



PROJECT REPORT

NEW ZEALAND

A SURVEY OF THE N.Z.
LOGGING WORK FORCE

P.R.11

1980

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P.O. Box 147

Rotorua

New Zealand

N.Z. Logging Industry Research Assoc.Inc.

Project Report No. 11.
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A SURVEY OF THE N.Z.
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Association Inc.



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- SUMMARY -

The importance of the human variable in logging productivity and efficiency has been stressed in many investigations. However, knowledge of the logging labour force in New Zealand is minimal. In order to improve this knowledge, a pilot study was carried out among the Bay of Plenty logging work force.

The survey objective was to obtain information on the education and training of the loggers, their skills, their accident record, the factors which motivate them, and their attitudes to their job.

The study took the form of person-to-person interviews based on a planned questionnaire. Interviews took place at the work site while the men were taking breaks from work or during smoko periods.

Some 125 men were interviewed representing approximately 10% of the logging work force in the Bay of Plenty. The men were from 25 gangs covering all types of operation and included Company gangs, N.Z. Forest Service gangs, and contract gangs.

The present work force can be characterised as being of the age of prime physical fitness, poorly trained for their present job, prone to accidents, liable to show a high rate of turnover, and holding their job in relatively low regard. On the other hand, the loggers have acquired a wide range of skills, enjoy their work and their working environment, and are strongly motivated by a desire to work, rather than a necessity to work.

Although the results were from a small survey, they provide some valuable information for those engaged in recruiting, training, or employing logging labour.

- ACKNOWLEDGEMENTS -

LIRA wishes to thank Mark Fielder and to acknowledge the work which he did in conducting the survey. His report, prepared as part of the course for the Degree of Forestry Science at Canterbury University, forms the basis of this report.

The co-operation of the men in the logging gangs who willingly answered questions is gratefully acknowledged.

Thanks are also given to the organisations (Fletcher Forests Limited, Kaingaroa Logging Company Ltd., N.Z. Forest Products Limited, N.Z. Forest Service) foremen and logging contractors who assisted with arrangements for the interviewing procedure.

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INTRODUCTION

1.1 BACKGROUND AND SETTING FOR THE STUDY

Productivity in a logging operation is influenced by physical factors - the stand, the terrain, the machines; and human factors - the loggers, the supervisors, and the planners. The performance of loggers is a major factor determining logging productivity and costs. This has been shown by a series of North American Studies.

Several early studies(*1,2) of the variation in productivity of skidder systems found that measurable physical characteristics of the operation explained only a part of this variation. One of these, known as the Battelle Study(*2) measured a factor called crew aggressiveness in pulpwood logging crews in Southeastern U.S.A. Crew aggressiveness could override physical logging conditions in affecting productivity.

In a more detailed study of both forest conditions and machine time (*3) it was found that the extra detail did not help explain productivity variation. There was, however, some variation related to a gang's standing in relation to bonus payments. A study of the productivity of Beloit Harvesters (*4) showed that 30% of the variation in harvesting time per tree was attributable to machine operators. A FERIC study (*5) reported that for tractor mounted hydraulic tree shears, one-third of the performance variation was attributable to day-to-day differences in operators

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- (*1) BENNETT, W.D., WINER, H.I., BARTHOLOMEW, A. 1965 "Measurement of Environmental Factors and Their Effect on the Productivity of Tree Length Logging with Rubber-Tyred Skidders". PPRIC Woodland Research Paper 166.
 - (*2) BATTELLE INSTITUTE 1966 "Highlights of a Battelle Study of Southeastern Pulpwood Harvesting" APA Technical Release 66-R-10
 - (*3) COTTELL, P.L., WINER, H.I., BARTHOLOMEW, A. 1971 "Alternative Methods for Evaluating the Productivity of Logging Operations" PPRIC Woodland Report No. 37
 - (*4) AIRD, P.L. "Evaluating the Productivity of Logging Machines" PPRIC, Montreal. Woodland Research Paper 22
 - (*5) COTTELL, P.L., BARTH, R.T., NELSON, L., MCORLAND, B.A., SCOTT, D.A. 1976 "Performance Variation Among Logging Machine Operators Felling with Tree Shears" FERIC Technical Report No. 4

and two-thirds was attributable to differences between operators. The variation between operators was significantly associated with certain operator characteristics such as experience, motivation, and manual dexterity.

Within New Zealand much attention has been focused on improving forests and machines. Substantial increases in the amount of wood available for harvesting are expected over the next few decades. Most of this wood must be exported and New Zealand must remain competitive in its pricing on overseas markets. Although the importance of the labour force is recognised from overseas research, little is known of the present labour force in New Zealand. This lack of knowledge extends to both its composition and to the steps which may have to be taken to recruit, to train, and to retain the men necessary to meet future expansion in harvesting. Detailed estimates of future wood supply and labour requirements are given in Appendix 1.

LIRA has initiated a research project in this area. The objectives of the project are to analyse the future requirements for logging labour, and to examine the factors which might improve the effectiveness of training and motivation with a view to increasing productivity and retention of workers in the industry. This report deals with the first step taken in this project: to overcome the lack of knowledge of the existing labour force and to indicate future logging labour requirements. The labour force was surveyed through a questionnaire and this is covered in the main body of the report. An analysis of future labour requirements, taken from other reports, is contained in Appendix 1.

There is a widely held view that logging labour is characterised by high turnover and high accident rates. There is limited knowledge of the attitudes to the job and the motivation for entering or remaining in the industry. At a management level there is concern over apparent defects of lack of skills (especially mechanical skills), low levels of training (except among larger employers) and the high cost of logging accidents. To obtain a more factual background on the logging labour force and the views held by loggers, this study was set up with the objectives of determining for the existing work force:

- (a) A social profile, such as marital status, age, etc.
- (b) Education and training relevant to the present job.
- (c) Skills relevant to the present job.
- (d) Accident experience and nature of work associated with accidents.

- (e) The factors which motivate people to work in logging.
- (f) The attitudes of workers to their jobs.

1.2

BASIS FOR THE SURVEY

The basic hypothesis of the study is that the logger's attitude to his work is determined by the aggregate of many individual relationships. The questions asked in the survey were designed to test hypotheses about the individual relationships. Some of the questions establish facts while others establish the opinions of the workers. Some of the ideas derive from a Canadian study aimed at finding out why loggers change jobs. (*1).

