

Closing the gap, Dr Stuart Tustin in his Future Orchard Planting System trial at the Plant and Food Havelock North Research Orchard.



Tustin's work still not done

By Rose Mannering

After a research career spanning 30 years, no time is more exciting for scientist Dr Stuart Tustin than the present.

His current work on Future Orchard Production systems (FOPS) has given him a blank canvas, with the opportunity to completely redesign an orchard from the ground up to capture as much light as possible. Stuart and his team are developing future orchard planting systems for summerfruit, kiwifruit, apples and pears of intensive architecturally framed trees set to revolutionise orchard production.

In his illustrious working career at Plant and Food Research, and all of its previous iterations, he has been internationally and nationally recognised for his work. In January he received the Hawke's Bay Fruitgrowers' Association Joe Bell Trophy for his service to the industry. President Lesley Wilson says the association was thrilled

to honour Stuart for his massive contribution to improving fruitgrowing systems in Hawke's Bay, and New Zealand.

Professor Emeritus Ian Warrington, Massey University puts it this way: "As a scientist, to be recognised for your contributions by your scientific peers is one thing but to be recognised by the industry that you have served is really special and valued."

During the 30 years Stuart has been involved in researching better growing systems, mainly in apples, gains in productivity have been exceptional. Productivity of New Zealand pipfruit orchards has had a quantum leap in the last decade, increasing by 50% to an industry average of 2,000 cartons per hectare by 2015. Previous decades have also shown substantial leaps in output, and Stuart is marching into a brave new future planning even more stunning yield outputs from New Zealand orchards.

In his role as science group leader of Crop & Fruit Production Systems at Plant & Food Research, Havelock North he has not only enabled major increases in productivity, but also enhanced fruit development and fruit quality through the use

of vigour reducing rootstocks, intensive planting systems and orchard canopy re-design and management, particularly to increase the capture and utilisation of sunlight. His research activities have included studies in the new field of genomics and gene regulation, aspects of postharvest physiology, and the roles of plant growth regulators in tree growth.

From a professional standpoint, Stuart has published over 60 papers in international scientific journals and over 40 manuscripts in the proceedings of international and national scientific conferences during his career.

FRUITGROWING FAMILY

Stuart's family were orchardists, father Ian Tustin was a berryfruit grower, orchardist and nurseryman based in Kaipoi Road in Hastings. Stuart worked weekends and holidays in the business; apple trees were planted at 20 x 20 foot spacings with about 250 trees per hectare. The common varieties were Red and Golden Delicious, Granny Smith, Cox's Orange Pippin, Sturmer, Gravenstein and several others. Gala was under very early evaluation. Rootstocks included MMI06, Northern Spy and Merton 793 and packouts were closer to 60 percent. Hydra-ladders had just come onto the market but wooden ladders up to 4m high were still being used routinely.

Stuart headed to Massey University to complete a Bachelor or Horticultural Science, planning to head back to Hawke's Bay on completion to work in the family business.

The lure of university was too great for Stuart, and he continued on to do a PhD in Plant Physiology. "Dad was not so pleased when I got a research job at the NZ Nursery Research Centre."

Next followed a stint with the UN Development Programme, a delayed "OE" working on a fruit development programme in Pakistan near the Afghani border. After two tours of duty, Russia invaded Afghanistan and that was the end of Stuart's involvement with the programme.

He worked for five years in the family business before his mind once again returned to continuing a career in research. Stuart was appointed scientist at DSIR in 1984 at the Havelock North Research Station based in Goddards Lane, and forerunner to Plant & Food Research now at Crosses Road. Stuart briefly worked

alongside Dr Don McKenzie until Don's untimely death in a car accident in 1989. Don had revolutionised the way apples were produced internationally, re-designing the old multi-leader trees to single leader trees on semi-dwarfing rootstocks and developing new semi-intensive orchard systems, resulting in better light distribution within the tree. Tree density then moved from around 277 to 670 trees per hectare, doubling the production potential of New Zealand apple orchards.

RETURN TO RESEARCH

Don's role was divided, Stuart was given pomology and physiology, and Allan White took over the breeding side. It was a very different environment in 1984 compared to the present time: "I said to Allan what do I do, he said 'anything as long as it's useful and it's not breeding'."

