CAN THE EFFICIENCY OF OUR
NURSERY PRACTICE BE IMPROVED?

G. M. WILL, G. W. HEDDERWICK and C. BASSETT *

Introduction

By 1965 the Forest Service hopes to expand its exotic afforestation programme to planting 20,000 acres a year; this is approximately double the area planted in 1961. As a further stimulus to forest establishment the Government has recently announced a scheme to encourage farmers to plant wood-lots.

This large upsurge in planting can only take place if our nurseries can produce the planting stock. While our nurseries are adjusting to this increased production, might it not be a good idea to see if some of our ideas on nurseries and nursery practice also need adjustment?

When planning the establishment of new nurseries or considering how to get the best results from existing ones, the expenses incurred should be seen in their true economic perspective. Raising tree seedlings is an intensive form of land use: the returns per acre are very high and can therefore justify a high outlay.

Purchase of Land

Where a new nursery is to be established the most suitable land available should be purchased regardless of cost. Average nursery costs are of the order of £900 per acre per annum in New Zealand so an extra £200–300 per acre initially is money well spent to get the most suitable land available. Too often nurseries have been developed at a particular place because the land was already owned or could be bought cheaply.

Some of the points to be considered when deciding on the locality of a new nursery are:

(a) the fertility of the soil – desirable chemical and physical properties for growing trees;
(b) availability of housing and labour;
(c) proximity to established forest stations for administrative control;
(d) proximity to plantations and ease of transport of planting stock.

* Senior Scientific Officer and Scientific Officers respectively, Forest Research Institute
Irrigation

If a nursery is in a district where seedling growth is liable to be affected by droughts, irrigation must be considered. Where high pressure water is available on the spot, costs will not exceed £120 per acre and can be substantially less. In a nursery producing 300,000 seedlings per acre per year, the cost of an irrigation system, to be written off over ten years, will add less than 1s 6d per year to the cost of each thousand trees. Surely this is cheap insurance against drought in almost any district in N.Z. If high pressure water is not available, costs will be higher but still warranted in many cases. An irrigation system ensures that maximum benefits are obtained from the use of fertilizers and weedicides. One thing is essential – some method of assessing the volume of water applied.

Fertilizers

It has often been suggested that fertilizers should never be used in forest nurseries – the poorer the land seedlings are grown in, the better they will be able to cope with field conditions after planting out. This is absolute nonsense. As with humans, so with trees – the fittest are those that are neither starved nor flabby. In N.Z. forest nurseries the balance is definitely towards the starved. In a number of cases visual symptoms of nitrogen, magnesium or potassium deficiency have become apparent. There must be many more where growth has been restricted without symptoms becoming obvious. Seedlings from these nurseries are not good planting stock. Chemical soil tests (and, perhaps in the future, chemical analysis of seedlings) are essential and represent money well spent.

Where there is a need, fertilizers should be applied without thought of cost. What is £25 an acre to produce 100,000–300,000 seedlings, compared to blanking planted areas or holding seedlings in the nursery for another year at a cost of £2 6s 0d per 1,000?

Seed-coating

A few years ago bird patrols and/or the use of scrim were standard practice in many nurseries. Costs were high – £200–300 per year for bird patrols and over £200 per acre for scrim, plus the additional labour involved. Today for the cost of £4 10s 0d an acre seed can be coated and the birds baffled. The seeds are coated with a non-wettable white powder containing 80 percent thiram. The greatest benefit of seed-coating comes from the bird-repelling effect but thiram is also a fungicide and can bring about a worthwhile increase in germination. In some cases post-emergence damping-off is reduced. Most Forest Service nurseries and some privately owned nurseries have already adopted this technique.

It has now been shown that coated seed can be stored for at least a year so the next step is the coating of seed at one central treating plant.
Weedicides

Hand weeding of nursery beds is time-consuming and back breaking; it is the most unpopular of nursery jobs. With the arrival of modern weedicides, hand weeding should soon be a thing of the past. There is still a need for further experimentation but much is known already. A conservative estimate of hand-weeding costs in many nurseries would be £350 per acre per year for seed beds. The application of pre- and post-emergence petroleum weedicide sprays costs less than £25 per acre. Simazine now enables seed beds and lined-out stock to be kept weed-free for six to seven months, for less than £5 an acre. There are, however, some reservations about using this weedicide on young Douglas fir — it is definitely not safe to use on seedlings up to the age of six months.

Heavy rates of simazine will keep headlands and hedges completely free of weeds.

Fungicides

Most N.Z. forest nurseries suffer only minor losses from fungal diseases, but there are some exceptions. For example, one nursery never manages to raise more than 4,000 radiata seedlings from a pound of seed (8,000–10,000 is normal); another lost 60 percent of its Douglas fir seedlings through damping-off in 1961; and a third has suffered heavy losses of 2-year Douglas fir from a persistent root-rot. Such heavy losses are likely to upset planting programmes, and as soon as this happens, expense on corrective measures is not only justified but essential. It is to be hoped that the annual profit from an acre of plantation is greater than the cost of keeping 1,000 seedlings from dying in the nursery.

Research into disease control in N.Z. nurseries is still continuing, and we are not yet sure that we know the best methods for general application. Partial soil sterilization is showing promise but, as it is only effective for one or two years, it is a recurring cost which is spread over comparatively few seedlings. However, when heavy losses are expected, it can be economically justified. Considering the use of chloropicrin, one of the materials showing promise as a sterilant, the cost of the material alone is about £100 per acre. Costs of application and rotary hoeing to disperse any residual sterilant before seeding, bring the cost up to £130 per acre. If this enables an extra 100,000 seedlings an acre to survive, as happened in a trial at Rotorua, the cost per 1,000 seedlings is £1 6s 0d. As many nursery costs are independent of seedling numbers, there is quite a profit to be made on these seedlings. Average production costs in Forest Service nurseries are about £3 5s 0d per 1,000.
Insecticides

Grass grubs have caused up to 50 percent mortality in nurseries before being detected. This means a loss of £300–400 per acre. Treatment with DDT or other insecticides costs less than £5 an acre. The important thing is to treat early. Do not wait until 50 percent, or even 10 percent, have died. If there is any reason to suspect the presence of grass grubs, dig up a few square feet of nursery bed and see if any are present. Routine checks can be done in a matter of minutes and applying the recommended insecticide for the district at an early stage can reduce losses to almost nil.

Mechanisation

Over the last decade a number of operations in nurseries have been mechanised, with considerable savings in costs. For example, the cost of wrenching lined out stock with a tractor is much less than half the cost of doing the job by hand. There are many other operations where specially designed equipment could be profitably used. Some suggestions are:

(a) Lining-out machines or attachments for tractors.
(b) Precision seeders which ensure uniform spacing and depth.
(c) More widespread use of mechanical hedge cutters.

General

The understandable aim of all nurserymen is to lower costs but this should be a secondary consideration. The primary aim in any nursery should be to produce the healthiest and most suitable planting stock. Nursery costs are only a small part of establishment costs. In the future large centralised nurseries will probably supply the greater part of the country’s requirements. In these nurseries the most economical use can be made of specialised knowledge, machines, irrigation systems, etc. However, even in small nurseries most of the points mentioned in this paper have some relevance.