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Singapore taps green tech to feed, water and power its people

This is the 11th of 12 primers on current affairs issues under the news outreach programme by The Straits Times and the Ministry of Education



Shabana Begum

For Ms Lin Fengru, 33, what

For Ms. Lin Fengru, 33, what started out as a hobby in cheese-making has turned into a career.

As co-founder of biotech start-up Turtlef Free, she is on a mission to find a cleaner way to produce milk.—not from cowe but not shown to the control of the control

Asia, she travelled to many dairy farms in Indonesia and Thailand to source for milk for the high-quality

source for mink for the night-quantity cheese she hoped to produce. What she found instead were farms where cows were injected with hormones, animal hygiene was poor and the water contaminated – resulting in poor-quality milk. So she turned to technology.

technology.

Today, her start-up can produce
milk from mammary cells. These
are immersed in a lactation solution TurtleTree produce: solution TurtleTree produces in-house which simulates the environment inside mammals bodies, thus causing the cells to convert the solution into milk. The technology behind cell-based milk is similar to that of cell-cultured meat, where chicken or beef cells are multiplied into tissue in bioreactors before they was a superior to the contract of the

are harvested as minced meat Most start-ups here and abroad are currently in their research and development(R&D) phase to

development(R&D) phase to transform cultured meat into textured cuts such as steak, using edible scaffolds. With the world's population expected to reach close to 10 billion by 2050, the demand for food and water will soar. The push food and water will soar to such the push of the push of the such water water water water water water by 2050. So as to prevent the worst

reach net zero carbon emissions by 2050, so as to prevent the worst effects of climate change. As an island nation facing the threat of both sea-level rise and food insecurity, Singapore is geared to innovate and tap the latest in green and biotechnology,

to feed and water its population and power their activities.

BEEFING UP NEW FOOD

A city-state that imports over 90 per cent of its food is wise to invest in research and development of novel food.

Singapore is on its way to becoming a hub for alternative proteins. There are start-up-shere working on growing cell-cultured seafood and meat. Production facilities and R&D centres are uponting in the control of the co

meat alternatives.
A report this year commissioned by the Good Food Institute Asia Pacific found that cultured beef produced via renewable energy can alsah the industry's global warming impact by up to 92 per cent. while slashing the amount of land needed by up to 95 per cent. Rearing livestock for meat and dairy contributes to about 15 per cent or global pre-mitiones goas, control of the per cent of global pre-mitiones goas, agricultural land is used for livestock according to the University of the period of the p livestock, according to the United Nations Food and Agriculture

Organisation. To eventually feed the country,

To eventually feed the country, alternative protein start-ups here need a platform to manufacture their food products affordably, their food products affordably, have pilot plants.
That is why despite the Covid-19 pandemic, Singapore has not dialled back on its ambition to mass produce and refine alternative proteins. In April, two Swiss firms launched a protein produce unto a doller of their produces and their produces and their produces are not produce and their produces are not produce and their produces are not alternative produces and not produce innovation centre that can produce up to 40kg of plant proteins in an hour, enough for about 330 burger patties, and start-ups can tap the facility's technology and equipment to develop new products. Local biotech company Esco Aster is seeking a Singapore Foo Agency licence for one of its facilities to produce novel food interedients such as cell-based in the composition of the composition

Aster is seeining a singaporir coor Aster is seeining a singaporir coor in a contract of the coordinate of the coordinate facilities to produce flood space is gaining steam here, the public's receptivity to cell-based meat and mik is still uncertain. Food is core identity, and start-up-asko need to their public overcome the "ick factor" of meat grown from cells. Will there come a day when people readily which to cell-cultured readily which to cell-cultured professor William Chen, director of Nanyang Technological

of Nanyang Technological University's (NTU) Food Science University's (NTU) Food Science and Technology programme, hopes public outreach and school workshops on growing cell-based meat will help to build consumers' buy-in. In April, a hub was launched in NTU to study the safety of novel foods and work

About The Straits Times-Ministry of Education News Outreach Programme

For 12 Mondays until Aug 2, in the Opinion section, this paper's journalists will address burning questions, offering Singaporean perspectives on complex issues. The primer articles are part of Fe Straits Times-Ministry of Education News Outreach Pro-gramme which this step rounous gramme which this step rounous dissues among pre-univer-sity students. sity students. The primers will broach con-

temporary topics, such as the future of work and evolving global supply chains. Other issues include the economics of modern cities and Singapor's blueprint for green development. Each primer topic will give a local perspective to help students draw links to the issues' implicaries with the such as the su

with industry to raise public awareness of such foods. A 2019 survey of 600 NTU students found that they had positive attitudes towards cultivated meat, with more than 70 per cent agreeing that cell-based meat is relevant and valuable, said Professor Shirley Ho from the Wee Kim Wee School of

Protessor Shirney for form me week
Kim Wee School of Information
who conducted the study.
This sentiment is reassuring, as
younger people will face the worst
effects of climate formation will
conduct focus group studies to
better understand public
perceptions of cell-cultured meat,
and plans to poll 1,000 adults next
war.

