

4th agricultural revolution needed to cut greenhouse gas: Nobel laureate

Cheryl Tan

The agricultural sector is responsible for a huge amount of greenhouse gas emissions – equivalent to the emissions from all the electricity generation in the world, said Nobel laureate Steven Chu.

Hence, there is a need to transform the sector – through a fourth agricultural revolution – where higher crop yields to feed the world's population are obtained sustainably without the use of fertilisers or insecticides.

Professor Chu, who is a professor of molecular and cellular physiology and of energy science and engineering at Stanford University, was speaking to *The Straits Times* at the Nobel Prize Dialogue 2022: The Future We Want Together on Sept 13.

The event was held at Raffles City Convention Centre, where Nobel laureates, students and other experts came together to discuss how to improve people's lives and how a better future can be built.

It was organised by the National University of Singapore's Yong Loo Lin School of Medicine.

Prof Chu, 74, who is American, noted how the previous agricultural revolutions helped the world's population to grow through the domestication of animals, cultivation of staple crops and the use of fertilisers to boost crop yield.

"But there were also unintended consequences – fertiliser requires a lot of energy to make, and the fertiliser run-off (into rivers and streams) is a potent greenhouse gas effect," he added.

Fertiliser run-offs release nitrous oxide, which has a warming potential of approximately 300 times that of carbon dioxide.



Nobel laureate Steven Chu says there is a need to transform the agricultural sector where higher crop yields to feed the world's population are obtained sustainably without the use of fertilisers or insecticides. PHOTO: NOBEL MEDIA

Some solutions are being tested, such as creating microbes which can take nitrogen from the soil to feed crops such as corn, wheat and rice, so that fertilisers will not be needed.

This has already been trialled on a small scale in the United States, where 50 per cent of the fertiliser needed for growing corn has been replaced with microbes in some farms.

However, it is unlikely that this will take shape on a larger scale until it is profitable for farmers to do so, said Prof Chu.

To prevent less methane from being released through cow burps, it is also possible to reduce the number of microbes found in cattle by 90 per cent, perhaps by modifying their feed or vaccinating them, he added.

Prof Chu was energy secretary in the US from 2009 to 2013, helping to implement then President Barack Obama's agenda of investing in clean energy, reducing the US' reliance on foreign oil and addressing the global climate crisis.

Prof Chu helped to propel the development of a funding agency

INVESTING IN THE FUTURE

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PROFESSOR STEVEN CHU, on helping to propel the development of funding agency Advanced Research Projects For Energy, which invests in projects such as accelerating solar power development to lower costs.

Young people from across the Asia-Pacific, together with Nobel laureates and international experts, took part in a series of conversations exploring the best path to a world with improved well-being for all.

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The Straits Times, in partnership with the Nobel Prize Dialogue 2022 and NUS Yong Loo Lin School of Medicine.

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"In 2010, we had a crazy ambition to cut (the costs of solar) by one-quarter in 10 years, and we managed to get it to one-quarter in seven years," he said. The feat took a detailed road map and required working closely with the industry.

Prof Chu, who returned to academia in 2013, is now working on a multitude of projects, including research on how lithium can be extracted for batteries in a more economical and sustainable way.

He will also be looking at carbon capture technologies to mitigate carbon emissions from the natural gas sector as well as metal and steel industries.

Carbon capture will be crucial to help achieve the goal of keeping temperature increases to 1.5 deg C – a goal from the 2015 Paris Agreement – to avert the catastrophic consequences of climate change, he said.

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First scientist to hold US Cabinet position

Prior to his role as United States energy secretary from 2009 to 2013, Professor Steven Chu became one of the three recipients of the Nobel Prize in Physics in 1997 for their work in cooling and trapping atoms using laser light.

These techniques helped improve the accuracy of atomic clocks, which are used to coordinate systems that require extreme precision, such as Global Positioning System navigation.

Before he was tapped as energy secretary, Prof Chu was director of the Lawrence Berkeley National Laboratory, where he delved into alternative and renewable energy technologies.

He was also professor of physics and applied physics at Stanford University, where he helped to launch Bio-X, a multi-disciplinary institute combining the physical and biological sciences with medicine and engineering.

As the first scientist to hold a US Cabinet position and the longest-serving energy secretary, Prof Chu was tasked by then President Barack Obama to assist energy giant BP in stopping the Deepwater Horizon oil spill in the Gulf of Mexico in 2010.