Innovations at Narromine Transplants©

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INTRODUCTION

From its creation, Narromine Transplants has endeavored to be at the forefront of its particular sector of the Australian nursery industry, namely cell-raised seedlings. To maintain this edge and at the same time ensure the enterprise remains economically viable, it has been necessary to be both innovative and inventive.

This paper outlines just some of the measures taken to ensure that we are the nursery of choice for our forestry customers, with a commitment to quality and service via the introduction of innovation.

SEEDLING PRODUCTION

In 1983, Narromine Transplants commenced its life as a containerised vegetable-seedling nursery based on the American Speedling® system. It became apparent that it may be possible to use the system to propagate tree seedlings, which to this point in time had largely been grown as bare root seedlings or grown-on in larger containers.

The South African Forestry Industry was the first to use these cells for this purpose, although they eventually enlarged cell volumes to better accommodate tree seedlings.

Narromine Transplants grew large numbers of tree seedlings in vegetable containers from the mid-1980s onwards, but it was apparent, particularly with farm customers, that the cell sizes were too small to ensure sufficient root development that would sustain the plant in the field in adverse conditions.

A trip to South Africa, Sweden, and the U.S.A. in 1992 confirmed that if we were to enter the forestry seedling market in Australia we would need to increase cell size to ensure adequate rates of field survival.

A decision was made to use the Swedish Hiko V93 tray consisting of 40 cells at a volume of 93 cc per cell. This compared to a 200-cell tray used previously of 22 cc per cell with a much higher seedling density per square meter.

The next challenge was to try and direct-seed the Hiko trays using *Eucalyptus* seed collected from the native forest. This led to the use of relatively sophisticated seed cleaning equipment to separate chaff and other extraneous matter from samples to finally end up with material that could be single-seeded using vacuum drum seeders.

Some species lent themselves to this treatment, while others remained obstinate and required additional treatment. This led to a further process of pre-imbibing seed under a mist, separating it in sugar solutions, then washing and partially drying it prior to seeding.

With one species in particular, *E. pilularis*, this process raised germination percentages from 12.5% to 63% but was still not enough to allow direct seeding without further intervention, usually by way of pricking in seedlings grown in community trays. This process proved expensive and required considerable skill from our staff to ensure the pricking-in process did not distort seedling roots.

The ornamental industry by this time had employed the use of a 512-cell plug tray for the germination of flower seed and then a growing-on period of about 6 weeks. Initially these plants were transferred to larger containers, mainly punnets, by hand.

At Narromine, we decided to try and sow our *Eucalyptus* seed into 512-cell plugs so that we could conserve space for the first 6 weeks of the seedling's life, accept a lesser germination, and not waste space. Finally, we wanted to grade our seedlings on transfer to the larger Hiko container, ending up with a much more uniform crop.

The system worked well, and we moved very rapidly to 100% use of plugs. The adoption of this method of propagation also demanded the construction of transplanting lines consisting of eight station conveyors and specialized container-filling equipment.

Today we have moved on to robotic transplanters capable of transferring 13,000 seedlings per hour using almost half the number of people required with a traditional transplanting line.

ASEXUAL PROPAGATION

Recently, based on demand from the forestry and revegetation sectors, we have moved to the propagation of clonal hybrids of *Eucalyptus*. This has required the addition of mother stock greenhouses as well as mist propagation facilities.

The technology for both the creation of *Eucalyptus* hybrids and their subsequent propagation has been developed in South America so it has been necessary to visit Chile, Brazil, and Uruguay in an effort to acquire enough information to commence production.

The South Americans, without exception, propagate their cuttings from stock plants either grown in an ebb and flow system, drip-irrigated sand bed, or in the ground. We decided to use coir slabs and supply nutrient and water via a drip irrigation system and as far as we know we, and a collaborating nursery, have been the first in the world to propagate *Eucalyptus* using this technique.

In addition we have further employed the use of plug trays in this process and at least, for subtropical hybrids, have found the use of these cells combined with specific stock-plant treatment, to yield in excess of 90% strike rates and also give the added benefits of space utilisation. In South America 100% of the propagation of eucalypt hybrids is carried directly in the final container requiring final sorting for unstuck cuttings. Our system eliminates this process due to a transfer of a struck cutting at approximately 6 weeks, which usually requires little further attention prior to dispatch.

Recently, we have been involved in a program of "clonal rescue." This process has been necessitated due to clonal archives of previously imported *Eucalyptus* clones being "lost" by nurseries initially charged with the responsibility of propagation some years ago. Data accumulated recently from replicated field trials of some of the lost clones indicates that they have potential to perform well under certain environmental conditions and within specific localities. A plan has been implemented whereby selected clones have been felled within these trials and allowed to reshoot, and then cuttings were taken from the juvenile coppice.

To ensure that the coppice keeps its integrity so that cutting material taken from it would have a chance of survival, an aircraft was chartered to quickly transport

the material, carried in cooler boxes with ice bricks in the bottom, back to the nursery. Elapsed time from when the material was taken on the central Queensland coast to when it arrived in the nursery was 8h 30 min.

Results of the exercise are still being evaluated, but we believe that it shows enough promise to be duplicated over a number of forest estates to either rescue clonal material as described above or take coppice from other hybrids or single species for trial and eventual mass propagation.

OTHER DEVELOPMENTS

In the last 2 years we have been involved in the propagation of large numbers of *Casuarina cunninghamiana* for eventual use in the production of activated charcoal. Because of the very high planting densities being implemented by the project manager we have tried to reduce the unit cost of seedlings to ensure that the economic viability of the enterprise and that our own cost of production remain within a predetermined limit.

To do this we have used a vegetable seedling tray with 392 cells and a volume of 17 cc per cell, direct-seeded with a 16- to 18-week growing period. The seedlings are then planted in the field using traditional vegetable seedling transplanters. Establishment rates have been quite acceptable, and we expect to continue this method of production for this purpose.