

Smart Farming Guide for Horticulture

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Project: (ST19023) Digital remote monitoring to improve horticulture's environmental performance

What is smart farming?

Australian horticultural industries are facing increased challenges with climate variability, supply chain reliability and labour shortages. While no single measure can address all these challenges, farmers can adopt new technologies to optimise management and remotely monitor farm conditions to inform decision making.

Using sensors and technology to improve productivity and performance are at the core of smart farming, with remote monitoring of farm conditions assisting growers to use their resources more efficiently, from labour to other inputs.

This is already happening in some horticultural sectors, with trials underway that could also show promise for berry growers.

Improving the productivity and environmental performance of farming systems using sensors and technology is known as **smart farming**. For smart farming to work, sensors are located at various locations around the farm and remotely monitor key parameters. The data from the sensors is fed into a centralised management tool, known as a dashboard. The Hitachi Vantara Control Tower is an example of such a dashboard. In addition to the data feed from on-farm sensors, dashboards can also use models and other tools to increase the value of measured data.

Project overview

The National Landcare Program has funded four pilot smart farms in Queensland and is supporting development of the Control Tower, which provides growers with an integrated data platform to farm efficiently. The Control tower also demonstrates environmental best practice to customers and compliance bodies.

The Smart Farming Partnerships team consists of Applied Horticultural Research, Hitachi Vantara, Freshcare, Greenlife Industry Australia, AusVeg, Growcom, Australian Banana Growers' Council and Hort Innovation.

The four pilot sites are Bartle Frere Bananas in Innisfail QLD, Golden Grove Wholesale Nursery in Torbanlea QLD and 2 separate areas at Austchilli Group in Bundaberg QLD, which hosts the avocado and vegetable smart farms. Each of the pilot farms are trialling different types of technology for their unique use needs and industry priorities. Videos from each of the four pilot smart farms are available on the AHR website at ahr.com.au/smart-farming

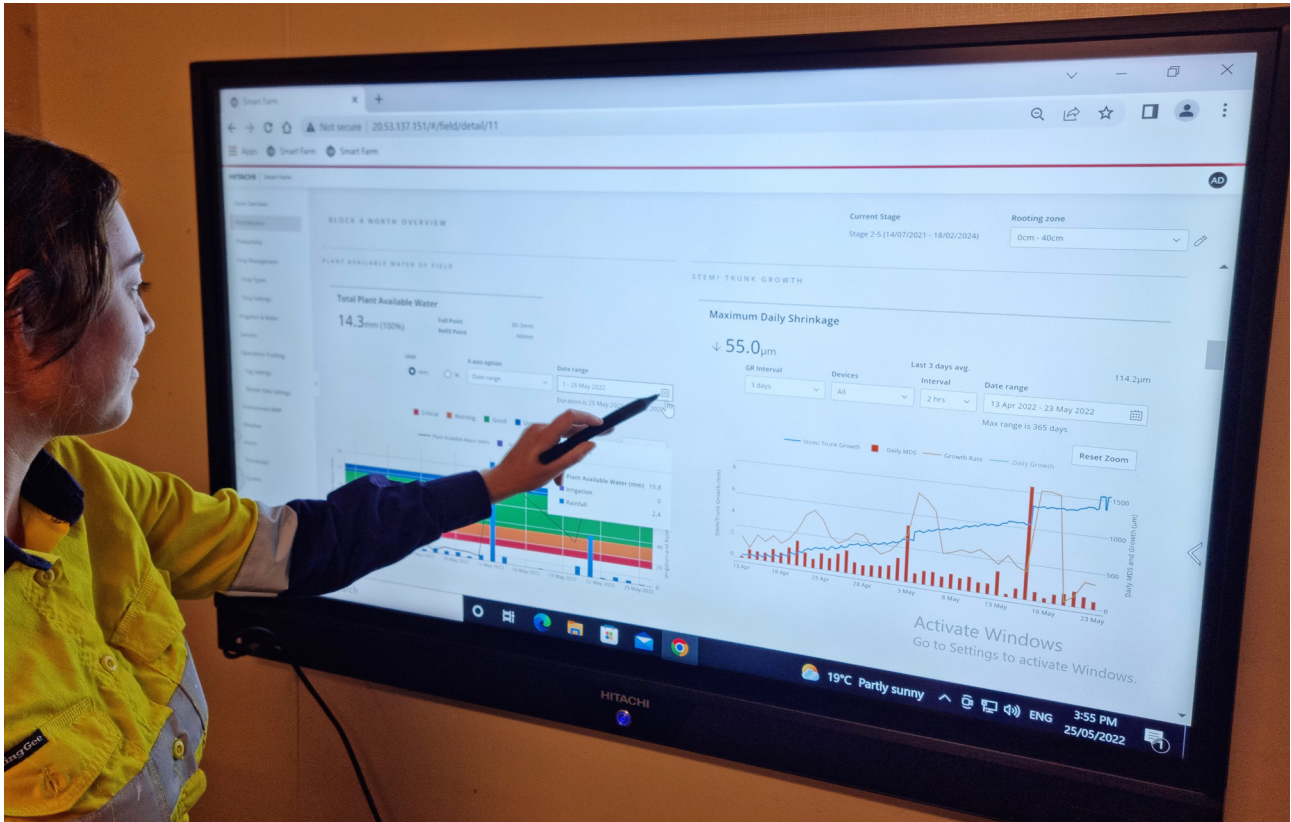
The suite of sensors at each pilot smart farm is designed to provide efficiency benefits and data that can satisfy remote audits of environmental management systems such as Freshcare Environmental and EcoHort.

