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# Forest Machinery

By E. R. HUGGARD, M.A., B.A.I., A.M.I.C.E., and T. H. OWEN, B.SC.

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IN so far as it brings together in book form practically all the equipments than can be applied to forest operations this can be a very useful guide to forest owners though obviously in arriving at a decision to either purchase or hire equipment much more information is necessary.

The suggestion in the preface that it would "stimulate intelligent experimentation in every sphere of forestry mechanisation", is a very important aspect and considering the items stated elsewhere to be in need of development e.g. a light machine for clearing forest drains in young timber and as a recent requirement here, a high pruning saw, should lead to work along these particular lines. I have always felt that the manufacturing industries would meet specific development requirements if the problem was properly explained to them, and while it can be said that the market is limited and consequently the cost of development would have to be spread over a small number of finished products, this is not a sufficient reason for baulking at the prospect. If this were done the machine designs would be special to Forestry rather than adaptations which is now the general rule. For example the authors state on page 55 in connection with ploughing; "it is difficult to see how costs could be reduced by improving the design of the machines now available"—one way would be to alter the gear ratio of ploughing tractors so that machines could work at designed engine R.P.M. rather than half throttle which is now the case.

In dealing with "The Mechanised Forest" the history of mechanisation is pertinently if of necessity rather inadequately dealt with. The statement on page 2 that "it would be short sighted policy to set up an organisation on the assumption that the horse will always compete favourably with the machine" is open to criticism. The authors have shown that horses have decreased by 70% and while they have not developed the theme, the remaining horse population has in general neither the breeding nor the training to handle timber, and the "teamster" is a dying skill. An examination of modern mechanical

methods of extraction of thinnings, especially pit props and pulpwood (and extraction from windblown areas) shows it is doubtful if any mechanical process will better the horse in the foreseeable future. Consequently any organisation that has a programme of such extractions should make haste to establish a suitable horse colony. If at any stage machines seem to be competitive then the horses can be disposed of over a period without any great loss to the organisation.

The saving of time and the precision that can be obtained with machine use is well brought out. In a seed bed count at a mechanised state nursery here, in one instance it was established that 1 lb. of Sitka spruce yielded 19,000 extra seedlings. The extra yield is attributed to the mechanised preparation of the bed and in particular to the accurate spreading of the sand cover by a grit distributor.

A factor that must be borne in mind, however, is that while machines can reduce the time to complete a particular operation very often they can only be worked in the summer months and must of necessity be idle for some months of the year—this can be an uneconomic proposition especially if by their introduction certain staff become redundant for the period of the machine use and then need to be re-employed for some other operation during the winter—in an emigrant country such as Iteland this redundant labour may well not be available when required. Careful thought must of necessity be given to this question of redundant labour before mechanising. The authors are very correct in saying that despite the reaction of organised labour the individual worker welcomes a machine that will lighten his work and the forest owner should provide this aid if he possibly can. Usually he will have to compromise with cost reduction and retention of necessary minimum staff especially where casual labour is not available or is difficult to deal with.

The application and operation of machinery is dealt with in one chapter which is rather a pity in that this is one of the most important aspects of all forest mechanisation. The authors should have developed at length the problems of operator training, especially technical education at school level, machine maintenance, machine overhaul, and mechanical organisation. This last point is touched on in only a very general way and while the problems of maintenance and overhaul are mentioned the details of the organisation necessary to carry out this work are not shown, though in a way these are subjects probably best left for another book. It is stated at page 83 that Grader operators are easily trained—good operators are very difficult to get.

The statement on page 19 that "it is often desirable to keep the same operator with a machine", is not strong enough; it is of the greatest importance that wherever possible the same operator should be kept with the machine in that there is then never any doubt as to who was negligent if the question arises. If an operator knows that the machine is his so to speak it is obviously in his own interest to maintain

it properly; this is quite apart from the fact that the more conversant with operating the machine he becomes the more satisfactory is his work likely to be. Some civil engineering contractors actually bring the operators to the base workshops when their machines are being overhauled so as to familiarize them with the construction and to point out any parts that might have been inadequately looked after.

The authors have rightly stressed the question of housing or covering for machines—it speaks very badly for management if machines are left on forest sites unprotected—tarpaulins are comparatively cheap when compared with the cost of machines and for wheel tractors a portable garage is easily and cheaply made up.

The costing system shown is, as indicated, that adopted by FAO/ECE and it will help management when setting up a cost system, something which, as the authors state, is indispensable. One point that is a problem in Ireland is that a great many machines were bought from the U.S.A. prior to the original devaluation of the £1 and this meant that machines greatly increased in price overnight. One way to take care of price fluctuations like this is to use the replacement charge rather than the purchase price for the figure A in the formulae quoted.

One very important aspect of costing is as a control to ensure that machines are being operated at the lowest possible cost and are being sold off when this starts to rise. This aspect has only been touched on and as it is of great importance I append here a very brief account of one system of American origin that may be used. This is known as the Metre System (Most Economical Time to Replace Equipment).

