SESSION 4

Paper (a)

FACTORS AFFECTING THE PERFORMANCE AND PRODUCTIVITY OF TRACTORS AND TRACKED SKIDDERS

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INTRODUCTION:

During the 1979-1980 Financial Year the first crop operations in the NZFP Bay of Plenty Region Matahina forest ceased.

Prior to the first crop logging ceasing, it became apparent to myself, and other NZFP staff, that with the commencement of full scale second crop logging operations in Matahina forest, that the current first crop logging equipment in use, would not be viable because of the following:

1.1 Expected decrease in piece size per stem and a younger clearfell regime. 50+ ——→35 years.

1.2 Increase labour content in trimming and felling.

1.3 Lower Vol/Ha as a result of 1.1.

1.4 There was a need to replace a current logging machine.

1.5 Topography in Matahina is 20^{o}+ slopes on 65% of the total area, and while first crop logging of age 50 years and above was alright with tractors, it was felt that small diameter timber would be more costly to produce.

The above points were discussed and it was decided to set up an evaluation committee to assess, study and determine the most suitable equipment for second crop logging operations in Matahina forest.

During the period of June 1980 to February 1981 six machines were trialled. The studies indicated that the replacement of present equipment with similar equipment would be a poor choice due to
- High wood cost
- Poor matching of machine size to piece size
- Lack of production achieved.

The most useful machines studied were the FMC tracked skidder, Tree farmer C8, Komatsu D65 and a Caterpillar D7.

The FMC tracked skidder stood out as being the most effective machine, due to the following:

2.1 High production capability.

2.2 Medium wood cost.

2.3 Ability to climb steep slopes.

2.4 Reduction in environmental damage, i.e. no tracking would be required, low ground pressure.

2.5 Reduction in dump requirements, i.e. because of the high speed of the FMC, longer haul distances could be used

without a marked reduction in production or conversely an increase in wood costs as a result of the longer haul distances. However an optimum distance that suited our requirements in Matahina Logging operations was set.

The following table gives an indication of the results of the evaluation:

Table 1:

Machine	Good Features	Adverse Features
FMC 220	Very good production figures Low wood cost Few operational limitations Moderate purchase price Minimal environmental damage Good roadline salvage machine	Possibly higher track wear than tractors Cannot form its own dumps
Back up Service	Unknown	
Safety	Very good	
Treefarmer C8	Good production figures Low wood cost Low purchase price	Limited climbing ability Allows potentially unsafe operation Cannot form its own dumps
Back up Service	Good	
Safety	Poor	
Caterpillar D7	Good production figures Cab layout and controls were ergonomically the best of tractors studied	Too big for second crop Must track its way up steep slopes The most expensive machine considered
Back up Service	Very good	
Safety	Very good	
Komatsu D85	Fair production figures Good earth pushing machine	Too big for second crop Slower than the Cat. D7 Must track up steep slopes Highest wood cost
Back up Service	Very good	
Safety	Very good	

Table 1 Cont'd ...

Machine	Good Features	Adverse Features
Komatsu D65	Good production figures	Must track up steep hills
	Machine well matched to the tree size	Ergonomically fair
	Adequate for roading and dumping	
	Moderate purchase price	
	Average wood cost	
Back up Service	Very good	
Safety	Very good	
Fiat Allis 14C	Good production figures	Poor mechanical design
	Machine well matched to second crop tree size	Ergonomically fair
	Hydraulic tilt blade option worked very well for roading, dump work and logging	
	Tracks up steep hills better than Cat. D7 or Komatsu D85 because of tilt blade	
	Moderate price	
	Average wood cost	
	Machine could track across a steep slope to logs	
Back up Service	Unknown	
Safety	Good	

As a result of the evaluations, further studies were carried out with an FMC tracked skidder. This involved a more complex cost analysis on the R & M of the machine, especially the track gear, detailed analysis of the expected clearfell method to be used in conjunction with an FMC, manning levels, wood costs, WBM sawlog requirement demands on a long term basis, and the potential of an FMC to meet these demands.

As a result of the analysis of the data that was collected an FMC was purchased and introduced into the Matahina second crop clearfell operations in August 1981.

The current D7 was retained as a backup logging machine, but was to be used primarily as a road and dump formation salvage, firebreak clearing, and land preparation (planting) machine.

After the initial operator familiarisation period and the change in gang operating procedures, the FMC began to produce at the expected levels of production, as detailed in our analysis prior to purchase.

However we were made very aware of the high R & M costs at an early stage. This related to excessive track wear which to staff at Matahina seemed too high, even for an FMC. We put the problem to the machines' importers, who discovered that the drive sprockets were the wrong type for the particular tracks. They were replaced free of charge. We experienced problems with the motor, differential transmission, and rear idler bearings which led to long periods of downtime. Downtime which I feel could have been reduced significantly if better organisation between ourselves and Hughes & Cossar in the ordering of parts, had been studied more closely.

We made attempts to reduce wear and tear by using one haul path for high speed logging, i.e. when the FMC went from the main haul path, to the break-out point low gear and subsequently low speeds were used.

The main haul path was not cleared of stumps etc., but the operator familiarised himself with the haul path very quickly and was able to use high speeds loaded to the skids without shock loading the track gear, or the machine through hitting stumps and other debris.

There were several modifications made to the machine, modifications that suited Matahina requirements, an example being 1" steel plate being welded to the arch frame to prevent the heads of trees hitting the hydraulic resovior etc.

The steep terrain in Matahina precluded the logging of trees by butt pulling, in about 70% of the areas logged by the FMC. We attempted to butt pull from the ridges, but found that there was a significant drop in production, as compared to the FMC climbing the hills to the heads of the trees. We were able to get to approximately 95% of those trees on steep slopes.

During periods of downtime by the FMC the D7 Caterpillar was used by the NZFP clearfell crew. The loss of production was supplemented by the engaging of a contractor. In the last 18 months of the four year period that the FMC was used in Matahina, a contract crew was engaged fulltime. This was due to a reduction in the NZFP manning levels in our crew, and the lengthier downtime period's we were experiencing with the FMC.

I am convinced however that with our particular problems associated with terrain, geological conditions (Tarawera ash especially) piece size etc., FMC tracked skidder's are still more viable logging proposition than tractors, or rubber tyred skidders. I consider that for the four years the FMC operated in Matahina forest, it was a period of learning, from the first day of operation until it was withdrawn from service.

If a possibility of purchase of another FMC was considered for our operations, I would have no hesitation in recommending its purchase. I believe that with the knowledge and experience gained another FMC in our operations would perform above the levels we had experienced.

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