Hitachi Vantara Control Tower

The Hitachi Vantara Control Tower is being developed to holistically measure farm productivity and environmental stewardship. The key approach to developing this system is to provide a single integrated platform that captures data from all key sensors used across a farm or nursery.

The integration of sensor data, weather forecasts and biophysical models can be collated and analysed. The data are then presented as simple user interfaces or actionable insights to enable users to make decisions regarding business operations.

Importantly, the Control Tower can also automate much of the Freshcare Environmental audit reports and provide decision support tools for managing nutrient runoff and leaching.



Control Tower in use at Austchilli in Bundaberg. Photo credit: Applied Horticultural Research

Technology

The project works with a range of technology providers that are prepared to share data from their proprietary software systems to the Control Tower, such as ICT International, Wildeye, Binary Tech, Eratos and Goldtec.

Data is shared securely via the Application Programming Interface (API) standard to the Control Tower. There is a great benefit to working with companies who are willing to share sensor data because no farming business is locked into a single ecosystem, and growers retain the flexibility to select the best equipment for their needs, maintenance capability and budget.

Is smart farming right for your property?

The term “Smart Farming” covers an extraordinarily large set of tools and practices. This can add to the daunting nature of working out where to start. The **Smart Farming Technology Guide for Horticulture** makes this a more manageable task with its Key Considerations chapter.

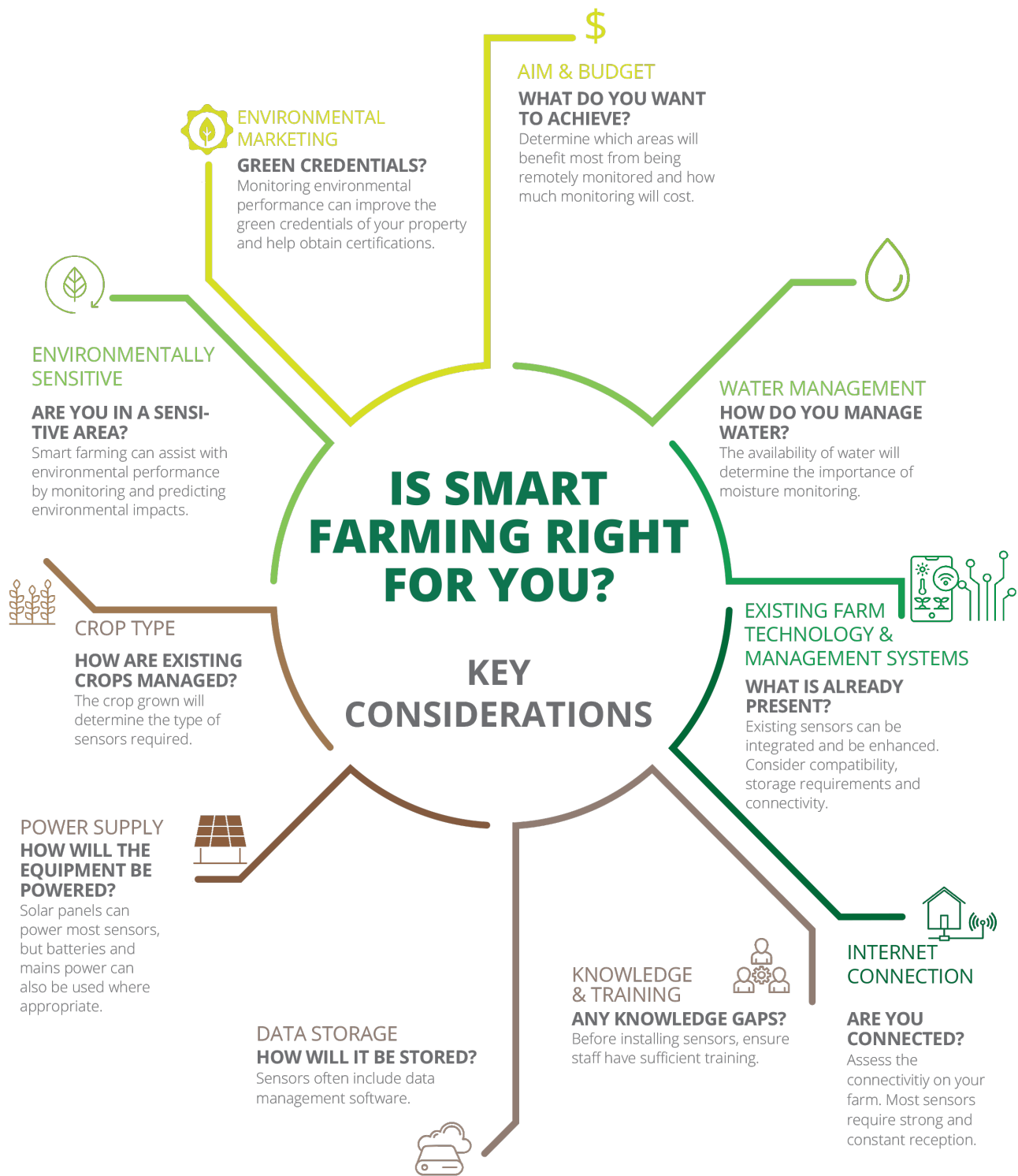
This section contains a list of easy to work through questions designed to help growers determine the smart farming practices and sensors that will offer the most benefit to their business.

