3 COVER STORY
SUPER-FARM – Vertical Farming

8 TECH FEATURE
Innovating for a Sustainable Water Future

6 FACE TO FACE
Interview with James Chew

11 NEWS
JLL scores four International Organisation for Standardisation Certifications
SUPERFARM – Vertical Farming

‘By the year 2050, nearly 80% of the earth’s population will reside in urban centers. Applying the most conservative estimates to current demographic trends, the human population will increase by about 3 billion people during the interim. An estimated 109 hectares of new land (about 20% more land than is represented by the country of Brazil) will be needed to grow enough food to feed them, if traditional farming practices continue as they are practiced today. At present, throughout the world, over 80% of the land that is suitable for raising crops is in use (sources: FAO and NASA). Historically, some 15% of that has been laid waste by poor management practices. What can be done to avoid this impending disaster?

A potential solution: Indoor farming’

Source: Dr DESPOMMIER, Dickson, The Problem, www.verticalfarm.com

In the footsteps of pioneers in vertical agriculture such as Dr. Dickson Despommier and recognizing unfortunately and without fail, that we will lack of agricultural areas to produce and feed the growing population in the coming years, Superfarm has dwelt on the matter and tried to provide a sustainable response to the urban food problems.

Nowadays, the agri-food system and its production methods are poorly organized and unsustainable over the long term, we see its limits and misdeeds everyday. Our food travels many kilometres from the producer and requires a very high consumption of water and fossil energy. Often wasted by large-scale retailers, food is not very nutritious, and its production methods generate soil pollution due to the use of insecticides, herbicides and other chemical fertilizers. Furthermore, within the next fifty years, we won’t have enough land surfaces to produce food for humans.

Nevertheless, the nearly eight billion people living mostly in the big cities today, and the ten billion inhabitants of tomorrow have and will need to be fed. Vertical agriculture in urban areas is an alternative to the current scheme of farms and agri-food industries, which has become ineffective and subsequently dangerous for the global balance.
Vector for ecological transition, the Superfarm project is part of a resilient and human-sensitive approach, paying attention to its health and its relations with food. Far from the traditional urban farm producing salads or other fruits and vegetables, the Superfarm project, as its name suggests, focuses its production on the culture of foods with a high nutritional value that can be consumed in addition to a healthy diet, but also on foods like fishes or honey. These foods have an exceptionally high content of essential nutrients, vitamins, trace elements, minerals, essential fatty acids, proteins or even fibers, enzymes, amino acids and antioxidants. The Superfarm project also strives to recreate an ecosystem in an urban environment. Seaweed culture, beekeeping, insect farming, aquaponics and also various greenhouse cultivations and outdoor cultures, allow each living being to serve the growth of the others.

Superfarm is an innovative project, open to the city and responsible, whose main principles are as follows:

1. **Implement the project in a pragmatic way, in town and on the water**
   The first objective is to face a major anthropic crisis by allowing with this project, a withdrawal of human activity from natural environments. We are thus returning lands to nature so that ecosystems can be restored, and we try to respond to the lack of available arable lands, thanks to an implementation in urban areas. On a twelve meters by twelve meters small surface, and a thirty-four meters height, this six-storey building is erected on the water to cope with the land crisis. Indeed, the price per square meter is very high in town. This reason has defined the direction of this constructive disposition.

2. **Produce high-yielding foods with high nutritional value**
   Produce vertically in stages is four to five times more efficient than the average yield of traditional horizontal farming, the latter requires large amounts of areas. From the seaweed to the bee, there is only one step! This farm aims to produce a wide variety of highly nutritious foods, in the open soil and soilless cropping techniques, these latter fed by substrates come entirely from organic products or waste released by the organisms them-selves. Here is a non-exhaustive list: seaweed (Spirulina, Chlorella, Klamath...), insects rich in protein and carbohydrate (beetles, caterpillars, grasshoppers...), fishes raised in aquaponics (Tilapia, Trouts...), berries (Go-jí, Acerola, Acaí...), plants such as Ginseng or Aloe Vera and finally honey thanks to the establishment of hives in the greenhouse’s heart, the culminating point of the farm. Today we know the importance of bees’ reintroduction in our ecosystem.

