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NUS team creates SmartFarm that uses new gel to tap water in the air

Tech utilises large, untapped source of fresh water: moisture in the atmosphere

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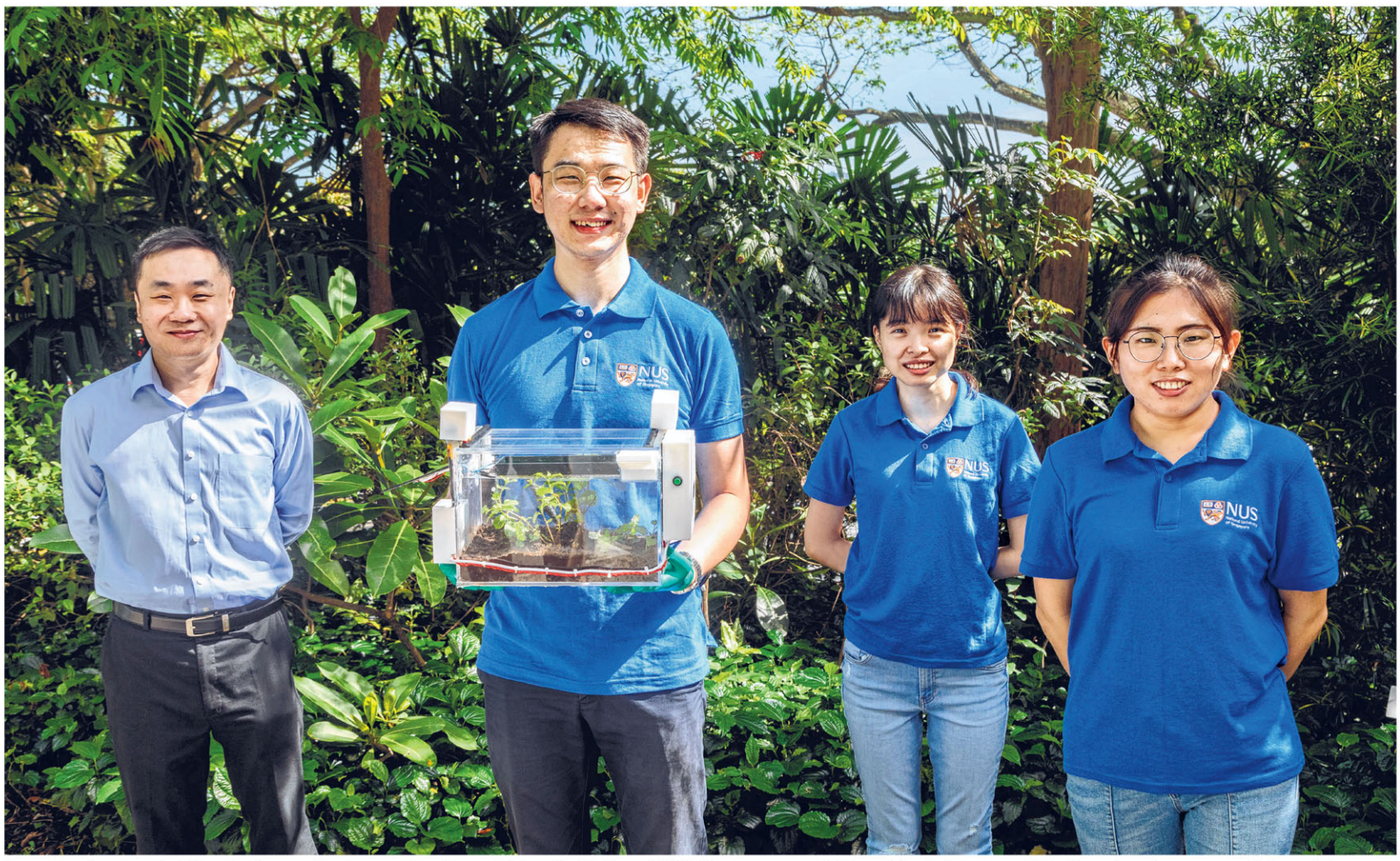

A research team led by Assistant Professor Tan Swee Ching (left) from NUS' Department of Materials Science and Engineering has created SmartFarm – a self-contained farming system which uses a new hydrogel as its main technology. The team members are (from right) Dr Zhang Xueping, Ms Yang Jiachen and Mr Qu Hao. So far, the NUS team has successfully grown kangkong in its prototype SmartFarm. PHOTO: NATIONAL UNIVERSITY OF SINGAPORE

Imagine being able to grow your plants with moisture from the air rather than from a tap.

Researchers from the National University of Singapore (NUS) have created a prototype device known as a SmartFarm – a self-contained farming system which uses a new hydrogel as its main technology.

The solar-powered, fully automated SmartFarm looks like a large fish tank. At night, the top cover opens to allow the hydrogel to trap moisture in the air.

After sunrise, at a pre-set time, the top cover closes to confine the water vapour, forcing it to condense on the surface of the enclosure. This is then wiped off the surface and onto the soil to irrigate the plants.

So far, the NUS team has successfully grown kangkong in its prototype SmartFarm.

Researchers say the technology is aimed at utilising a large, untapped source of fresh water – moisture in the air – which could address two of the world's biggest problems: water scarcity and food shortages.

"Atmospheric humidity is a huge source of fresh water but it has remained relatively unexplored," said SmartFarm's project leader, Assistant Professor Tan Swee Ching, from NUS' Department of Materials Science and Engineering.

He added that Singapore's humidity levels – which are usually well over 80 per cent – are uniquely suited for the hydrogel technology.

Prof Tan, who spent many years working and studying in more temperate climates, initially began work on hydrogels to solve a different problem: Singapore's often uncomfortable heat.

"A lot of the heat we experience is actually due to Singapore's humidity. It is so humid that moisture – our perspiration – cannot evaporate off our skin, which is how we usually lose heat," he said.

The copper-based gel, which researchers began work on in late 2019, is non-toxic and is extremely absorbent, capable of holding up to 300 per cent or three times of its own weight in water.

$20

Cost to make a kilogram of the new hydrogel. The researchers expect the cost to fall when demand rises.

By comparison, current commercially used drying materials like silica gels can hold only up to 30 per cent of their own weight in water.

A kilogram of the new gel costs about $20 to make but the researchers expect the cost to fall when demand rises.

The NUS team is currently in talks with industry partners to explore commercialisation options.

The hydrogel's applications stretch far beyond farming.

It has been used to simulate farming at the Hawaii Space Exploration Analog and Simulation, a habitat created for human spaceflight to Mars.

The hydrogel was also used to control humidity in small experimental greenhouses to grow and sustain crops in Selene II, a simulated Moon mission from November to December last year.

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