



Advancing Smart Agriculture through Shizuoka–Singapore Collaboration



ITE & Happy Quality

6th Shizuoka-Singapore Agri-Food Forum

2nd December 2025



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Scope of Collaboration

1) AI Irrigation System @ ITE HortITEch Hub - System installation, tomato trials, measurable water savings & nutritional quality gains.



2) Digital Twin (VR) Platform for Learning - Interactive & engaging virtual reality (VR) system that enhances student & staff learning on latest agricultural technologies in the HortITEch Hub.



3) Student Exchange & Industry Exposure - Sep 2024 Overseas Student Exchange Programme (20 students; Happy Quality hosted students for a 2-day agricultural experience); Sep 2025 Overseas Industrial Attachment Programme (20 students; Happy Quality hosted students to work in various partner farms).



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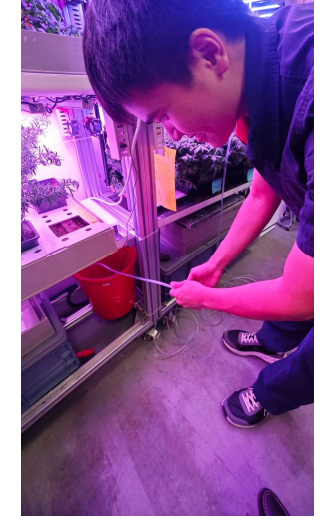
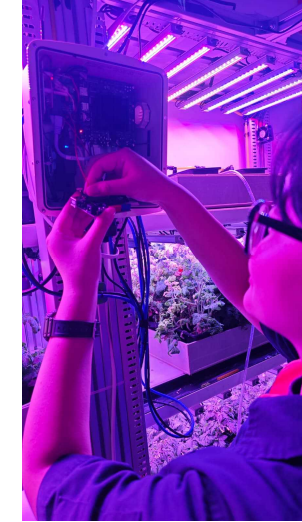
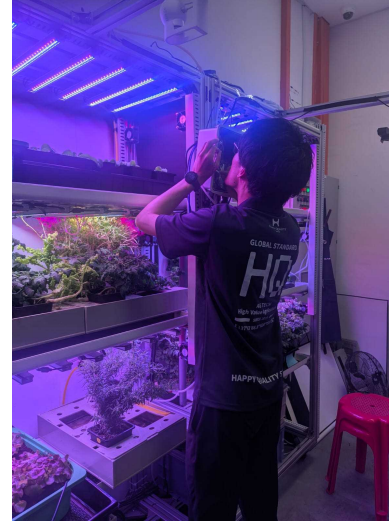
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AI Irrigation System @ HortlTEch Hub

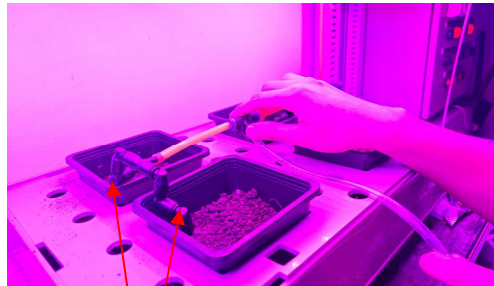
A joint collaborative project with Happy Quality Co., Ltd. (Japan) to integrate AI-driven irrigation technology into indoor farming systems.

Objectives:

- Precise water dosing tailored for different plant species
- Controlled plant stress to enhance nutritional quality and flavour
- Resource savings in nutrient and water use throughout the crop cycle



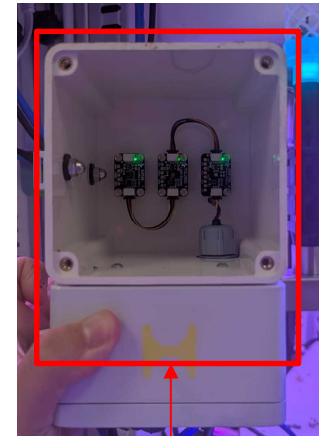
Installation of AI Irrigation Monitoring Unit in the R&D Growing Racks



Drip Irrigation System



Edge Unit



Sensor Unit



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AI Irrigation System @ HortlTEch Hub

In the initial phase, tomato plants utilised manual water dosing under controlled-stress conditions to train the AI system using environmental and image data on growth and wilt patterns.

