

Forestry Commission

Engineering Branch

25, Savile Row,
London, W.1.

Phone: Reg: 0221

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1 COPY - REPORT NO 26

E (S)

- 1) Mr. Allwood
- 2) Mr. Pennington
- 3) Mr. Dyer

Col. Blenkinsop has seen.

PLEASE ACKNOWLEDGE RECEIPT

The Caterpillar Mounted Toolbar (Type 64)

Origin

The convenience of mounted implements on wheeled tractors has long been appreciated but their development on fully tracked tractors has been slow largely owing to the steering problems that are involved. The announcement of a mounted toolbar by the Caterpillar Co., with designs for all sizes of Caterpillar tractor was, therefore, of great interest and arrangements were made to purchase one for trials on a D4.

Description

The toolbar assembly consists of two side members which are attached to the trunnions which are also used for the side arms of the bulldozer frame when the tractor is used as a bulldozer. Attached to these side arms and passing behind the tractor is the toolbar beam ($4\frac{1}{2}$ " x $7\frac{1}{2}$ " x 8'). Provision is made for securing to this beam any of a wide variety of implements (see Photograph No. 1).

An essential feature of the design is that the forward end of the side members is attached to the trunnions through a ball joint thus allowing movement in both the vertical and horizontal planes. At the rear end of these side members the attachment of the toolbar beam incorporates a pin joint which can be clearly seen in Photograph No.1. This articulation at both front and rear of the side members allows the tractor to swing freely within the limits allowed so that there is no resistance to steering even though the toolbar beam may be held rigidly by an implement in the ground.

The angle of the toolbar beam can be adjusted by means of the screw seen between the top of the pin joint and the side arm in Photograph No.1. Raising and lowering of the assembly is achieved by hydraulic power from the Standard Caterpillar hydraulic pump and control unit. The hydraulic ram can be seen in Photograph No.2 in the centre just ahead of the toolbar beam.

No implements were purchased with the toolbar as special ploughs designed to meet particular forest planting needs were required.

Some of these ploughs can be seen in Photographs 1 and 2. No.1 shows two double throw units at 5 ft. spacing the object in this case being to plough two furrows together. No. 2 shows one large double throw plough used to give deep cultivation by a centre line and also suppress vegetation over a wide area.

The cost of the complete toolbar equipment including the hydraulic ram and linkage was £242. This figure does not include the hydraulic pump and control unit which would be already fitted to a tractor equipped for bulldozing. (In tractors not so equipped, the cost of the pump and control unit would be £240 extra).

Trial
Conditions

The trial was carried out in East Scotland during the period February - October 1953. The ground consisted partly of compacted heathland and partly of old felled woodland covered with heather only part of which had been previously burned.

Observations

1. Several different implement designs were tried on the Toolbar which has the great advantage that any particular implement that suits local conditions can be adapted to fit.

2. A feature in this type of toolbar layout is the closeness of the mounted implements to the back of the tractor thus reducing the effect on tractor balance with the implements raised.

It was found, however, that for ploughing ground covered with a growth of vigorous heather this closeness of the implement to the tractor resulted in frequent choking due to the heather "balling up" in front of the plough. Fitting a disc coulter resulted in a marked improvement but to provide room to do this it was necessary to mount the plough on a beam extending to the rear as seen at Photograph 2.

