

CONSTRAINTS ON SMALLWOOD HARVESTING

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Introduction

Before effective research and development can be undertaken there is a need for a complete understanding of the problem faced. Major constraints that influence the problem must be identified. Some constraints have more influence or control on a problem than others, and research efforts need to be concentrated on these areas where the biggest gains can be made. It is recognised that some major constraints may not be rewarding research fields but it is still important to identify all constraints and their degree of influence.

LIRA's smallwood harvesting working group felt it was necessary to identify these major constraints on smallwood harvesting. At a meeting 34 constraints, broken into seven groupings, were identified. The group recommended a survey covering the New Zealand industry as a means of isolating the more crucial constraints. The first goal of the survey was to identify whether the constraint was regional or universal to the industry. Next, the survey asked whether the constraint was considered to be major or minor in influence. Once all the major constraints were identified, the industry representative was then asked to rank the major constraints in order of priority (1, 2, 3, ...). The survey was sent to 25 people from a variety of backgrounds, including forest managers, logging managers, contractors, work study people, and researchers.

Smallwood, for the purposes of the survey, was defined as 'wood arising from thinnings, clearfell of small trees, and logging residues from clearfell of old crop radiata'.

The Survey

Seven constraint groupings were identified, each group containing 3-7 constraints. The groups and constraints contained are explained below.

1. Market Conditions

This group contained constraints controlled by markets, such as :

- fluctuating markets for smallwood arising from changing mill demands and post markets;
- lack of market for smallwood in some regions due to no outlet for pulp and limited post markets;
- the low value of smallwood resulting from the high harvesting cost;
- the effects of strikes and mill maintenance shuts on the harvesting operation.

## 2. Silviculture

This area dealt with the overall forest control on harvesting, covering :

- the loss in final crop quality and growth caused by soil compaction and residual tree damage occurring during harvest;
- the effect of thinnings on the wind firmness of the stand and the effect of residual stocking levels on the harvesting operation;
- landings and roads for thinnings take land out of production.

## 3. Harvesting

These constraints deal with the day to day harvest, controlling factors like :

- the small tree size requiring more trees per cubic metre and the problem of load accumulation to optimise machine utilisation;
- the heavily branched and malformed growth of radiata pine and the high delimiting effort required;
- the safety hazard associated with delimiting;
- low volumes per hectare removed in thinnings and the long haul distances required to extract these volumes.

## 4. Product Handling

This covered the problems of handling smallwood once delivered to the landing, such as :

- problems loading smallwood and transporting it on truck or rail;
- the restrictions the mill place on product dimensions (length and diameter);
- the high delimiting standard required by most mills.

## 5. Physical Site Factors

This area identified the restrictions the harvesting site placed on logging operations, like :

- terrain factors with regard to brokenness of terrain and steepness of slope;
- the ground conditions and their effect on machine ability to work under different climatic conditions;
- the effect the soil may have on processing of final product (sand and mud).

## 6. Labour

As we are most aware, labour can be the controlling factor in any business operation. Some of the constraints identified were :

- the availability, cost and high turnover of the workforce;
- the quality of labour required and the training needed to achieve this skill level;

- the work content with regard to high physical requirements and often the monotony of work.