3. **Reduce the health risk and water consumption**
   We reduce health risks and infectious diseases through a highly controlled indoor environment. We ban pesticides that are usually found in more conventional agriculture, we recycle and save water by recovering the vapor produced by plants’ evapotranspiration. Finally, we limit plants’ hydric stress through a controlled environment by providing them what they need, when they need it.
4. **Provide fresh products by promoting short circuits between producers and consumers**
Restoring a social link between the producer and the consumer in the city, bringing them a greater proximity, allows inhabitants easier access to these products by coming directly to the farm. Accessible from the footbridge, a direct sales area has been imagined as well as a storage area for dry goods, cold rooms for perishable goods and a space-conditioning. In addition, the delivery to individuals, restaurants and associations can be implemented through couriers traveling in tricycles.

5. **Create a growth lever against unemployment, and revive the local economy**
On a neighborhood scale, the « Superfarm » project can lead to substantial jobs creation and an ethical and responsible citizen contribution to the city’s economy. It also helps to create a collective awareness by federating the inhabitants and local partners around a common project of innovative and healthy urban agriculture.

6. **Energy self-sufficiency**
To operate such a building, it requires to supply it with energy and ensure its operation all times of day and night. Thanks to the installation of wind turbines and solar panels, several Kw/h can be produced daily to supply the heat production systems and to allow the ventilation and lighting of indoor production areas.

Basic cut of the functioning of the farm and details of the food produced by floors
James Chew is the Director of Business Development for Southeast Asia for JERDE. Prior to JERDE, he founded and owned VinaPlanners Co Ltd and TPO Vietnam – Singapore. He also worked for Nagecco as Business Development Director, Vingroup JSC as Product Development Director, BRG Group as Director of Project Management, Vung Ro Petroleum jsc as Development Director, VinaProjects as Director of Planning, VinaCapital Real Estate as Deputy Managing Director, Real Estate and the Urban Redevelopment Authority of Singapore as Head of Local Planning.

Chew holds a Bachelor’s Degree in Urban Planning and Master’s Degree in Town Planning from the University of Westminster.

James Chew shared his views with Green in Future on the role JERDE plans to play in Singapore’s architectural development. Here is an excerpt of the interview.

Can you elaborate a little more on the concept of ‘Placemaking’ that JERDE follows?

In essence, JERDE Placemaking is the art of making places where people want to go. Rather than focus solely on the buildings themselves, we prioritize the spaces between the buildings, where we feel people really experience a project – where they share moments and create memories. We envision place as multi-layered experiential environments that we can, in a sense, orchestrate using architecture, landscape, interiors, environmental graphics, programming, lighting and water features. And because of our small scale we can take a boutique, collaborative approach to the creative process.

Our passion is community building. Our projects are designed to enrich their surroundings and the communities in which they are built, and hopefully act as catalysts for future growth and development.

What are your plans in Singapore and the adjacent South East Asia, now that you have created a base here?

We established our office in Singapore as the regional headquarters for our work in Southeast Asia because of its global communication and transportation links. As we look to build up our Singapore design studio, we are first making a concerted effort in creating brand awareness, and we are confident that our internationally renowned brand of architectural design, planning and placemaking stemming from our global Los Angeles headquarters - the entertainment capital of the world - puts us in a good position to secure projects in Southeast Asia. Looking longer term, JERDE intends to set up a network of smaller design studios in the key emerging nations in the region, like Vietnam and Indonesia, so that we can share our unique brand of design expertise with the local design talent.

