zealand in 1991, as reported in this survey, was 1.8m^3.

Mechanisation

There has been little change in extraction and processing systems over the last five years. Since 1986, there has been slow introduction of mechanised logging equipment into New Zealand. Except in some quite specialised areas, mechanical felling and processing has not increased as predicted back in the mid-1980s (Prebble, 1986). Less than 5% of the volume harvested, as recorded in this survey, was produced by partially or fully mechanised systems.

From LIRO records, only 17 felling/processing machines were operating in logging as of mid-1991 (5 grapple harvester/processors; 7 feller buncher/ directors; 3 stroke-boom delimbers; one stroke-bed delimber; and one locally developed chain flail-chipper).

CONCLUSION

The characteristics of the logging industry, in terms of the proportions of clearfelling versus thinning, machine type, and numbers of machines per crew, have remained fairly constant over the last six years.

Logging systems have undergone little change, with the exception of the addition of Bell machines on the landing, and a slow introduction of mechanical harvesting equipment.

Average annual clearfell crew production appears to be increasing, related to increasing man-hour productivity through the move to contract operations.

This survey was undertaken during a period of no production quotas and when the export market was buoyant (47% of all crews surveyed were cutting export logs). These factors may help to explain the improvements in man-hour productivity.

This increase has been partly offset by the downward pressure on crew production caused by reducing clearfell piece size over time, increased work content in young crop stands, and increased labour requirements of log grading.

REFERENCES

Donovan, V.F. (1982) : "Prediction of Machine Requirements", Session 1 Paper(b), presented to the LIRA Seminar on "Logging Machinery", Rotorua, June.

Fraser, T., Murphy, G. and Terlesk, C.J. (1976) : "A Survey of the Logging Industry for the Year Ended March 31, 1974", New Zealand Forest Service Forest Research Institute, Economics of Silviculture Report No. 84.

Liley, W.B. (1985) : "A Survey of the Logging Industry - 1985", LIRA Report, Volume 10, No. 12.

MOF (1991) : "Market Report", June, Sept., Dec., 1991, Issues No. 11, 12, 13, Ministry of Forestry, Wellington.

NZFOA (1991) : "Forestry Facts and Figures", New Zealand Forest Owners' Association Inc., Wellington.

Prebble, R.L. (1986) : "Session 2 : Felling and Delimbing Workshop and Panel Session", in Proceedings of the LIRA Seminar on "Ground-Based Logging", Rotorua, June.

Terlesk, C.J. (1990) : "Productivity in Harvesting Since the 1970's", Paper presented to the LIRA Seminar on "Manpower Management in Logging", Rotorua, June.

Vaughan, L.W. (1986) : "Projected Changes in Thinning Regimes and Thinning Frequencies for Radiata Pine for the Decade 1986 - 1995", Paper presented to the LIRA Seminar on "Ground-Based Logging", Rotorua, June.

Wilson, P., Gaskin, J. and Smith, B. (1988) : "Production and Capital Equipment in Logging (Supplementary Data from the Logging Workforce Surveys), LIRA Report Vol.13, No.15.

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