

# Green Bio Business

of ISU Group

2025 Green Bio Division of ISU Chemical





## ISU Group has strong competencies in diversified business

Established in 1969

9 subsidiaries within the group / Diversified business areas into Chemical, IT, Construction, Bio and Smart farm

More than KRW 3 trillion in sales / Stable business structure

Green Bio Division of ISU Chemical, the key affiliate of ISU Group

## The group has advanced Smart farm-related technology

A subsidiary, Hangaram Ponics / Has built a greenhouse and possesses MGS (Mobile Gutter System, automatic cultivation spacing control system)

equipment and its own technology for a nutrient solution supplier

A subsidiary, ISU System / Develops and operates a cloud-based environmental control & farm management system

A subsidiary, ISU Longkun (JVC) / Directly operates a 5ha glass greenhouse-type Smart farm

A subsidiary, ISU Australia (JVC) / Directly operates a 1ha poly carbonate greenhouse-type Smart farm

ISU E&C / A comprehensive construction company has overseas business records

## Manpower

The group has the best Smart farm experts, cultivation personnel, EPC, and safety management specialists

## Under expansion of global smart farm business through own technology

<b>2025(E)</b>		Establish JV in Vietnam to execute Korean Variety Strawberry Indoor vertical Farm demonstration project
	<b>2024</b>	
	<b>Oct</b>	Initiate greenhouse operation for a 1ha leafy vegetable in Brisbane, Australia
	<b>May</b>	Complete installment MGS growing system in Green house and multi-layer MGS in vertical Farm, Sangju Korea
<b>2023</b>	<b>March</b>	Obtained production/sales rights for sleep-inducing lettuce, 'Heukharang' in Australia
<b>2022</b>	<b>November</b>	ISU Longkun secured High Technology Expertise certification.
	<b>August</b>	Initiated joint research on vertical farm-based functional crops with the Korea Institute of Science and Technology (KIST)
<b>2021</b>	<b>December</b>	Registered as a cannabis academic researcher
	<b>April</b>	Selected as a company for a national project 'Development of northern Smart farm package model for export'
	<b>February</b>	ISU Longkun obtained Global/China GAP certification
	<b>January</b>	Started to operate a strawberry Smart farm having a 2.5ha greenhouse and conducted a start-up agricultural business training program in Uiseong, Gyeongbuk
<b>2019</b>	<b>September</b>	Initiated direct management for a 5ha paprika and tomato Smart farm in Xinjiang
	<b>May</b>	Secured distribution rights to China and Vietnam for Damyang strawberries (Jukhyang, Merry Queen)
<b>2018</b>	<b>April</b>	Established ISU Longkun, a JVC with Longkun Agriculture and Forestry Development Co., Ltd. in Xinjiang, China
<b>2017</b>	<b>October</b>	Selected as a company engaged in the national project 'Intelligent Smart farm Platform Export Project'
	<b>July</b>	Established Green Bio Division





# STRENGTH

- 1 Top-level technology & Synergy through omnidirectional capabilities
- 2 Rich construction experience

STRENGTH

1

Top-level technology  
& Synergy through omnidirectional capabilities

### Smart farm technology



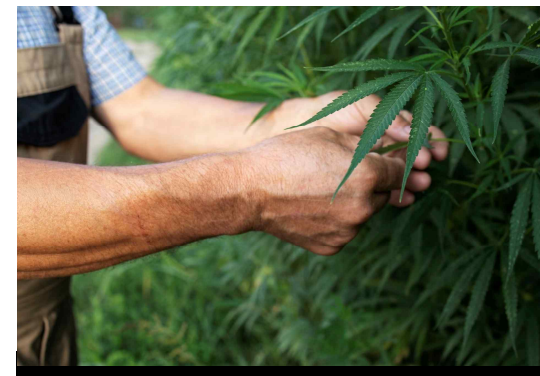
- Smart farm construction technology
- Smart farm facility
- Nutrient solution supply system
- Automation technology
- Cultivation recipe

### Data-based agriculture



- Complex environment control system, SmartRoot™
- Total Farm management system (Cultivation, HR, ERP, etc.)
- Big data based Remote cultivation management

### Portfolio with high value-added crops



- Experiences of 75 cultivars of crops
- Production sites in China Xinjiang and Australia Gold Coast
- Continued efforts to secure High-value and Functional crops portfolio
- R&D with a government-funded research institute KIST

