

Prof. Beattie

1. DIRECTOR

2. MR. BATHURST

3. MR. GYLE

16/4/52

Prima facie this has reached a point at which:-

(a) we ought to consider field-scale trials in each constituency of the large wheeled trailers. I agree, please arrange.

(b) Mr A. Watt should be given the FORESTRY COMMISSION suggestion that parties be forwarded to F.A.O. re the Logging Techniques, etc. Pilot Ctr. Headquarters Mechanical Development Committee

③ Prof. Beattie 2/8.

Report No. 15

perhaps you will be put away

B coming - done. 2/8

The Use of Large Diameter Wheels and Tyres on Forest Extraction Vehicles **TRAILERS**

Origin

The damage being caused to forest rides and racks through the transport of forest produce has directed attention to the improvement of vehicles designed for "off the road" transportation. In many cases produce converted in the forest is carried on trailers hauled by tractors for considerable distances to the nearest road point over rides which are frequently soft and uneven. Most of the trailers in use for this purpose by the Forestry Commission are on tyres/giving an overall wheel and tyre diameter of about 39 ins. using a tyre section of 9.6 ins or less. These tyres are normal in the commercial field where modern improvements in the large section tyre may have diverted attention from the advantages to be gained from really large diameters for soft and uneven ground conditions. For this reason the Committee have investigated the use of wheels fitted with 11 x 36 tyres giving an overall diameter of 58 ins. on one of the Commission's standard two wheel trailers.

Not. As to (a) above. Progress is in hand. Mr. Watt will report at next M.D.C. meeting. As to (b) I spoke to Mr Watt on 2 Aug. He said that normal channel for all such reports to F.A.O. was from Shaw through Lloyd at Oxford. He noted the name of a member of this report. I said he would check it. I had gone that way. Shaw on leave so I could not myself check on this point. S.A.B. 2/8

Description

Two Fordson Major rear wheels (11 x 36) were fitted to the hubs of a trailer as shown in photographs 2 and 4. This was done by welding a plate over the wheel centre and drilling stud holes to suit the trailer hubs. Part of the platform was removed to accommodate the wheels. The cost of the conversion excluding the new wheels and tyres was £33.

Mr. Baldwin. For next M.D.C. meeting. S.A.B. 2/8.

Tests

The large wheeled (overall diam. 58 ins.) trailer was tested in direct comparison with a similar trailer on 36 x 8 wheels (overall diam. 38.7 ins.). As any advantage to be gained from the large wheels would be revealed by a reduced rolling resistance a dynamometer was inserted between the tractor and trailer in each case.

Conditions.

Rolling resistance tests were made on a very wet and soft ride on clay, at Alice Holt. There was very little vegetation on the ground covered by the wheel tracks. Total distance was 120 yds. There was no appreciable gradient.

Load A load of 2 tons was carried on each trailer, the same actual load being transferred from one to the other for each test. As balance can affect drawbar readings on 2 wheel trailers great care was taken in the balance of the load in each case.

Tractor The towing tractor was a special Fordson Roadless half tractor modified by Roadless Tractors Ltd. which will be the subject of a separate report.

Speed No speed recorder was available but a speed of about 1.5 m.p.h. was maintained throughout each trial except when nearing the track slip condition with the small wheeled trailer.

The gross weights of the two trailers each with a load of 2 tons were:-

with 36 x 8 wheels	=	2 Tons - 14 cwt.
with 11 x 36 wheels	=	2 Tons - 12 cwt.

The explanation for the latter being the lighter is that the large wheels allow the axle to be mounted direct onto the frame with no undercarriage.

Load carrying capacity of the tyres is:-

36 x 8 (12 ply) at 90 lbs per sq. in.	=	4480 lbs. per tyre
11 x 36 (4 ply) at 12 lbs. " " "	=	2130 lbs. " "
11 x 36 (6 ply) at 20 lbs. " " "	=	2880 lbs. " "

(These figures were supplied by the Dunlop Rubber Co.)

Observations 1. Drawbar readings were taken at thirteen points along the course on each trial. The actual point at which each reading was recorded being as nearly as possible the same in each case. Details of the figures are given at Appendix A, the maximum and average figures being:-

	Max. figure recorded	Average figure recorded
Large wheeled trailer	1980 lbs.	1320 lbs.
Small " "	4400 lbs.	2175 lbs.
Large " " (repeat trial)	2200 lbs.	1405 lbs.

At 4400 lbs. with the small wheeled trailer movement ceased due to track slip on the tractor the trailer then being sunk up to the axle as shown at Photograph 1. It will, however be seen in Appendix A.

that the pull with this trailer far exceeded that with the large wheeled trailer as soon as soft ground was encountered long before track slip occurred.

The repeat trial with the large wheeled trailer was carried out to ensure that the comparatively unfavourable performance of the smaller wheeled trailer was not due to worsening conditions as the ground became more cut up. The figures on this repeat trial again demonstrated the value of the large wheels.

2. The average rolling resistance of the trailer with small wheels is some 55% greater than that of the similar trailer and load on large wheels (even taking the less favourable figure recorded for the latter at Observation 1.)

3. Quite apart from the excessive drawbar pulls required much labour is expended in unditching trailers on the present standard wheels under soft conditions.