3. No difficulty was experienced in steering the tractor under any conditions experienced during the trial.
4. The rate of lift of the toolbar as delivered was far too rapid and modifications were made to reduce this at an early stage in the trial.
5. No opportunity has arisen to weigh the toolbar equipment but it is estimated that the weight is about 10 cwt.
6. The centre of balance of the tractor with the toolbar raised and fitted with one plough is 35 inches forward of the sprocket centre.
7. Transport from site to site with the mounted equipment is much simpler than with trailed implements since only one transport vehicle is required.
8. It is difficult to give a fair ploughing cost per acre on new equipment during early trials but test figures recorded over a period of 7 weeks showed that at 5 ft. spacing output was 0.55 acres per hour. Taking the tractor cost as 22/9d per hour and the toolbar equipment as 5/- per hour this means a total cost of £2.10.6 per acre.
9. Some trouble was experienced with the hydraulic ram. There were several cases of sheared stop bolts and also of bending of the ram shaft.
10. Some criticism has been made on the variation in the depth of cultivation resulting from the pitching of the tractor on uneven ground. It must however be mentioned that no depth control wheel was fitted in this case. As a depth control wheel is an optional extra it must be assumed that under these ground conditions it becomes a necessity.
11. The opinion of the users in Scotland who carried out this trial is that they prefer an alternative method of mounting a plough on a swinging beam with which they have been experimenting for some time.

Conclusions

Experience in Scotland suggests that whilst the Caterpillar toolbar possesses many advantages and is, no doubt, excellent for agricultural cultivation it is not entirely suitable for the very severe conditions often met in ploughing for afforestation. The main criticism is that strong vegetation chokes the implement and there is not sufficient space for an effective coulter to deal with this condition.

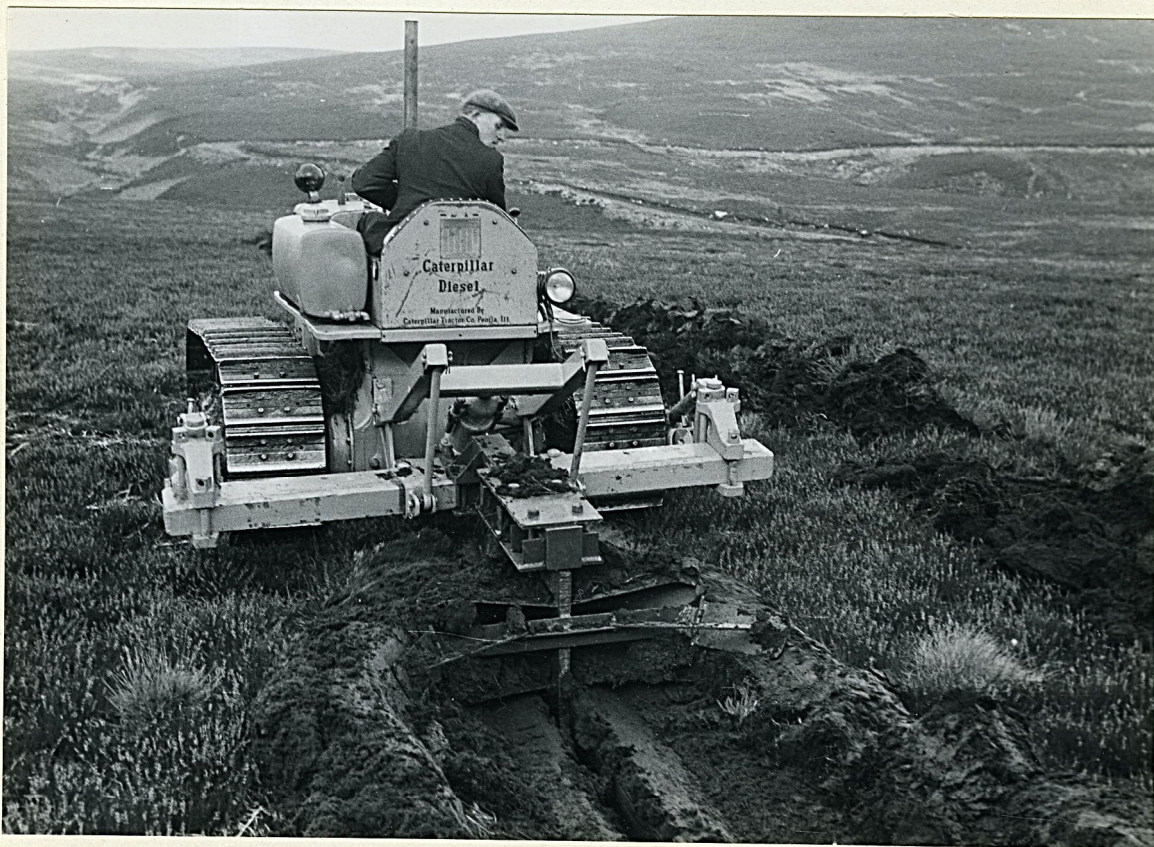
Further Action

Trials will be continued under different conditions in North East England.

