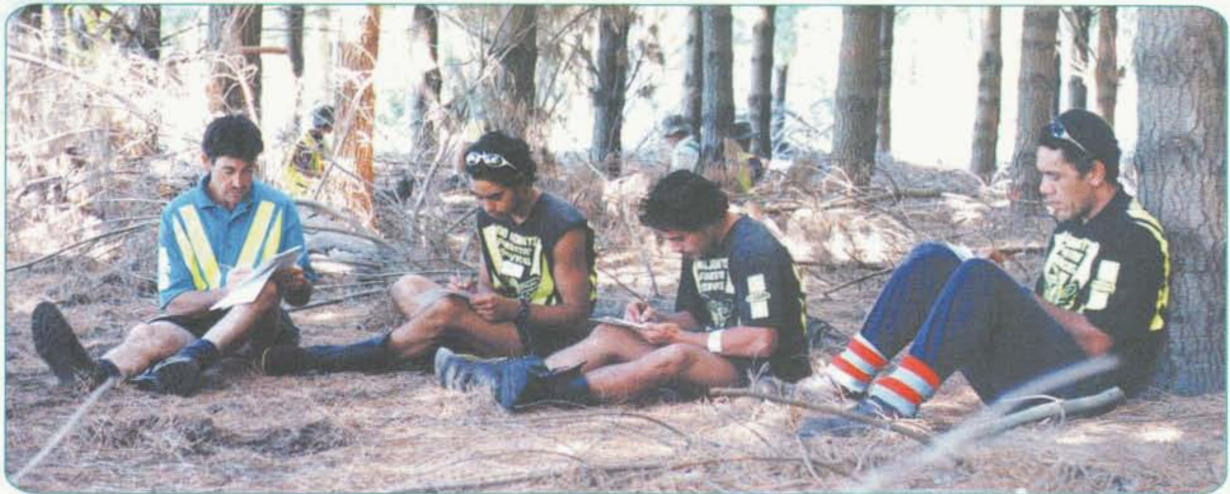


# Reading Comprehension Levels in the New Zealand Forest Industry

Tina Cummins and Mark Sullman\*



*"Reading is more than understanding written words on a page or screen, it is being able to understand who wrote it and why and being able to act on what is read"*

*"Writing is more than putting words on paper, it involves writing in a way that suits the situation so the message is understood"*

Excerpt from Workforce Literacy—an economic imperative. Workbase NZ.

## Summary

A study was carried out to determine reading comprehension levels within the New Zealand forest industry. A sample of 159 harvesting and silviculture workers were tested with the GAPADOL reading comprehension test. The study found 58% had a reading ability below the adult level, as defined by the test. Within this group, the average reading age was 11.5 years. There was a strong correlation between the length of time at school and the reading age scored on the test.

## Recommendations

It is vital that industry information (safety codes, company guidelines etc) be tailored to the reading ability of the forest workforce. Therefore, a thorough understanding of the reading ability of the target audience is vitally important. When this information is supported by appropriate writing

techniques, the proportion of forest workers who are able to read and understand the information should be increased. However, it is important that writing at appropriate levels is seen as only a small part of a planned strategic response. The improvement of workforce skill levels, organisational structures and processes which can contribute to communication difficulties, also needs to be addressed.

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## Introduction

The forest industry conveys a large amount of information to the workforce through written material. To ensure the correct interpretation and understanding of this information, a reasonable level of literacy is essential, as uncommon words and complex word combinations have been shown to result in reduced understanding (McLeod and Anderson, 1970). A worker with low literacy may miss out on important information, unless someone else is present to interpret the written material. The majority of industry information such as hazard management systems, codes of practice and training material, is usually presented in written format. Therefore, it is vitally important the information provided is written at a level which is easily understood by the vast majority of forest workers. This is not only commonsense, but is an ergonomic approach to communication (Bridger, 1995).