# 1) Smart farm technology

## Smart farm Construction technology

### Future

Full  
Autonomous  
Farming

### 2024



Vertical Farm

### NOW

Own patent-based technology

Plastic film greenhouse  
Glass greenhouse  
PC(Poly Carbonate)  
greenhouse

## Smart farm Facilities



Cultivation Bench



Tube Rail Car



heating boiler



CO2 Supply System

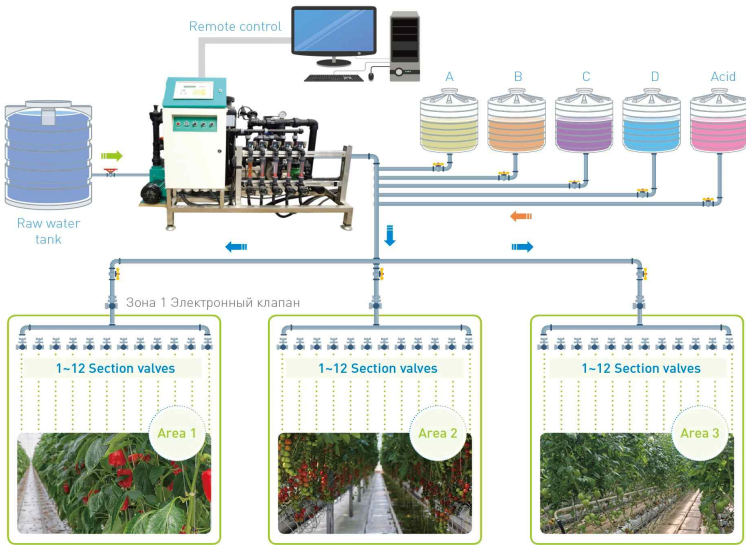


Purified water system



Environmental Control System

## Nutrient solution supply system (own system)



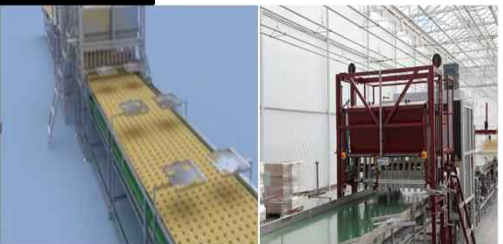


Automation technology



**Mobile Gutter System (MGS)**

- Adjusts cultivation spacing according to crop growth
- Reduces labor (50%) and increases land efficiency (2x) and productivity (3.5x) compared to the traditional method
- Under construction in Gold Coast, Australia. Planned to harvest the first crop from late 2023



**Automation**

- Continued research toward autonomous & unmanned Farming
- Start R&D with partners



**Wireless**

- Zigbee-based interference-free sensor control

Cultivation Recipe

**Secures the manual for the cultivation of high-value-added crops**

- 6 cultivars of strawberries, 2 cultivars of melons, 7 cultivars of paprikas, 4 cultivars of tomatoes
- 10 cultivars of low-potassium leafy vegetables
- 24 cultivars of sprouts and baby vegetables