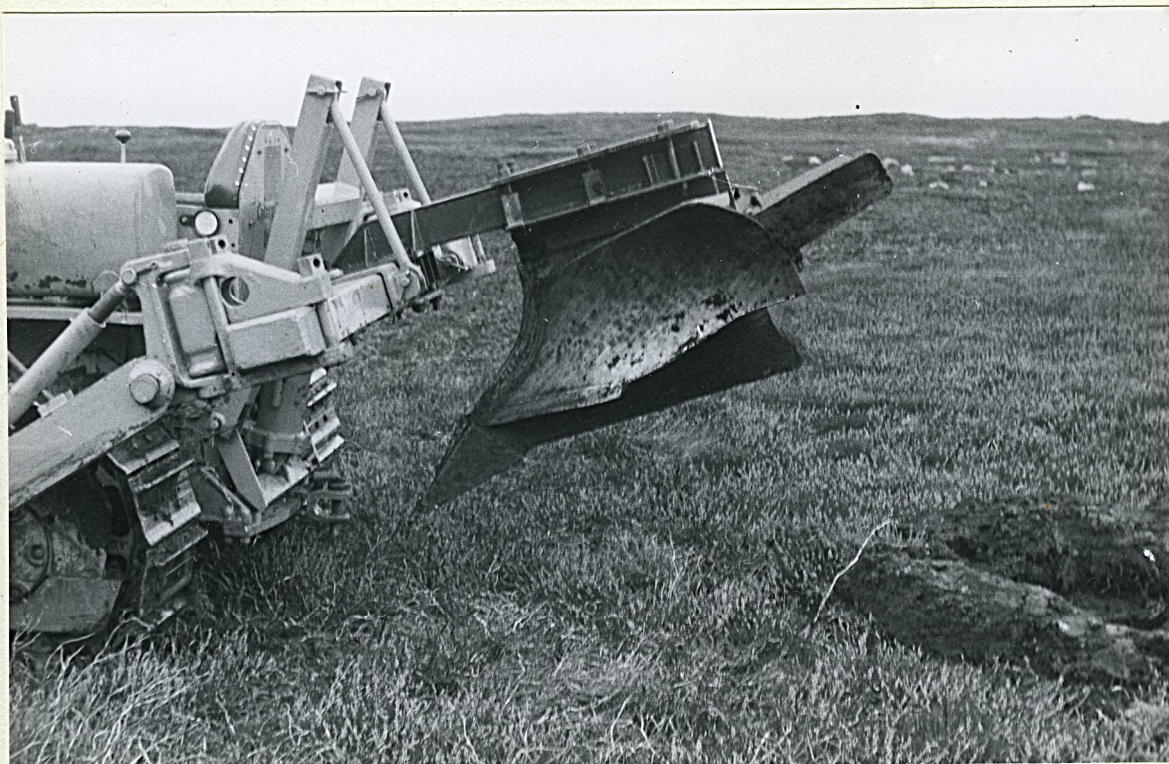
R.G. SHAW
Machinery Research Officer



PHOTOGRAPH 1. A D4 tractor with mounted toolbar fitted with two double throw ploughs for ploughing at 5 ft. spacing.



PHOTOGRAPH 2. Rear view of the toolbar fitted with one double throw plough with centre tine. Note the extension beam mentioned at observation 2.



PHOTOGRAPH 3. Showing the toolbar and implement in the raised position.