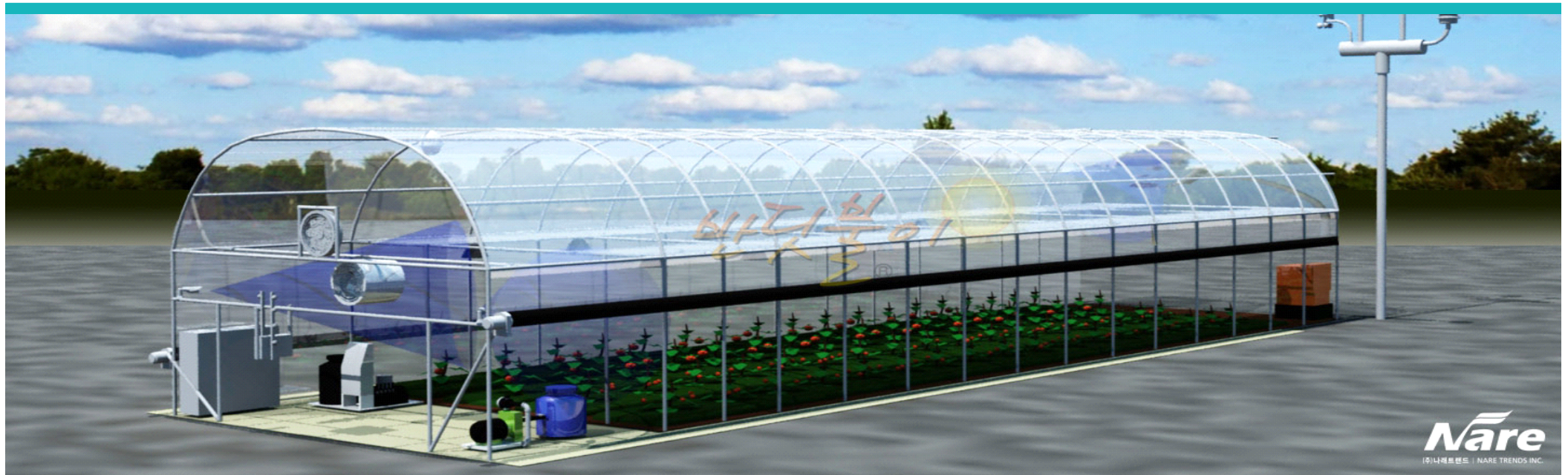




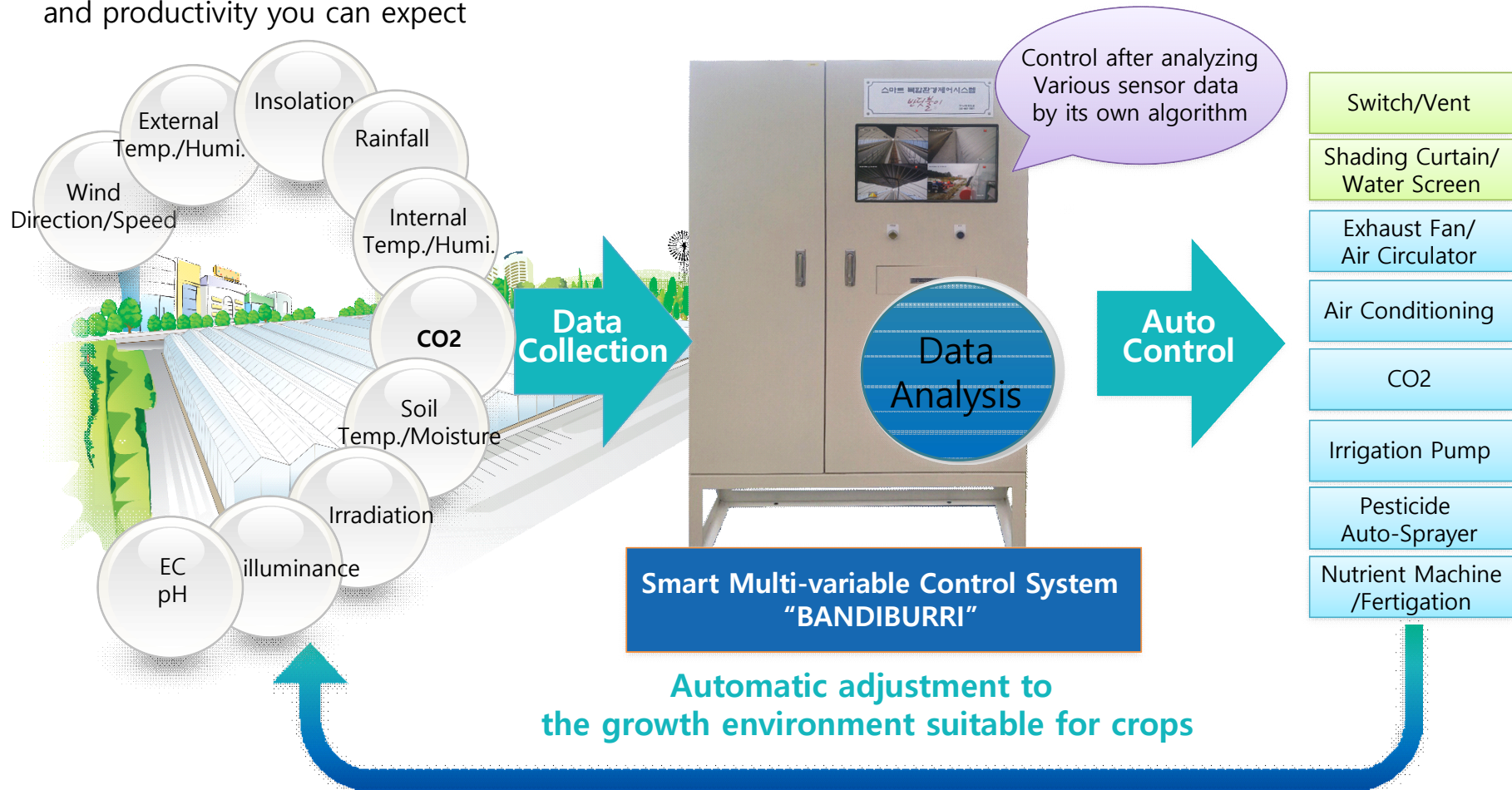
# Smart Farm

Complex Environment Control System for Precision Agriculture



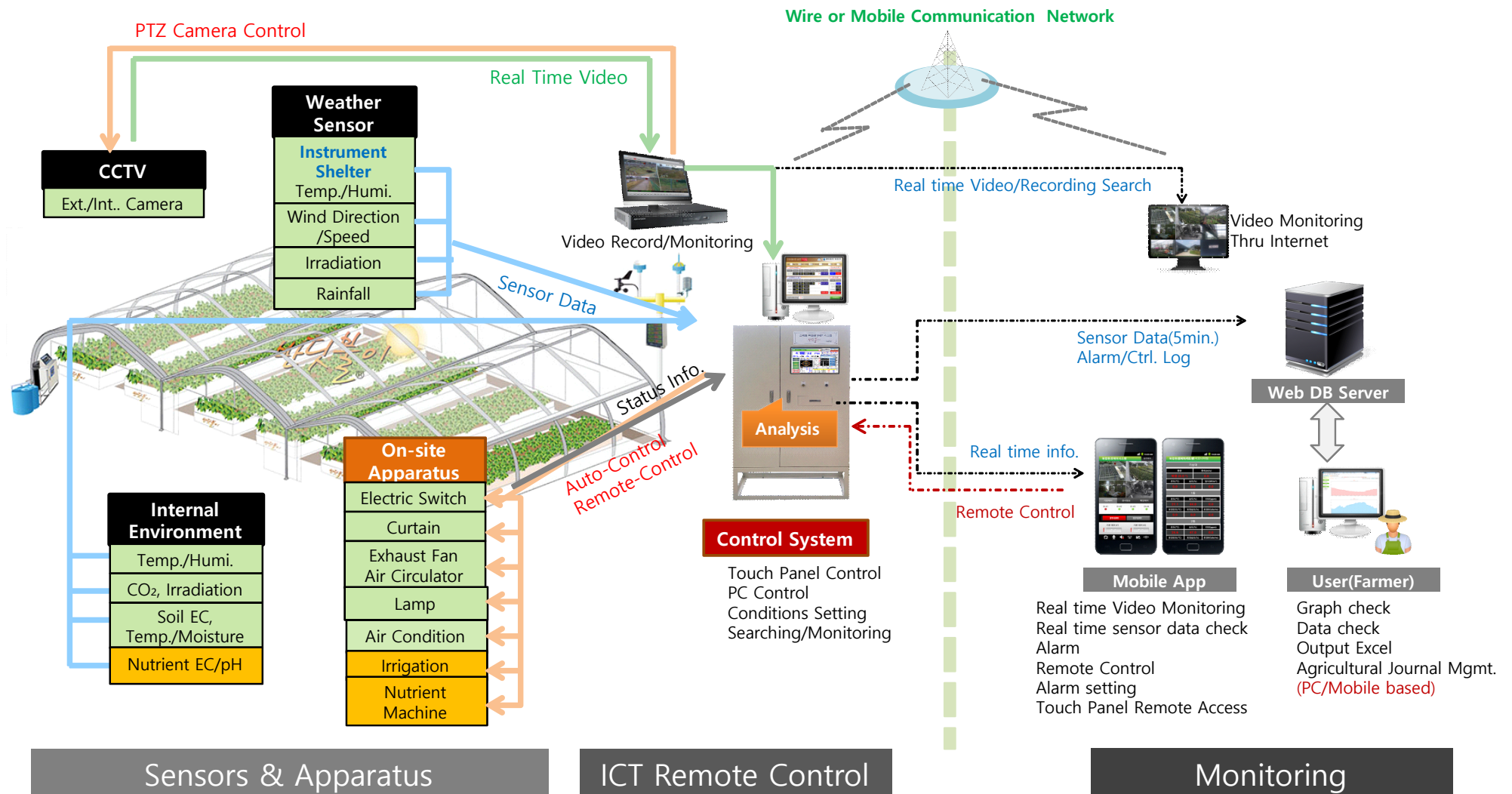
## Outline of Complex Environment Control System

Various sensor information is analyzed by the computer, and the control devices are automatically adjusted to the proper growth environment to maintain the optimum environment condition and improve the quality and productivity you can expect