The guide also points to external references for those looking to dig deeper into the topics covered.

Shorter ‘How To’ guides will soon be available in print versions, each focusing on different aspects of smart farming. An updated version of the document will be developed later in 2023 with an additional section discussing new methods for digital reporting for environmental management systems, such as Freshcare Environmental and EcoHort.

Those wishing to learn more about the project, or smart farming in general, can do so by visiting the project website www.ahr.com.au/digital-remote-monitoring or by contacting Liam@ahr.com.au or Henry.Hyde@ahr.com.au.

You can also join the smart farm mailing list at eeurl.com/hLsoCD to be notified of relevant upcoming events, such as webinars and workshops.



The **Smart Farming Technology Guide for Horticulture** contains detailed information on the technology used on the smart farms. Scan this QR code to find out more or visit www.ahr.com.au/digital-remote-monitoring. Factsheets on each of the four pilot smart farms are also available.

Case Study: Smart Production Nursery

Golden Grove Wholesale Nursery is a 2ha citrus production nursery in Torbanlea, Queensland, producing and supplying commercial growers with containerised fruit-tree nursery stock for planting in orchards.

Golden Grove is a pilot smart production nursery as part of the digital remote monitoring project.

Golden Grove is an innovative operation; recent additions to the production nursery include a new smart irrigation system and a redesigned growing container (pot) for horticultural tree stock. The nursery has had a range of technology installed to monitor productivity and environmental performance.

The technology installed at Golden Grove includes:

Technology	Productivity	Environmental	BMP
Weather Station	On-site real time weather information, such as wind and rain	Overwatering can be minimised	Spray records are automatically populated
Smartphone & Tablet	Reduced time required for audit forms	Improved accuracy of audit forms	EcoHort records are automated
Weight-based irrigation system	Improved irrigation management	Overwatering can be minimised	Irrigation water use is recorded
Dam monitoring (pH, temperature, depth & EC)	Improved water quality management	Improved release water quality	Irrigation water quality is recorded
Drain monitoring (pH & EC)	Improved irrigation and nitrogen management	Nutrient loss to environment can be minimised	Release water quality is recorded
Pest cameras	Improved pest management	Improved pesticide management	Sticky trap record is automatically filled
Pot leachate monitoring (volume, pH, EC & temperature)	Improve nutrient/water management	Improved release water quality	Release water quality is recorded
Desktop photometer	Improved nutrient management	Nutrient loss to environment can be minimised	Release water quality is recorded
Stem dendrometer	Plant stress can be monitored more effectively	Overwatering can be minimised	Nutrient management efficiency is increased
Potting media moisture monitoring	Improved irrigation management	Overwatering can be minimised	Irrigation water use is recorded



Weight-based monitoring at Golden Grove Nursery.

Photo credit: Applied Horticultural Research

The smart technology installed at Golden Grove is helping to optimise operations and reduce costs. For example, the potting media moisture monitoring probes have helped improve irrigation management, leading to a 30% reduction in water usage. There have also been significant labour savings in water monitoring, as the nursery is now able to remotely access irrigation water quality data. Potting media EC and leachate monitoring sensors have allowed the nursery management team to optimise fertigation and reduce excess nutrient loss.



Acknowledgements

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