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ScienceTalk

Supercharging 'future foods' in Asia and beyond

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Years before phrases such as "cellular agriculture" and "animal-free dairy" entered the global lexicon, Singapore's leaders sensed an opportunity.

As a densely populated city-state with virtually no arable farmland, officials had grown increasingly concerned by what they perceived to be widespread instability in the global food supply. Bird flu, African swine fever, droughts, floods and other disruptions created significant uncertainty for a country reliant on protein imports.

Singapore's dilemma is far from unique. Global trends such as population growth, urbanisation and diminishing natural resources mean that other countries also need innovative ways to make more with less.

Alternative proteins – an emerging field that harnesses protein from plants, cell cultivation or fermentation – could potentially deliver the flavours and nutrition that consumers crave, in a more secure and sustainable way.

On Sept 3, the National University of Singapore (NUS) announced it will be opening a new Bezos Centre for Sustainable Protein, funded by a US$30 million (S$39 million) investment from the Bezos Earth Fund, one of the world's leading climate philanthropies.

The centre will focus on all three pillars of alternative proteins and serve as a launch pad to pioneer new technologies, formulations and manufacturing techniques that can enable large-scale commercialisation.

It will also create a wide array of new jobs and cement Singapore's position as a regional and global leader in food innovation.

Singapore has played a central role in funding the critical research and development to get "future foods" off the ground, investing roughly 24 times as much public funding into protein innovation as a percentage of gross domestic product as the United States and many other tech hubs.

The Republic also worked to build a comprehensive safety approval framework for novel foods.

Those moves bore early fruit in 2020 when Singapore became the first country to approve commercial sales of cultivated meat – more than two years before the US.

OVERCOMING PAIN POINTS

Inspired by Singapore's rapid progress, global media outlets trumpeted a forthcoming food revolution, prompting a surge of new interest from investors who feared missing the boat.

Between 2020 and 2021, equity financing for the alternative protein sector doubled, reaching US$5.6 billion, and hopes ran high that quick returns were right around the corner.

That didn't happen.

While alternative protein innovators continued to make steady progress scaling up manufacturing and driving down costs, it soon became clear that the road to mainstream commercialisation was going to be longer than initial estimates theorised.

When a global economic downturn prompted a fresh round of belt-tightening, investors who jumped on the bandwagon to make a quick buck leapt right back off and food tech investments tumbled precipitously.

As disenchanted venture capitalists pulled back, misinformation spread on social media and start-up stock values fell off a cliff. In the press, rumours of the plant-based meat sector's death were greatly exaggerated.

Yet, despite a wave of scepticism, Singapore's leaders remained confident that their early bets would pay off.

The Economic Development Board told The Straits Times in March that the agri-food sector's outlook "remains strong, given rising food demand and increasingly stressed supply chains".

AN EYE ON ASIA

The NUS centre is one of three new facilities established by the Bezos Earth Fund to resolve alternative protein pain points around the world, the others being at Imperial College London and North Carolina State University.

All three are part of the Earth Fund's US$1 billion commitment to transforming food systems, which are responsible for about one-third of all global emissions, according to the World Bank.

Research shows that decoupling protein production from animal agriculture not only reduces zoonotic disease risk, but also facilitates abundance by eliminating the inefficiency of feeding up to 40 calories of crops to a cow to get back just one calorie of beef.

By streamlining food production, alternative proteins can reduce the amount of land needed to feed the human population by as much as 75 per cent, freeing up about three billion hectares for ecological restoration, renewable energy and regenerative agriculture.

Cultivated and plant-based proteins also slash meat's greenhouse gas emissions by up to 92 per cent and 98 per cent, respectively, making them essential tools in the global shift towards decarbonisation.

Through targeted research, the Bezos centres will collaboratively explore potential technological breakthroughs and tackle key bottlenecks such as the bioproduction efficiency of alternative protein materials (producing high-quality ingredients in larger quantities at lower prices), safety and risk assessments, consumer perception challenges, workforce development and Asia-focused nutritional research.

Studies show that ramping up the nutritional benefits of plant-based meat is among the biggest potential levers to increase purchases among mainstream South-east Asian consumers, second only to reducing costs.

Much of the centre's research will be free to access, thus liberating start-ups from engaging in duplicative R&D and empowering food innovators to refocus on what they do best: crafting and scaling up production of delicious products.

The Bezos Earth Fund's investments will boost the entire industry rather than any single company, providing a much-needed shot in the arm for the global alternative protein sector, which, despite Singapore's best efforts, remains woefully underfunded relative to its food security potential.

An assessment by the non-profit ClimateWorks Foundation and Britain's Foreign, Commonwealth and Development Office estimated that making alternative proteins commercially successful will require US$10.1 billion in public investment every year. For comparison, total government funding worldwide in 2023 was only US$323 million – 5 per cent of what's necessary.

The NUS centre – which will bring together experts from across NUS, as well as ETH Zurich, Nanyang Technological University and the Singapore Institute of Technology – can help close that gap, not by supplanting public funds, but by resolving fundamental scientific challenges that have driven some companies to the brink of bankruptcy and kept apprehensive governments sitting on the sidelines.

Cultivated seafood start-ups, for example, have historically faced acute R&D hurdles in scaling up their operations because the aquatic animals their cells are obtained from live in the deep ocean, where oxygen and pressure levels are different from on land.

This means that much of the existing research on growing cells from terrestrial animals is of limited use, forcing every cultivated seafood company to invest some of its finite funds into conducting costly in-house R&D. Open-access research, by comparison, lifts all boats.

By constructing a stronger foundation for the alternative protein ecosystem to build on, Singapore now has the opportunity to further boost confidence in the sector's long-term viability and spur other countries to dive in.

The Bezos Earth Fund investment follows a year-long search that included competing submissions from dozens of top-tier research hubs, which were rigorously reviewed by an independent committee of subject matter experts.

In the end, Singapore's unwavering commitment to alternative protein research and NUS' research expertise helped seal the deal for the university.

NUS will now seek to unlock what ClimateWorks estimates could be US$700 billion in economic growth over the coming decades, as the need for more secure and resilient protein sources grows more urgent.

Research by environmental, social and governance firm Asia Research and Engagement (ARE) shows that under a business-as-usual scenario, inefficient protein production now risks derailing ambitious emissions reduction goals across the continent.

Successfully decarbonising Asia's protein supply, ARE warned, will require peaking industrial animal production within the next six years, while simultaneously scaling up alternatives to conventional meat, dairy and eggs. By 2060, alternative proteins need to account for more than half of all protein production by volume.

In other words, this is a time to lean in, not pull back.

Mr Jeff Bezos' decision to green light the launch of a world-class research centre in the Lion City represents a strong vote of confidence in the Republic's vision for a safer, more secure protein supply in Asia and beyond.

The challenges ahead are substantial and time is not on our side, but by bringing Singapore's brightest minds together to unleash the climate-mitigation potential of "future foods", NUS could reignite humanity's hope for a better tomorrow, fuel domestic economic growth, and help sustainable proteins finally achieve escape velocity.

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