4. There are some points against the large wheel, they are:-

- (a) The load has to be lifted over the top of the wheel when loading.
- (b) There is some reduction in the load carrying capacity per tyre.
- (c) It is often said that the price is higher. There is really not a great deal in this, the actual figures being:-

	<u>36 x 8 (small wheel)</u>	<u>11 x 36 (large wheel)</u>
Wheel	£6: 9: 6	£9: 0: 0
Cover	£30: 3: 10	£31: 17: 9
Tube	£3: 3: 2 (includes flap)	£3: 19: 7

These prices are Dunlop retail figures except the 11 x 36 wheel which is the Ford retail price.

Conclusions

The results of this trial show the great advantage to be gained by fitting very large diameter wheels to any load carrying trailer which is to be used on soft or uneven ground. The horsepower required is proportional to the drawbar pull at a given speed and in this case the average required to pull the load on standard 36 x 8 wheels was 55% greater than that required to pull an identical pay load on 11 x 36 wheels.

This means that powerful and expensive tractors are sometimes used to do work which should be within the scope of smaller and cheaper machines. Moreover, all this unnecessary horsepower is being consumed in doing damage to the rides.

Further Action

Investigation is continuing into the use of large wheels on four wheeled trailers with greater load carrying capacity and into trailers fitted with rubber track units.

Photographs are attached showing:-

1. The trailer with standard wheels sunk up to the axle.
2. The trailer with large diameter wheels easily passing over a soft wet ride.
3. and 4. The behaviour of the two trailers at the same point.
5. The method of inserting the dynamometer for recording rolling resistance.

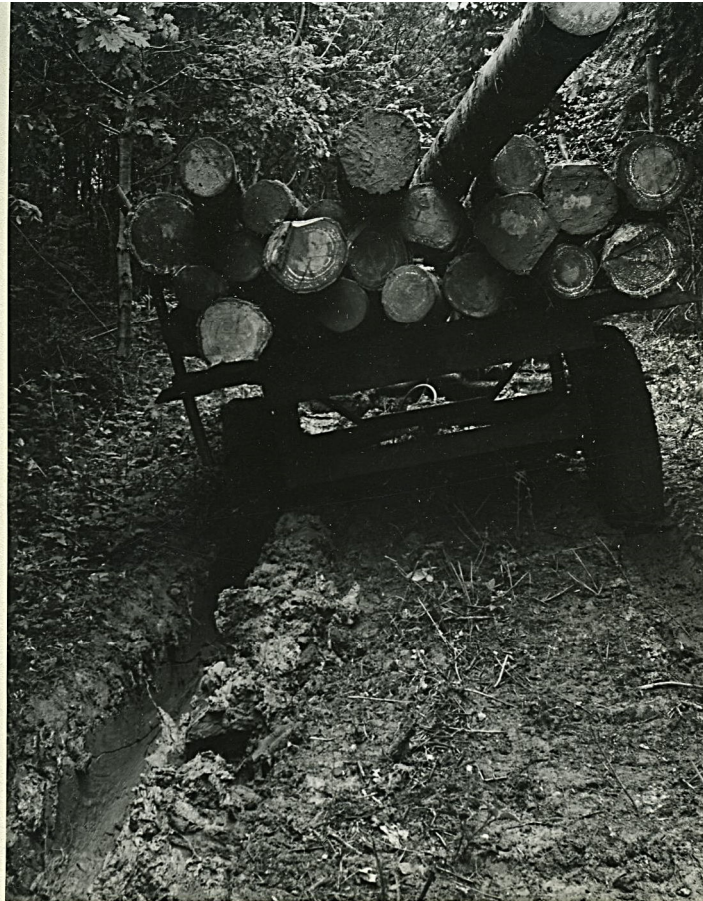

R. G. SHAW
Machinery Research Officer
Machinery Research Officer
16.7.52

APPENDIX A
to H.Q.M.D.C. Report No.15

Detailed results of drawbar pulls recorded when pulling 2 wheeled trailers running on Standard Wheels (36 x 8 tyres) and large diameter wheels (11 x 36 tyres).

Large wheels	Standard wheels	Large wheels (Repeat Trial)
1100 lbs.	1100 lbs.	1100 lbs.
880 lbs.	1540 lbs.	880 lbs.
1100 lbs.	1100 lbs.	1100 lbs.
1320 lbs.	1540 lbs.	1320 lbs.
1320 lbs.	1650 lbs.	1320 lbs.
880 lbs.	2200 lbs.	1540 lbs.
1100 lbs.	2420 lbs.	1540 lbs.
1320 lbs.	3300 lbs.	1760 lbs.
1980 lbs.	3960 lbs.	2200 lbs.
1540 lbs.	4400 lbs. *	1320 lbs.
1320 lbs.	1320 lbs.	1100 lbs.
1540 lbs.	1540 lbs.	1540 lbs.
1760 lbs.	2200 lbs.	1540 lbs.
<u>Averages</u> 1320 lbs.	2175 lbs.	1405 lbs.

* Track Slip



THE TRAILER WITH STANDARD WHEELS
SUNK UP TO THE AXLE.
2.



THE TRAILER WITH LARGE DIAMETER WHEELS
EASILY PASSING OVER A SOFT WET RIDE.



3

THE BEHAVIOUR OF THE TWO TRAILERS AT THE SAME POINT.

4





THE METHOD OF INSERTING THE DYNAMOMETER
FOR RECORDING ROLLING RESISTANCE