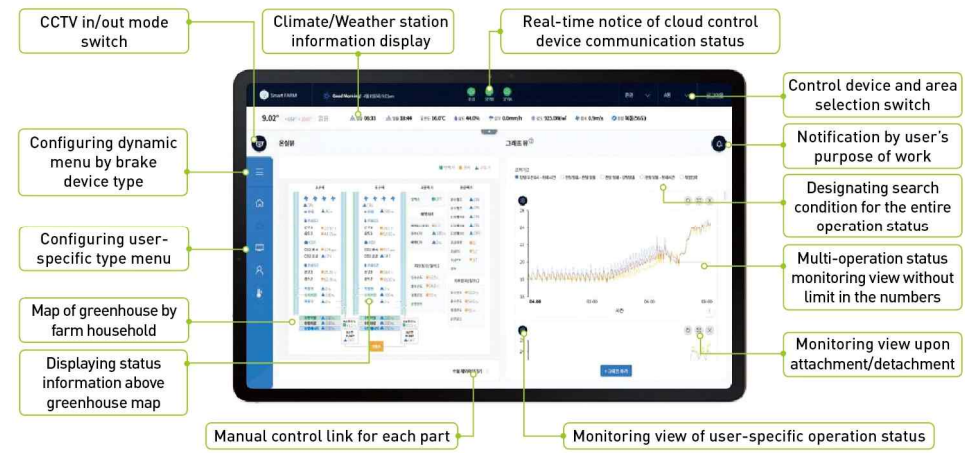




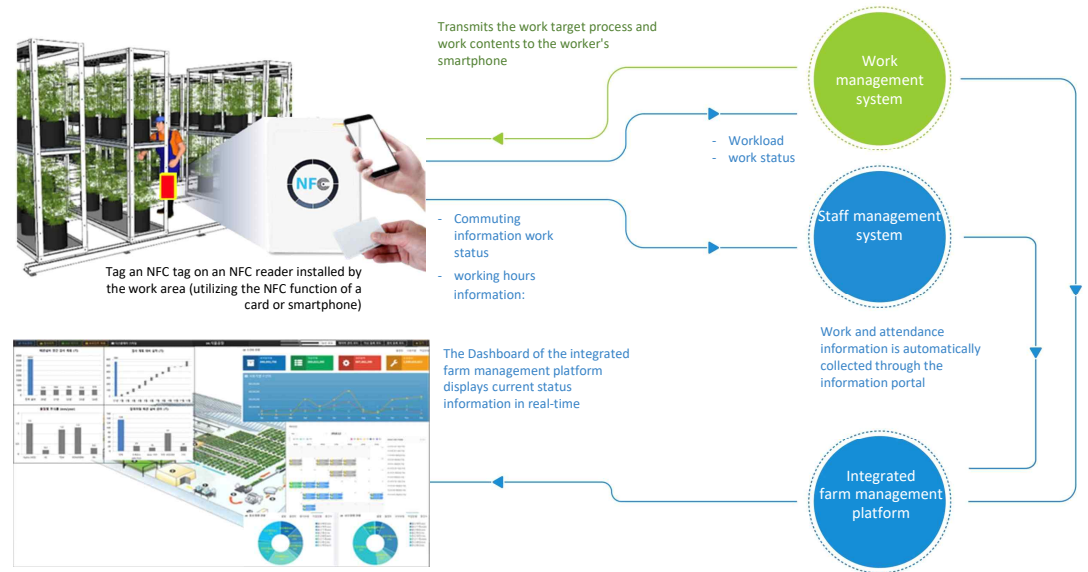
SmartRoot™

- Jointly developed with Electronics and Telecommunications Research Institute, a government-funded research institute
- An enterprise-type agricultural management platform that integrates complex environment control, workloads & staff management, and business management like ERP(Enterprise Resource Planning)
- Cloud-based remote control enables management of the farm on the opposite side of the earth
- It provides the fastest upgrade and functional enhancement among domestic programs

### SmartRoot User Display



### Control System

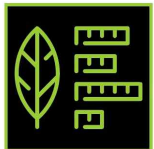


### SmartRoot Main Function



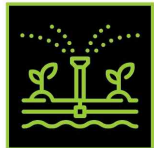
#### Nutrient Control

Supplies nutrients needed for the growth of plants. Controls PH, EC, etc. and considers the plant's growth process, external environment and internal environment of the greenhouse.



#### Rooting Area Control

Weighs part of the plants to identify the period to receive nutrients and water to make sure it grows at an optimal period.



#### Drained Solution Control

Controls to reuse the irrigated solution released after nutrient provision by sterilizing it and adjusting EC concentration.



#### Heat Storage Tank Control

Controls boiler in accordance with the set temperature, accumulates heat needed for heating to provide it when necessary, thereby saving energy.



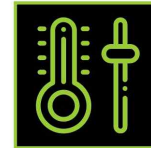
#### Worker Management

To manage and harvest plants, resources are deployed by work over certain scale and deliver the content of work to identify and manage the work progress, workers' achievement and the amount of harvest.



#### CCTV Monitoring

Supports connection with CCTV to intuitively manage all parts of greenhouse through video screen.



#### Greenhouse Environment Control

Reads temperature, humidity, CO2 level in greenhouse through sensors, as well as wind direction, amount, light amount, temperature, rain record as part of external environments to control curtains(side, upper), ceiling, heating(pumper, valve), etc.

