

PLANT PRODUCTION SCIENCE

Bringing you the latest plant science from New Zealand and around the world.



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In Issue One we focus on plants *in vitro* or tissue cultures.

We look at the latest technologies and advanced automation, applications for conservation and research, and the myriad ways that New Zealand businesses are innovating with tissue culture.

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Technology

Innovation in tissue culture automation



Photo: Nic-In Systems Automated transplanter

Tissue culture production is a time-consuming and manually intensive process. The need for sterile technique in each stage is paramount. Automation is now available that will revolutionise the transplanting process.

I spoke to Nico Van Rooijen of [Nic-In Systems](#)® about the technology he developed for his plant production business in Australia. Nico looked around the world to find automated transplantation systems for tissue culture and found a big gap in the market. He set about adapting the technology used by other industries to the tissue culture environment.

While the initial goal was to improve production efficiency, many other improvements have been realised. Most tissue cultures around the world are produced in round "takeaway" containers. By switching to rectangular containers, 30% more plants can be grown in the same space. The growing room is an expensive space to power lights and keep temperatures and humidity within an acceptable range, so extra plant production makes a big difference.

The Nic-In system has also led to improvements in transportation of plants. The agar growing medium is very fragile and if the container gets knocked during transit, or has any pressure applied, the agar breaks up and turns into a kind of soup. Bruised plants can fail their border inspection and get thrown out. The cells in the Nic-In system have a smaller volume of agar and holes in the bottom of the cell trays mean that agar can flow from one cell to another in the boxed tray. With freight costs up 400% and the massive reduction in air-freight post-Covid times, it costs as much to ship tissue culture from Australia into NZ as it does to ship into the USA. Reducing plant losses saves cost.



Photo: Plants growing in Nic-In tray system.



Photo: Individual plants in agar cell plugs.

The Nic-In trays are a 7 by 7 cell tray, containing 49 plants. Many people like the system because it saves having to manually count plantlets! Improvements in robotics has meant the transplanting systems used for tissue cultures can handle the plantlets in almost the same way that seeds get handled. Two splashes are inserted into the cell and lift the plant with the plug of agar up, the robotic arm moves sideways and plants the agar plugs into their final pots. Different transplanting heads are available, and different agar mixes are used depending on the species. There is a lot less transplanting shock as the root systems remain completely intact and are precision planted at exactly the right depth every time. A single transplanter can do 14,000 - 15,000 plants per hour, so this is a significant savings in labour costs. Smaller transplanters can plant up to 5000 plants per hour.

Major developments are just around the corner which will enable the micro-propagation process to be automated. The equipment uses laser technologies and machine learning to train computers exactly where to make precision cuts (even zig-zag cuts!) and with no risk of contamination.

Nic-In was poised to sell systems into several very large plant breeding and cut flower companies in Europe but Covid-19 put paid to those plans earlier this year. Now the dust has settled and six months later it has become even more apparent that one of the greatest risks to many businesses is a guaranteed labour force. Automation is now seen as a necessity for business continuance.

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