An international survey on adult literacy skills revealed over 40% of employed New Zealanders and 75% of unemployed were below the minimum level of literacy needed to function in everyday life and work (Workbase, 1999a). The same survey found half the unemployed, and many Maori and Pacific Islands people, were at the lowest possible literacy level. The distribution of literacy skills within the New Zealand population was similar to Australia, the United States and the United Kingdom, but only one in five (20%) of the New Zealand population sampled was found to be operating at a highly effective level of literacy (Ministry of Education, 1998). A 1993 exploratory survey of literacy and basic education needs in the workplace carried out by Adult Reading and Learning Assistance Federation (ARLA) Workbase, found 21% of workers reported difficulty with reading their Employment Contracts, and 7–15% reported difficulty across a range of reading and writing tasks (ARLA, 1993).

The benefits to an organisation through improved literacy include the economic benefit of improved quality and productivity and reduced injury, and social benefit of assisting employees to gain confidence, become more self managing, and develop their capability to take on new roles (Workbase, 1999b). There is also a financial benefit to improving workforce literacy, shown by a 1996 Australian study where in a number of different cases, literacy training at work resulted in a net saving to the company of downtime costs (AUD\$82,080 per annum), reduced maintenance (AUD\$10,670 per annum), "unproductive" labour costs (estimated AUD\$64,500), and 10 saved jobs (Workbase, 1999b).



*Loggers completing the reading ability test*

## Method

Visits were made to harvesting and silviculture crews working in forests throughout New Zealand. Workers present on the day completed a standard reading ability test to determine their reading ability. The test required each person to read a series of short prose stories which had words removed at various points throughout the text. The missing word which most suited the context of the story was identified by the subject and written in a box adjacent to the missing word. As the tests were administered during worker meal breaks, the period assigned for the test was reduced by one-third, from the preferred 30 minutes to 20 minutes. The raw reading age score was later linearly corrected and converted to a reading age. At the time the test was given, additional information was collected on age, ethnicity, years out of school, and the highest year of schooling attended.

Reading assessments measure different types of literacy, including prose literacy, document literacy, and quantitative literacy (Ministry of Education, 1998). The GAPADOL Reading Comprehension Test (Form G) (McLeod and Anderson, 1972) was selected for its ability to discriminate reading comprehension at high ability and age levels, yet remain quick and easy to administer. However, GAPADOL relies solely on prose texts to determine reading ability. GAPADOL is a normative reading test, and reading norms may shift over time.

Disclaimer: The reading age test had to fit within the constraints of the forest working environment. That is, it needed to be administered within the time allowed for the meal break. As no short reading age test was available, the test was administered in less than the recommended time and the raw score was linearly corrected. This was the only alternative available to ensure the study could be carried out. Therefore, these results should highlight the importance of measuring the reading ability within the forest industry, and further research is recommended.



# Results

## Reading Age

A total of 159 harvesting and silvicultural workers were tested in the Northland, Hawke's Bay, Central North Island, Otago and Southland regions. The GAPADOL Test revealed 42% of this group had an adult reading ability. In the GAPADOL marking system, adult reading ability is denoted by a reading age of 16 or more. There was a wide range below the adult level, with 18% having a reading age below 10 years (Figure 1). This indicates the point below which someone may have real problems handling everyday print demands (Moore, 1999). The average reading age of the 58% who demonstrated a reading ability less than the adult level, was 11.5 years. There should be concern that over half of the forest workforce tested showed a reading age below adult ability.