The following are examples of the hypotheses put forward to be investigated by the questionnaire:

- (a) The average logger is young, has had a relatively short period of formal education and has had little training.
- (b) The average logger who has been in the industry for one or more years is multi-skilled, that is he can fill most of the jobs in the gang in which he is working.
- (c) There is a high rate of turnover, however, it is expected that many workers move between gangs and few leave the industry altogether.
- (d) Some jobs would take longer to learn than others and would be seen as being more highly skilled. These jobs would be considered the most desirable.
- (e) The work associated with most accidents would be tree felling.
- (f) The reasons for working in logging would include the social and physical environment and pay rates.
- (g) The motivation for working would be largely based on goals set either by the supervisor or by the way in which the gang work.

(*1) COTTELL, P.L., 1974, "Occupational Choice and Employment Stability Among Forest Workers" Yale School of Forest and Environmental Studies, Bulletin 82

METHODS

2.1

QUESTIONNAIRE DESIGN

The questionnaire was designed bearing in mind the hypotheses put forward in the Introduction. Discussions were held with university and research sociologists and others experienced in this field. The relevant criteria to be used in designing the questionnaire were as follows:

- (a) Considering the type of person and the job situation in which the interview would take place, a person-to-person interviewing technique would be the only one which would ensure that all questions were answered in the required manner.
- (b) The questionnaire results must remain anonymous so that answers could be given quite freely.
- (c) The person interviewed must know that he has the respect of the person doing the interview.
- (d) Honesty is important. It is necessary to explain the true reason for the overall study and the reason for each individual question. The worker will share his personal thoughts with the interviewer in proportion to the degree the interviewer shares his thoughts with the worker. However, the initiative to "open up" is firmly placed on the interviewer.
- (e) A sense of humor is important to establish a relaxed and normal interviewing atmosphere.

The questions to be asked during the interview were of two kinds. First, those to which the answer would be an unambiguous fact, such as the person's age. Second, were those which required the opinion of the loggers, such as the main reasons for choosing logging as a job. The questionnaire commenced with the simplest factual questions and moved on towards more complex opinion questions. Where possible the questions were made to be closed rather than open; that is, the response had to fall within certain categories which had been predetermined. This was done for two reasons. First,

it made the interviewing easier because where a person, for example, could not think of a reason for working in logging a number of possible responses could be listed to him and he could choose those which were most appropriate. Second, it made the analysis of data simpler as the categorisation had been done beforehand..

A draft questionnaire was circulated to a number of people for critical evaluation. After rewriting, a version of the questionnaire was field tested. After some slight modifications a final questionnaire was prepared and used for the survey.

2.2

SCOPE OF SURVEY AND SAMPLING PROCEDURE

Manpower limitations required that the survey be completed within 12 weeks over the summer period 1978/1979. The survey was therefore restricted to the Bay of Plenty region in order to reduce travelling time. The Bay of Plenty region currently produces some two-thirds of the total harvested volume in New Zealand. The survey, while restricted in area, therefore covered a large proportion of the logging work force in New Zealand.

The survey covered all the major logging compaines in the Bay of Plenty area as follows:

- (a) The Kaingaroa Logging Company: three company gangs and one contractor.
- (b) N.Z. Forest Products Ltd: three company crews and four contractor crews.
- (c) N.Z. Forest Service: three company crews and six contractor crews.
- (d) Fletcher Forests Limited: five contractor crews.

The operations covered by the varios gangs were clear felling with skidders, clear felling with tractors, clear felling with haulers, and thinning with skidders. The majority of operations were in radiata pine with a smaller number in Douglas fir and Corsican pine.

The gangs were chosen on one main basis: the kind of operation had to be representative of the logging operations for that particular company. For Fletcher Forests, for example, one radiata pine thinning crew was interviewed, three radiata pine clear felling crews using skidders and tractors were interviewed, and one radiata pine clear felling crew using a hauler was interviewed.

At the time the survey was initiated there was no information available giving the overall characteristics

of the logging industry in the Bay of Plenty region. It was, therefore, not possible to use a stratified random sampling procedure which might assist with later statistical analysis. It is, however, believed that the sample is representative of logging in this area. In total 125 loggers were interviewed from 25 logging crews. This is approximately 10% of loggers in the Rotorua Conservancy.

2.3

INTERVIEWING TECHNIQUE

The interviewer was introduced to the gang by their supervisor. The supervisor was not present during the interview. The interviewer then explained who he was, what LIRA was doing working in this field of research, how the information they gave would be utilised, and how he was to go about his questioning. Generally the interviewer stayed with one gang for one day, interviewing as many men as possible during that time. Questioning took place during breaks in the work or during smokos. During work periods the interviewer was often able to assist the logging gang, which improved relationships between crew and the interviewer.

The gang members were generally very co-operative. Only one gang approached refused to be interviewed. The basis for their refusal was that the information would be for the bosses, and not their advantage.

2.4

A BRIEF QUESTIONNAIRE DISTRIBUTED BY THE UNION

An attempt was made to reach a large number of loggers throughout New Zealand through the N.Z. Timber Industry Employees' Industrial Union of Workers. A very brief questionnaire was designed and given to the union. A short article explaining the survey was printed in the "Timber Worker", the journal of the union. The questionnaire was to have been distributed by the union delegates and the responses returned through the union to LIRA. However, in total only 12 questionnaires were returned. This questionnaire is not discussed any further in this report. The experience does, however, highlight the problems in working through a third party in this kind of survey.

RESULTS

3.1 INTRODUCTION

Complete result summaries are in the original report prepared by M. Fielder and are held in the LIRA library. This report summarises the main points of the results. Differences between company and contract gangs and between different types of operation are highlighted only where significant differences occurred. A full analysis of all data has not been made. It has not been ascertained, for example, whether experience is age-related or whether accidents are experience-related or age-related. As this was only a pilot survey with limited objectives, extensive resources were not allocated to it and detailed analysis was not possible.

3.2 AGE

Distribution of ages of loggers sampled is shown in Table 1. There was no consistent pattern of differences in age distribution for company or contract gangs or type of operation.

<u>AGE (Years)</u>	<u>% SURVEYED</u>
Under 20	14
20 to 24	19
25 to 34	35
35 to 49	26
50 and over	6

Table 1. Age Distribution of Loggers

3.3 MARITAL STATUS

The majority of loggers (74%) sampled were married and had 1 or more dependants.

3.4 EDUCATION AND TRAINING

The majority of loggers (68%) had been at secondary school for between 1 and 3 years, with 22% staying more than 3 years and 8% less than 1 year.

Approximately half of all loggers surveyed had received formal training after school, although the percentage was higher (62%) amongst company crews. Note that this does not include 'on the job' training practised by some organisations. Of those having received formal training only one-half had training directly related to logging; for example, Forest Ranger and Woodsman courses, company courses, chain saw courses.

