

EXPECTED CHANGES IN FELLING TECHNIQUES FOR
NEW CROP TREES

BOY BIDDLE
TRAINING OFFICER
TASMAN FORESTRY
MURUPARA

LIRA PROJECT OUTLINE

1. INTRODUCTION

Development of safer and more efficient delimiting methods has been one of LIRA's major research projects. Much of this work has been led by John Gaskin (see bibliography for details of published work). While Gaskin was overseas in 1985, the writer was seconded from Tasman Forestry Ltd, Murupara, to carry out this work in new crop radiata pine using the work plan prepared by Gaskin.

This work plan proposed a three stage approach. Stage One involved a review of the felling literature and a survey of existing techniques. Stage Two suggested testing of the more promising techniques. Stage Three involved demonstrating the best techniques around New Zealand in conjunction with the LFITB.

2. FELLING SURVEY

The purpose of the survey was to obtain information on the present "state of the art" by studying fallers working in new crop radiata pine. After discussions with staff from the LFITB and the major industry organisations, seven forests were selected.

(i) SURVEY RESULTS

The seven exotic forests surveyed were; Matahina and Kinleith forests, Gwavas, Esk, Tairua and Golden Downs State Forests and Whakarewarewa State Forest Park.

Logging experience of the fallers averaged 11 years (range 4 to 30 years). Husqvarna 181's were the most popular chainsaw, but other sizes of Husqvarna and Stihl were also popular. The most common size of guide bar was 51 cm (20 inches). The sizes varied from 46 to 66 cm (18 to 26 inches).

Stand age averaged 35 years (range 25 to 45 years). Most new crop stands are expected to be in the 25 to 35 year range.

Stump diameters averaged 64 cm over the 180 trees assessed (range 30 to 111 cm), with 67% of them lying between 50 cm and 78 cm. These values are similar to those expected from new crop stands.

The main factors arising from the survey were the problems that some operators were experiencing in :

- (a) Matching top and bottom cut of scarf;
- (b) Estimating correct scarf angle;
- (c) Judging correct back cut height;
- (d) Judging correct hinge width;
- (e) Setting up trees to be driven;
- (f) Using inappropriate felling techniques (e.g. using long bar techniques on large trees while operating a chainsaw with a short bar);

Operators who had been exposed to formal training were generally more proficient and achieved better results, but some needed follow up to maintain their standards.

3. FELLING TRIALS

INTRODUCTION

Following analysis of the survey data, it was decided to undertake a series of felling trials that would allow the testing of factors (such as scarf angle, scarf depth, back cut height and hinge thickness) on butt damage. The results of these tests would lead to further development in testing felling techniques to minimise butt damage.

Felling trials were initially carried out in 40 year old radiata pine in Compartment 15, Whakarewarewa State Forest Park. This involved using carefully controlled felling techniques, maintaining the same scarf type, scarf angle and keeping scarf depth, back cut height and hinge thickness constant (as a proportion of diameter) as far as possible. The use of a small group of trees made some allowance for the tree-to-tree variation. It had originally been planned to try and match the trees, the diameter and lean in each group, but this proved impractical. Instead each tree was subjectively assessed for lean in two directions - side lean and forwards/back lean. This was expressed on a scale of 0 to 2, where :

- 0 = lean having little or no effect on falling;
- 1 = lean having some effect on falling (forward and side leaners);
- 2 = lean having a major effect on falling (forward and side leaners);
- 1 = lean having some effect on falling (back leaners);
- 2 = lean having a major effect on falling (back leaners).

This greatly assisted in identifying potential candidates for severe butt damage. Previously lean has only been noted in terms of its effect on the felling direction.

- (i) The first phase of the trials involved the testing of key factors. Those tested were the variables within conventional felling techniques.
 - (a) Scarf depth
 - (b) Scarf angle
 - (c) Back cut height
 - (d) Hinge thickness

- (ii) The second phase of the trials led to the testing of a wider range of treatments, and the development of the more promising techniques. This included testing :
 - (a) Scarf type
 - (b) Side cut type
 - (c) Under cut type
 - (d) Back cut type

- (iii) The third phase involved testing and refinement of the most promising techniques on a range of ages and sizes of trees with varying degrees of lean in different forests, and varying topography.