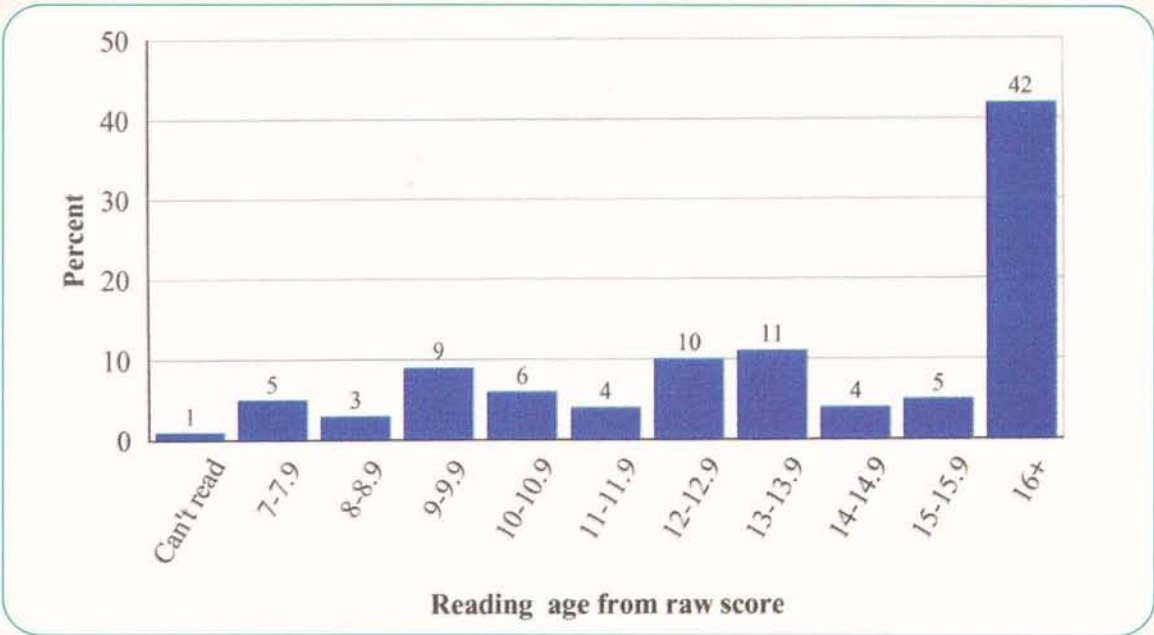


Figure 1 - Reading age distribution

## Reading age and age

The ages of those tested ranged from 16 to 54 years. No statistical relationship was found to exist between age and reading ability. However, there was a trend for younger workers to have a lower average reading age (Figure 2 ). This is of concern, and indicates younger people are leaving school without the basic literacy requirements. Table 1 shows the average reading age by age, of the group "<20 years".

