



# REPORT

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## MODIFICATION OF AGRICULTURAL TRACTORS FOR LOGGING

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### INTRODUCTION

Agricultural tractors, modified for logging, could be suitable for many small-wood operations in New Zealand. Not only are they a relatively low cost prime mover, but they are available in a range of sizes and prices. A modified tractor can enable a contractor to commence logging on easy terrain in smallwood and farm woodlots, initially with lower capital outlay than if a small skidder was purchased.

If thought is given to the modifications, then the tractor can easily be converted back to its standard form at the end of its useful logging life. With a coat of paint, it can be sold again, and the accessories transferred to another tractor, or sold also.

To investigate their potential in the logging industry, LIRA recently completed a nationwide survey of modified agricultural tractors. Currently 15 units have been modified to basic skidder level, around 55 have lesser modifications, and numerous others are involved in part-time extraction operations.

This report summarises the findings of the survey and gives guidelines for the selection and modification of an agricultural tractor for logging. The resulting unit will reflect individual preference and be dependent upon availability of components, and on the budget. Most tractors are in the 45 to 70 kW (60-90 hp), four-wheel-drive range. In this size range they have enough power, ground clearance, and robust enough construction to cope with the rigors of a logging environment, yet are still small enough to fit between rows or trees.

### ACKNOWLEDGEMENTS

*LIRA acknowledges with thanks all those who contributed information for this survey.*

### MODIFICATIONS

There are four essential factors to consider when contemplating modifying an agricultural tractor:

1. tractor selection
2. winch and sub-frame
3. safety canopy
4. overall mechanical protection and blade

Diagrams of these suggested modifications are shown in Figures 1 - 4.

When selecting a tractor, consideration must also be given to ease of service, parts availability, and location of nearest service agent.

NOTE: The transmission of a tractor with a de-rated motor will last longer. as it is unlikely to be overstressed.