Singapore is very different to United States, in terms of the size, architectural style and necessities – how do you plan to delve into the market here?
With regard to the Singapore market, JERDE primarily focuses on its strengths in placemaking for mixed-use, hospitality, and retail projects. This includes revitalization of entertainment and commercial areas like the Singapore River precincts or the repurposing and renovations of the many shopping malls in the heartland of the country. We are constantly monitoring the market in Singapore to identify areas where JERDE specialties are needed. In some cases, this may involve forming strategic alliances with local architects and planners in Singapore to provide design services.

Can you give some details of your current projects in South East Asia?
We have had a great deal of success in securing a number of projects in the region despite being relative newcomers here, though because most are still in the early stages, we can’t yet say a great deal about them publicly. The most advanced are hospitality and mixed-use projects, though we have approximately 20 more in the pipeline.

How does JERDE address the climate change and sustainability factors through design?
There are a number of ways in which we address sustainability directly through design. For instance, bringing nature into our projects and infusing them with greenery has always been a big part of our process. In our Namba Parks project we put a giant park on the rooftop of a mixed-use project, bringing nature into a very dense urban environment. The park featured trees, miniature ponds, shrubbery, and planting beds—all irrigated by recycled water filtered from the greywater of the restaurants within the complex. During the summer, when asphalt can reach a surface temperature of 124 degrees Fahrenheit and concrete is 113, the rooftop park is only 93.
In our Oxigeno project in Costa Rica, our design included wind turbines and over 3,000 solar panels that generate more than 50% of the project’s energy needs.
But to us true sustainability means a holistic approach that includes not just environmental, but social and economic benefits to each project’s local and regional surroundings. That philosophy—of placemaking, of community building, of enriching life experience—is the through-line that carries across all of our work. Our approach goes beyond “green” to produce places for people that enrich all aspects of society and create a focus for the human experience.
INNOVATING FOR A SUSTAINABLE WATER FUTURE

Along with rapid urbanisation and industrial growth, Asia’s water supply remains susceptible to pollution and climate change. Notorious for on-site leakages and disposal of contaminated wastewater, the industrial sector is responsible for the release of 80% of untreated wastewater into the environment globally. Given that we live in a world where the use of resources might exacerbate the effects of climate change, governments and corporations are prioritising efforts to mitigate the effects of water pollution on the environment - with efficient water management, treatment, reuse and recycling systems.

Singapore’s national water agency, the Public Utilities Board (PUB) is researching on sewage surveillance by sampling used water for pathogens, to detect the presence of viral outbreaks like the COVID-19 pandemic. In Indonesia, the provincial government of Jakarta and the Water Resources Agency has proposed a funding of USD 207 million for the Jakarta Sewerage System (JSS) project to manage domestic waste and water treatment through advanced technologies in 15 city zones.

As the consumer market leans towards a sustainable agenda, the industry is ramping up efforts to improve energy efficiency and reduce the environmental impact of their operations through investments in R&D and adopting a smarter approach for clean water management.

Reducing waste and carbon footprint

Fluence Corporation’s SUBRE tower incorporates the membrane aerated biofilm reactor (MABR) technology to remove waste and biological nutrients from water. The process involves submerging the semi-permeable membrane into a wastewater tank and blowing low-pressure air through the air side of the membrane. Oxygen is constantly supplied to the fixed nitrifying biofilm that develops on the wastewater side of the membrane, while denitrification occurs in the anoxic bulk liquid. Lowering chemical use by 30%, the SUBRE MABR is available as a retrofit upgrade to existing basins, and as a new greenfield solution for custom-built towers. With the capacity to treat up to 757,000 litres of wastewater per day, the system improves effluent water quality, resulting in operational savings, increased capacity and minimal footprint requirements.

