

MEDIA RELEASE

Republic Polytechnic launches new agritech facility in support of Singapore's food resilience and sustainability drive

“The Greenhouse” features different types of agricultural systems, and utilises sustainable building elements as well as data analytics to optimise plant growth

Singapore, 3 August 2022 – Republic Polytechnic (RP) today launched The Greenhouse, making it the first Institute of Higher Learning (IHL) in Singapore to feature a teaching and research facility dedicated to growing plants in naturally ventilated and climate-controlled conditions. The new purpose-built facility spanning 650m² will provide first-hand real-world experiences in the training of over 700 Pre-Employment Training (PET) and Continuing Education and Training (CET) students annually, as part of their agriculture-related curriculum.

Dr Mohamad Maliki Bin Osman, Minister, Prime Minister's Office, Second Minister for Education and Foreign Affairs officiated the opening of the facility today.

Explaining the significance of this new facility, Mr Yeo Li Pheow, Principal/CEO, Republic Polytechnic said, “Developing self-sufficiency and a resilient food supply chain will help Singapore cushion against external food disruptions. In line with this vision, we are pleased to announce the launch of The Greenhouse, as we mark our 20th anniversary milestone this year. This facility will further deepen RP’s engagements and expertise in the agritech space and nurture a pipeline of industry-ready talent. This new facility will also serve to strengthen cross-industry collaborations and accelerate the development of new technologies for the sector.”

The facility consists of a core building comprising a naturally-ventilated greenhouse, a climate-controlled glasshouse and two storeys of laboratories within containers which allow for the precise control of the growing microclimates. It also houses different types of agricultural systems, together with remote and smart monitoring systems for the collection of critical physiological and environmental data. In line with the nation’s sustainability drive, sustainable building elements such as the installation of integrated photovoltaics (BIPV) on the roof, and a water treatment system have been integrated into the construction of the facility. These elements help to reduce the environmental footprint of the facility.

New facility features multiple advanced agricultural systems

The Greenhouse also features industry-standard cultivation systems, designed to accommodate the growth cycle of plants and facilitate the smooth supply of nutrients. For example, the Bato bucket system provides larger space for root growth while the growbag system supports the use of different substrates. Utilising the vertical space, multi-tier tray-based systems and the A-frame nutrient film technique systems enable the growth of more plants within a small physical area. Besides growing plants, the facility also adopts the principles of circular economy, where unconsumed plant parts can be upcycled through black soldier fly into fertiliser, along with plants and fishes in an integrated aquaponics system.

The facility’s advanced agricultural systems will support a range of student and staff research, consultancy and industry projects in the fields of agriculture and plant science. These projects include the optimisation of plant growth, plant genetics and the cultivating of superior crop varieties, Internet-of-Things (IoT) enabled and machine learning solutions for smart farming, as well as bio-based solutions for the prevention of plant diseases. It will also help bring

together established industry partners, such as Sembcorp Industries and Ripe Fresh, to collectively drive the institution's initiatives in urban agriculture, plant science as well as sustainable energy and water solutions.

Students will have the opportunity to acquire first-hand experience on farm operation, plant genetics, crop physiology and breeding principles that will help prepare them for a career in the agritech sector.

Further information on the new facility can be found in the accompanying factsheet.

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About Republic Polytechnic

The first educational institution in Singapore to leverage the Problem-based Learning approach for all its diploma programmes, Republic Polytechnic (RP) has seven schools and one academic centre offering 36 full-time diplomas in Applied Science, Engineering, Management and Communication, Hospitality, Infocomm, Sports, Health & Leisure, and Technology for the Arts.

RP is committed to nurturing professionals with strong problem-solving capabilities through an innovative and entrepreneurial learning environment, based on a holistic and industry-relevant curriculum. RP's Academy for Continuing Education also offers a comprehensive suite of lifelong learning programmes to provide adult learners with skills upgrading opportunities. For more information, visit <http://www.rp.edu.sg>.

