

## WEIGHT OF SOIL CARRIED BY DIFFERENT TYPES OF EQUIPMENT

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## Introduction

Work done by ADFO. S. Shea has clearly demonstrated that diseased soil can be readily transported for considerable distances on logging equipment. No data was available on the relative quantities carried by different types of equipment or on the patterns of spread. The trial described investigated these aspects which are of considerable importance to the hygiene logging programme.

## Method

The tests were run on the following units

1. Caterpillar D7 Tractor
2. Caterpillar D4 Tractor
3. Michigan Tractor Shovel (fitted with fork lift arms).
4. Bedford 7 ton tip truck (one set of duals).
5. Chevrolet 15 cwt. ex Military Truck.
6. Short Wheelbase Land Rover.

The soils were wet loams in plantation areas not affected by P. cinnamomi. Each of the units was bogged in a wet creek crossing and was then walked or driven in second gear for ten chains along a gravelled road. A 50% sample (i.e. one track) of the soil falling on to the road between the starting point and 7½ chains was collected, air dried and weighed. At the 10 chain mark, any readily removable soil was collected into bins; the unit was then washed thoroughly using a heavy duty pumper and the soil removed by washing was collected onto a tarpaulin. This soil was then air dried and weighed.

All tests except for the Caterpillar D4 were run in the same location within the Mundaring Division. The test with the D7 was run at Dwellingup using the procedures described. The soil types at these two localities were analysed mechanically to test for comparability of sites.

## Results

The weights of soil carried and dropped by the various types of equipment is shown in table 1.

Table 1

Weight of Soil (Air Dry) Carried by  
Different Types of Equipment

Unit	Approximate Soil Weight on Unit at Beginning (lbs.)	Soil Weight Lost Between 0 & 7½ Chains (lbs.)	Soil Weight on Unit at 10 Chains (lbs.)
Caterpillar D7	1629	172	1457
Caterpillar D4	697	357	340
Michigan Tractor	181	45	136
Bedford 7 Ton Truck	270	260	10
Chevrolet 15 cwt.Truck	26	19	7
Land Rover	12	3	9

The table shows marked differences between the units tested. At the 10 chain mark, relatively little soil remained on the rubber tyred units with the exception of the Michigan. In contrast large volumes of soil were retained on the tracked equipment. The D4, Bedford and D7 lost the greatest quantities of soil whilst travelling whereas the losses from the other units were relatively small by comparison.

The patterns of spread by the various units are shown graphically in Figure 1. Most of the soil which fell onto the road was lost quite rapidly (Table 2).

Table 2

Weight of Soil (Air Dry) Falling onto Road Within Specified Distances, as a Percentage of the Total Weight of Soil Falling Onto the Road.

Unit	Distance		
	0 - ½ Chain	½ - 1½ Chains	0 - 1½ Chains
Caterpillar D7	60%	12%	72%
Caterpillar D4	72%	15%	87%
Michigan Tractor	64%	17%	81%
Bedford 7 Ton Truck	33%	45%	78%
Chevrolet 15 cwt. Truck	43%	24%	67%
Land Rover	52%	24%	76%

Mechanical analysis of the Mundaring and Dwellingup soils indicated that both were loams.

#### Discussion

The data presented should be used to obtain trends rather than quoted as absolute values since factors such as soil type, soil moisture and road surface would markedly influence any results. Though care was taken in the sampling and washing process, some soil was inevitably lost. It is considered that these losses were not large and that they would not materially alter the trends obtained. The soil falling onto the road could be readily distinguished due to its colour and wetness and was readily handled excepting for the smallest particles. The units were washed at 10 chains so as not to interfere with the samples on the road. As the soil losses between 7½ and 10 chains were small, the calculated soil weights on the units at the beginning should be reasonably correct.

As *P. cinnamomi* may be readily recovered from soil samples weighing 3 to 4 ounces, the extremely large soil weights moved by these units constitute a real threat to any hygiene programme. The weights tabled are air dry equivalents and under normal operating conditions could be increased by 1/5 to 1/3 depending on the soil moisture content. This dead weight could in some cases affect machine performance.

Most of the soil which fell onto the road was lost within the first 1½ chains. In most instances, large clods were uncommon beyond 3 chains. The probability of *P. cinnamomi* initiating a new centre of infection is likely to be dependent both on soil weight

and on clod size. This indicates that the 2 to 3 chains wide strip adjoining the "green line" is most likely to become infected during cross travel, though new infections at 10 chains or beyond are still possible.

The proportion of soil lost to soil retained differed greatly between units. This is a function of a number of factors e.g. rubber tyred vs. tracked, travelling speed, road quality and vehicle construction. The differences observed between the D4 and the D7 are probably due to the D7's longer track base and heavier weight which reduce jolting. The general construction of the D7 provides a number of wide flat surfaces very suitable for retaining soil. Of the rubber tyred units, the Michigan tractor and Land Rover were atypical in the amounts of soil retained. In the former, a large mound of soil was held on the large flat towbar frame. In the latter, most of the soil was retained on the sump protection plate. Both of these attachments were fitted at Departmental Workshops. The two trucks were relatively efficient at self cleaning.

The soil retained on the units constitutes a further source of new infections. The efficiency of this source is highly dependent on its subsequent treatment. If the soil dries thoroughly "in situ", the survival of *P. cinnamomi* will be severely reduced. If however, the unwashed unit is rapidly transferred to a new area on a low loader, long range spread of *P. cinnamomi* to a previously healthy area is possible.

### Conclusion

All types of equipment tested are capable of transporting diseased soil for considerable distances. Potential for new infections varies greatly between units. The D4, Bedford with duals and D7 are the most efficient units for spread of diseased soil over short distances. The D7 and D4 have the greatest potential for spread over longer distances. The large soil weights involved indicate that segregated logging operations and the elimination of cross-travel from diseased into healthy areas are essential if the artificial spread of *P. cinnamomi* is to be reduced to a minimum.

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WEIGHT OF SOIL DROPPED OVER 7½ CHAINS BY DIFFERENT TYPES OF EQUIPMENT