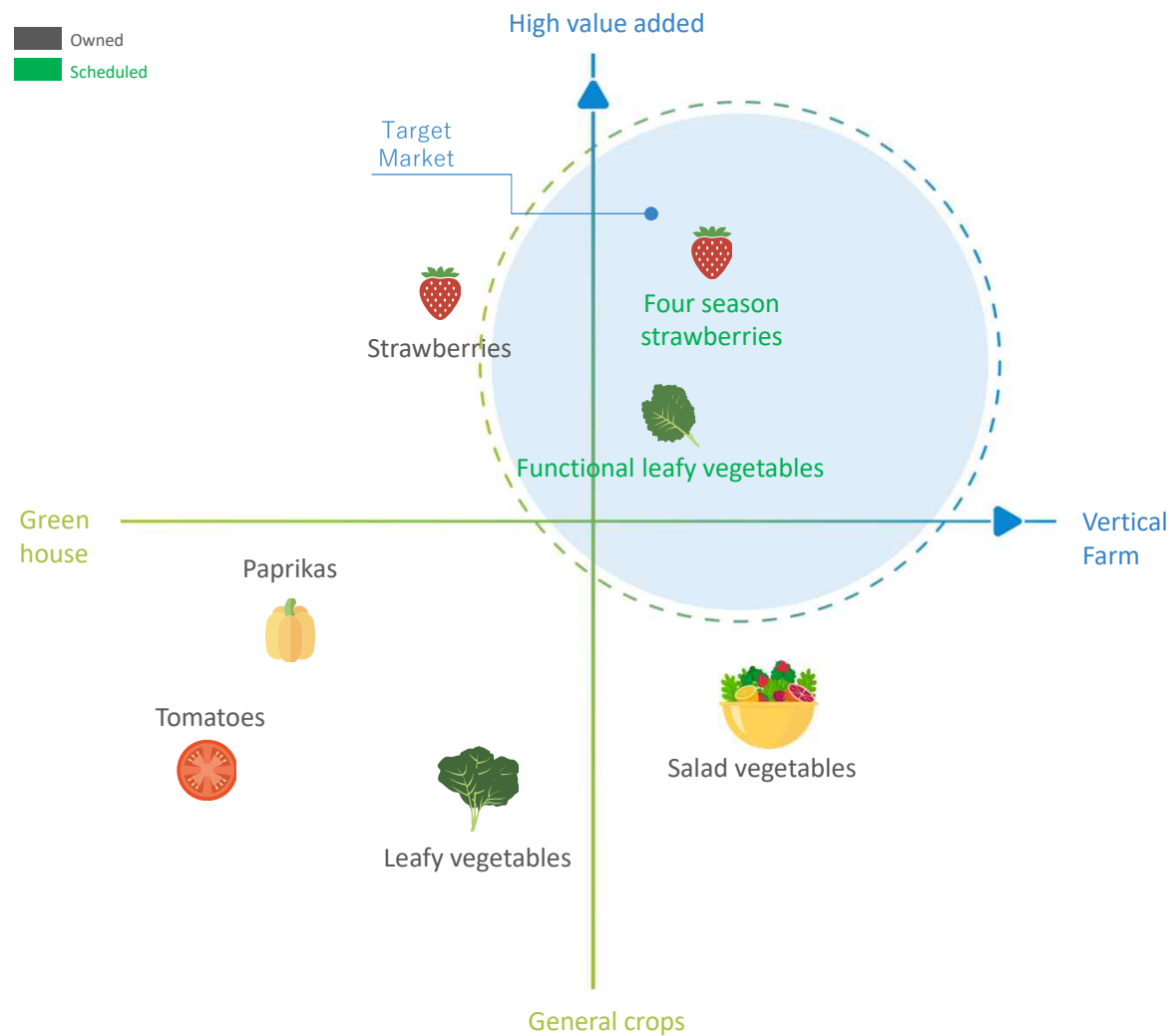
### Cloud & Module base Farm Management system

- Vertical Farm management system, Robotics & Facilities management will be added on the SmartRoot platform.
- 3<sup>rd</sup> party solution can be easily adopted with API(Application Programming interface).