# Smart Complex Environment Control System

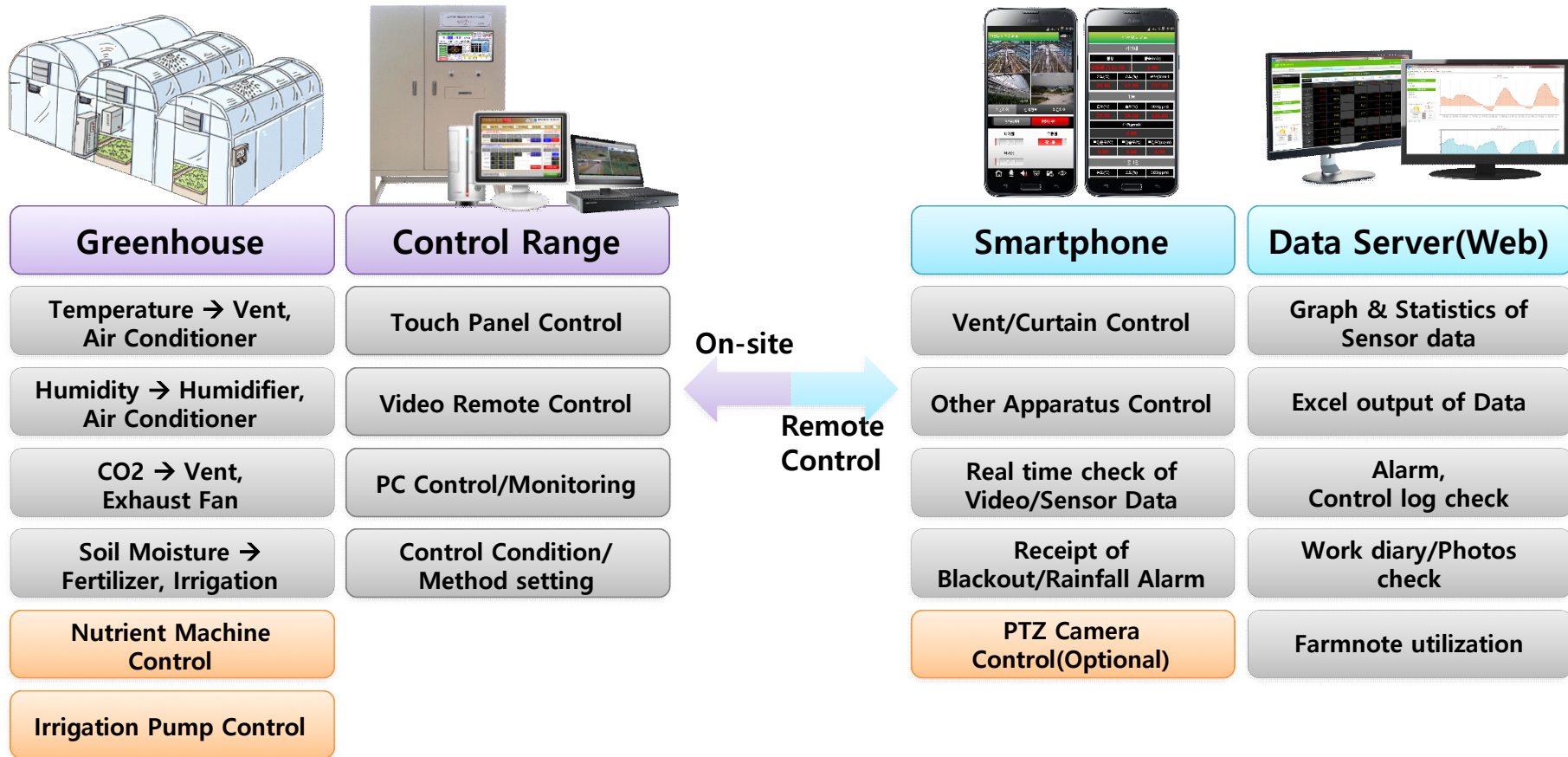
## System Diagram





## Main Services

### 『Complex Environment Control System "BANDIBURRI"』 Main Service





# Smart Complex Environment Control System

반딧불이

## Key Features

### Application of Intelligent Complex Control Algorithm Optimized for Growth Environment



#### Multiple Control by Various Conditions

Support front window opening & Adjust opening/closing range

Greenhouse control with average temperature

Temp. deviation, Wind speed → Minimizing greenhouse temp. deviation by opening/closing speed control