A dwarf tomato variety (Tiny Tim) was selected for the following reasons:

- Compact growth height (around 40 cm tall), suitable for indoor farming systems
- Shorter fruiting cycle, ideal for quick experimental turnover
- Uniform growth and fruit size, supporting consistent data collection
- Ideal model crop for studying AI-controlled irrigation in small-scale systems



Seedling Stage – Beginning of 1st Trials



Growing (Vegetative) Stage for Dwarf Tomatoes



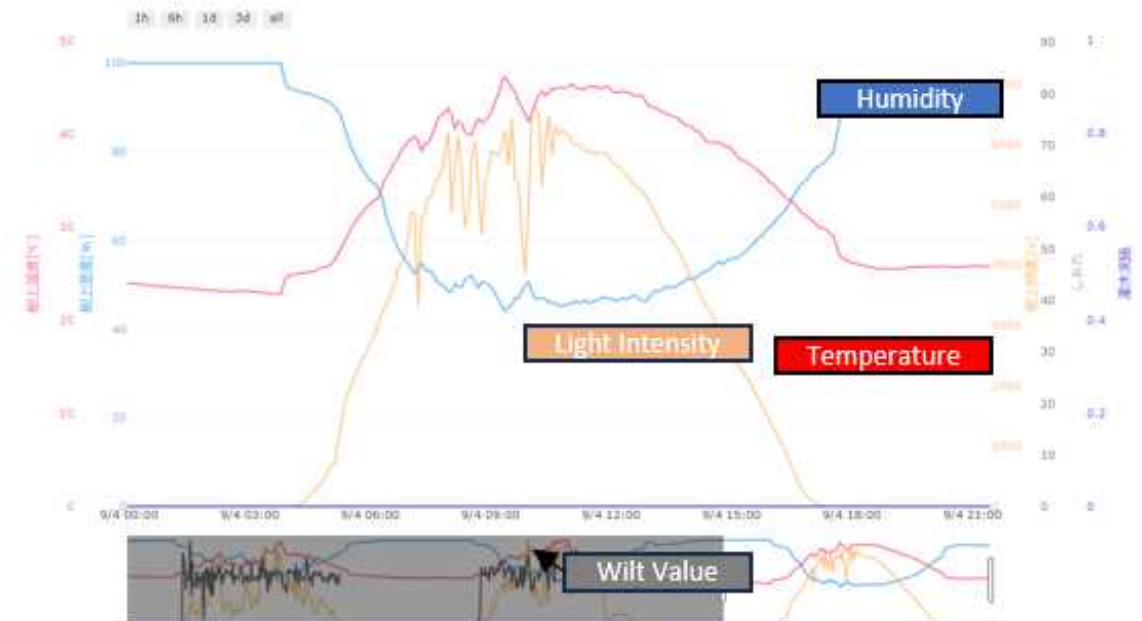
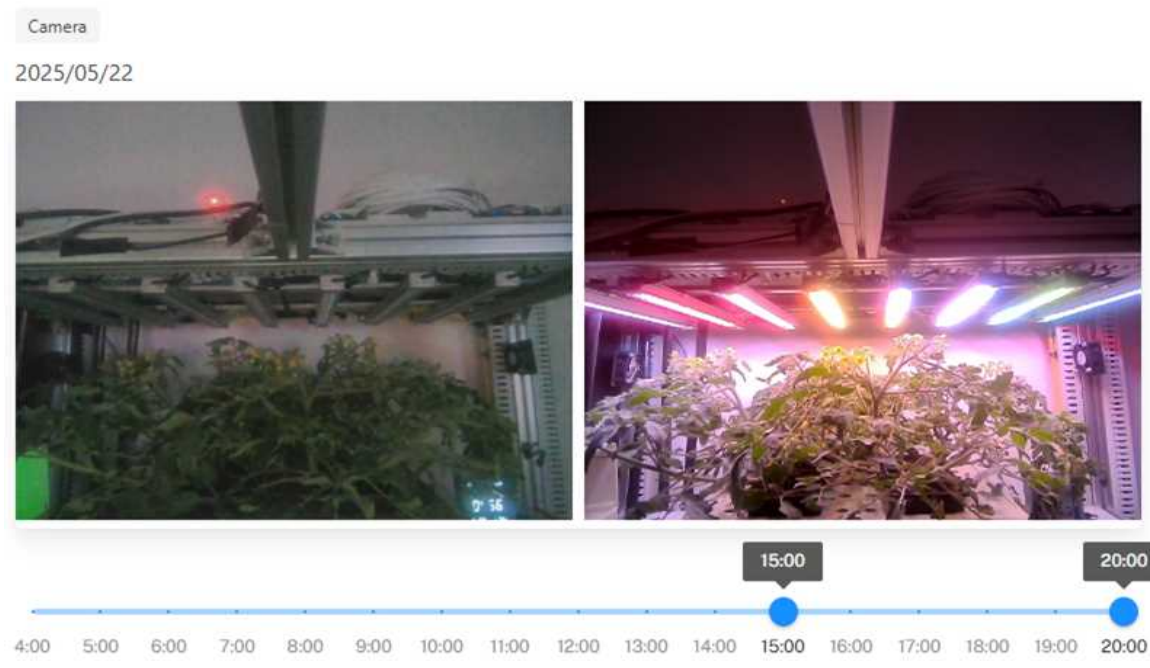
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AI Irrigation System @ HortTEch Hub

The AI Irrigation System in operation at the Horticulture Technology Hub to monitor indoor tomato cultivation. Sensors measured light intensity, temperature, and humidity, while imaging data tracked tomato growth and wilting patterns over the cultivation period.