### 3) Portfolio with high value-added crops

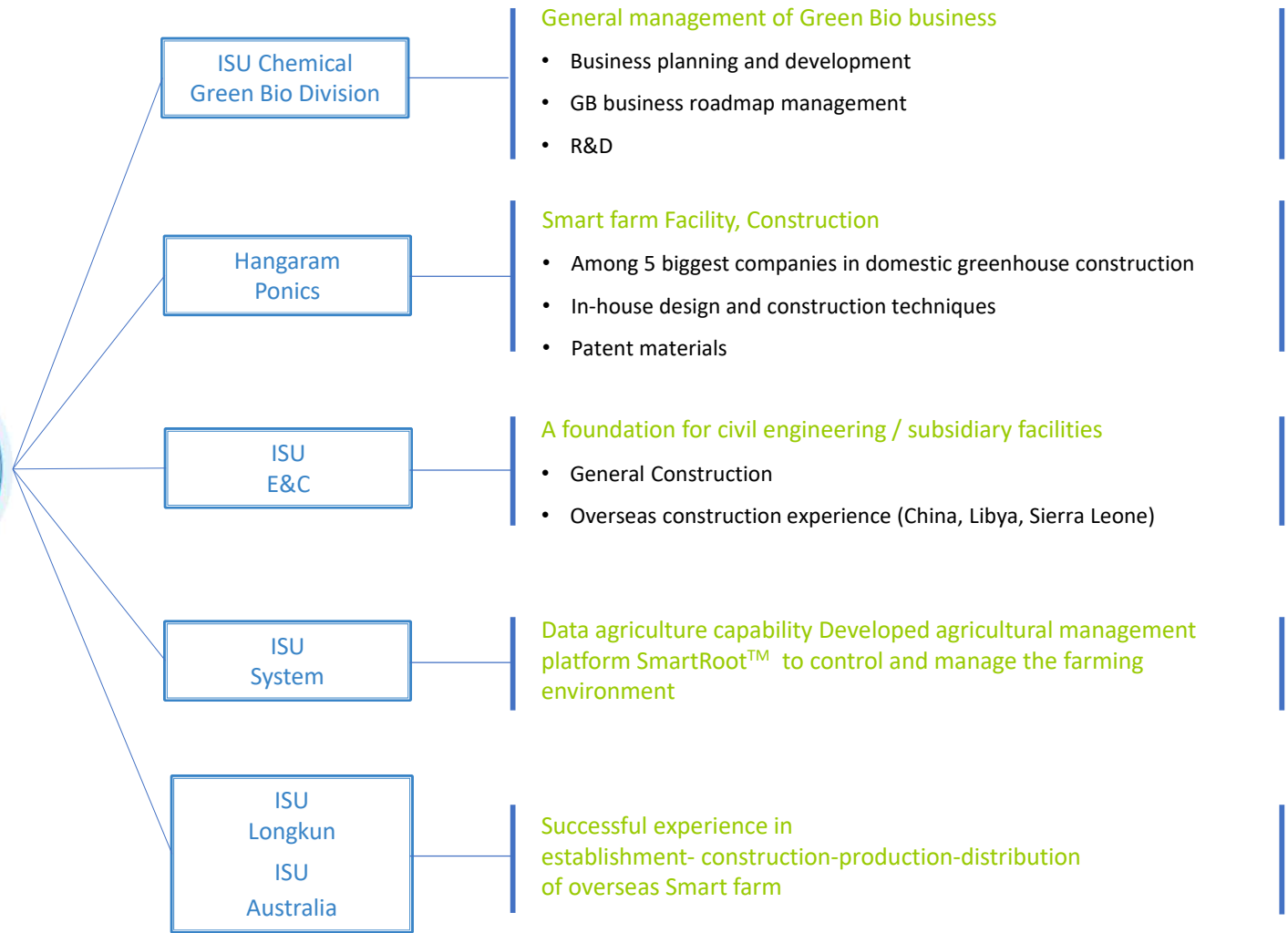
#### Secure the right to research on high-yield crop seeds

- High-quality Korean strawberries have higher sugar content and hardness.
- Functional leafy vegetables : Lettuce 'Heukharang' which is highly effective for insomnia.
- Low-potassium lettuce suitable for patients with the kidney-related disease.
- Sprouts, young leafy vegetables.