#### Automatic Control of Skylight, Window, Curtain

6-cycle automatic control & Multiple condition setting

5 stage control of shading curtain according to irradiation

Opening/closing range & Closing speed adjustment

#### Automatic Control of Heating, CO2 supply, Irrigation

Internal/external temp. → Proportional control, Circulating pump control

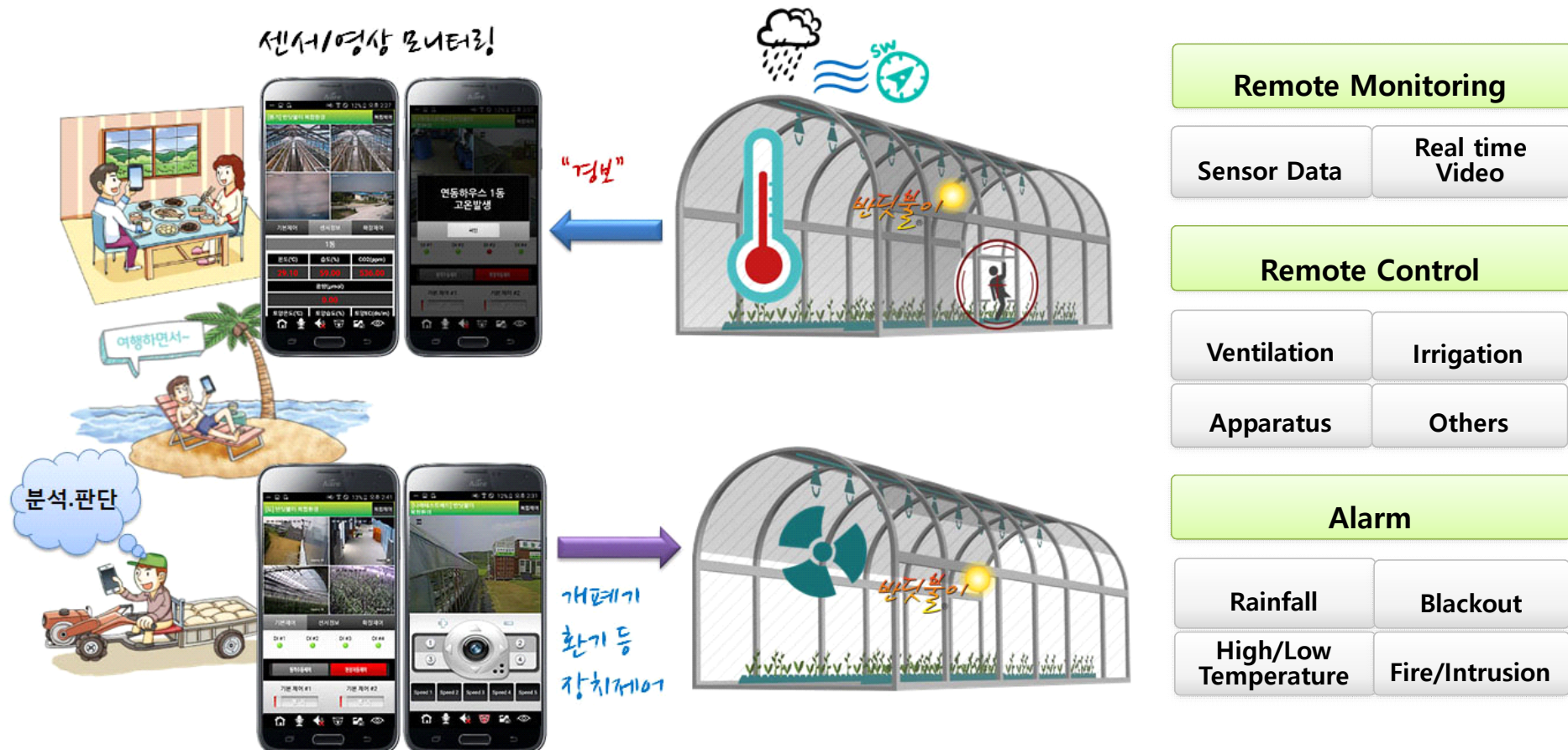
Random adjustment of CO2 injection time & ratio

Irradiation, wind speed, opening & closing range, humidity → Automatic conversation of CO2 input concentration

# Smart Complex Environment Control System

## Key Features

Increasing Convenience & Reducing Labor  
By Remote Control of Smart phone



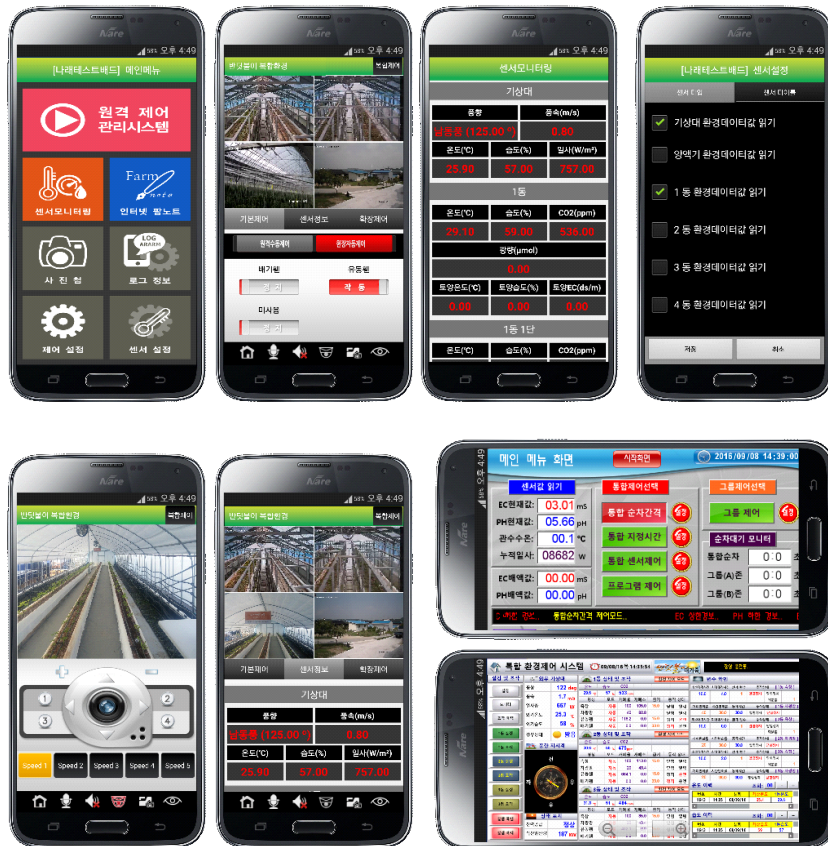
# Smart Complex Environment Control System