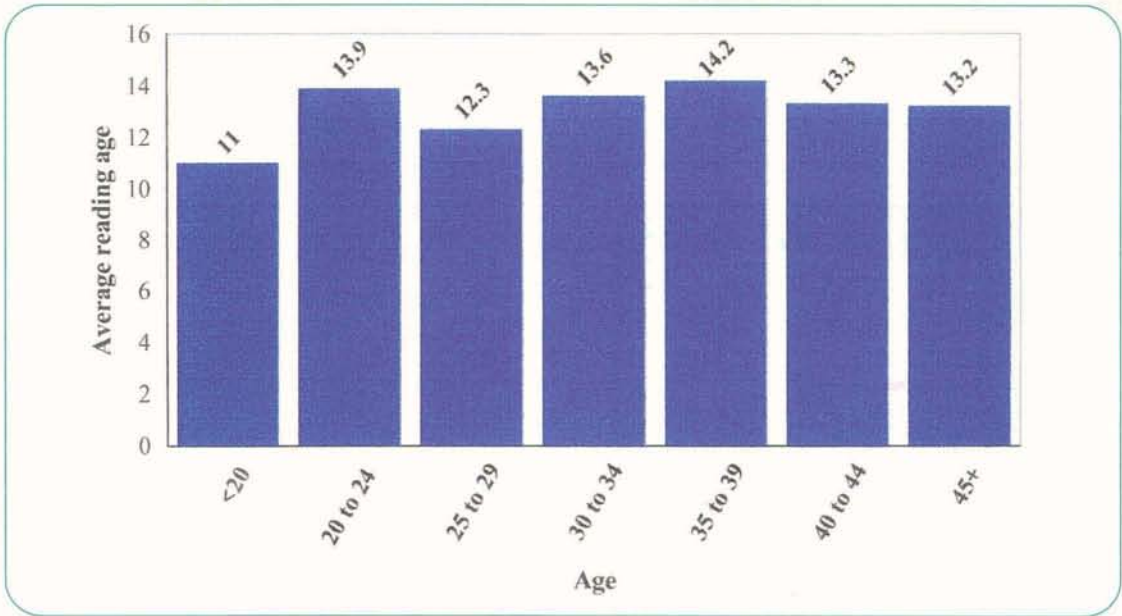


Figure 2- Average reading age by age group

Age	Average Reading Age	N*
16	8.1	1
17	10.4	3
18	11.9	5
19	10.9	4
20	13.7	4

Table 1 - Average reading age of group <20 years

\*Care must be applied when interpreting these results due to the small sample size. Results are indicative only.

## Literacy and length of time in secondary school

A strong relationship ( $P=0.003$ ) was found to exist between the highest school year attended and the reading age. As expected, those who had stayed longer at school and moved into a higher school year, showed a higher reading ability. There was no statistical relationship between age and reading ability. The adult literacy survey also found a strong relationship between educational attainment and literacy, where staying longer at secondary school was associated with improved literacy levels (Workbase, 1999a).

## Ethnicity

Maori dominated the Northland (66%) and Hawke's Bay (60%) regions. There were substantially fewer Maori in the Southland/Otago region (13%), consistent with the 13% found in the 1993 Otago/Southland Forestry Workforce Census (Byers and Adams, 1995). Overall, 50% of those tested said they were either Maori or European Maori, and 48% were European. The small percentage (2%) who indicated "other", said they were Samoan or New Zealander. In the 1995 New Zealand Forest Owners' Association Workforce Census, 50% of the workforce was European, 45% Maori, and 5% Other (Byers, 1995).

## Reading Ability by Operation and Ethnic Group

Similar levels of adult reading ability were found to exist in harvesting and silviculture workers. Half of the European sample had an adult reading ability, compared to 31% of Maori (Figure 3).