Double filtration for maximum security

For drinking water and wastewater treatment, compressed air treatment technologies are crucial. High-efficiency compressors conserve resources and reduce harmful emissions. The BOGE CC-2 oil-water separator is a direct and cost-effective solution for the treatment of oily condensate before releasing to the common drain systems. BOGE, a leading specialist in industrial air compressor systems, developed an oil-water separator system utilising high quality active carbon and polypropylene filters to provide optimum and superior condensate cleaning. With its double filtration process, the system effectively removes mineral oil and synthetic coolant residue. The condensate is
first discharged through a pressure relief chamber and passed through a polypropylene element, followed by another filtration process in the second chamber to remove any final impurities. The treated water with less than 10 ppm of residual oil content directly discharges into the sewage system for maximum security. Opting for a fuss-free servicing of systems which reduces maintenance and environmental disposal costs, the compressors are designed with replaceable filter elements without the additional step of removing liquid or oil residues from the containers.

**Real-time cloud insights**

Arming users with real-time data, tech start-up, WEGoT Utility Solutions’ VenAqua technology addresses the lack of clean water supply and greater incidence of wastewater in residential and commercial sectors by managing demand. WEGoT equips water treatment plants with innovative IoT-enabled ultrasonic sensors to detect leakages and abnormal consumptions like drips and fixture efficiency. Consumption pattern data from a series loop of sensors installed in water inlets is transmitted to an accessible WEGoT 3.0 cloud mobile application. Along with minute-wise insights, users also have remote access to shut off open taps and valves when not in use. To date, the start-up has successfully saved more than 1 billion litres of water with sensors installed in over 30,000 homes and 2.79 million sqm of commercial spaces. Last year, the start-up received a seed funding of USD 2 million to enhance its sensor based IoT device and scale up operations in India.

**Drivers of change**

The future of urban water is influenced by many factors including water scarcity, urban population growth and necessity for efficient systems. Asia’s cities will have to focus on local water sourcing, reuse and recycling to sustain their populations. An early response to increasing energy and resources through the development of efficient processes and smarter systems is key. Increasing investments in green infrastructure offers the opportunity to access and directly treat new and underutilised water sources.
Upcoming GREEN Events:

World Battery Industry Expo (WBE 2020)
Formerly the 5th Asia Battery Sourcing Fair (GBF Asia 2020)
16th-18th August 2020
China Import & Export Fair Complex, Guangzhou, China

11th World Renewable Energy Technologies
20th-23rd August
Convention Centre, New Delhi, India

Future Food Asia 2020
21st-25th September 2020

Mena Energy Meet
Virtual Expo and Summit
2nd-3rd November 2020

2nd Vietnam Solar Expo 2020
3rd-4th November 2020
National Convention Center, Hanoi

Asean Clean Energy Week
24th-25th November 2020
Okado Manila, Philippines

RHVAC Expo 2020
10th–12th December 2020
JIEXPO Kemayoran, Jakarta
JLL Singapore scores four International Organisation for Standardisation certifications

JLL Singapore has been recognised with four International Organisation for Standardisation (ISO) certifications by SOCOTEC Certification Singapore for its integrated facilities management services.

A new standard developed specifically for the management of facilities, the firm received ISO 41001, making it the second real estate company in Singapore to be certified. JLL was also recognised with ISO 9001 (Quality), ISO 45001 (Occupational Health & Safety) and ISO 14001 (Environment).

Marina Krishnan, Division President, Corporate Solutions, JLL Asia Pacific, says: “We’re incredibly proud and honoured with the results, particularly in this current climate where health and safety play a large role in every organisation. Employee wellness and sustainability are at the forefront of our clients’ minds and this success reflects our hard work and dedication to enhance our innovation and service offerings in this area.”

According to JLL, the global facilities management market of in-house and outsourced services is projected to be worth around USD $1 trillion by 2025, of which, an estimated 36% lies in Asia Pacific.

“With increasing emphasis on efficient and productive integrated facilities management, JLL has invested considerably in deploying technology and expertise to reduce operating costs and deliver long-term sustainable experiences for our clients,” adds Segar G, Executive Director, Corporate Solutions, JLL Singapore.

