Growing the Future: Advancing Tree Genomics for Smarter, More Productive Orchards

QUT research delivers genomic tools to boost productivity, resilience, and sustainability in tree crops

Tree crops such as almonds, apples, citrus, macadamias, and mangoes are vital to Australia's economy and food security, yet breeding new varieties is slow, costly, and vulnerable to climate, disease, and labour challenges.

Since 2017, Professor Peter Prentis and researchers at QUT's Centre for Agriculture and the Bioeconomy (CAB) have been advancing tree genomics to transform how orchards are designed, managed, and sustained. Through the National Tree Genomics Project (2017-2023) and the current Genetics for Next Generation Orchards program (launched in 2024), QUT has partnered with Plant & Food Research New Zealand, the Queensland Department of Primary Industries, and Superior Production to equip breeders with genomic tools that shorten breeding cycles, improve yield, and reduce costs.

The team's work includes identifying the genetic basis of key traits, such as flowering time, to accelerate citrus and mango breeding with the Queensland Department of Primary Industries, and contributing to the Citrus Disease Resistance Project with Superior Production to develop disease-resistant citrus varieties through mutation breeding and gene editing.

In a breakthrough with major commercial potential, QUT and Plant & Food Research New Zealand have developed the first gene editing system for avocado, overcoming tissue culture challenges. This innovation is paving the way for smaller avocado trees, enabling more efficient orchard management and lowering production costs in Australia's $1 billion avocado industry.

Impact highlights

- Launched and delivered two major national programs in tree genomics (2017 - 2023; 2024 - ongoing).
- Partnered with industry leaders across Australia and New Zealand to accelerate breeding and orchard innovation.
- Developed disease-resistant citrus varieties through advanced mutation breeding and gene editing.
- Research team includes Professor Peter Prentis, Dr Stephanie Kerr, Dr Leena Thung, Dr Sudipta Das Bhowmik and Maiko Kato.

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Find out more
research.qut.edu.au/cab/