### 7. Business of Logging

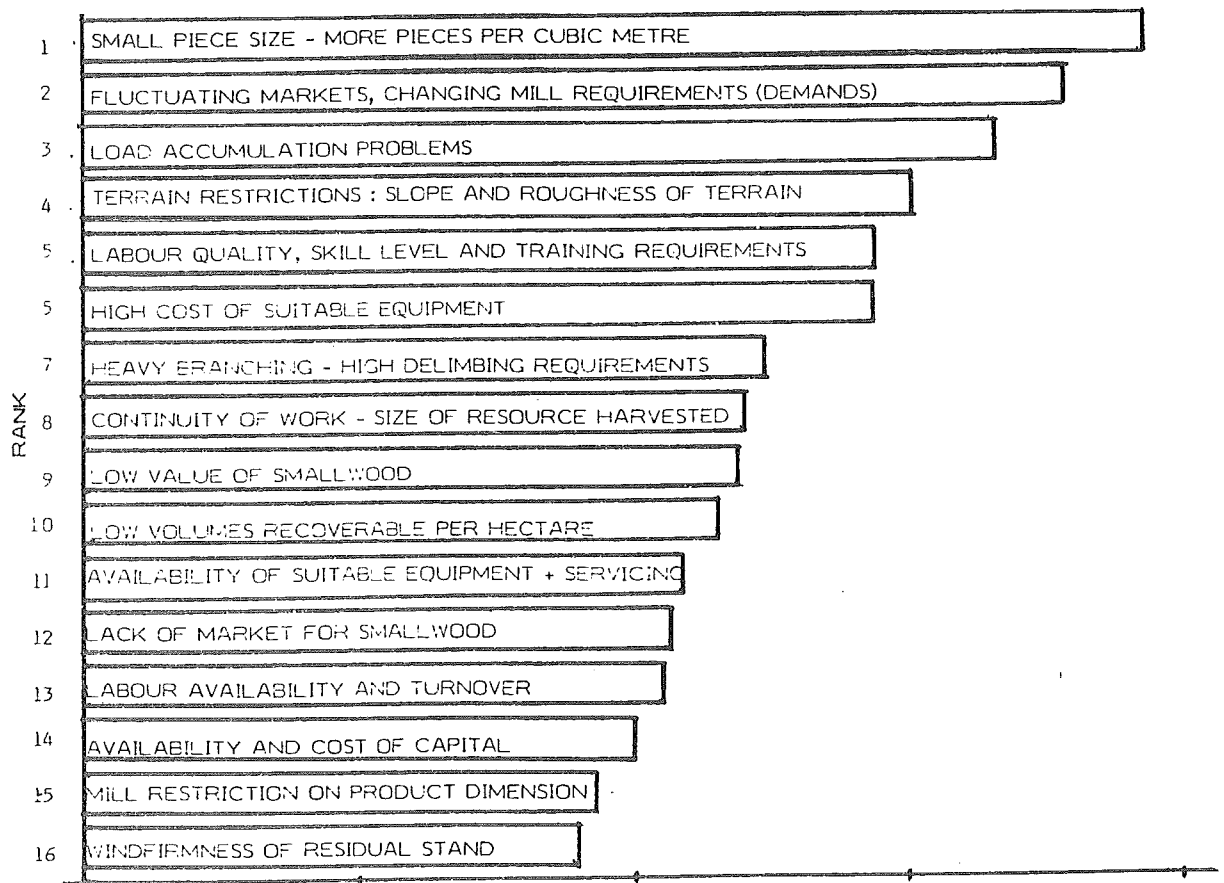
These constraints are not unique to smallwood harvesting, but they do play a major role and include such things as :

- the high cost and availability of suitable equipment and servicing backup;
- the size of resource and continuity of work for harvesting systems specific to that resource;
- the terms and uncertainty of logging contracts;
- the high cost and availability of finance;
- the restrictions to contractor innovation due to rate adjustments.

### Results of the Survey

Twenty-three of the 25 people surveyed responded and LIRA would like to thank them for their assistance. Although ranking the constraints was difficult, some definite trends did show up (survey and complete results are shown in Appendix 1). Of the 34 constraints, 16 were identified as being major constraints on smallwood harvesting. The rankings of the major constraints are shown in Graph 1.

Graph 1 - Ranking of Smallwood Harvesting Constraints



## Discussion

By ranking constraints it is hoped that research efforts can be directed towards problems that are considered most critical. The following discusses the major constraint groups identified and makes suggestions of areas for future research.

Most people surveyed felt that the harvesting group had the major constraints. This indicates a need for research into overcoming these problems associated with small pieces, load accumulation, low volumes per hectare, and the delimiting requirements. It would appear research in these areas, particularly in load accumulation and delimiting, could make greatest gains in smallwood harvesting.

The next highest importance was market conditions. Smallwood's low value and fluctuating or complete lack of markets being the main constraints. The only way research efforts could improve this would be in reducing harvesting costs and therefore increasing value of smallwood, or to develop new markets for smallwood, such as energy wood.

The physical site factors, particularly steep country, were identified as the next most important. With a projected increase of forests on steep country there will be a need for research to improve system productivity and reduce overall harvesting costs on such difficult terrain.

With regard to business of logging constraints, there is little that research can do to reduce the cost of equipment and finance. Research can provide tools in the form of handbooks or courses to help contractors understand these constraints and by controlling costs help to improve their profitability. Research can also outline the needs and concepts for new machinery that is better suited for smallwood harvesting. Care must be taken so that machines are versatile enough to ensure continuity of work.

Labour constraints can only be overcome by good training. Research efforts should be aimed to develop better and safer techniques, but it is the training organisations that must implement these techniques in the field.

Mill constraints on product dimensions are fixed because the opportunity for redesigning mills is limited, but communication and understanding between the mill manager and logging manager can help. Each must be made aware of the added cost associated with keeping each other satisfied. New mills or major expansions should be designed with logging systems and type of wood produced in mind. Research should be aimed at identifying the cost benefit trade-off between the bush and mill constraints with regard to product dimensions.

The last constraint identified was the effect of harvesting on wind firmness of the stand. Past windthrows have forced research in this area and resulting are different site preparation techniques, planting orientations, and alteration to thinning regimes. All aim to improve wind firmness of the stand. Research is continuing in this area.

## Conclusions

It is crucial to understand the constraint on smallwood harvesting

so that research can be focused on areas where it will have the greatest effect. The areas highlighted by the survey, that require immediate attention, are :

1. Load accumulation problems associated with small tree size.
2. High delimiting requirements.
3. Systems for harvesting steep terrain.
4. The need for training to improve the workforce's skill levels.