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AI Irrigation System @ HortITech Hub

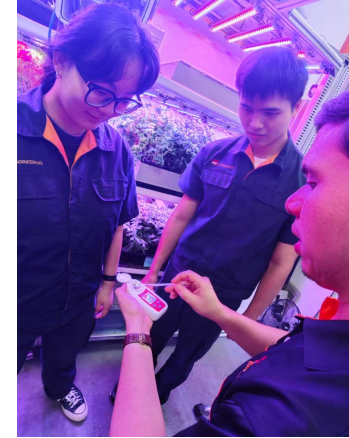
Preliminary Results

Preliminary results from BRIX, mineral, and vitamin C analyses indicate a strong positive effect of controlled water stress on fruit quality.

Tomato plants grown in the 1st AI-irrigation trial achieved:

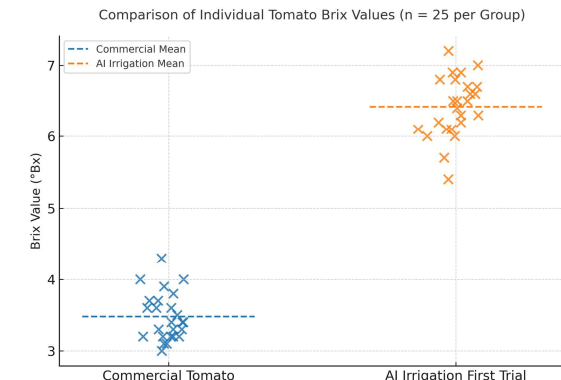
- **+2–3 % increase in BRIX value** (sweetness indicator)
- **Enhanced mineral accumulation:**
 - ✓ **Calcium (Ca): +31%**
 - ✓ **Iron (Fe): +250%**
 - ✓ **Potassium (K): +51%**
 - ✓ **Magnesium (Mg): +61%**
- **Comparable vitamin C levels** to commercial (market) tomatoes

Data based on internal trials conducted at ITE HortiTech Hub, 2025 (n = 25 samples per treatment).



BRIX Testing of 25 samples for Market and Hub Grown Tomatoes

	BRIX (%)	Minerals (mg/100 g)				Vitamin C (mg/100 g)	
		Ca	Fe	K	Mg	Fresh	Frozen
Hortitech Hub Tomatoes	6-7	12.3	0.35	450	18.7	16.5	17.3
Market Tomatoes	3-4	9.4	0.1	299	11.6	16.7	17.1



Digital Twin (VR) Platform for Enhanced Learning

A virtual replica of the HortITEch Hub that simulates key indoor farming processes in a 3D interactive environment. It provides an immersive way for students to learn about automation in agriculture when physical space or access is limited.

Key Features:

- Simulates automated seeding, irrigation, and dynamic lighting control
- Step-by-step walkthrough of crop growth stages from germination to harvest
- Accessible through VR headsets or desktop devices

Educational Impact:

- Builds understanding of automation and system workflow in smart farming
- Integrated into ITE's Sustainable Agriculture elective (Full-Time Nitec/Higher Nitec) and Agriculture 4.0 module (Work-Study Diploma)



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Overseas Industrial Attachment for Students

A two-week overseas attachment held in **September 2025**, hosted by Happy Quality, providing students with hands-on exposure to Japan's advanced agricultural practices.

Program Overview:

- 20 students from Landscaping, Applied Science, and Mechanical Engineering disciplines
- Practical training in AI-driven irrigation, crop monitoring, and greenhouse operations
- Visits to partner farms and interaction with Japanese agronomists and engineers

Learning Outcomes:

- First-hand understanding of high-tech farming operations
- Enhanced appreciation of Japan–Singapore agricultural collaboration
- Development of cross-cultural teamwork and professional skills



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Collaboration Summary & Future Plans

Summary:

- Successful installation and validation of AI Irrigation System for Indoor Farming with improved tomato quality
- Development of Digital Twin (VR) Platform for engaging and scalable agricultural training
- Two successful student exchange and attachment programs with Happy Quality in 2024 and 2025

Ongoing Plans:

- Advance the next phase of AI irrigation research on dwarf tomatoes, with plans to scale to other crop types
- Enhance the Digital Twin platform by integrating real-time data for live system monitoring and performance analytics
- Deepen academic–industry collaboration through ongoing student attachments and staff development programmes with Happy Quality



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Thank you for the opportunity!

Our sincere appreciation to the Shizuoka–Singapore partnership for providing the platform that has strengthened our friendship and collaboration with Happy Quality in advancing Agri-technology education and research.

We look forward to continuing this partnership, exploring new opportunities, and achieving greater innovation together in the years ahead!



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