The International Organization for Standardisation (ISO) certifications represent the assurance that an organisation meets the international market-relevant standards in various areas including quality, environment, facilities management and occupational health and safety.

JLL Singapore has been recognised with the following:

1. ISO 9001 (Quality)
   ISO 9001 refers to the scope of provision of Integrated Facilities Management services. This standard is based on a number of quality management principles including a strong customer focus, the motivation and implication of top management, the process approach and continual improvement.

2. ISO 14001 (Environment)
   ISO 14001 is an internationally agreed standard that sets out the requirements for an environmental management system. It helps organisations improve their environmental performance through more efficient use of resources and reduction of waste, gaining a competitive advantage and the trust of stakeholders.

3. ISO 41001 (Facilities Management)
   ISO 41001, the international facilities management system standard helps to increase awareness and support the development, implementation and maintenance of effective facilities management regimes in all sectors of industry and commerce worldwide. ISO 45001 (Occupational Health & Safety)
4. ISO 45001, Occupational health and safety management systems is the world's first International Standard for occupational health and safety. It provides a framework to increase safety, reduce workplace risks and enhance health and well-being at work, enabling an organisation to proactively improve its health and safety performance.

About JLL

JLL (NYSE: JLL) is a leading professional services firm that specializes in real estate and investment management. JLL shapes the future of real estate for a better world by using the most advanced technology to create rewarding opportunities, amazing spaces and sustainable real estate solutions for our clients, our people and our communities. JLL is a Fortune 500 company with annual revenue of $18.0 billion, operations in over 80 countries and a global workforce of more than 94,000 as of March 31, 2020. JLL is the brand name, and a registered trademark, of Jones Lang LaSalle Incorporated. For further information, visit jll.com.

Contact: Vernia Lim
Phone: +65 9691 3912
Email: Vernia.Lim@ap.jll.com
Announcing the 11 AgriFoodTech startup finalists competing for the Future Food Asia Award 2020

For its fourth edition, ID Capital innovates with a new format for its annual conference, the Future Food Asia Collective Edition

In spite of the major disruptions recently faced by agrifood industry, such hardships have nevertheless given way to perseverance, and have shed light on the imperative need for innovative agrifoodtech solutions within the APAC region. As part of the continued efforts to celebrate innovation in the region, Future Food Asia 2020 (FFA) is now set to take place on 21-25 September 2020. The conference will allow all 11 finalists to present their innovation in front of investors, industry leaders and domain experts, and one them will be awarded the US$ 100,000 Future Food Asia Award. The 11 finalist startups are: AgNext (India), Agrisea (United States), Aqua Development (South Korea), Crowde (Indonesia), Flurosat (Australia), Fyto Foods (Singapore), Marine Innovation (South Korea), ProAgni (Australia), Soos (Israel), Tartansense (India) and TerraQuanta (China).

This year’s Future Food Asia Award jury for the selection of the finalists and winner consists of Gérard Jacquin, former Director of Partnerships, Transfer and Innovation at INRA, Europe’s leading agricultural research institute; Dr. Ralph Graichen, Senior Director of Food & Consumer Cluster at Agency for Science, Technology and Research’s (A*STAR) Biomedical Research Council; Peter Huang, President of Greater China, Corteva Agriscience; and Isabelle Decitre, Founder and CEO of ID Capital.

The deadline for this year’s start-up application was extended in acknowledgement of many start-ups who voiced their desire to take part in the competition despite operational disruptions resulting from COVID-19. In total, this year saw a 45% rise in total applicants, with India, China, Australia, South Korea and Singapore being the top 5 contributors. Alongside the US$ 100,000 grand prize, Future Food Asia 2020 will further empower innovative solutions in the region by featuring two additional awards presented by this year’s partners. Bühler and Givaudan’s Plant Protein Award will provide one plant protein start-up from the APAC region access to their recently announced joint innovation centre in Singapore along with technological support.
Corteva Agriscience’s Food Resilience Award will support market expansion trials to a start-up that empowers workers along the food supply chain and achieves food security through technological disruption.