반딧불이

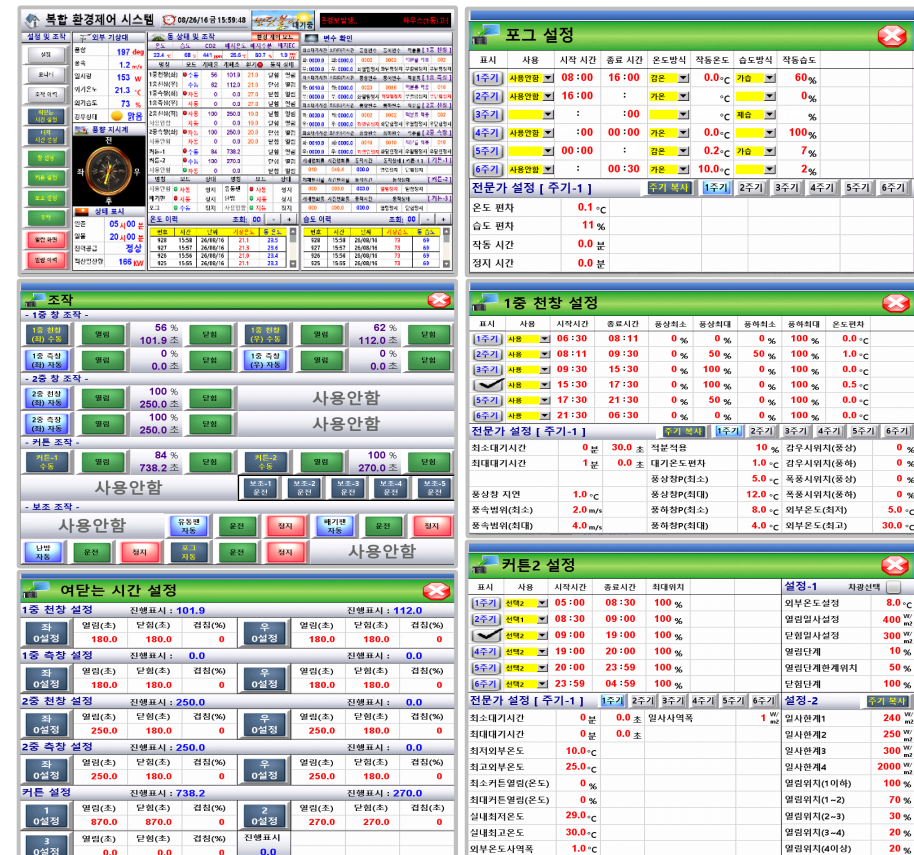
## Key Features

## Screen of Remote Monitoring & Control

### Mobile App.



### PC(Web)





# Smart Complex Environment Control System

반디팜이

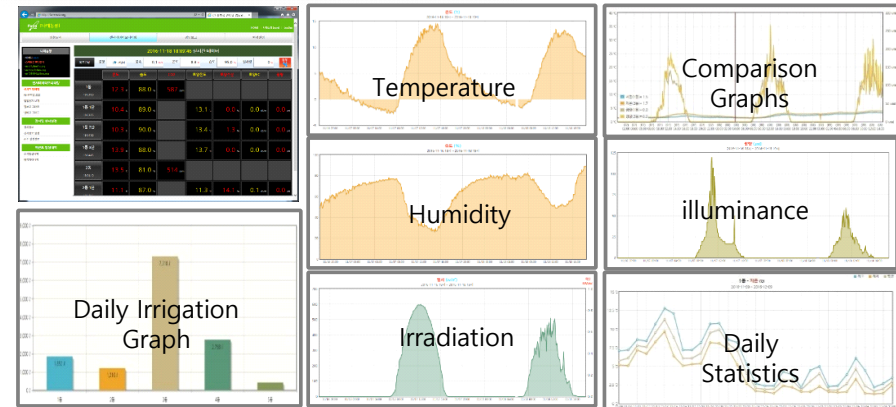
## Key Features

### DB Utilization & Agricultural Journal Services

#### Mobile-Sensor data check



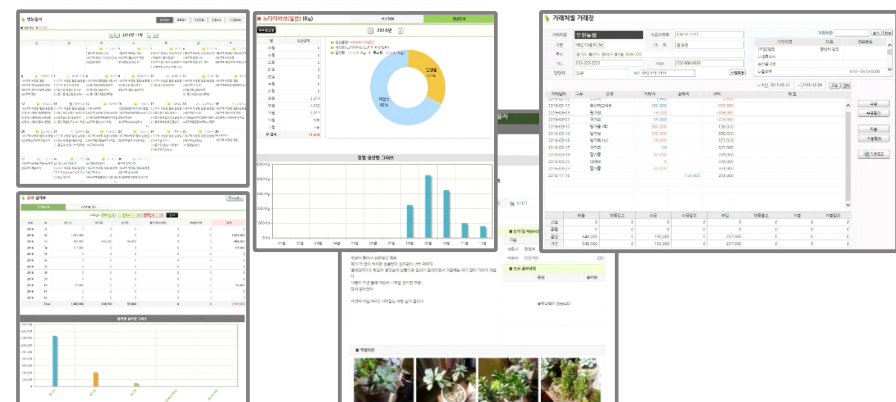
#### PC-Sensor data check



#### Mobile-Farm Note



#### PC-Farm Note Management



## Configuration of Equipment

### Environment Control Master



Environment control & Video control on touch Panel

#### ▼ Environment Ctrl.



#### ▼ Video Ctrl.



Remote Controller		
Main Control	Vent	20-ch (Standard)
	ON/OFF Control	6ea(Standard)
	Alarm	Blackout, High/Low temp, Rainfall
Greenhous Mgmt.	PC	1set
	Monitor, Internet	
Data Transmission	Weather Sensor Transmission	1ea
	Internal Sensor Transmission	Max.10ea
	Included Convertor & Display	
Telecom. Module	TCP/IP, 485	Other sensor interworking, Network communication, Push alarm, data transmission, Remote control bi-directional communication

