An Ergonomics Analysis of Manual versus Chainsaw High Ladder Pruning of *Pinus radiata* in New Zealand

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Abstract:

Two methods of ladder pruning *Pinus radiata* from 4.5 - 6.0 metres were compared using a cost-benefit approach within a framework provided by ergonomics. Chainsaw pruning is practiced in areas of New Zealand where large branches occur.

The objectives of the research were to compare the costs and benefits of the two pruning techniques and provide recommendations as to whether or not the practice of chainsaw pruning should continue. These objectives were achieved by comparing the risk of injury, the physiological costs, the musculoskeletal costs, the productivity and the quality associated with the use of the two techniques.

The general methods used to assess the relative costs and benefits of the two techniques were:

1. Numeric descriptions of the 'risk' involved with each method of pruning
2. The use of a relative heart rate index to compare the physiological costs of the two techniques
3. Using questionnaires focusing on musculoskeletal pain and discomfort to assess any relative differences between the two techniques
4. Using continuous time study to quantify any difference in labour productivity between the two techniques
5. Sampling pruned trees to assess differences in the quality of work between manual and chainsaw pruning

The research concludes that although both methods of pruning are hazardous, chainsaw pruning is more hazardous than manual pruning. Chainsaw and manual pruning were found to have the same physiological costs. Findings of the research indicate that manual pruning is not associated with a higher prevalence of musculoskeletal discomfort than chainsaw pruning on a yearly basis, although it is associated with a greater relative increase in BPD on a day to day basis and that this may lead to the development of musculoskeletal disease. Chainsaw pruning was found to be significantly more productive than manual pruning, although this was at the cost of quality.

The research concludes by recommending that the use of chainsaw pruning should be limited to areas where the branches are demonstrably large. Further research is called for to compare the physiological and musculoskeletal costs of manual pruning in plantation areas of both large and small branch sizes. Further research is called for to compare the safety of two methods of chainsaw pruning with the use of the technique of wrapping one leg around the tree as opposed to not wrapping the leg around the tree. Research to investigate new ladder designs which are safer to use in the New Zealand forest environment is also called for.

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