Future Food Asia’s fourth edition will return this September with a brand-new format in line with the platform’s motto of continuous innovation. This year’s ‘collective edition’ is the product of FFA’s continued efforts to encourage collaborations and will provide a platform for conversations to take place simultaneously in multiple locations. There will be various satellite locations where local groups will convene to amplify discussions across multiple cities around the world. Over the course of 5 days, attendees will be provided with virtual networking opportunities and be able to visit exhibitors’ virtual booths. Registrations for the event is now open at: https://futurefoodasia.com/ffa2020/

“The current state of our world has cast light on the prominent role of agriculture and food innovation, and stakes in the Asia-Pacific are higher than ever. With this first Collective Edition of Future Food Asia, we are glad to broaden the reach of regional Agripreneurs and influence an even wider community of stakeholders,” said Isabelle Decitre, CEO and Founder of ID Capital.

Future Food Asia 2020 has been made possible by continued support from our partners: Agency for Science, Technology and Research (A*STAR), Singapore’s lead public research agency, Corteva Agriscience™, a global pure-play agriculture company that provides farmers around the world with the most complete portfolio in the industry, Bühler Group, the leading global technology supplier to the food processing and advanced material manufacturing industry, Givaudan, the leading global flavours company, Dole Asia Holdings Pte Ltd., one of the world’s largest producers and marketers of high-quality packaged and fresh fruit, ADB Ventures, an Asian Development Bank (ADB) program supporting entrepreneurs to scale technology companies for sustainable impact in Asia and the Pacific, and The Singapore Economic Development Board (EDB), the lead government agency responsible for strategies that enhance Singapore’s position as a global centre for business, innovation and talent.

Overview of the Future Food Asia 2020 Finalists
AgNext (India) | https://agnext.com/
AgNext, provides a technology platform (“Qualix”) for rapid commodity assessment solutions across procurement, trade, production and consumption of food and agriculture value chains. Using state of art technologies, we have created the right singular platform, through which quality for multiple commodities could be assessed in a minute, enabling agribusinesses to leapfrog their procurement and operations processes, optimise costs, provide traceability, sharpen and smoothen blockchains and most importantly produce excellent products of highest quality.

Agrisea (United States) | https://www.agrisea.co.uk/
Agrisea was built to solve world hunger by evolving sustainable food systems through ocean agriculture. We have developed a way to grow crops in high salt conditions such as salt soils or coastal ocean waters. We are Agrisea, the Ocean Agriculture company.

Aqua Development (South Korea) | https://www.aqua-development.com/
Aqua Development (AD) leveraged decades of research in aquaculture and marine biology to develop and successfully implement and test its nature inspired aquaculture system KAMI SYS, which achieves 10 times higher productivity, ZERO antibiotics and chemicals, ZERO water exchange, very competitive production costs and modular system fit for urban farming.

Crowde (Indonesia) | https://www.crowde.co/
Crowde is an agriculture-focused fintech startup that empowers farmers across Indonesia with technology and capital by creating a farmer-friendly financing ecosystem that puts in touch investors with farmers that are looking for capital to grow business, create employment, and support local communities.

Flurosat (Australia) | https://flurosat.com/
FluroSat is a full crop cycle analytics provider that delivers proactive reports and alerts on crop performance, stress, nutrient requirements, and sustainable management practices to crop advisors and agronomists in 14 countries. Its analytics engine, FluroSense™ monitors over 7 million acres of arable land supporting leading agribusinesses in delivering precision agriculture programs and decision support to their growers.

Fyto Foods (Singapore)
Fyto Foods’ plant-based meats resemble uncut real meats and when sliced or diced, would look, cook and taste like real meats with real nutrition! Cooks have unprecedented freedom to cook our meats with hotpot, stews, stir-fry, frying and grilling, allowing for Asian-style cooking and a wide range of international cuisines.