Singapore may have shed its fishing village identity and plantations to become a metropolis, but farms are now making a comeback. Only this time, the farms are high-tech with some run on robotics, others going vertical for both vegetables and fish.

Covid-19 has also brought food security to the four. The two-week closure from [hly 170 of the Jurong Fishery Port - which handles about 30 per cent of the nation's seafood imports - highlights the need for more local produce to cushion supply shocks.

Singapore aims to produce to prevent of the shock of the per cent off its food locally by 2030, up from under 10 per cent of the shock locally by 2030, up from under 10 per cent off short of the aim of the short of the short of the per cent of the short new to the short of the short of the short of the short new the short new the short of the short of the short of the short new the short new the short of the short of the short new the short new the short of the short of the short new the short

seawater to meet up to 85 per cent of the nation's water needs by 2060, The year after that, 2061, is when Singapore's water agreement with Malaysia expires. The erratic weather patterns wrought by climate change will also affect water supply. During a

dry spell in 2016, Malaysia's Linggiu Reservoir, from which Singapore draws a big share of its water, plunged to 20 per cent of its capacity – a historic low. Singapore also seeks to drive

down the amount of energy needed for desalination, which is the most energy -intensive so of water here.

A team from the Singapore University of Technology and Design has found a way to harness energy from the desalination process. The sodium ions from seawater are extracted through a process called electrolysis, and arincorporated into sodium ion

batteries. The team hopes that the "desalination battery" can eventually be used in desalination plants.

plants.

Meanwhile, over the next five years, national water agency PUB is aiming to reduce the amount of energy used in desalination by more than 40 per cent.

One of its solutions is to scale up the development of membranes that mimic the ability of plants and animals to extract fresh water

Although Singapore is on track to becoming water-resilient, the same cannot be said for some

same cannot be said for some other parts of the world. The United Nations (UN) says that by 2025, two-thirds of the world's population could be living under water-stressed conditions. worth a spopulation could be livin under water-stressed conditions Ensuring clean water and sanitation is one of the UN's 17 Sustainable Development Goals. Whether it is a village-level water filtering machine or a regional-scale water technology

company, innovations at every scale are crucial to overcome the water crisis and make a difference A small Kenyan company is converting air into water through a process that involves filtering, amassing moisture from the air, and condensation. The firm, Majik Water, started out by providing a children's home in a water-scarce area in Kenya with 50 litres of water a day. Since 2017, numerous Majik

Since 2017, numerous Majik Water units have provided thousands of litres of water to people in water-stressed regions, including parts of South Africa and

Although natural gas – the cleanest fossil fuel – will remain Singapore's dominant fuel for the next 50 years, the country has started to green its energy mix.

Currently, about 95 per cent of Singapore's electricity is generated from natural gas.

The city-state is also one of the lost solar-dense cities in the world, with solar panels now found on many HDB rooftops and laid out on water bodies.

out on water bodies.
The country aims to generate at least 2 gigawatt-peak (GWp) of solar energy by 2030, equivalent to powering around 350,000 households a year.
The public sector will do the heavy lifting by taking care of three-quatrers of that target by 2030, as part of its bigger goal to great haxyimum carbon emission reach maximum carbon emissions around 2025.

around 2025.

And yet, just a few decades ago, it seemed unlikely that solar energy would be the most viable form of renewable energy for Singapore, given the country's small size and intermittent sunshine due to cloud

cover.

What has made it possible for the city-state to soak up sunshine for electricity is a plunge in the cost of solar cells, which have also become more efficient, and

creative space use. Between 2010 and 2018, the cost Between 2010 and 2018, the cos of the most widely used type of solar panels fell by more than 80 per cent, according to last year's Update of the Solar Photovoltaic Roadmap for Singapore. On luly 14, Singapore unveiled one of the world's largest inland need the world's largest inland Reservoir, which can power the country's water treatment plants. Two more solar farms at Bedok and Lower Seletar reservoirs are

Two more solar farms at Bedok and Lower Seletar reservoirs are expected to be completed later this year, while Sunseap Group has installed a solar farm out at sea in the Straits of Johor.

As other forms of renewables like wind and hydropower are not viable here, the country is on the hunt for more novel forms of

hunt for more novel torms or renewable energy.

The Government has set aside
\$49 million to fund low-carbon energy research and test-bedding efforts in hydrogen and carbon

efforts inhydrogen and carbon capture utilisation and storage. The authorities recently commissioned a study to find out if it is feasible to use hydrogen as a fuel. For hydrogen to be earlied, for hydrogen to be earlied, for hydrogen as a fuel, for hydrogen was to be extracted via renewable energy. Singapore's limited renewable energy. Singapore's limited renewable energy. Singapore's limited resulting to hydrogen as called using domestic hydrogen as fuel to sing domestic hydrogen as fuel to sing domestic eart thus looking at ways to import hydrogen or produce; it in a low-carbon way.

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