- Additional sensor types, quantity & camera are chosen to suit the farm environment
- Control ports can be extended according farm

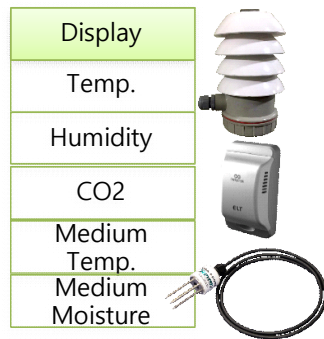
S/W	
Remote Control Program	Touch Monitor(Controller), PC Program
Mobile APP	Real time Monitoring for Video, sensor data
	Remote Control
	DI Detection push alarm, AI setting over push alarm
Data Server	Sensor data DB → Graphs & tables check Push alarm history, Remote control log check Provide the agriculture journal(production, shipment, work diary, accounting, inventory)

## Configuration of Equipment

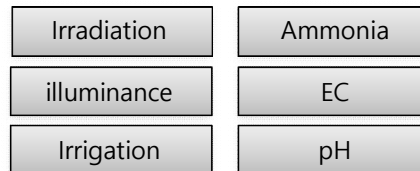
### Internal Sensor Data Transmitter



Max 10ea access  
per main system

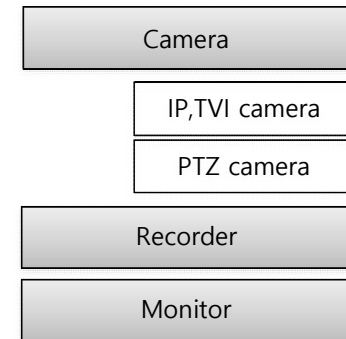


#### Other sensor



※ Various sensor interwork

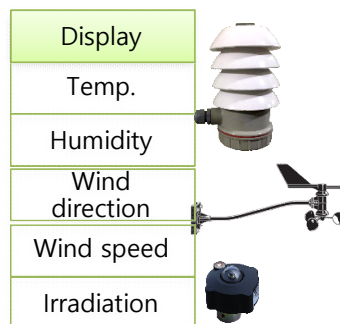
### Video Equipment



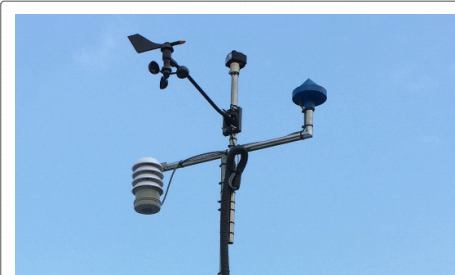
### Weather Sensor Data Transmitter



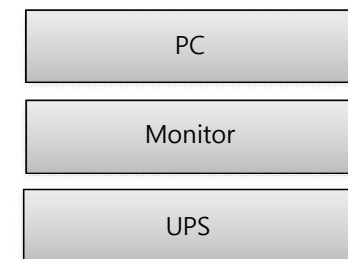
Weather sensor interwork



#### Weather sensor stand



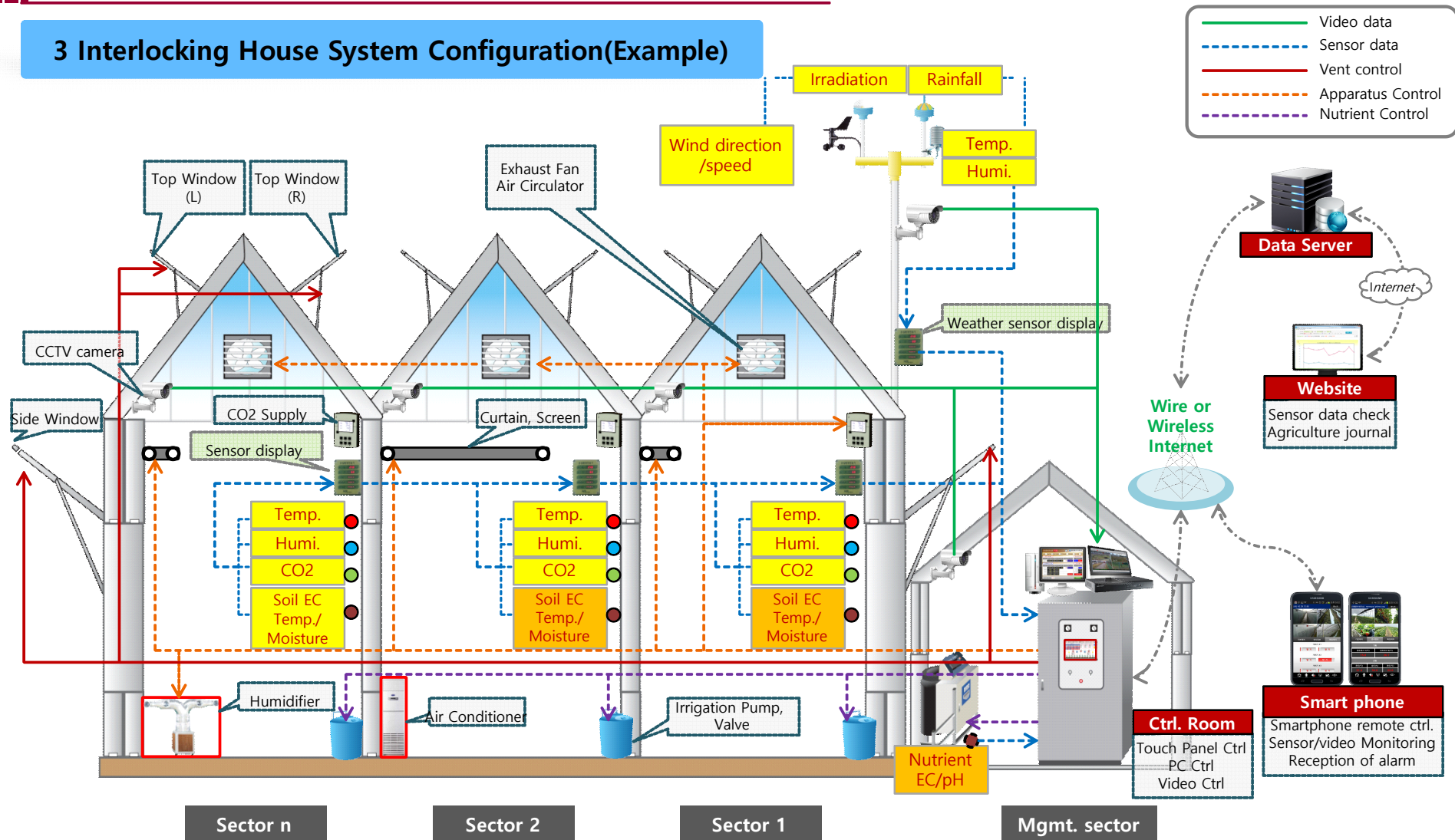
### Computation Equipment





## Configuration of Equipment

### 3 Interlocking House System Configuration(Example)

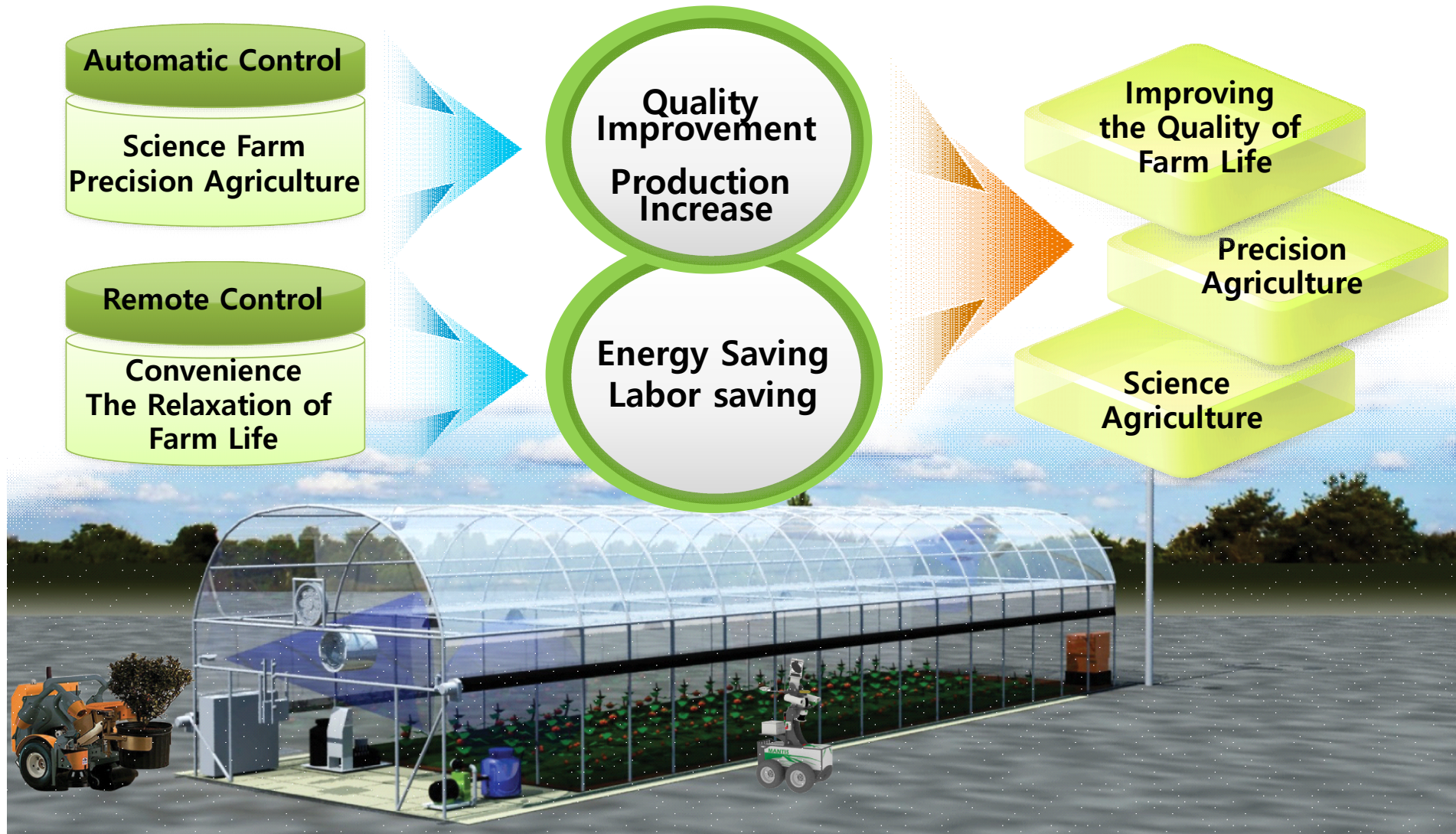


## Configuration of Equipment

No.	Category	Item	Descriptions	Q'TY	Optional
1	Greenhouse Management	PC/Monitor(Laptop)	Intel i5, SSD 128GB, Memory 8G, 15" win10	1set	-