Marine Innovation (South Korea) | https://www.marineinv.com/
With the right idea for people and nature, what about changing our ways of lives and introducing seaweed-based products into the environment? We go green and replace the plastics with our innovative technology. We’re an environmental initiative to go green. Seaweed-based products will be the answer to the plastic crisis!

ProAgni (Australia) | https://proagni.com/
ProAgni is a revenue producing Australian Ag Bioscience company. We develop and commercialise animal nutrition products which improve farm economics and address global challenges, such as food security, antimicrobial resistance, and emissions. We are the future of affordable, abundant & clean food.
Soos (Israel) | http://www.soos.org.il/
Every year, the egg-industry exterminates 7.5 billion male-chicks since they have no commercial use. Soos develops an incubation platform to eliminate this practice and produce more female layers with the same resources. Our solution uses sound waves to transform male embryos into egg-laying females, thereby increasing production capacity in commercial hatcheries.

TartanSense (India) | http://www.tartansense.com/
TartanSense addresses the problem of weed management for cotton farmers in India through its flagship technology, 'Brijbot'. Brijbot is an AI-driven 250kg robot that semi-autonomously travels through cotton fields, sees and sprays weedicide/herbicide with 98% precision, effectively killing weeds and substantially improving yield. With TartanSense, cotton farmers benefit from using 75% less chemical in their fields and do not need to worry anymore about sourcing manual labour for weed removal.

TerraQuanta (China) | https://www.terraqt.com/
TerraQuanta focuses on large-scale application of satellite remote sensing imagery and AI-based data processing technologies. We put our emphasis on the automation of algorithm development and imagery processing, and provide insightful data service to fields such as agriculture, forestry, as well as environment protection.

About ID Capital
ID Capital is an investment company headquartered in Singapore specialized in the domain of AgriTech and FoodTech in the Asia-Pacific region. ID Capital is a pioneer in the agrifood sector in Asia-Pacific and has contributed effort and capital in also catalyzing the ecosystem in the region through its Future Food Asia platform launched in 2016. Its thesis is built on the fact that in this growing vertical, Asia-Pacific is the nexus between high growth and high stakes. ID Capital is also an Appointed Partner for start-up SG Equity for the AgriFoodTech sector.

For further enquiries please write to ffaa@idcapital.com.sg
Green Bio-Based Materials form Agricultural Waste for a Circular Economy

The Integrated Biorefinery Laboratory (IBL) in KMUTT has developed energy efficient pre-treatment & fractionation processes with recoverable solvents and chemicals that improve the biomass digestibility and separation of biomass constituents including Microcrystalline Cellulose (MCC), Xylitol, Vanillin and more. IBL’s proprietary technology enables lower cost production of high value-added biomaterials/biochemicals with high purity for Pharmaceutical, Cosmetic, and Food additives applications.
Enzyme, Peptide, Protein from Biosynthesis and Biomass Extraction

The Bio-factory Lab, in the Department of Microbiology, KMUTT, led by Dr. Nujarin Jongruja, is a platform for designing and synthesis of functional enzymes and peptides. This lab is able to produce functional, high performance and affordable Eco-friendly products such as antibacterial peptides (replacing antibiotics and preservative) applicable for customized animal and human needs. This lab has also developed cost effective processes for extracting peptides/protein from chicken feathers and other bio-waste.
Green In Future is a novel venture of like-minded professionals with achieving a sustainable future as the target. Among the many services provided, the diffusion of technology to as many as possible and as far as possible, educating and generating awareness by being the link between the producer and the user, giving adequate training to the interested to adopt an innovation in Urban Landscaping, Urban farming, Education, Environmental issues and Health etc. are in the forefront.

For further details, please contact:
**GREEN IN FUTURE PTE LTD**, Reg No. 2016273692
14, Robinson Road, 08-01A, Far East Building, Singapore-45.
Tel: +65-9737 9356 • Email: paru@greeninfuture.com
www.greeninfuture.com