When asked how they had learnt to do their job, the most common opinions were from self experience and from a more experienced bushman. Formal training was a more common response for company than contract gangs (see Figure 1.)

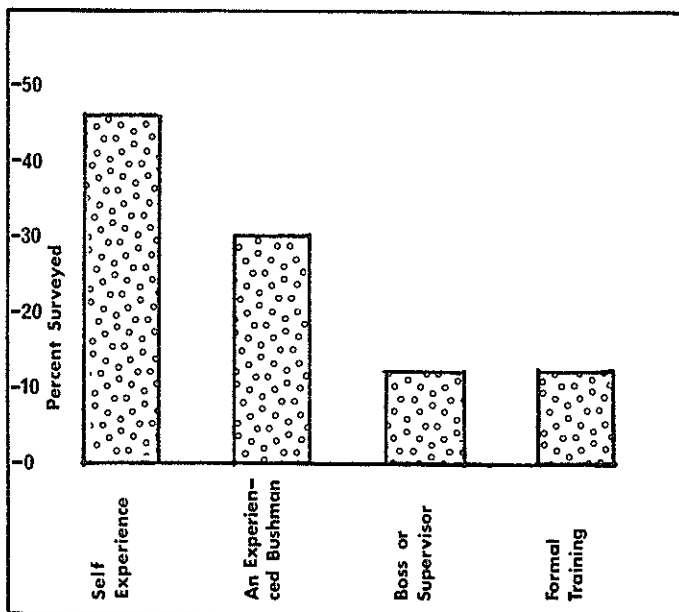


Figure 1. How Loggers Learnt Their Job

Some 70% of the loggers felt their job would be improved by more training (the percentage was 92% for company crews and 60% for contract crews). The most popular form of training would be learning from more experienced loggers, seeing new techniques demonstrated in the bush, and formal courses (see Figure 2). Those not in favour of further training felt that they were too old to learn or that they had been at work long enough to have learnt all there was to know.

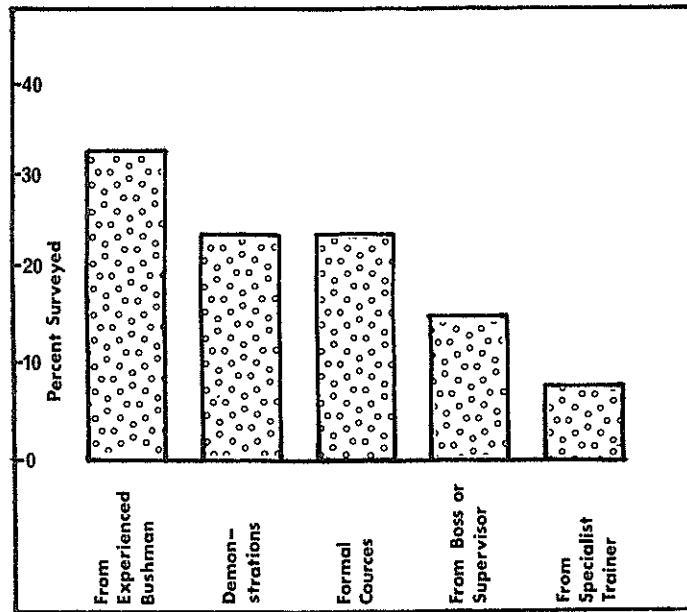


Figure 2. Training Preferences of Loggers Surveyed

3.5

JOB EXPERIENCE

Figure 3 shows a smoothed graph representing the time loggers had been in the logging industry and the time they had been in their present job. Although the total length of experience of those surveyed varied from a few days to more than 30 years with an average of 8 years, the most common length of experience was between 3 and 5 years. The average length of time worked in the present gang was less than 3 years.

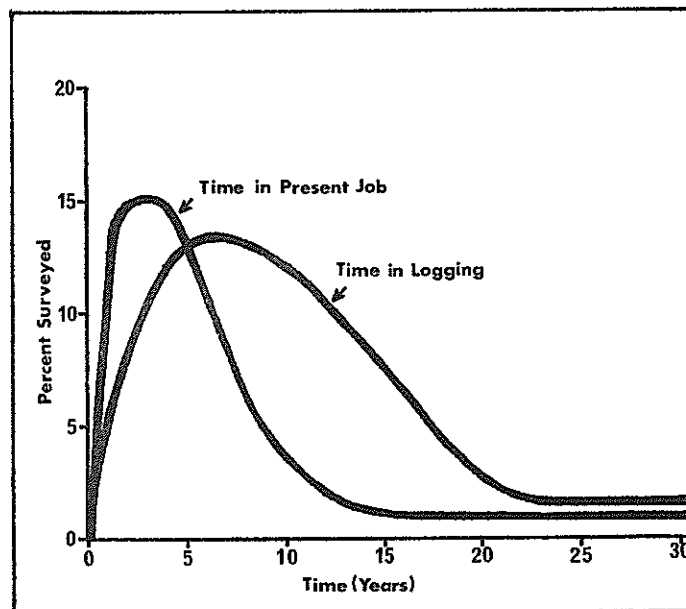


Figure 3. Job Experience in Logging Industry

The loggers were questioned on their job histories for their two previous jobs. The results shown in Table 2. indicate that many loggers have moved from one job to another within the logging industry. The forestry industry has provided another major source of recruits while rural industries have proved a better source of recruits than urban industries. Only a small proportion of loggers have come directly into the industry from school.

<u>Type of Job</u>	<u>Percent Surveyed</u>	
	<u>Previous to current job</u>	<u>Pre-previous job</u>
Logging	47	32
Rural	22	24
Forestry	12	11
Urban	16	16
School	3	17

Table 2. Job History of Loggers

3.6

SKILLS

More than 75% of the loggers sampled had experience at felling, trimming, breaking-out, and skid work. 40% had experience at operating skidders, tractors or loaders. No check was made to see how well the loggers could perform the skills which they stated they had.

The loggers' opinions were sought on the time required to learn the various skills. Table 3 summarises the results.