Building on Don's significant work, Stuart set about understanding tree physiology and impacts on fruit crop load and fruit quality. He knew with high light intensity, and a long growing season in New Zealand there was capacity to produce more and better quality fruit per unit land area. Reducing labour inputs and increasing export packouts also underpinned his research efforts. >>

Dr Stuart Tustin receives the Hawke's Bay Fruitgrowers Association Joe Bell Award for service to industry: From left Professor Emeritus Ian Warrington, Massey University, Dr Stuart Tustin, Plant & Food Research, Lesley Wilson, President Hawke's Bay Fruitgrowers' Association, Chris Herries, Farmlands Horticulture.



HIS AWARDS INCLUDE:

1994 – Distinguished Researcher Award from the International Dwarf Tree Association

2003 – Appointed Fellow of the New Zealand Institute of Agriculture and Horticultural Sciences in recognition of his outstanding service to horticultural science.

2008 – Elected Chair of the Orchard and Plantation Systems Working Group within the Fruit Section of the International Society for Horticultural Science.

2014 – AgMARDT Technology Transfer Award from the New Zealand Institute of Agricultural & Horticultural Science (NZIAHS).



Meantime many in the industry were following European trends further increasing tree density up to around 1000 trees per hectare, but excessive shading became a problem as the trees matured and developed under the high vigour conditions in New Zealand. Stuart and colleagues re-designed the New Zealand apple tree into the slender pyramid with a well-developed basal tier and improved light distribution, resulting in fruit of exceptional colour uniformity, size and taste.

Working with colleague John Palmer and others at what was then called HortResearch, extensive trialling of dwarf rootstocks, in particular Malling 9 and briefly MARK rootstocks, with current and new varieties dramatically changed the industry. Dwarfing rootstocks to control tree vigour assisted the establishment of new varieties easily and quickly, producing large yields of export-quality fruit. Intensive planting systems of 1,500 to 2,000 trees/ha resulted in top yields of 80 to 90 tonnes/ha.

Stuart continued his involvement with commercial orcharding until 2006 when he sold his interest in a 20 hectare apple orchard. His commercial involvement has kept him grounded. "It is a good thing if you appreciate what horticulture involves," he says. He regrets he no longer has a commercial interest in fruitgrowing.

NOT ALL ROSES

For Stuart, one of his biggest frustrations has been the rate at which the fruitgrowing industry changes its behaviour. "The amount of momentum it takes to bring in new and different ideas is massive."

Some growers still persist with the idea to control tree growth they need to prune. Halving the cost of growing a good tree is possible if growers work with the natural growth of the tree. "Less is more; there is a concept of contract pruners they need to be cutting to be seen to be working hard."

A decade of hard times slowed the adoption of new technology and he is hopeful the pace of change may increase in the future as the industry returns to a surer footing.

He has no thought of slowing down, the FOPS project is ground changing, and he can see a super-orchard productivity potential from the research work. "It could bring profitability back to how it used to be in the 1960s."

Already using the industry standard tall spindle growing system in a research block of Envy apples at the research centre, production has reached 150 tonnes/hectare with prunings that could "fit in your hand".

Average growers achieve yields of 60 tonnes/hectare, the best producers currently achieve yields of 100–110 tonnes/hectare. "We are trying to drive through to the next level of yields of 160–200 tonnes/hectare." Capturing light and allowing light to travel through the tree to gain greater interception is key. Close spacings would mean smaller machinery and different sized bins would be needed.

Plant & Food Research chief operating officer, Dr Bruce Campbell says the Joe Bell Trophy is great recognition for a career spent supporting the New Zealand horticultural industry. "Not only has Dr Tustin's research transformed horticulture practices in the past, but his current work is looking to dramatically enhance the productivity of future orchard planting systems also. Sustainably increasing yield while maintaining premium quality fruit is key to helping the New Zealand pipfruit industry meet its goal of \$1 billion by 2022."

One thing is for certain, Stuart's work is not done. He continues on his journey of constant improvement to make the fruitgrowing industry better than he found it. 🍏