

PRUNING DOUGLAS FIR

INTRODUCTION

Recent increases in value of Douglas fir has sparked interest in pruning of this species. Douglas fir is "self-pruning", but this natural action occurs too late to give the desired amount of clear wood. To keep DOS in the 15 cm range, trees must be first pruned when they are no larger than 10 to 12 cm DBH. Although Douglas fir has been pruned in the past, records are limited. Production standards generated by the New Zealand Forest Service were not developed under piece rate conditions and were generally for larger trees than are now being considered for pruning.

LIRO recently completed a study to determine productivity of pruning Douglas fir, and to evaluate the physical workload involved, as indicated by the heart rates of the pruners.

STUDY CONDITIONS

Pruning was conducted in a ten-year old plantation in Kaingaroa Forest Compartment 96. Ground slope was negligible and hindrance levels were low. LIRO studied first lift pruning to 2 metres, and simulated a second lift to 3.8 metres by working in a block that had just been pruned to the first lift. DBHs of the pruned trees averaged 13 cm in the first lift and 15 cm in the second lift block. Stand densities averaged 1100 trees per hectare, of which 300 were to be pruned.

The gang was experienced with radiata pine but had not worked with Douglas fir. They spent one week in the stand testing pruning tools and adapting their techniques. Modified Hit shears and relatively light Wilkinson shears were tried. The blades on the Wilkinson shears

broke frequently because the branches, although smaller than those on radiata, were harder. The crew decided to stick with the modified Hit shears normally used in radiata. An epicormic knife was used to cut small dead branches, which were too flexible and tough to be knocked off. An aluminium ladder was used during the second lift.

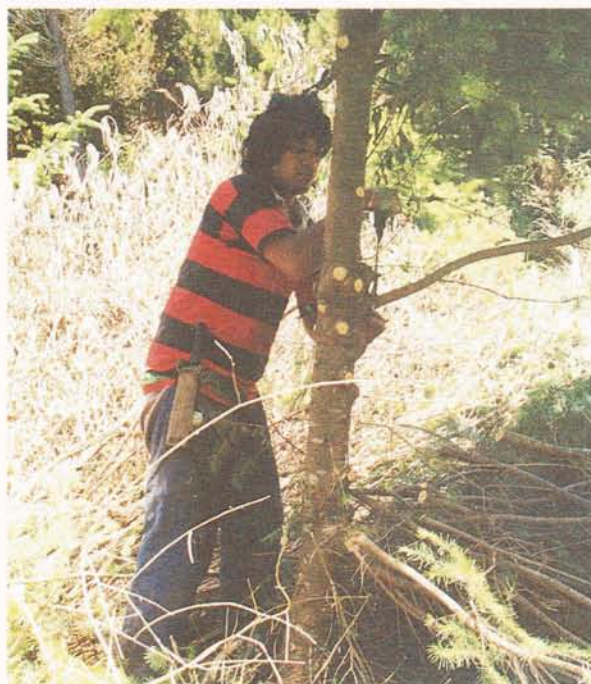


Figure 1 - First lift pruning

RESULTS

In the first lift, the pruners averaged approximately 20 trees per productive hour. (There are roughly six productive hours in an eight hour day.) Several factors contributed to the low production rate. Because of the bushy Douglas fir canopies, the gang spent more time selecting trees. Branches were smaller than on radiata (the largest were 4 cm in diameter, although some 8 cm double leaders were removed), but there were more of them: on

average, over 50 branches per tree were cut with the shears and 20 small dead branches were removed with the epicormic knife. One-third of the time per tree was spent removing the small dead branches.

Second lift pruning was considerably faster, averaging over 30 trees per hour. There were fewer branches than on the first lift (40 large and 10 small dead); they were usually in well-defined whorls and the epicormic knife was used only sparingly.

Heart rate data was collected on one pruner during both lifts, under similar time-of-day and temperature conditions. Figure 3 shows a trace recorded during the second lift. The average heart rate was higher during the second lift (126 beats per minute versus 114 for the first lift), indicating a higher physiological workload. This was probably due to the extra lifting of the arms above the head and added work of the legs while one was wrapped around the tree. By international standards, both lifts are classified as "heavy" workloads.