<u>SKILL</u>	<u>TIME REQUIRED</u>
Trimming	About 1 month
Breaking-out, skid work, hauler operator	About 3 months
Felling, driving skidder, tractor, front-end loader	About 6 months
Crane operator	About 1 year

Table 3. Loggers' Opinions of Time to Learn
Logging Skills

3.7

ACCIDENT HISTORY

An accident, for the purpose of this survey, was defined as an incident which had caused the logger to have 1 or more days off work. Some 36% of those surveyed had had an accident in the past 5 years. A small proportion had had more than one accident. There was very little difference between company and private gangs in

respect of accident frequency, however, the kind of work being done at the time of the accident did vary between company and contract gangs. 47% of company gang accidents had occurred during felling and trimming while the same tasks accounted for 76% of accidents in contract gangs. The figures for skid work were 42% for company gangs and 15% for contract gangs. This is largely explained because there was a higher proportion of hauler operations among company crews than contract gangs, and the felling crews associated with hauler gangs were not necessarily interviewed in this survey. Skid work accounted for 60% of accidents in hauler crews and 15% of accidents in skidder crews. Felling and trimming accounted for 30% of accidents in hauler crews and 80% of accidents in skidder crews. These results are shown in Figure 4.

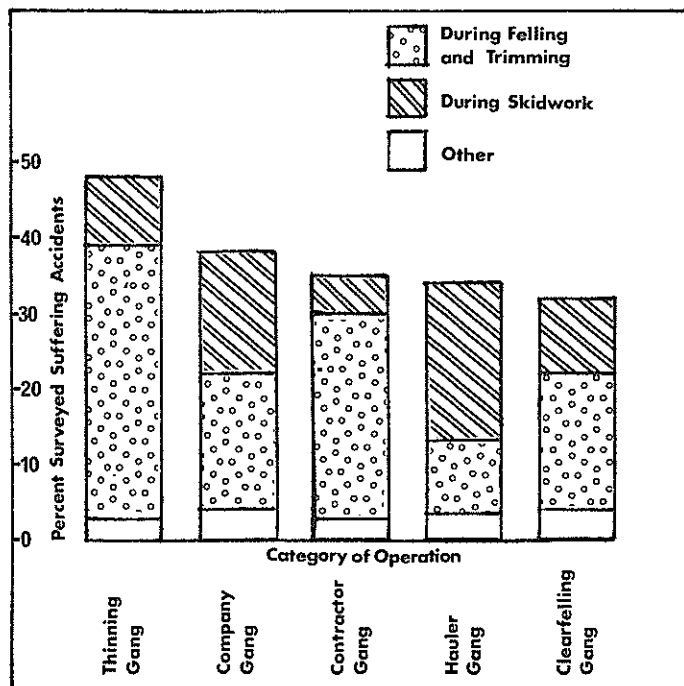


Figure 4. Accident History of Loggers

3.8

ATTITUDES AND MOTIVATION

Five questions were asked in an attempt to ascertain loggers' attitudes to their work and their motivation in their job. Loggers were asked what they felt were their main reasons for choosing logging as a job. Many gave more than one reason but by far the most common was because they liked working outdoors in the forest. Following this were the work activity and the wages. The results are summarised in Figure 5.

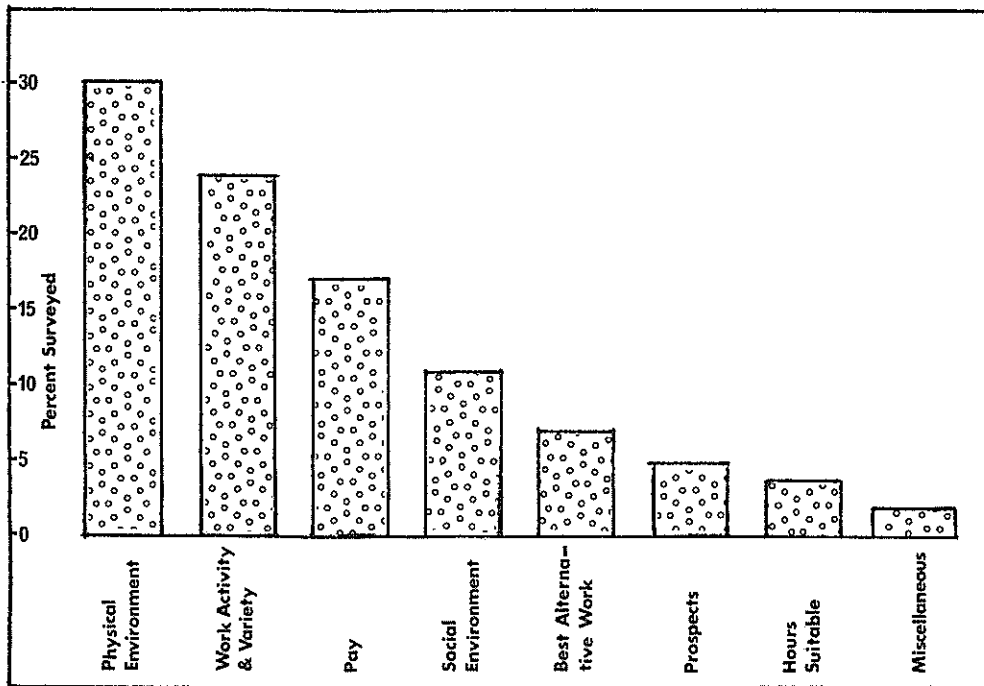


Figure 5. Reasons for Entering the Logging Industry

More than 90% of the loggers surveyed said that they enjoyed doing their job. There was no significant difference between company and contract gangs or type of operation. In terms of job preference felling stood out as being by far the most popular, preferred by some 50% of those surveyed. Machine operating was the next most popular followed by breaking-out and skid work. These results are summarised in Figure 6.

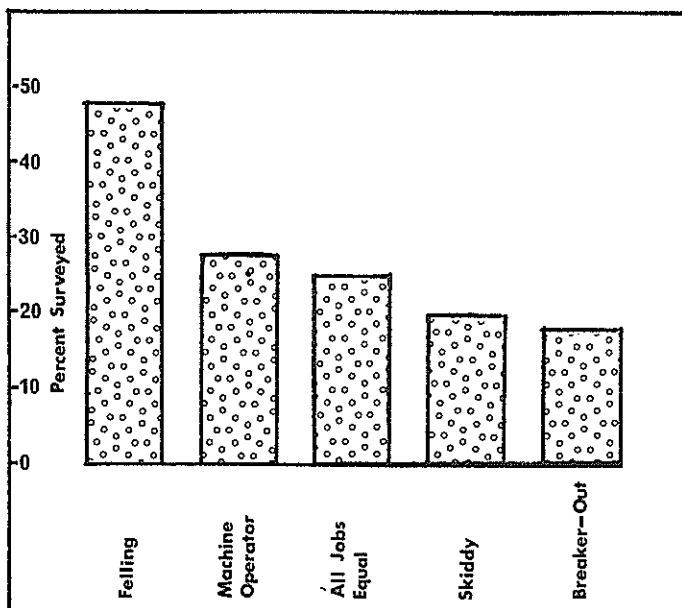


Figure 6. Job Preference Among Loggers

The loggers were questioned as to what set the pace of their work. The response was very varied, however, the most common answer was that the work pace was set by himself. A smaller number worked hard because they enjoyed hard work or to meet a day's tally. Better pay was among the minor reasons for working hard. Results are shown in Table 4.