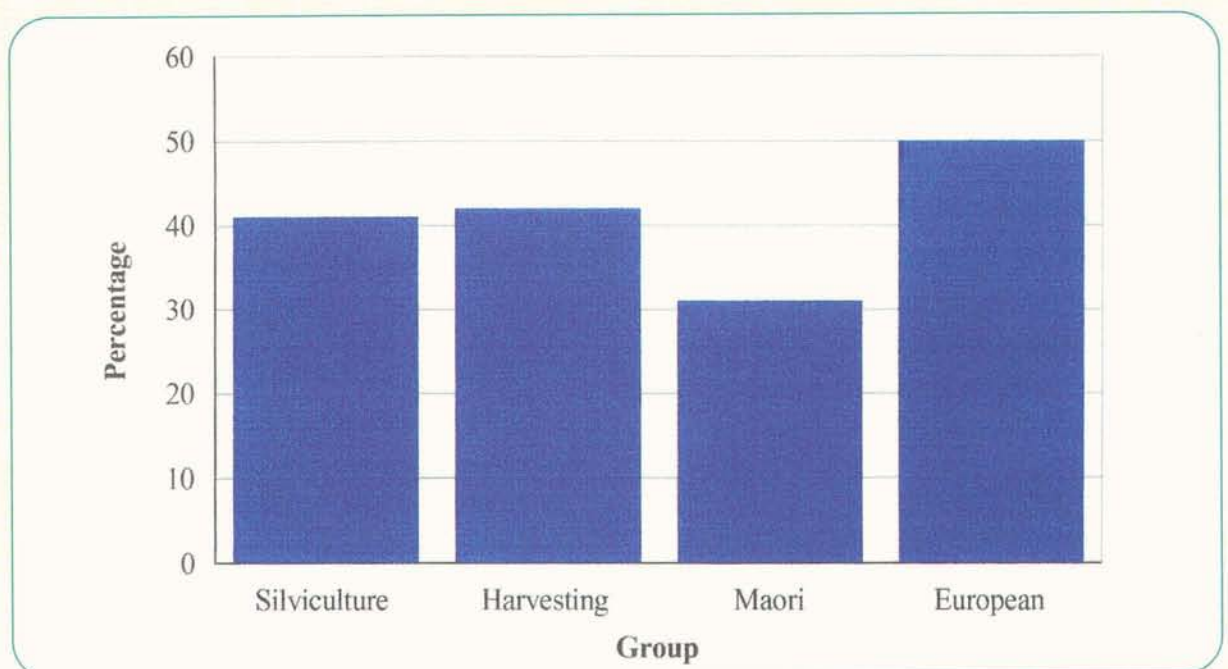


Figure 3 - Percentage of group with adult reading ability - sector and ethnicity



The International Adult Literacy Survey found 60% of employed Maori and 80% of unemployed Maori were below the minimum level of literacy competence (Workbase, 1999a). These findings support a theory that the needs of Maori are not being met by the current educational system (Brell, 1998, Cummins, 1999).

Statistical analysis revealed a difference in the distribution of Maori and European reading ability. Although overall fewer Maori had an adult reading ability, there were a greater number who could read at a level just under the adult level. In contrast, more Europeans had an adult reading ability, but those with reading ages less than adult were widely distributed across the range.



## Recommendations

### Strategic response

A strategic response by the forest industry is the best method to improve workplace literacy. This may take the form of further research, which investigates how well workers are understanding the material which is prepared for them. Alternatively, the Industry Training Organisation (ITO) could work with employer groups and forest companies to develop a strategy to lift skill levels in the industry. One way would be to develop literacy training interventions. Given the results from this study, it would be important to include Maori responsive interventions.

### Writing for beginner level readers (Summarised in Appendix 1)

Guidelines are available to assist the writer to prepare documentation for readers of beginner ability. The following outlines a selection of writing tools which should assist the reader to understand the information written.

#### 1 – Consider your target audience

To effectively reach the target audience, written material should be at a level which is easily understood by the vast majority of all forest workers. Lack of understanding of training information can lead to uninformed decisions being made during work. This could create problems, especially when the information missed relates to company instructions (safety, quality and productivity issues) or recommended

practices. It is also important to take time to plan the purpose and topic of the document prior to writing, taking the target audience into consideration (Kindler, 1994).

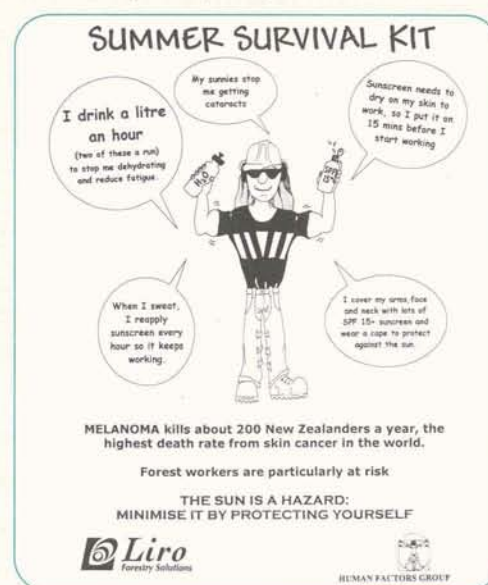


Figure 5 – Use cartoons to convey information

#### 2 – Use simple, single syllable words and short sentences, or a visual medium

Where readers are of a beginner reading level, words of mostly one syllable should be used to convey information. Short sentences with common words are more easily understood (McLeod and Anderson, 1972). However, this may lead to more words being used, and a longer final document. An alternative is to use a visual medium such as pictures, cartoons and diagrams (Figure 5). A visual medium can highlight and explain information, and add interest to text (Kindler, 1994). A visual medium is often used to convey information where language barriers may exist, such as on international road signage and safety symbols. Video is another medium frequently used to convey information.

