A Note on Nursery Mechanization.

By O. GRANT

THE use of machinery in the carrying out of large scale nursery operations was initiated at the Forestry Division's Nursery at Clonegal this year. Although it is, as yet, too early to pass final judgement on the merits or de-merits of mechanization, a preliminary glance at the matter may be of interest. Let us deal with the machines* in order in which they were utilized.

1. *The Ledmore Lining-out Plough* performs in all nine simultaneous operations. Let us assume that one line of seedlings or transplants has been affixed to a previously prepared line in lining out operations and the tractor, with Ledmore plough attached, has been brought into position at one end. The plough in its passage up or down the line, as the case may be, carries out the following operations :—A small front skimmer moves the soil from the furrow in against the roots of the trees. Following this a compaction wheel, rubber tyred, presses the soil firmly about the roots. A plough-share attachment turns the soil inwards, a soil leveller levels the surface and a metal roller rolls it flat. A raking device takes off any surplus soil which may have become piled up against the lining-out boards. A rear cutting disc cuts out the next line trench. A rear reverse skimmer moves loose soil to the outer edge of this and, lastly, from a metal container, attached to the plough, an even flow of artificial manure is deposited in the trench.

The Ledmore plough was used with a complement of fifteen men. Seventy-two lining out boards were employed on a line one hundred and twenty yards in length. The workers were divided as follows :— One ganger, one tractor driver, one labourer, whose function it was to follow along after the plough and square off generally, or otherwise assist the operation. The remaining twelve men were divided into units of four. Each unit had charge of one-third of the line. There were three fillers to keep the boards replenished and one man to carry these to the line and to return empty boards to the fillers after passage of the plough. It was possible to reduce lining out costs by fifty per cent. but one must get away from the idea of having those straight, geometrically laid lines which generally follow manual lining out. The Ledmore plough worked well up and down gentle slopes but failed to do a good job along contour.

2. *The Tractor Rotovator.* Enough praise could not be given to this machine. Its rotating blades leave behind a fine meal-like tilth to a depth of seven inches. This machine is a 'must' wherever the Ledmore plough is used. Without the benefit of this precursor the Ledmore

* Some of the equipment mentioned in this note was designed and developed by the Forestry Commission and the Ministry of Agriculture, Northern Ireland. —*Editor.*

plough will not function well save, in soil of optimum friability. Its work is far superior to that of the ordinary disc harrow which was used for purposes of comparison. The rotovator will always do more than pay its way and would confer great benefit in otherwise manually operated nurseries. It is possible to cultivate one thousand one hundred and eighty square yards of ploughed ground, in one hour, with this machine.

3. *The Ridger* was used on ground previously prepared by means of an all-purpose plough, disc harrow, tractor rotovator and three-ring plain roller. Lines, one hundred and eighty yeards in length and five feet apart were marked out on this seed bed area with the aid of ordinary garden line and a wooden handle. The tractor, using one of these lines as a guide, drew the plough behind it. Two parallel blades cut out the bed and a smaller one, actually a stabilizer, centre-ways between these two, broke up the middle of the bed, in such a way, that a drag chain attachment affixed to the rear of the machine could level this loose soil, giving the whole the usual seed-bed formation. A few men followed the machine with rakes to put the final finish to the bed surface. Using this machine, it was found possible to prepare three hundred and eighty square yards of seed-beds in one hour. A thirty-inch hollow metal roller, also tractor drawn, followed the Ridger and the bed was then ready to receive the seed.

4. *The Drill Seed Sower* lays down six bands of seed lengthwise on the bed. The bands lie six inches apart and a margin of like width is left towards each bed edge. The machine comprises six metal seed containers, each being fitted with an interior revolving brush which assists the passage of seed to the conduction pipe. The rate of flow of seed from the container is controllable by rotating discs set close to the side of container and external to it. Each disc is bored through by holes of ascending sizes one of which, to suit size of seed to be sown, being brought into position, allows only a certain rate of seed flow to the conduction pipe. A viewing panel enables the hole to be properly adjusted in relation to the container outlet. The seed passing down the conduction pipe is deposited on the bed in a neat band line. The bottom end of the conduction pipe comprises, besides the seed outlet, a small dual-purpose plough which scores the bed surface to the required band width and depth. A metal cuffing plate follows the attachment, to cover in the seed. A small wooden compaction roller suspended on a metal arm brings up the rear behind each conduction pipe and this rolls the seed cover into place. When covering with sand is adopted, the metal cutting plates are removed. The Drill Seed Sower will lay bands over three hundred and ninety square yards of seed beds in one hour. The tractor should be speeded up as much as possible as this will ensure uninterrupted seed flow. The machine is suspended on two rubber tyred power drive rollers travelling in the seed bed alleys. Rotation of these activates the seed-discharge mechanism viz. a series of cogs. The beds stand three inches above the alleys.

5. *The Grit Distributor* is used for spreading the sand with which the seeds are covered. It can also be employed in spreading artificial manures over green-crop areas. The Distributor, on two rubber tyred wheels, can be drawn fairly fast behind the tractor. An adjustable shutter device regulates the sand fall. An interior rotating spiked spindle keeps the sand agitated. Speed is essential in the use of this machine as, otherwise, the sand will pile up in ridges across the bed's length. Five hundred and forty square yards of seed beds can be covered in one hour by using this machine, which is replenished from sand dumps conveniently placed.

6. *The Inter-row Cultivator* does work similar to that achieved by the use of the bucco. It is possible to hoe two yards width of transplant lines in one passing. Unlike the sand-spreading machine, the cultivator should not be speeded up, as the least deviation from the true line will cause the tines to drag trees from the transplant lines. The machine is not supported otherwise than on the tine points and the eye of the tractor driver determines the quality of the work. It is, however, possible for a good tractor operator to hoe eight hundred square yards of transplant lines in one hour. The machine does better work in areas lined manually than in areas laid down with the aid of the Ledmore plough. A reduction in the number of tines and a flattening out of the grubbing ends of these may increase the efficiency of this machine.

7. *The Sprayer.* This is a forty gallon machine having nine jets for spraying purposes. Owing to the fact that in a mechanized nursery an eighteen inch alley is left between every five lines of transplants, to allow passage to the tractor wheels, it was necessary to block three of these jets. It was necessary too, to construct a seat projecting somewhat behind the sprayer. From this vantage point one man, seated, can control the cowls placed about the six operating jets. A seed-bed lath bored through at nine inch intervals and taking the jets and hoses through these holes facilitates cowl control considerably.

8. *The Transport Box.* This three feet by two feet steel box, attached like all the above machines to a tractor by means of three-point linkage, gives good service in the movement of trees about the nursery, the distribution of T.V.O. barrels and the removal of large stones from green crop area. In the latter instance and by lowering the box to ground level, it was possible to roll the stones on to the floor of the box thus avoiding the hazard of lifting them.

The above short resumé of the mechanization of Clonegal Nursery is but a preview of what it is hoped to achieve. Some indication of the possibilities may be gauged from the fact that the cost of preparation sowing and covering seed beds was reduced by seventy-five per cent., taking labour content only into account. It is hoped to further reduce the cost of lining out operations by providing and affixing rubber strips to the holding sides of the lining out boards. Some difficulty was occasioned by the inability of the wooden holding sides of the boards to keep trees securely held during passage from fillers to line.

Other items of equipment which have not yet been brought into use are a centrally-mounted U-shaped plant lifter with root-separating tines, an offset plant lifter for lifting tall transplants (over which the tractor could not pass without doing damage) and a seed-bed undercutter. It is expected that these will be as satisfactory as the implements already used.