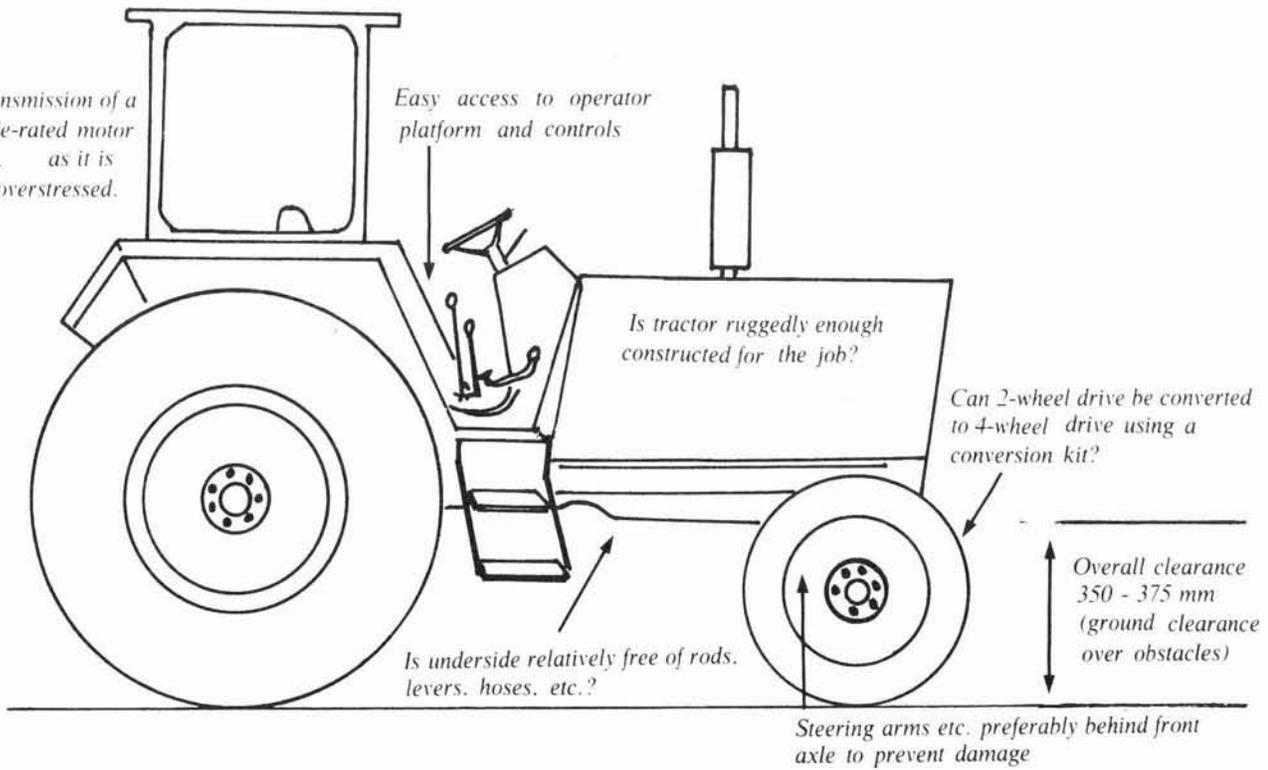


FIGURE 1 — BASIC TRACTOR SELECTION

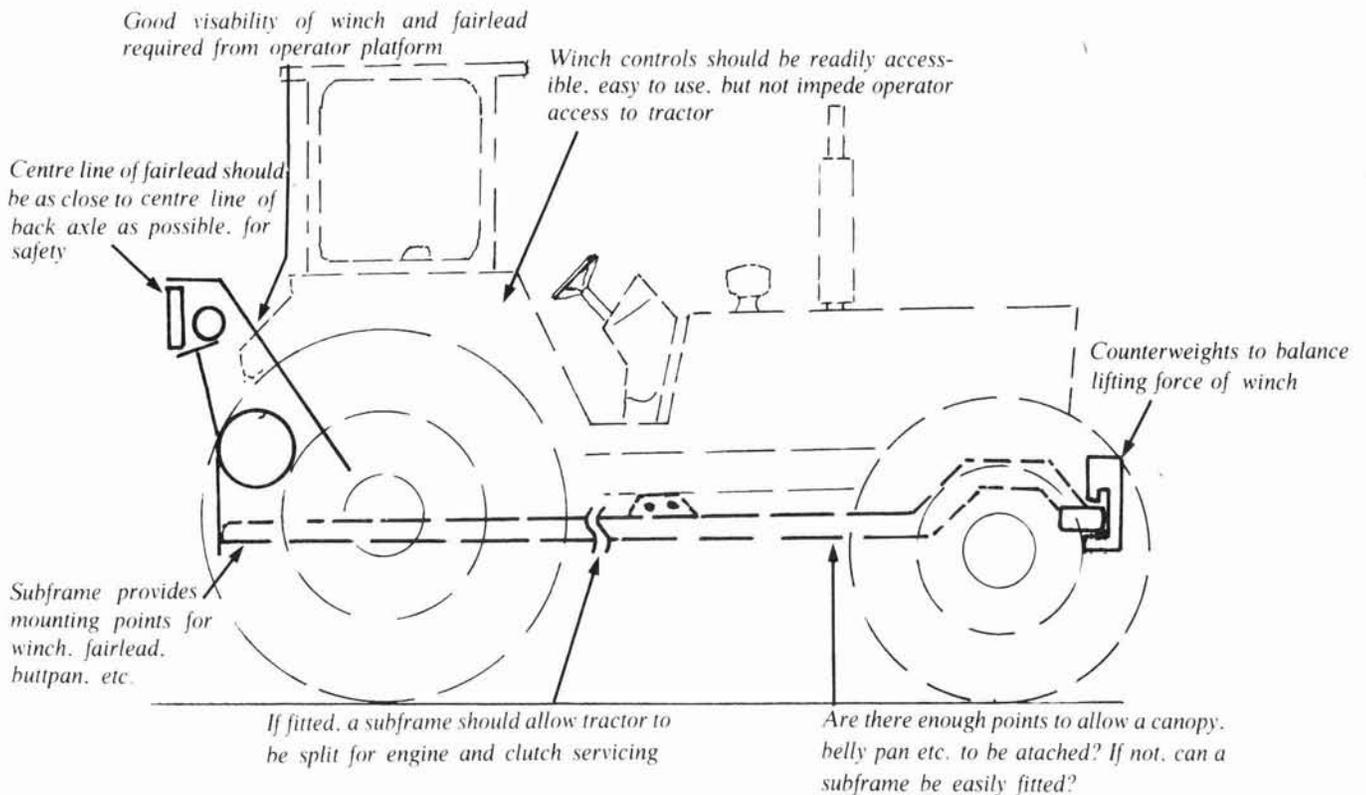


FIGURE 2 — WINCH AND SUBFRAME

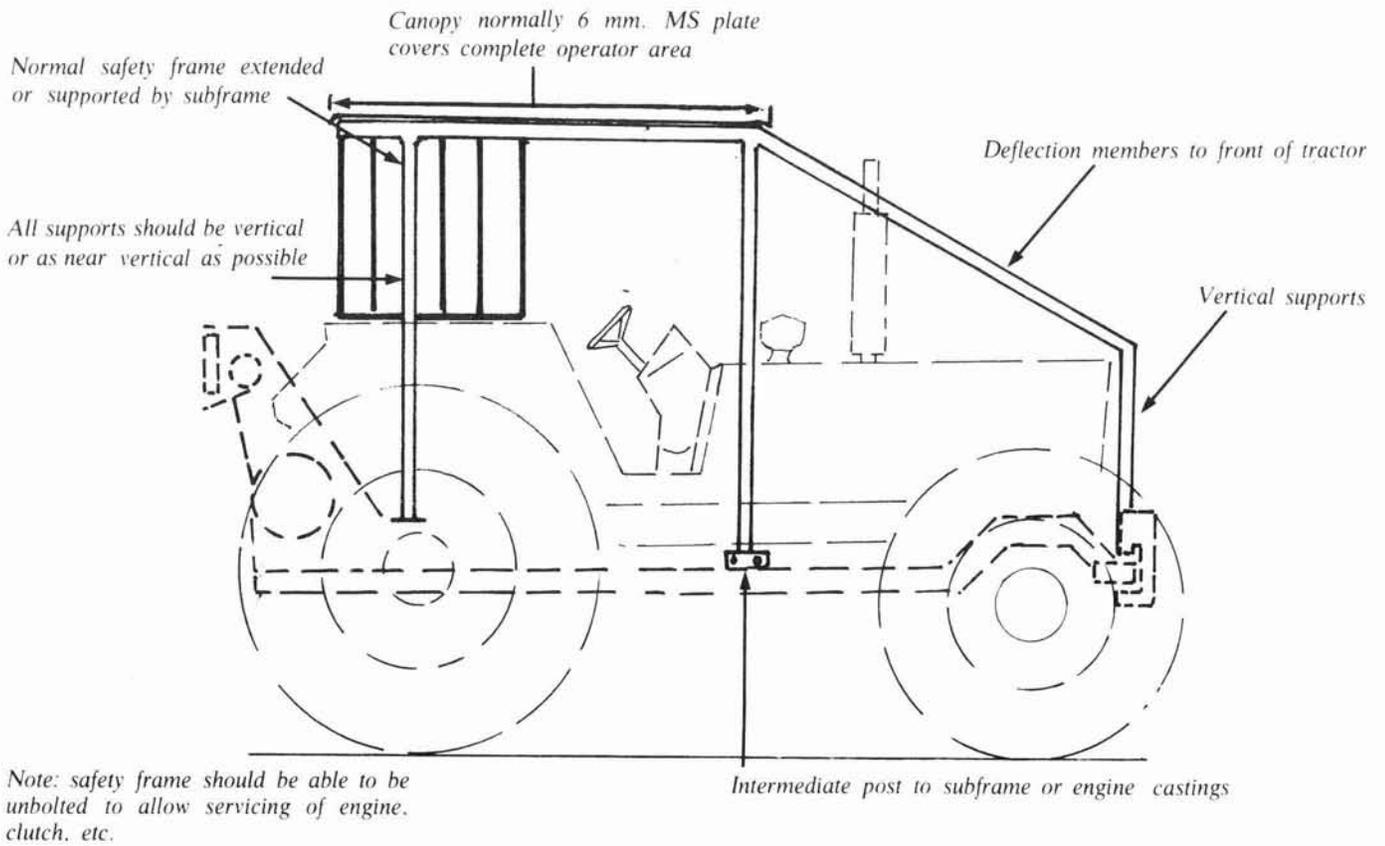


FIGURE 3 — SAFETY FRAME AND CANOPY

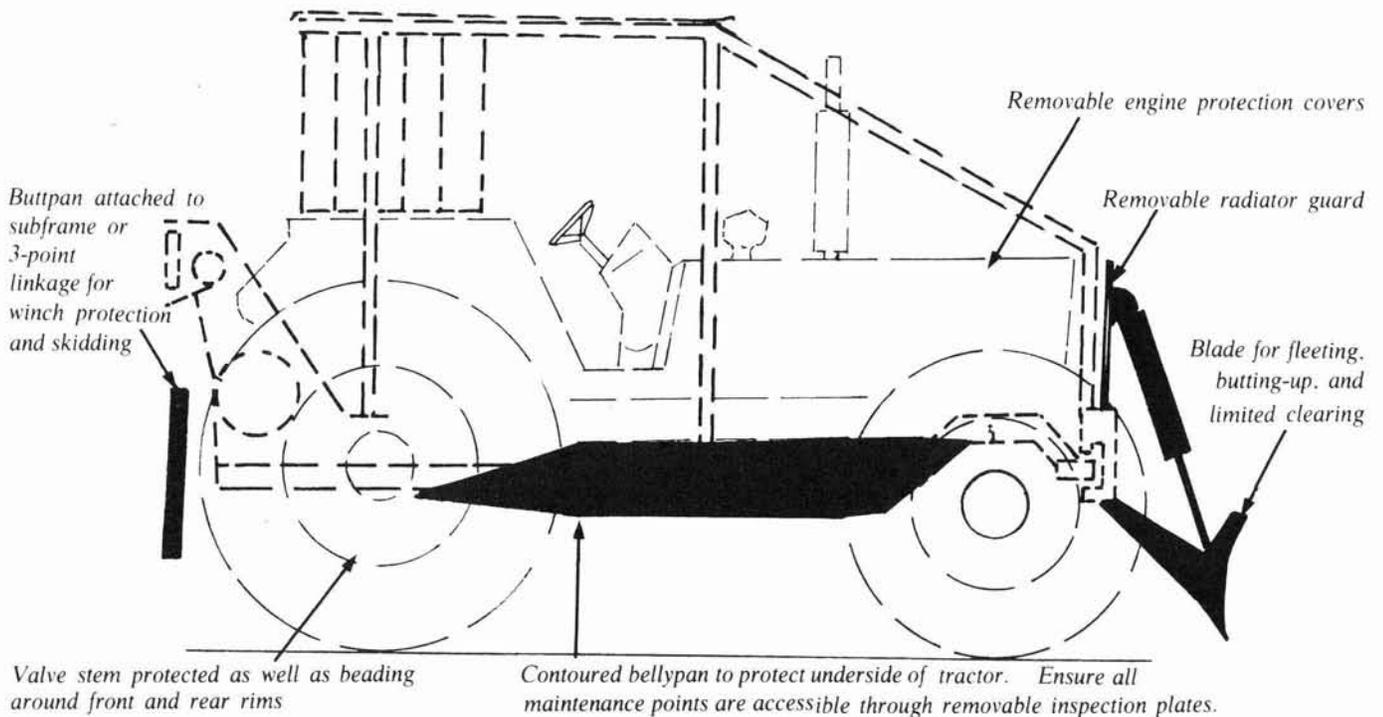


FIGURE 4 — OVERALL MECHANICAL PROTECTION AND BLADE

### *Extraction Equipment*

There are three options:

- (a) direct mounted winch
- (b) three-point linkage mounted winch with integral butt pan, fairlead, stabiliser, etc.
- (c) small arch and butt pan mounted on three-point linkage

The first option implies that the machine is to be used solely for logging, whilst the second and third are attachments which enable the tractor to be used for other purposes as well.

The minimum requirements for a winch are that it have a rated maximum line pull no less than 3000 kgs; a drum capacity of at least 50 metres of 10 mm diameter wire rope; and a line speed of one metre per second or more. Detailed specifications of suitable winches are covered in LIRA Brief Report Vol.6 No.8 1981, titled "Winches for Agricultural Tractors and Small Skidders".