Generating synergy through collaboration between group companies - Agricultural Total Solution Provider possible

Green Bio Business





STRENGTH

2

Rich construction experience  
& Technology

## Overseas



### Gold coast Australia

(1ha PC Greenhouse\*,  
Leafy Vegetables)

Export type  
K-Smart Farm

- The first Korean company to enter the Australian greenhouse business
- 1<sup>st</sup> stage: Project scale : 1ha, KRW 5.2 billion(completed by 1Q, 2024)
- 2<sup>nd</sup> stage: Under discussion for additional development of 2ha



### Kandal Province Cambodia

(1.1ha Plastic Greenhouse)

Multi-stake Venlo type

- Official Development Assistance (ODA) project hosted by the National Agricultural Research Service
- Order received in 2021 ~ Completed in 2022



### Mongolia/CIS

(Northern type Export Greenhouse)

Export type  
K-Smart Farm

- 1<sup>st</sup> stage : 2023 National University of Agriculture and Life in Mongolia
- 2<sup>nd</sup> stage : 2024 CIS (Commonwealth of Independent States) demonstration of greenhouse
- Low temperature overcoming type, disaster-resistant type



### Xinjiang China

(5ha Glass Greenhouse, Paprika)

Single loop, Venlo type

- 1<sup>st</sup> stage : 5ha direct operation
- 2<sup>nd</sup> stage : Under discussion with Chinese government about investment for additional development of 20ha

Domestic



Gyeongbuk Sangju  
(1acre PC Greenhouse,  
MGS Leafy Green and Vertical Farm)

- ISU Green bio business R&D center as well as production site.
- Cultivation test for various crops, cultivars with MGS and vertical farm



Gyeongbuk Uiseong  
(2.5ha PC Greenhouse,  
Strawberry Bench Cultivation)

Disaster-resistant,  
educational greenhouse

- Provides opportunities to young start-up farmers to produce and learn about farming
- Seedling, production, shipment, and export all in one



Carrying out a number of  
National projects

Smart farm Export

- Smart farm business and export management. '2017~'2021 project cost of 3.1 billion won
- Northern export greenhouse development, '2021~'2024 project cost of KRW 8.2 billion, 11 models developed

Vertical farm production and operation management

- Scheduled to establish and operate demonstration facilities in 2023

## Targeting from 2025 – Green Leafy Vegetable – Indoor Vertical Farm



### Advanced Technology

R&D

Multi-layer MGS vertical Farm

Test operation in Korea

Leafy Veg.

Profit of vertical farm depends on how much it can save labor and energy cost. For the reason, ISU is proceeding R&D on vertical farm automation and energy-saving technology.

### Save Labor & Energy cost with High Yield

Multi-layer MGS vertical farm can produce 16% more than conventional vertical farm. The patent for the technology is under prosecution. It is designed with our own technology



### Middle East

Indoor vertical Farm

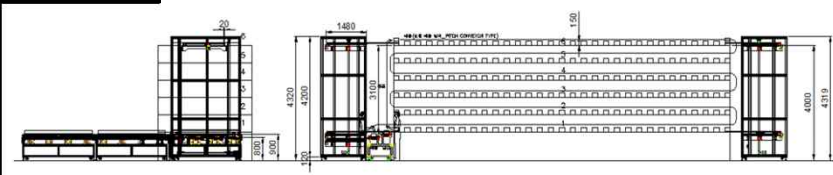
1ha Facility for 2KT

Leafy Veg.

Leaf vegetables are a low-temperature crop, so vertical farm is suitable for Middle East which has a high temperature climate.

### High Productivity

Vertical farm with 12-layer make it possible to harvest 5.3 times more than a conventional greenhouse, and automated system can reduce labor costs.



### Indoor Vertical Farm F/S scenario

	Remark
• Facility Size (growing area only)	1 ha
• Investment (excluding land cost)	\$30 M
• Period (Construction)	10 months

NPV	U\$ 550K
IRR	8.6%
Payback	6.5 year

\* This figure is reference only and detailed quote required.



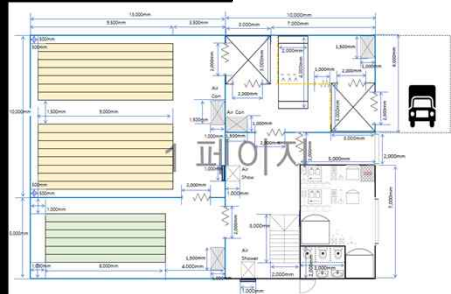
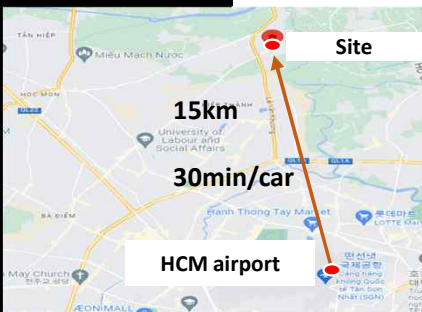
Overseas  
(Developing)

Korean Strawberry– Indoor Vertical Farm Demonstration Project (City Farm)



Hochiminh, Vietnam  
Indoor vertical Farm

Korean Strawberry  
production  
in Vietnam



Indoor Vertical Farm Demonstration Project

Given the harsh environment of the Vietnam, proposing the indoor vertical farm. Korean Strawberries loved around world. Korean Strawberry import prices are 3x higher than average.