4. ANALYSIS OF FELLING TRIALS

A total of 290 trees on four forests were assessed after felling according to a prescribed method. This information is summarised in the following table.

TABLE 1 : FELLING TRIALS - FORESTS, STAND AGES AND NUMBERS OF TREES ASSESSED

<u>Forest</u>	<u>Stand Age (Years)</u>	<u>No. of Trees Tested</u>	<u>Purpose</u>
Whaka	40	70	Testing of key factors
Whaka	40	70	Testing of treatments and method development testing and refinement of most promising methods
Kinleith	33	64	Testing and refinement of most promising methods
Matahina	27	51	Testing and refinement of most promising methods
Rotoehu	29	28	Testing and refinement of most promising methods

(i) Effect of Scarf Type

Three scarf types were tested. These were conventional, Humbolt and Vee. Difference existed in the levels of draw wood achieved, but these were not statistically significant, partly due to the high degree of variability in the data.

(ii) Effect of Side Cuts

The use of side cuts was highly effective in reducing slabbing to minimal levels. The proportion of stumps that were free from slabbing increased from 56% to 97% in trees that had been side cut on both sides. They also achieved a lower mean value of draw wood, although this was not statistically significant. It is considered that this result was mainly due to the side cut trees not having any heavy leaners.

(iii) Effect of Under Cuts

A comparison was made between the two types of side cuts and under cuts, where a horizontal cut is made about 10 cm below the hinge and to a depth of approximately 15 cm on each side of the tree. Similar values were achieved from draw wood with all three types, but there was a much higher incidence of slabbing in the under cut trees with 67% of these trees having slab wood exceeding 10 cm in length.

(iv) Effect of One Side Cut and Three Vertical Under Cuts

This combination was tested on heavy side leaners and was highly effective in reducing potentially high slab wood into three lesser pieces.

Method

One horizontal side cut on the compression side of the tree.

Three vertical under cuts on the tension side of the tree, directly beneath the hinge about 4 cm apart, to a depth of 25% of the diameter.

(v) Back Cut Types

Conventional Back Cuts

Long guide bar felling techniques

- (a) Cut from the back up to hingewood width.
- (b) Quarter the far side, then cut from the back up to hingewood width.

Alternative Back Cuts

Short guide bar felling techniques

- (a) 3/4 bore
- (b) Face bore and 3/4 bore
- (c) 2 stage
- (d) 2 stage split level
- (e) Bore and back
- (f) Bore and back then release from the back.

5. CONCLUSIONS

(i) Normal Trees

This group on a whole required a minimum of treatment, basic practice generally returned good to excellent results, but if slabbing was a problem it was usually solved by the application of side cuts.

(ii) Problem Trees

Back leaners
Heavy forward leaners
Heavy side leaners
Heavy forward and side

The full range of treatments and alternative felling methods were required to help minimise the incidence of butt damage in these groups with encouraging results.

6. RECOMMENDATIONS

(i) Basics of Felling

The introduction of training techniques to assist the faller in achieving the basics of felling.

- Correct scarf - matching top and bottom cut
- Correct back cut height
- Correct hingewood width
- Safely executed.

(ii) Advanced Felling Techniques

To be introduced to the fallers who have mastered the basics. These treatments and techniques would include :

- Scarf types
- Side cut types
- Under cut types
- Back cut types

(iii) Working Group

Set up a committee from members of industry to pursue the following subjects :

- (a) Terminology
 - standardise terms for felling techniques
- (b) Lean assessment
 - method
- (c) Tree stability
 - further measurements
- (d) Felling techniques
 - further testing and refinement
- (e) Extension
 - side commentary presentation
- (f) Field demonstration