APPENDIX

REPUBLIC POLYTECHNIC THE GREENHOUSE FACTSHEET

A. Overview

THE GREENHOUSE is Republic Polytechnic's (RP) new learning, teaching and research facility. It is the first Institute of Higher Learning (IHL) to feature a training and research facility dedicated to growing plants in regulated climatic conditions. The 650m² facility leverages cutting edge technologies such as remote monitoring and the internet of things (IoT). It also features sustainable building elements such as a building-integrated photovoltaics (BIPV) on the roof to generate electricity and water treatment system to recycle spent nutrient.

The purpose-built facility includes a core building comprising both naturally-ventilated greenhouse and climate-controlled glasshouse, as well as two floors of container laboratories for precision control of microclimate. It also features industry-standard cultivation systems for growing plants, insects and fishes (aquaponics).

The Greenhouse plays an integral role in supporting RP's goal in becoming a specialist in the agritech space. It will also bring together established industry partners, such as Sembcorp Industries, to drive our initiatives in this area.

B. Purpose and use

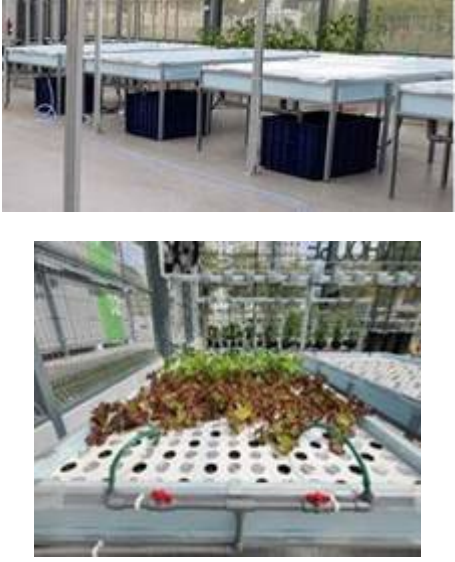

Designed to optimise the use of urban space, the Greenhouse houses different types of agricultural systems in a single site.


The Greenhouse is well-placed to support the following objectives:



1. Facilitate the training of Pre-Employment Training (PET) and Continuing Education and Training (CET) students in agriculture and plant growth and development. This includes the following groups of students:
 - PET students from the Diploma in Biotechnology (Food and Agrotech Track)
 - CET students from the Diploma in Applied Science (Urban Agricultural Technology)
 - CET students from the Specialist Diploma in Agritech and Agribusiness
 - CET short courses, (e.g Agriculture 101, Sustainable Mushroom Cultivation 101)
2. Support research and consultancy projects in the field of agriculture and plant science. The facility will support industry projects in the following areas of agritech:
 - Increasing plant's growth, yield and nutritive value
 - Biobased solutions for preventing plant diseases and pest control
 - Genetics and breeding of superior varieties
 - Automation and machine learning solutions for farming





- IoT enabled smart farming
3. Provide a platform for community and industry collaboration to drive the nation's "30 by 30" goal to raise domestic food production and enhance food resilience. RP stakeholders can take the lead and initiate agriculture-related research projects and provide solutions to our industry partners through research and development (R&D).
 4. Final year project students have been able to gain first-hand real-world experience on plant genetics, crop physiology and breeding principles to become industry-ready agritech professionals.

C. Facilities of The Greenhouse

No	Facility Name	Information / Facts
1	 <p data-bbox="411 1424 753 1480" style="text-align: center;">Deep Water Culture (DWC) hydroponic system</p>	<p data-bbox="855 1010 1469 1111">The DWC hydroponic method produces plants by suspending the plant roots in a solution of nutrient-rich, oxygenated water.</p> <p data-bbox="855 1144 1469 1312">This method uses a rectangular tank filled with nutrient-rich solution with plants floating in styrofoam boards. It has the benefits of easy assembly and low maintenance due to having few moving parts.</p>
2		<p data-bbox="855 1597 1477 1865">Bato bucket (also known as Dutch bucket growing system) is set up by connecting two or more growing containers to the same irrigation and drainage pipes. Water and nutrients are supplied via drip irrigation. The larger space for root growth makes it suitable for growing heavy-feeding and vining plants like tomatoes, peppers, and cucumbers.</p>