<u>WORK RATE SAID TO BE:</u>	<u>% RESPONSES</u>
Independent of other factors	43
Set by a goal	25
Set by other phases of the operation	23
Set by higher authority	9

Table 4. Factors Motivating Loggers

Finally the loggers were asked whether they would encourage their sons or their mates into logging as a career. Only 40% said they would, however, 15% said they would if their son or mate had some other training behind them. 15% said that they would not encourage them. 30% stated that they would leave the decision up to those concerned.

DISCUSSION

4.1

SOCIAL PROFILE

The age structure of the logging labour force (100% male in this survey) differs from the total N.Z. male work force and from those engaged in rural industries (*1). This is illustrated in Table 5.

<u>N.Z. CENSUS</u>		
<u>Age Group</u>	<u>% Male Workforce</u>	<u>% Male Rural Workforce</u>
Less than 25 years	24	21
Less then 35 years	46	43
Less than 55 years	66	52

<u>LIRA SURVEY</u>	
<u>Age Group</u>	<u>% Logging Labour Force</u>
Less than 25 years	33
Less than 35 years	67
Less than 50 years	94

Table 5. Workforce Age Structure

There is a very marked absence of older workers in the logging labour force, and a high proportion in the 25 - 34 year old age group. These findings probably reflect the fact that many logging tasks require workers of peak physical fitness. This age structure also fits in well with the majority of loggers being married and with dependants

(*1) Department of Statistics, 1974 "N.Z. Census of Population and Dwellings" Vol. 4 Industries and Occupations. N.Z. Government Printer.



Figure 7. Many Logging Tasks Require Men in the
Peak of Physical Fitness

The age class of the majority of loggers must have an important bearing on training programs on retaining the existing work force and on recruitment into the logging industry. Apparently the industry at present does not offer a career structure from school leaving until retirement so that a high level of retention within the work force cannot be expected.

4.2

RECRUITMENT

For most loggers their first job after school was not in the logging industry but was more likely to be in some rural based industry such as forestry (silvi-cultural work). It should be noted that in New Zealand, by law, no person under 18 years of age is allowed to be in control or charge of a machine (including a chain saw) (*1). The high proportion of loggers in the 25 to 34 year old group indicates a preference for those with high physical stamina. These findings point to school leavers being an unpromising area for recruitment into the industry.

(*1) N.Z. Government, 1973 "Machinery Act, 1950 with Amendments"
N.Z. Government Printer.

It is important, however, that recruitment procedures be established before the large projected increase in demand arises (See Appendix 1 for details). One course of action would be to recruit forestry workers from school and then loggers from amongst the ranks of forestry workers. Some thought could also be given to introducing a forestry line in some appropriate secondary schools to encourage this process, as is done in Sweden (*1). Other rural based industries may continue to be an important source of recruits as may those currently in urban jobs who desire to move on to the outdoors. The relative importance of rural and urban sources in the future is uncertain.

The attractions of logging which may be used in recruitment programs are discussed under Attitudes and Motivation (Section 4.6).

4.3

TRAINING

Most loggers have spent some time in the secondary school system, but few have had any formal training in logging. The majority have been employed in some other industry before moving into logging. These factors must be considered when formulating a training program. Training is considered by many in the industry to be an important way of increasing the effectiveness of the logging labour force. It has led in New Zealand to the setting up of the Logging Industry Training Board to co-ordinate all logging training.

The success of training depends on the training program itself, and perhaps more importantly, on the characteristics of the person entering the training program. A survey of Canadian training programs (*1) found one of the biggest defects to be the absence of screening of candidates for course entry. This may have been a major reason that their survey showed less than one half of the graduates from industry training programs were retained in the forest industries for 1 year. The possibilities of preselection for training have been shown in a study (*2), where tests were used to successfully predict the results of machine operator training programs.

It can be misleading to look at only formally structured courses. Of the loggers questioned in this survey, only 15% thought their jobs would be improved by formal

(*1) Scott, D.A. and COTTELL, P.L., 1976 "Survey of Logger Training" FERIC Technical Report No. TR11

(*2) ANDERSSON, L., BERGSTROM, L., KRANTZ, A., 1968 "Selection of Tractor Operators by Means of Psychological Tests" Skogsarbeten Report No. 7

training. The author of a study of the New Zealand logging industry (*1) considered that most of those working in logging had not developed the ability to learn from written or even generalised oral communication. Knowledge of the correct course of action for a logger in his job should be communicated by demonstrations and guidance. He also considers that such training needs to be continually reinforced, perhaps by promoting competitiveness in the various logging skills.

Many of the loggers surveyed considered that they had learnt their skills from a more experienced bushman and the most popular forms of training were said to be learning from a more experienced logger and seeing techniques demonstrated in the bush. However, it has been pointed out (*2) that informal, on the job training tends to result in unnecessary hazards to new workers and their co-workers, and to the machines. Also, learning is at a slower rate and productivity lower for longer than if organised instruction is used.



*Figure 8. Planned Instruction in The Forest Can be Effective
in Training*

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- (*1) MCCALLION, H., 1979 "On Modelling the N.Z. Logging Industry to Study Factors Affecting its Operational Efficiency" University of Canterbury, Department of Mechanical Engineering, Technical Report No. 14
- (*2) COTTELL, P.L., 1978 "Approaches to Training & Motivation in Forest Work" Paper to 8th World Forestry Conference, Jakarta.