The following items are costed each year :—

Depreciation—by actually obtaining from the suppliers a trade-in figure for the machine.

Repair and overhaul costs.

Cost of unavailability due to maintenance of the machine on the site.

Cost of lack of productivity due to obsolescence.

The running total of these divided by the running total of the hours operated gives a figure which is indicative of cost/hour of all of the above. This running quotient should fall steadily from year to year. When it begins to rise it is a clear indication that the machine has now been run to the point where all the working hours have been obtained at the lowest possible price—the machine should then be sold off as if it is retained the extra hours are being obtained at a higher price.

The rates per hour shown for wheel tractors and crawlers appear to be high considering that they do not take account of profit or operators' wages.

For the most part the book is directed to a description of the various mechanical tools available to foresters with brief specifications and some

excellent photographs. As it does not curtail the equipments to those in use in the British Isles one can feel happy that American and Continental methods are presented though no Russian machine is mentioned. Line drawings showing cross sections of excavations would have been helpful.

A chapter dealing with the use of the wheel tractor would have been very welcome in that now when 7-8 miles per sq. mile of roading is proving acceptable the use of the wheel tractor is increasing and its use in the mechanised nursery is an essential. The basic prime mover in State Forestry here is the wheel tractor and various ancillaries are in use with it; ploughs, dozers, graders, trailers, sawbenches, winches, rotovators, compressors. In this last case it is very hard to decide whether to use the 3-point linkage compressor or the bolted up unit depicted at page 91. The possibility that if one unit breaks down the other can be detached readily and the fact that excess weight is not being hauled around the forest unnecessarily, commends the 3-point linkage unit to one reader.

The use of 4-wheel-drive wheel tractors is also very much on the increase here and because of the cost of track overhauls of crawlers any effort that can be made to increase the performance of these 4-wheel-drive machines is worthwhile in order to reduce the crawler fleet to the minimum.

An error seems to have been made in the weight of the Cobra shown at 33 lbs. The correct weight is 53 lbs.

Towed Rollers have proved quite satisfactory in Ireland for forest road work.

The authors are right in this comment that the multiple purpose machine; crawlers—excavator—loading shovel—will not displace the bulldozer (more correctly called angledozer) though for the smaller owner their purchase may well be a proposition.

The use of the 10-14 ton dozers here has proved the point that heavier machines are rarely necessary and too cumbersome for forest road work. In connection with working dozers downhill a few difficult areas in Ireland have proved this conclusively and indeed an examination of the principles clearly indicates that the dozer "punch" is very much influenced by the grade e.g. a 1 in 10 grade working uphill detracts 224 lbs. per ton of crawler so that for a D.6 class machine weighing 10 tons there is a loss of punch of 2,240 lbs. or, if working downhill, an addition of 2,240—a total difference of 2 tons. This difference is bad enough in itself but if, as happened in at least one instance here, the ground conditions are not able to sustain the full tractive effort of the machine and track spin was occurring even on the level—then uphill working was impossible. Fortunately it was possible to get to the top of the grade and work downhill thus availing of the 2,240 lbs. above mentioned to aid the tractive effort. This site also made clear the necessity for working the wet sites in the summer. In

small forest operations transport of dozers by truck can be quite all right but where proper supervision of both the loading and unloading is impossible this reviewer would advise the use of low loader only, even for the smaller machines.

The table shown for dumpers and tippers required to keep face shovels fully employed brings out a point which is of interest—that the use of dumpers on long hauls is a very poor proposition; e.g. to keep a 21 cu. ft. machine busy on a  $\frac{1}{2}$  mile haul requires 10 dumpers and 3 tippers and as the distance increases dumpers are not shown at all. The Shawnel-Poole system developed on a wheel tractor as a rear dump is not mentioned.

In the case of compressors it is suggested that these be drained during frost whereas for other machines anti-freeze is recommended; a definite policy on this matter is essential and considering water conditions on the sites the use of anti-freeze for the winter and rust inhibitor for the summer in conjunction with 2 flushings per year would seem practical.

The authors include a section dealing with a recent development in aerial extraction—the Tractor Operated Aerial Ropeway. This is not yet on the market. The basic unit was developed by J. A. Cuthbertson of plough fame, and is operating at Loch Goilhead in Scotland.

A double drum which has been devised by Boughton & Sons Ltd. and used to carry a strawline as is suggested on page 129.

One picture on page 131 showing a D.4 hauling some very poor quality logs is hardly an economic proposition.

The tables shown in the appendix are useful although in one instance the table is not in agreement with calculations of "Caterpillar" who claim that every 1% of grade requires 22 pounds of draw per pull per ton so that a 1 in 10 grade or 10% takes 220 lbs. as against 114 quoted in the appendix.

Generally, the authors in wishing to present to the forester and forest owner a book which would enable him to see at a glance what equipments are available for any particular problem within the forest have been successful.