Demonstration project on the production of Korean Strawberries, a year-round low-temperature crop, regardless of external climate conditions.

Expected to be completed and cultivation to begin in the send half of 2024

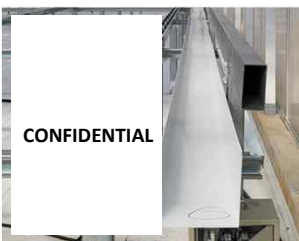
Demonstration Target	Remark		Remark
• Brix (sweetness)	Min. 12 ↑	• Facility Size (growing area only)	130m2
• Productivity	57Kg/m2	• Period	'24.11~'26.10
• weight	20g/ea		

Domestic

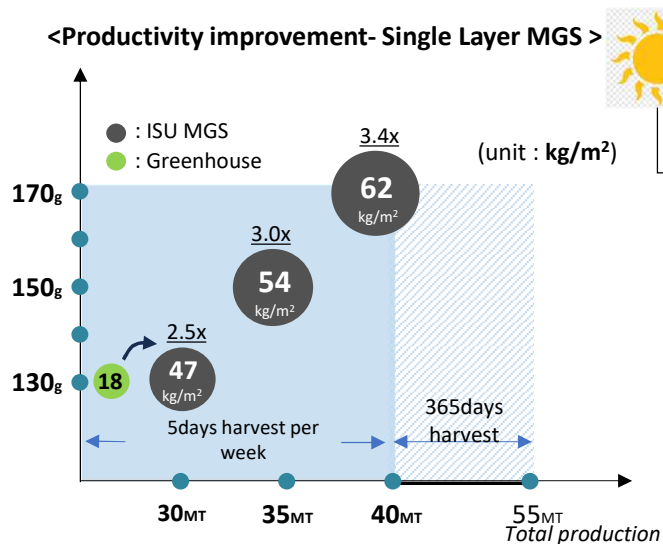
# Green Leafy Vegetable – Greenhouse Multi-layer MGS Demonstration Project

## Improve Productivity , reduce Cost

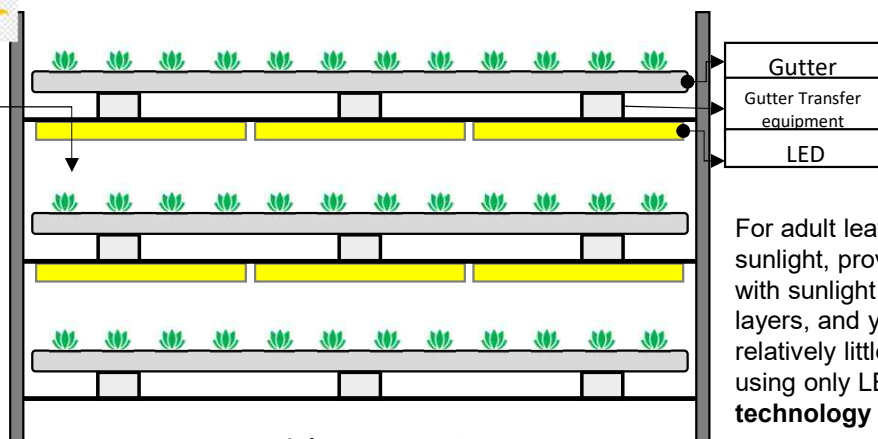
We are preparing a demonstration project on productivity improvement and cost reduction compared to general greenhouse. Single-layer MGS alone is expected to improve productivity by up to 2.5 - 3.4 times compared to general greenhouses, and productivity is expected to be further improved when upgrade to multi-layer.



<Productivity improvement- Single Layer MGS >



<Future Project- Multi Layer MGS for Greenhouse >



<Triple- Layer MGS >

For adult leaves that need a lot of sunlight, provide light in combination with sunlight and LED on the upper layers, and young leaves that need relatively little sunlight provide light using only LED. **Patent for the technology is under prosecution.**