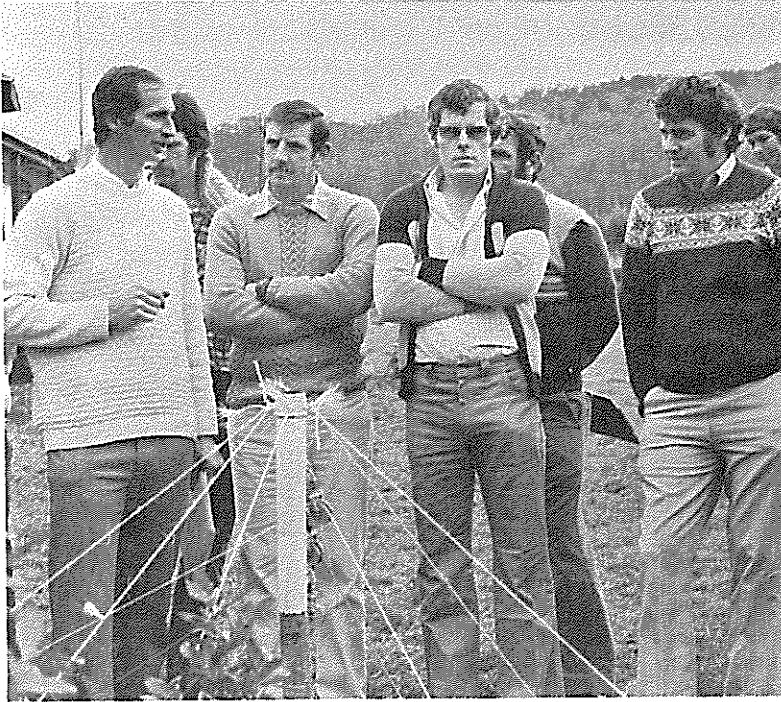


Figure 9. Formal Instruction in New Techniques

Loggers were asked how long they considered it would take a new recruit to learn the most common logging tasks. The average times ranged from around 1 month for trimming to about 1 year for operating a cable log loader. Around 6 months was required for most tasks such as felling and machine operating. These times are based largely on self-experience as the method of learning, and could obviously be speeded up with training programs. It is also possible that loggers exaggerate the time required to learn their jobs to make the job seem more difficult. A logging training supervisor from an industry organisation was contacted for his views on the length of time required for training. In his organisation bushmen are under constant supervision for 3 months to learn breaking-out, 3 months for felling, and 12 months for machine operating. After this time they are tested to see if they have learned enough to go on a higher rate of pay. However, it was considered that these times were a minimum and not necessarily all that was required. The Logging Industry Training Board in New Zealand has established minimum experience times required before loggers can be certified as competent in the various fields. The experience required without training programs are - for skid work 4 months, for breaking-out 12 months, for felling 24 months, and for machine operating 23 months. These times tie in closely with the requirements of another major industry employer.

Obviously there are some differences of opinions on length of experience required to become competent at the various tasks in logging. Further work would be required to find out how much variation there was between the different loggers and what effect different training programs would have on actual learning times.



Figures 10 & 11. Skid Work and Crane Operating - the
Extremes of Learning Times Required



4.4

EXPERIENCE AND SKILLS

Labour turnover in the forestry and logging industrial group is relative higher than for other industrial groups in N.Z. (*1). This is illustrated in Table 6.

<u>INDUSTRIAL GROUP</u>	(Terminations as a percentage of average payroll strength) Oct. 1978
Forestry & Logging	34
Mining & Quarrying	14
Manufacturing	19
Electricity, Gas, Water	9
Wholesale, Retail, Hotels, Restaurants	20
Transport, Communications	10
Finance, Insurance, Real Estate, Business	13
Community and Personal Services	17
TOTAL (All Industries)	17

Table 6. Half Yearly Turnover Rates by Industrial
Groups (Excluding Seasonal and Construction)

A study of organisation records would be needed to see if this pattern holds for logging alone. The survey results indicate a high degree of turnover within the industry (i.e. from one logging job to another). It is generally felt that loggers move from one job to another chasing higher wages and better bosses, although not all terminations are voluntary.

There is a wide variation of time loggers spent in the industry and in their current job. This indicates that there may be a fringe of loggers that either stays a short time or a long time in their job or industry while the majority stays a moderate length of time. Two-thirds of loggers have spent between 3 and 20 years in the industry, while in their current gang two-thirds have spent between 1 and 10 years. LIRA is currently analysing the records of employing organisations to determine the pattern of turnover for loggers.

Reduced turnover would increase the efficiency of labour in the logging industry. Some suggestions are made towards achieving this end in the next section of this discussion.

(*1) Department of Labour, 1978 "Statistics on the New Zealand Labour Force" Labour and Employment Gazette Volume 28 No.1

A large majority of loggers have been in the industry long enough to have learnt several skills, as judged from the length of time the loggers consider is required to learn various skills. It is apparent that most loggers do, in fact, become widely experienced rather than specialists. 75% could perform all the skills of felling, trimming, breaking-out, and skid work, while 40% considered they could operate 1 or more of the common logging machines. This should make logging gangs flexible and able to cope with short term absences of members, which is more important in smaller gangs. It may also help to increase the variety of work because the loggers are able to change tasks within one gang. It may also make it easier for loggers to find jobs elsewhere in the logging industry.



Figure 12. Most Loggers are Multi-skilled and Many Can Operate a Logging Machine

4.5

ACCIDENTS

Logging is a highly accident prone industry and employers pay one of the highest Accident Compensation Levies. In this survey about one-third of all loggers questioned had had an accident in the past five years which caused one or more days off work.

It was surprising that there was little difference observed between company and contract operations. One large company included in the survey reports that from their records only 25% of loggers had had lost time accidents in the past five years. It is known that some companies have very vigorous safety programs.

The accident statistics support the following:

- Felling and trimming are the most dangerous areas of work in logging.
- Thinning is more dangerous than clear felling. (There is probably no significant difference between other categories of tasks.)

Using a chainsaw and felling trees are obviously the most dangerous tasks. In thinnings operations there is less skid work and more trees felled per day than on clear felling, which may explain why accidents in the bush in thinnings are higher than in clear felling.



Figure 13. Felling - The Most Popular and Most Dangerous Task

The survey has borne out a widely held view that felling and trimming, particularly in thinnings operations, are the most dangerous areas for loggers. These then are the areas where safer techniques should be sought and at which safety programs should be concentrated. However, skid work with an environment of moving machines and chainsaw operations is also a hazardous one and safety programs should not ignore it.

4.6

ATTITUDES AND MOTIVATION

Loggers entered the industry primarily because of their expectations regarding the physical environment. This applies to people coming from urban environments who desire an outdoor life and to those from rural environments who do not want to work in a town or city. The kind of work was also an important reason for going into logging. This includes the nature of the work and the variety of work. While tree felling may be repetitious on a day-to-day and week-to-week basis, the forest in which it is carried out is certainly non-standard and new challenges are faced with each tree during each day and with each new work area.

Thus the major factors which make logging attractive to loggers are the outdoor life, the excitement, the danger, the variety of jobs, and the varied nature of any one job. This does not mean that logging is either easy or pleasant. It is interesting to speculate whether highly mechanised logging tasks would provide the same kind of attractions - none were included in this survey.