#### 3 – Include a glossary for technical words

Where technical vocabulary is required for workplace performance, these words should be taught, rather than removed from written training material. Technical vocabulary is able to be read and understood by readers as long as a glossary of technical terms accompanies the text (Moore, 1999)

#### 4 – Consider alternative teaching techniques

An alternative teaching technique may need to be adopted for readers with reduced reading ability. One such method is to pre-record the material, for playback to a trainee during learning periods. This form of training needs to be followed up with a discussion period to ensure correct understanding.

#### 5 – Give thought to layout

Comprehension of written material can also be influenced by the layout of the information. In much the same way as a table



of contents informs the reader of what is likely to follow, a mind map or diagram can be used by the beginner reader to predict what is to come, thereby assisting comprehension. Introducing the material and showing how the document has been organised will help the reader to find important information (Kindler, 1994). Another tool to use when writing for beginner level readers is to make effective use of white space on a page by allocating generous margins and space between paragraphs. Placing fewer words on a page encourages the reader to focus on fewer words at a time (Fairbrother, 1999). Select a plain typeface such as Times New Roman or Helvetica for the body of the document as they are easier to read, and use a size which is large enough to read, usually 12, for documents (Kindler, 1994).

### 6 – Utilise computer software to check writing levels

The use of MS Word readability statistics enable the document to be checked for ease of reading, based upon the average number of words per sentence and the number of syllables per word. This may provide some guidance but should not be relied on, as the test does not allow for technical vocabulary (often multi-syllabic). Therefore, the readability test measures the text as more difficult (Moore, 1999).

## Summary

Results from this study indicate that a large proportion of forest industry workers do not have an adult level of reading ability. Consideration of the above factors when writing for the industry should lead to more effective communication and uptake of information within the forest industry. This will result in better utilisation of training resources and industry documentation. However, it is important that writing documentation at appropriate levels is seen as only a small part of a planned strategic response. It is also important to address ways of improving workforce skill levels, organisational structures and processes which can contribute to communication difficulties.



## References

- ARLA Workbase (1993): Literacy at work: An exploratory survey of literacy and basic education needs in the workplace. Adult Reading and Learning Assistance Federation Aotearoa New Zealand Inc.
- Brell, R. (1998): Education strategy for Maori: Update – Making education work for Maori. Education Gazette, 77, 5.
- Bridger, R.S. (1995): Introduction to ergonomics. McGraw-Hill, Inc.
- Byers, J. (1995): New Zealand Forest Owners' Association forestry workforce census 1994. Liro project report 57.
- Byers, J. and Adams, D. (1995): Otago/Southland forestry workforce 1993 – five years later. Liro project report 58.
- Cummins, T (1999): Are the needs of Maori being met by current industry training? New Zealand Journal of Forestry, 43, 4.
- Fairbrother, J. (1999): Pers. comm. Learning Support Tutor, Waiariki Institute of Technology, Rotorua
- Kindler, J. (1994): Working Words: A user's guide to written communication at work. Adult, Community and Further Education Board, Victoria.
- McLeod, J. and Anderson, J. (1972): GAPADOL Reading comprehension manual. Heinemann Publishers.
- Ministry of Education (1998): Adult Literacy in New Zealand – interim results from the International Adult Literacy Survey.
- Moore, L. (1999): Pers. Comm. Executive Director, Workbase – National Centre for Workplace Literacy and Language, New Zealand.
- Workbase (1999)a: Literacy skills and the New Zealand workforce. New data from the Adult Literacy Survey. Workbase, The National Centre for Workplace Literacy and Language.
- Workbase (1999)b: Workforce literacy –An economic imperative.

## Appendix 1

### Guidelines to writing documents for forestry workers

1. Use a clear, straightforward writing style
2. Use simple, single syllable words and short sentences
3. Consider the audience you are writing for
4. Use pictures and diagrams to add interest and to help explain information
5. Leave enough white space to make it look uncluttered
6. Include a glossary for technical words
7. Highlight important information in boxes or bold print
8. Use a plain typeface large enough to be easily read
9. Organise the document so the reader is helped to find important information
10. Start the information with a mind map or diagram summary to prepare the reader for what is to follow