

New Zealand nurseries – predictions for the future

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Fossil fuels are used to grow seedlings, but some hope nurseries in 2050 will stop using products made from oil and coal. If this does occur, will bareroot seedlings be cultured using mainly labour and electricity and will container-grown seedlings be grown year-round in greenhouses without the use of fossil-fuel based fertilisers and pesticides?

In the USA, some northern conifers are grown in greenhouses, but about 83% of loblolly pine stock is bareroot while 17% is grown outside in plastic containers. Managers know that growing pines outside reduces seedling production costs. The following provides a few ideas about future nursery practices in New Zealand.

If fossil fuels are prohibited in 2050, nurseries might return to the methods used 140 years ago. A low-tech Amish approach to growing bareroot seedlings would likely be self-sufficient and more sustainable than a high-tech system that relies on imported equipment and materials. Another bareroot option would involve applying herbicides and pesticides using tractors powered by wood-gasification generators. At container nurseries, media can be produced using pine bark and seed can be sown in containers made from polyester-free paper or bamboo.

If government policies increase the price of electricity, some nurseries may produce their own electricity using wood and solar. Nursery managers could recharge electric ATVs by using wood-gas powered portable generators. If energy becomes more expensive, they will look for ways to cut costs and produce seedlings more efficiently. To clarify, if nurseries only use human labour to grow seedlings, the one that produces 1,000 target seedlings per 20 hours of labour is more efficient than one that produces 600 seedlings per 20 hours.

I predict >85% of New Zealand nursery stock in 2050 will be bareroot because:

1. With effective herbicides the cost is less than container-grown stock; and
2. Container-stock requires more fossil fuel and labour per seedling. The following are some of my predictions for future research in New Zealand.

I predict a detailed life-cycle analysis will show less fossil fuel is used to produce bareroot stock than container stock. For example, producing a million Swedish container-grown pine seedlings (400–550 seedlings m⁻²) can result in emitting 50 Mg of CO₂ (10.1016/S0959-6526(01)00012-9). Although a similar analysis is not available for bareroot nurseries, producing a million bareroot pine seedlings might emit 3.5 Mg of CO₂ (diesel fuel, fertilisers, pesticides).

Due to labour requirements, economies of scale and energy costs, seedling cost will be less for a 10 million/year bareroot nursery when compared to an enclosed greenhouse facility that produces 0.7 million/year. Producing seedlings year-round in a greenhouse requires additional energy for cooling, heating and irrigation. Researchers will compare the amount of energy used to irrigate 0.7 million seedlings in a heated greenhouse with the energy used to irrigate 0.7 million bareroot seedlings (at a location with 1,400 mm of rainfall a year).

Outside-grown pine seedlings are more cold-hardy, have more epicuticular wax, and the diameter (at ground-line) is usually thicker due to thigmomorphogenesis. Research will demonstrate that properly top-pruned pine seedlings grown outside in containers will outperform non-pruned greenhouse-grown seedlings that are shipped directly from the greenhouse.

After air-pruning produces a callus on a taproot, elongation after transplanting is inhibited. Therefore, some fast-growing container-grown genotypes will topple after high wind events.

Research will show that when outplanting seedlings by hand in New Zealand, the cost of labour is about 10% more for container-seedlings versus bareroot seedlings. In Alabama, the cost is 25% more when planting container stock. After comparing chemical fertilisers regimes with a compost only regime, researchers will document better field performance when container-plugs contain a 'packed-lunch' of slow-release fertilisers.

Finally, our profession should be a place where questions about nursery practices, government policy and three-dimensional climate models are welcomed. Debate should be encouraged and hypotheses should be tested (not simply proposed). However, some advocates believe CO₂ is the primary driver of a changing climate and, therefore, they encourage nursery managers to stop using fossil fuels and petroleum-based pesticides. Some ignore factors such as changes in cloud cover, surface albedo, heat islands, cosmic rays, and increases in soot (in air and on ice) and the Pacific Decadal Oscillation.

Ignoring these factors results in a belief that the Earth's complex climate system is relatively easy to predict and the atmospheric mean temperature can be controlled by planting fast-growing trees on temperate and boreal grasslands. This flawed logic explains why some advocates look forward to the day they can purchase seedlings from nurseries that do not use fossil fuels.

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