Pay was the third major reason for entering logging. Unlike other reasons there was a big difference between company and contract gangs in this respect. Pay was cited two and a half times more commonly as a reason for entering logging in contract gangs than in company gangs. Although not assessed, it is a generally held belief among loggers that pay is higher in contract than company gangs.

The reasons for loggers entering the logging industry will be useful both in planning and recruitment procedures and improving the retention of workers in the industry.

A very large proportion of the loggers (93%) said they enjoyed doing their job. In a study in Finland (*1) it was found that 43% of fellers and 59% of tractor operators were satisfied with their jobs. The contented workers explained their attitude mostly by the fact that

(*1) Teikari, E., 1978, "Job Satisfaction Among Forest Workers" Työtehoseura Metsätiedotus No. 286

forest work is independent and that the workers themselves can decide when and how they work. Dissatisfied workers on the other hand, complained of working in the open, physical strain, and poor pay. There are, of course, many differences in the environment and in the system of logging between Finland and New Zealand, but this comparison indicates the need to study the New Zealand logging labour force rather than rely on overseas studies.

By far the most popular task among the loggers surveyed in the New Zealand study, was felling. Felling is possibly the most challenging and the most dangerous task in the logging industry. Following felling, most other tasks ranked about equal. It would seem that loggers may find greater satisfaction during their career in the logging industry if they have training in all aspects of logging rather than specialising in one particular task.

An understanding of the factors that set the pace of work or motivate loggers is important to management. According to the loggers themselves there is a wide variety of reasons for working hard. The single most common was that loggers set their own pace and that, therefore, working hard just came naturally to them. Among the second ranking reasons was because the loggers enjoyed the work and to meet the day's tally. The rate of pay was another reason with similar ranking. Among the large number of third ranking reasons were to help the crew, to keep up with machines, to keep up with the gang, to stop boredom, and to work for a good boss.

With such a wide variety of factors motivating loggers it is difficult to judge which would be the most effective. Obviously an independent work rate ranks highly as it did in the Finnish study cited earlier. The rate of pay is of some importance but the effect of incentives was not assessed. The various phases of logging operations in New Zealand are frequently closely linked so that keeping up with some other part of the operation is not surprisingly reasonably important.

If loggers can be motivated to work harder, productivity should rise and costs decrease, however, motivating loggers has always been a problem, partly because motivation comes from within a person and cannot be imposed by external forces. Incentives have been tried, including financial and goal setting. A comprehensive study set up by the American Pulpwood Association (*1) showed that in pulpwood gangs high

(*1) Warren, B.J. & Rahburn, J.A. 1975 "Effective Management of Pulpwood Logging Crews." LSU/MSU Logging & Forestry Operations Center, Timber Harvesting Report No. 1

productivity, low turnover, and low accident rates were associated with close supervision and specific goals. The effectiveness of goal setting in logging has been further evaluated in North America and its effectiveness shown by experiments and demonstrations (*1).

This survey in New Zealand indicates that goal setting is not widely used to motivate the logging labour force. Goal setting can be a very simple process, and perhaps should be encouraged within the industry.

The degree to which loggers would encourage their son or friends into the industry is probably a reflection of a regard in which the loggers themselves hold their own jobs. Only 40% said they would encourage their sons or friends into logging. A further 15% said they would if they had some other training behind them. Although it may be common for fathers to wish for better jobs for their sons it is apparent that logging is not particularly highly regarded and is often thought of as only a temporary occupation before going back to a more established trade.

There would seem to be a need to improve the image of logging as a job that is more attractive and holds people in the industry for longer. Organisations such as the New Zealand Loggers Association could play an important role here. Some options already mentioned, such as introducing forestry to the school curriculum and encouraging competitive sports to which the public are invited, could also assist in promoting the image of logging as a career. However, the age structure of the present work force does indicate that the logging industry is not the place for older men. The industry must seriously face the problem raised by the question - where do loggers go when they are too old for the bush?



Figure 14. Loggers Sports Help Encourage Skills & Public Awareness of Logging

(*1) Latham, G.P. 1979 "Goal Setting: A Motivational Technique That Works" Paper to the Skyline Logging Symposium, Seattle.

CONCLUSIONS

It is important for the New Zealand logging industry that the logging labour force has a high rate of productivity in order to keep our logging costs low. The future requirements for logging labour will increase greatly. To maintain efficiency, retraining of the present labour force will be needed as well as recruitment and training to meet future requirements. In addition, attention must be paid to retaining loggers within the industry for as long as is practicable. This survey is limited in its scope and the extent of data analysis which has taken place. The results do, however, provide some useful information for those engaged in recruiting and training and employing logging labour and also some indications of the further research which is required.

The present work force can be characterised as being of the age of prime physical condition, poorly trained for the job which they are doing, liable to serious accidents, likely to show a high degree of turnover within the industry and to other industries, and finally, holding their own job in relatively low regard. On the other hand loggers have acquired a wide variety of skills, enjoy their present job, like the environment in which they work and the kind of work they do, and seem to be motivated by the desire to work rather than by a necessity to work.

Recruitment of the current work force seems to have been most successful from among those with some other job experience since school and particularly where that job experience has been in a rural or forest environment. In order to attract larger numbers into the logging work force in the future, it may be necessary to look more towards school leavers. One way to do this would be to introduce forestry subjects at appropriate schools. Organisations such as the N.Z. Loggers Association could encourage schools to invite speakers into their classes to discuss forestry and logging. However, to take school leavers directly into the logging work force will require a re-structuring of training programmes as many of these people will be either too young or too physically immature to carry out normal logging operations.

It is of some concern that there are many forms of training currently practiced on the logging work force but the effectiveness of them is not fully understood. The simplest approach which will produce reasonable results appears to be to provide properly structured on-the-job training programmes. This may be the best procedure for reinforcing past training programmes. It is very likely that some people will be more suited to certain kinds of training techniques than will others, so that a number of techniques may be useful in the industry. The chances of successfully training and retaining a logger in the industry could be improved if there was a better understanding of the physical and psychological factors which best suited the tasks to be performed and which could be used to screen applicants.

Overseas studies have shown that simple achievable goals are very effective in motivating loggers, however, this technique appears to be infrequently used in the New Zealand industry. An analysis of the New Zealand experience with various kinds of incentives and goals could throw some light on their effect on productivity. The quality and type of supervision of logging operations is very important in achieving high productivity. This aspect of labour efficiency needs further research in New Zealand.