Research cannot solve all problems, but it can highlight and explain constraints so that people can make decisions that will minimise the impact of these restrictions.

CONSTRAINTS ON SMALLWOOD HARVESTING QUESTIONNAIRE

Column A : U = Universal; R - Regional or local.  
 B : Ma = Major; Mi = Minor.  
 C : Rankings, 1, 2, 3, .....

A B C

1. Market Conditions :

- |          |           |            |  |
|----------|-----------|------------|--|
| <u>U</u> | <u>Ma</u> | <u>2</u>   | (a) Fluctuating markets for smallwood, changing mill demands.  |
| <u>R</u> | <u>Ma</u> | <u>12</u>  | (b) No market available for smallwood in some regions, outlets have not been developed yet except for posts. |
| <u>U</u> | <u>Ma</u> | <u>9</u>   | (c) Low value of smallwood due to high harvesting costs.   |
| <u>U</u> | <u>Mi</u> | <u>   </u> | (d) Union strikes at mill disrupt harvesting operations.   |

2. Silviculture :

- |          |           |            |   |
|----------|-----------|------------|---|
| <u>U</u> | <u>Mi</u> | <u>   </u> | (a) Damage to residual standing trees.          |
| <u>R</u> | <u>Mi</u> | <u>   </u> | (b) Site damage due to compaction.              |
| <u>U</u> | <u>Mi</u> | <u>   </u> | (c) Landings used take land out of production.  |
| <u>U</u> | <u>Ma</u> | <u>16</u>  | (d) Effects on wind firmness of residual stand. |
| <u>U</u> | <u>Mi</u> | <u>   </u> | (e) Residual stocking levels.                   |
| <u>U</u> | <u>Mi</u> | <u>   </u> | (f) Loss on final crop increment.               |

3. Harvesting :

- |          |           |            |  |
|----------|-----------|------------|--|
| <u>U</u> | <u>Ma</u> | <u>1</u>   | (a) Small piece sizes - more pieces per cubic metre. |
| <u>U</u> | <u>Ma</u> | <u>3</u>   | (b) Load accumulation problems.                      |
| <u>R</u> | <u>Ma</u> | <u>7</u>   | (c) Heavily branched, high delimiting required.      |
| <u>U</u> | <u>Mi</u> | <u>   </u> | (d) Safety factors with regard to delimiting.        |
| <u>R</u> | <u>Mi</u> | <u>   </u> | (e) Malformation of trees to be removed.             |
| <u>U</u> | <u>Ma</u> | <u>10</u>  | (f) Low volumes recoverable per hectare.             |
| <u>U</u> | <u>Mi</u> | <u>   </u> | (g) Long haul distances.                             |

4. Product Handling :

- |          |           |            |  |
|----------|-----------|------------|--|
| <u>U</u> | <u>Mi</u> | <u>   </u> | (a) Loading.                                 |
| <u>R</u> | <u>Mi</u> | <u>   </u> | (b) Trucking, Railing.                       |
| <u>R</u> | <u>Ma</u> | <u>15</u>  | (c) Mill restrictions to product dimensions. |
| <u>R</u> | <u>Mi</u> | <u>   </u> | (d) Delimiting standards required by mill.   |

5. Physical Site Factors :

- |          |           |            |   |
|----------|-----------|------------|---|
| <u>R</u> | <u>Ma</u> | <u>4</u>   | (a) Terrain : steep slopes and brokenness of terrain.                               |
| <u>R</u> | <u>Mi</u> | <u>   </u> | (b) Ground conditions : effect on working conditions and susceptibility to erosion. |
| <u>R</u> | <u>Mi</u> | <u>   </u> | (c) Soil effects on product : sand, mud, pumice.                                    |

6. Labour :

<u>R</u>	<u>Ma</u>	<u>13</u>
<u>U</u>	<u>Ma</u>	<u>5</u>
<u>U</u>	<u>Mi</u>	<u>   </u>
<u>U</u>	<u>Mi</u>	<u>   </u>

- (a) Availability, turnover.
- (b) Quality of labour, training requirements, skill levels.
- (c) Cost of labour.
- (d) Work content : monotony of work.

7. Business of Logging :

<u>R</u>	<u>Ma</u>	<u>11</u>
<u>U</u>	<u>Ma</u>	<u>5</u>
<u>U</u>	<u>Ma</u>	<u>14</u>
<u>R</u>	<u>Ma</u>	<u>8</u>
<u>R</u>	<u>Mi</u>	<u>   </u>
<u>R</u>	<u>Mi</u>	<u>   </u>

- (a) Availability of suitable equipment, R&M servicing backup.
- (b) High cost of equipment.
- (c) Availability of finance - cost of capital.
- (d) Continuity of work - size of resource to be harvested under contract.
- (e) Contract uncertainty, term of contract.
- (f) Restriction to contractor innovation - "rate adjustment" syndrome.