The crew preferred pruning radiata over Douglas fir. Fir branches were distributed over the pruned length rather than in whorls, which made it more difficult to cut an opening to

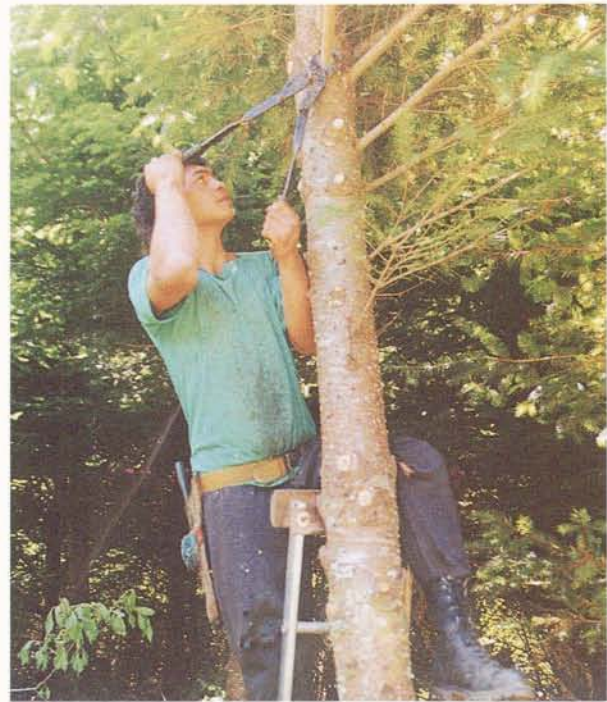


Figure 2 - Second lift pruning

reach the trunk. Extra care was needed to avoid damaging the branch collars, which protruded further from the trunk than on radiata. The dense fir crowns made it more difficult to select trees and obtain desired spacing. High variability in numbers of pruned trees on quality control plots meant that more trees on average had to be pruned to ensure that the minimum stocking standard was met.

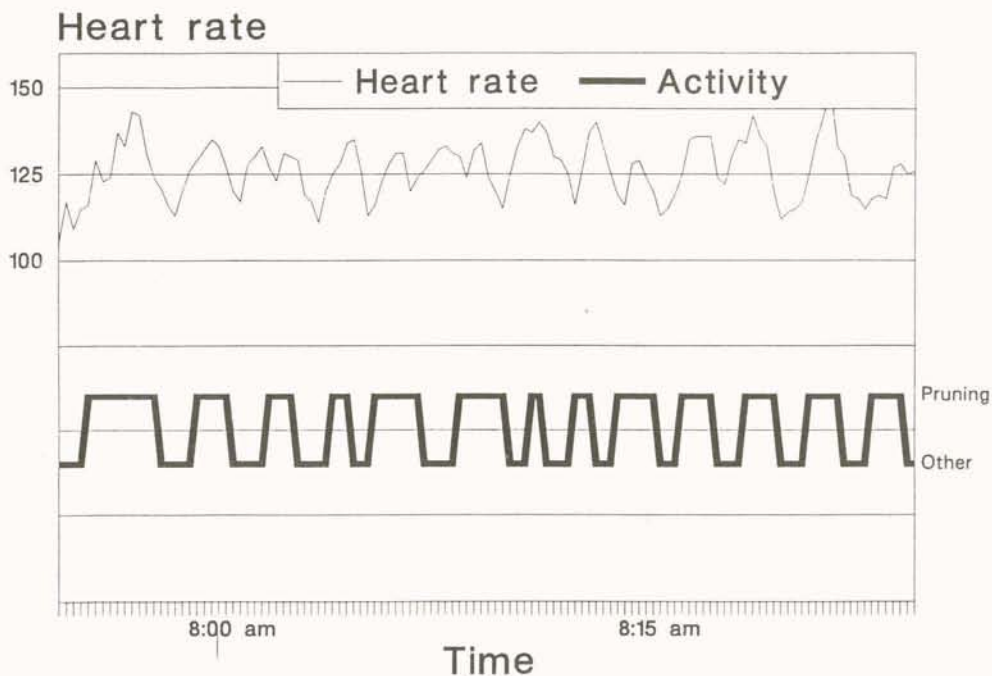


Figure 3 - Typical heart rate trace for second lift pruning