There is an overall problem in the logging industry in that the career structure is not particularly satisfactory. Men of only a narrow range of ages form the bulk of the work force and their attitudes to their jobs indicate that it is not held in particularly high regard. It is, however, difficult to see a way around this problem as there are only a limited number of positions available for supervisors or prime contractors. Increased mechanisation with its associated decrease in requirements for physical stamina may encourage older men to stay in the industry. Mechanisation, however, may in turn decrease the variety and excitement of logging work, making it less attractive. Loggers both in New Zealand and overseas appear to gain a considerable degree of satisfaction from the independent nature of the work. Smaller independent work groups in the logging industry may provide this kind of satisfaction as well as giving more opportunity for leadership and a better career structure in the industry.

ESTIMATES OF FUTURE WOOD SUPPLIES AND LOGGING LABOUR REQUIREMENTS IN NEW ZEALAND

1. FUTURE WOOD SUPPLY

Even if no new forest planting is undertaken in New Zealand after 1980, annual roundwood volumes available from the exotic forests will approximately double between 1985 & 95. If available land continues to be planted, this volume could double again by the year 2005. These figures are based on the New Zealand National Planning Model prepared by the N.Z. Forest Service and presented in a recent paper (*1). The results are summarised in Table 1 below:

	<u>1976-80</u>	<u>81-85</u>	<u>86-90</u>	<u>91-95</u>	<u>96-00</u>	<u>2001-05</u>	<u>06-10</u>	<u>11-15</u>
<u>Ownership</u>								
Forest Service	5.1	5.2	5.0	6.2	10.0	13.0	18.0	19.5
Other owners	3.5	3.7	4.2	6.2	7.5	11.1	15.4	16.9
Total	8.6	8.9	9.2	12.4	17.5	24.1	33.4	36.4
<u>Logging systems</u>								
Cable logging	1.5	1.9	2.3	3.6	5.8	8.7	13.4	16.4
Tractor logging	7.1	7.0	6.9	8.8	11.7	15.4	20.0	20.0
Removed by thinning	0.6	0.8	0.6	0.6	0.6	0.7	0.7	0.6
Removed by clear felling	8.0	8.1	8.6	11.8	16.9	23.4	32.7	35.8
Total	8.6	8.9	9.2	12.4	17.5	24.1	33.4	36.4
<u>Species</u>								
Radiata pine	6.4	6.8	7.7	11.3	16.6	23.1	32.3	35.0
Douglas fir	0.5	0.5	0.5	0.6	0.7	0.8	1.0	1.2
Other species	1.7	1.6	1.0	0.5	0.2	0.2	0.1	0.2
Total	8.6	8.9	9.2	12.4	17.5	24.1	33.4	36.4
<u>Log quality</u>								
Big logs	6.1	6.2	6.8	9.9	15.0	21.3	30.0	32.9
Small logs	2.5	2.7	2.4	2.5	2.5	2.8	3.4	3.5
Total	8.6	8.9	9.2	12.4	17.5	24.1	33.4	36.4

Table 1. Expected Changes in Average Annual Volumes of Roundwood Removals by Ownership, Logging Systems, Species, and Log Quality (Millions m³ per Annum)

(*1) LEVACK, H.H., 1979, "Future Forest Volumes for Loading and Transport" Paper presented to LIRA Log Loading and Transport Seminar, Rotorua, June 1979.

2. FUTURE MANPOWER REQUIREMENTS

Clearly if the available timber is to be harvested, a substantial increase in the logging labour force will be required. Several estimates of this future requirement have been made and two of these are discussed here.

The two estimates differ in the basic assumptions which have been made and therefore have different results. The first of these, with the results given in Table 2 below, assumes the same productivity as is being currently achieved but adjusted according to future tree volumes which it is estimated will be harvested (*1). The second estimate, with the results given in Table 3, assumes that manpower productivity will increase in the future at the same rate that it has in the past (*2). In effect the first estimate assumes a slight decrease in productivity while the second assumes a continuing productivity. In both cases the productivity estimates are coupled with the available roundwood estimates prepared in the National Planning Model to come up with the manpower requirement estimates.

Regardless of the method used to make the manpower requirement estimate, the increase is seen to be substantial. In particular, Table 3 shows that the increase required in cable logging operations will be especially large and as special skills are required for cable logging, this area of training should receive special attention.

Not shown in the figures given here, but given in the National Planning Model, is the importance of increases in logging activity in certain areas. For example, in Northland available roundwood increases 4 fold in the 10 year period from 1985. As this increase is on top of a very small base of experience, these areas will need careful attention to ensure that high productivity levels are achieved and maintained in the newly recruited labour force.

1976	2613
1981	2524
1986	2649
1991	4045
1995	6025
2001	7990
2006	10753
2011	11450

Table 2. Future Logging Labour Requirements
Productivity Based on Tree Size

(*1) ELLIS, P.J., 1979 - Pers. Comm.

(*2) GROOME, J.G. & ASSOCIATES, 1979 "Logging and Silviculture Worker Training in N.Z." A Report prepared for the Vocational Training Council

	<u>Skid- Workers</u>	<u>Breaking- Out</u>	<u>Felling</u> (Number of Men)	<u>Machine Operation</u>	<u>On-the-job Supervision</u>	<u>Total</u>
<u>Exotic Skidder/Tractor Loggers</u>						
1981-1985	407	276	714	592	173	2 162
1986-1990	247	238	601	505	147	1 838
1991-1995	409	285	699	597	173	2 163
1996-2000	479	338	309	700	202	2 528
2001-2005	574	408	967	841	243	3 033
<u>Exotic Cable Logging</u>						
1981-1985	85	65	108	92	35	385
1986-1990	98	75	124	106	40	443
1991-1995	143	110	182	156	58	649
1996-2000	205	159	261	224	84	933
2001-2005	288	222	366	314	118	1 308
<u>Indigenous Skidder/Tractor Logging</u>						
1981-1985	8	7	70	43	7	135
1986-1990	5	4	40	25	4	78
1991-1995	4	3	34	21	3	65
1996-2000	2	2	19	12	2	37
2001-2005	1	1	11	7	1	21
<u>Indigenous Cable Logging</u>						
1981-1985	9	110		52	3	174
1986-1990	5	64		30	2	101
1996-2000	2	30		15	1	48
2001-2005	1	18		8	1	28
<u>Total manpower requirements for the industry</u>						
1981-1985	509	348	1 002	779	218	2 856
1986-1990	455	317	829	666	193	2 460
1991-1995	560	398	964	797	235	2 954
1996-2000	688	499	1 119	951	289	3 546
2001-2005	864	631	1 362	1 170	363	4 390

Table 3. Expected Manpower Levels by Logging Activity
Productivity Based on Continuation of Past Trends