'Digital twins' concept boosts food production

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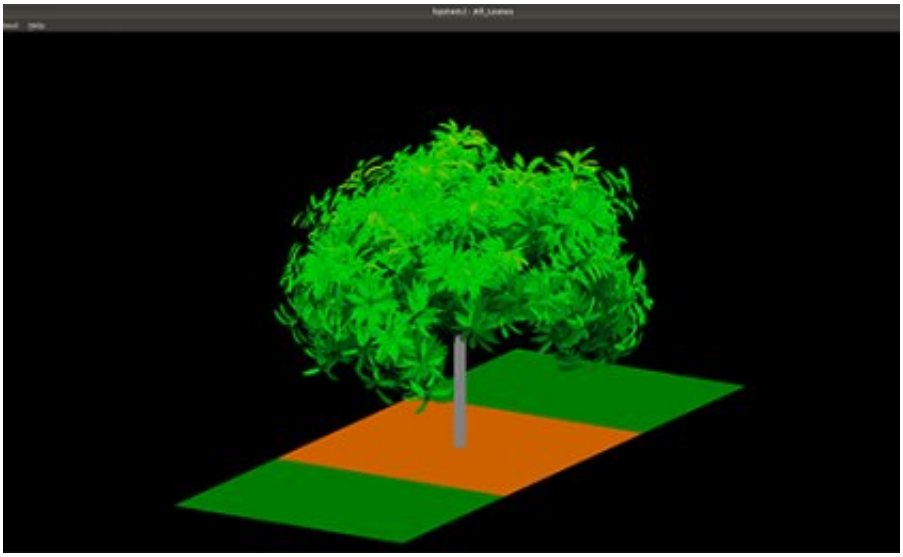

Digital image of mango tree by Dr Liqi Han. Credit: University of Queensland

Using technology familiar to computer gamers, University of Queensland scientists are creating 'digital twins' of mango and macadamia orchards to help boost food production.

Professor Neena Mitter, the Director of the Centre of Horticultural Science at Queensland Alliance for Agriculture and Food Innovation (QAAFI), said it was an example of how computers were changing the industry.

"Developing a digital model for an orchard with slow growing crops like mango and macadamia enables us to run virtual experiments at a scale and speed never before possible," Professor Mitter said.

"Digital technologies offer an unprecedented acceleration in innovation that will help make food production more productive, resilient, and sustainable."

Lead researcher Dr. Liqi Han said the technology would particularly benefit slow growing crops like fruit trees.

"The digital modeling provides untapped opportunities for users to rapidly trial new ideas and acquire a reliable indicator of how to best optimize production systems," Dr. Han said.

"We call this technology 'DigiHort', short for Digital Horticulture."

The computer simulations can be a conceptual design of an orchard that doesn't yet exist, a digital twin or detailed replica of an existing orchard, or a digital variant, where changes are made to a digital twin.

"All three forms can be integrated with environmental and management simulators," Dr. Han said.

"For example, this might include sunlight and chemical spray simulations to allow for evaluation and optimisation of orchard management practice."

Virtual trials start with the design, with software users able to decide where in a landscape to plant trees, the density of the canopies and the configuration of the rows.

Users then consider how the trees are maintained, wielding virtual

pruners and testing the impact of different—and even unconventional—tree training systems.

This innovation is based on new LiDAR scanning technology applications undertaken with industry partner, Riegl Australia, and state government research stations in Queensland, Western Australia and Northern Territory.

It relies on High Performance Computing (HPC), which allows Dr. Han to run extremely fast virtual experiments without loss of accuracy.

"These days, we talk more and more about precision agriculture," Dr. Han said.

"We enhance precision by looking at the details, such as how much light can be captured by each leaf or fruit, or the distribution of sprayed chemicals across the canopy.

"We can accumulate small benefits into big benefits or prevent big losses from occurring.

"And we've found that small differences can have a big impact."

The DigiHort platform was designed as a decision-support service for industry and will be accessible via the internet.

Provided by University of Queensland

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