		Router	4ports Wireless router		
		UPS	AC220V, 240Watt, 400VA, Blackout detector of main Power		
2	Integrated Controller	Central Process Unit	15" Touch monitor, Data collection module, RS485,, Extension unit	1set	-
		Enclosure	Material: Plastic(Size: 1000*1300*350mm over)		
		Complex Environment Control S/W	PLC PC control program, Mobil APP, Data server Farmnote		
2	External Environment Sensor	Data Transmitter	LCD/ PoE/ RS485, Convertor, Display	1set	Scale up to 10sets depending on area/sector  Irradiation, illuminance, ammonia, water quantity sensor can be connected
		Wind Direction/Speed	8 cardinal points 0~50m/s, RS485, TCS module		
		Irradiation	0~2,000 W/m <sup>2</sup> , Accuracy ±5%		
		Temperature/Humidity	NTC 10KΩ, -25~60°C, 20~90%RH		
		Instrument Shelter + Weather measurement stand	5 stage, Natural ventilation type		
		Rainfall	Dry contact Type, Heating, Delay Circuit		
3	Internal Environment Sensor	Data Transmitter	LCD/ PoE/ RS485, Convertor, Display	1set	
		Temperature/Humidity	NTC 10KΩ, -55~90°C, 20~90%RH		
		CO <sub>2</sub>	0~10,000PPM, LCD Display, Accuracy ±5%		
		Soil	0.01~1.5S/m, -10~55°C, Soil moisture, EC		
4	Video Equipment	Camera (CCTV)	2.0M pixel HD camera, IR 20m	4ea	8~16ea
		Recorder	4Ch DVR, 1TB, Video convertor	1ea	
5	Alarm Equipment	Surge Protector	Main power protector		Intrusion, Fire, Water level alarm