No	Facility Name	Information / Facts
	 <p data-bbox="411 696 751 757">Bato bucket/Dutch bucket hydroponic system</p>	
3	 <p data-bbox="331 1711 831 1771">A-frame Nutrient Film Technique (NFT) hydroponic system</p>	<p data-bbox="852 1211 1481 1473">The A-frame Nutrient Film Technique (NFT) system maximises yield by expanding growth space vertically. It works by arranging the NFT channels in a slanted frame such that plants in every layer have access to sunlight. Nutrient solution flows from the top, down through every channel via gravity, until it returns to the reservoir to be recirculated.</p>

No	Facility Name	Information / Facts
4	 <p data-bbox="399 1037 766 1070">Greenhouse rolling benches</p>	<p data-bbox="858 571 1484 801">Instead of a fixed frame, the planting tray of the rolling bench is designed to easily move sideways. This reduces the need to have numerous walkways between growth trays, as it can be created by shifting the neighbouring benches, thus maximising space for plant growing purpose within the facility.</p>
5	 <p data-bbox="395 1966 769 2000">Growbag hydroponic system</p>	<p data-bbox="858 1120 1484 1350">The frame of the growbag system supports usage of substrates such as peat moss, and soil. The plants are nourished via drip irrigation. The amount of substrate can be adjusted to the requirement of the plants grown, and is suitable for larger plants such as tomatoes and cucumbers.</p>

No	Facility Name	Information / Facts
6	    <p data-bbox="347 1715 815 1778">Multi-tier tray-based hydroponic system (Greenhouse and Container)</p>	<p data-bbox="855 875 1453 1106">The multi-tier tray-based system allows us to grow more plants within a small footprint. The top tier receives light from the sun, while the bottom tiers are powered by LED lights. Nutrient solutions are circulated to ensure nutrients are provided to the plants homogenously.</p> <p data-bbox="855 1144 1469 1205">This system is installed in the Greenhouse and our container.</p>

No	Facility Name	Information / Facts
7	 <p data-bbox="400 640 762 674">Moving Gully System (MGS)</p>	<p>The Moving Gully System (MGS) comprises a network of gullies that move plants through different stages of cultivation, from seedling stage, to growth stage, to harvesting stage. The gullies are moved from stage to stage at pre-programmed intervals, speed and direction via an electro-mechanical system. As the plants grow, space between the gullies gradually expand, to ensure each plant has optimum spacing at different stages of growth.</p>
8	 <p data-bbox="368 1189 794 1249">Building-integrated photovoltaics (BIPV)</p>	<p>Installed in collaboration with Sembcorp Industries, building-integrated photovoltaics (BIPV) on the roof generate electricity to supplement the energy used in the facility. There are 90pcs of 195W solar modules and 64pcs of 325W solar modules on the roof of the climate-controlled glasshouse and container laboratories respectively. With about 6 hours* of sunshine on an average day, the solar panels are able to produce green energy to offset 20 – 30% of the energy usage in the facility.</p> <p>*Note: Average sunshine in Singapore taken from https://www.statista.com/statistics/879697/singapore-daily-sunshine-hours/</p>
9	 <p data-bbox="427 1677 735 1711">Water treatment system</p>	<p>Similar to the BIPV, the water treatment system is installed in collaboration with Sembcorp Industries. The water treatment system allows the facility to recycle spent nutrient solutions to offset water usage. Solutions pass through a sand filter (to remove suspended solid substances), an activated carbon filter (to remove organic compounds and inorganic contaminants such as free chlorine and odour), reverse osmosis (to filter out dissolved mineral), and Ultra Violet (UV) disinfection (to destroy the microorganisms). The water treatment system is able to recycle up to 80% of waste water generated, depending on the feedwater quality.</p>