Designs vary for the three-point linkage mounted logging arches.

### *Canopy*

It should be noted that the supplement to the Department of Labour's booklet "Bush Tractor Canopies", states that "the safety frame fitted to an agricultural tractor is designed for the purpose of protecting the driver in the event of the tractor overbalancing, whereas, in bush operations, while it is not unknown for a bush tractor to overturn, the major hazard is from falling trees and branches".

### COSTS

Unlike buying a purpose-built skidder, the costs of modifying an agricultural tractor can be tailored to suit a budget. An indication of costs is as follows:

- (a) Tractor - 45-80 kW 4WD, from \$10,000 secondhand to \$30,000 + new
- (b) Winch/Arch - \$300 to \$12,000, depending on make, model, features, etc.
- (c) Modifications - from \$500 in own workshop to \$10,000 in engineering shop

Therefore, a low cost, fully bush-rigged unit, incorporating second-hand tractor but new accessories would be in the \$20,000 bracket, whilst an all-new unit could be as high as \$50,000. If, however, expenditure in the upper end of the range is contemplated, then the secondhand skidder and the small new skidder markets should also be investigated. Factors such as production rates, fuel, parts, service facilities, and resale value of the machine all have to be taken into account before a decision is made.

### CONCLUSIONS

If logging is to be contemplated using an agricultural tractor, the following modifications would produce a working unit suitable for full-time logging:

Bush canopy; integral mounted winch & fairlead; sub-frame; belly pan; blade; mechanical protection - valve stems, wheel rims; radiator and engine guards.

The minimum modifications required before bushwork could be undertaken, are:

Bush canopy; valve stem protection and reinforced wheel rims; radiator guard.

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