		Electric Arc detector	Arc sensor, AC220V	1ea	
6	Warranty	1 year	Warranty does not cover in case of performance and functional failure due to user's intentional negligence		-
7	Option	Nutrient Machine installation/interwork			
		Heater installation/interwork			

- In the basic package, indoor environment sensors & cameras can be expanded as many units as necessary, and are designed for control capacity & channel expansion

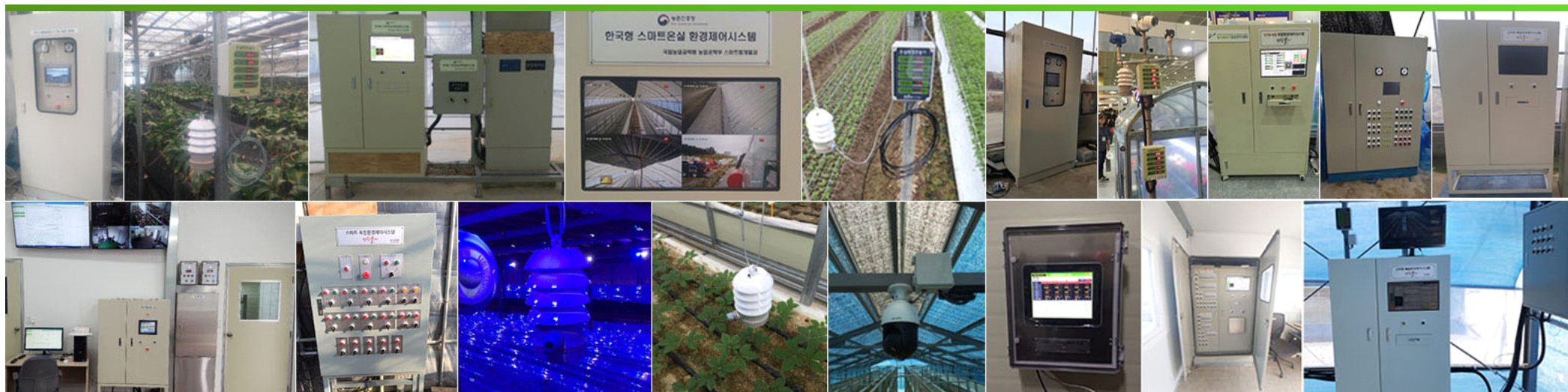
## Benefit







# 『Smart Complex Environment Control System』 *Installation Examples*



## GIMHAE-Smart Complex Environment Control System

Chrysanthemum



### Outline

By constructing a complex environment control system 'BANDIBURRI' in two chrysanthemums houses in GIMHAE, various sensors information is analyzed by the computer, and the control devices are automatically adjusted to the proper growth environment to maintain the optimum environment condition and improve the quality and productivity you can expect

Category	Item	Q'TY
External Environment Sensor	Rainfall	1
	Wind direction/speed	1
	Temperature/Humidity	1
	Irradiation	1
Internal Environment Sensor	Temperature/Humidity	2
	Irradiation	1
	Soil EC/Temp./Moisture	2
Security Sensor	Blackout	1
Main Controller	Environment Controller	1
Video Device	CCTV camera	5
	Recorder	1
Control Server	PC+Monitor+UPS	1

Top Window

Side Window

Turbo

Double Vinyl

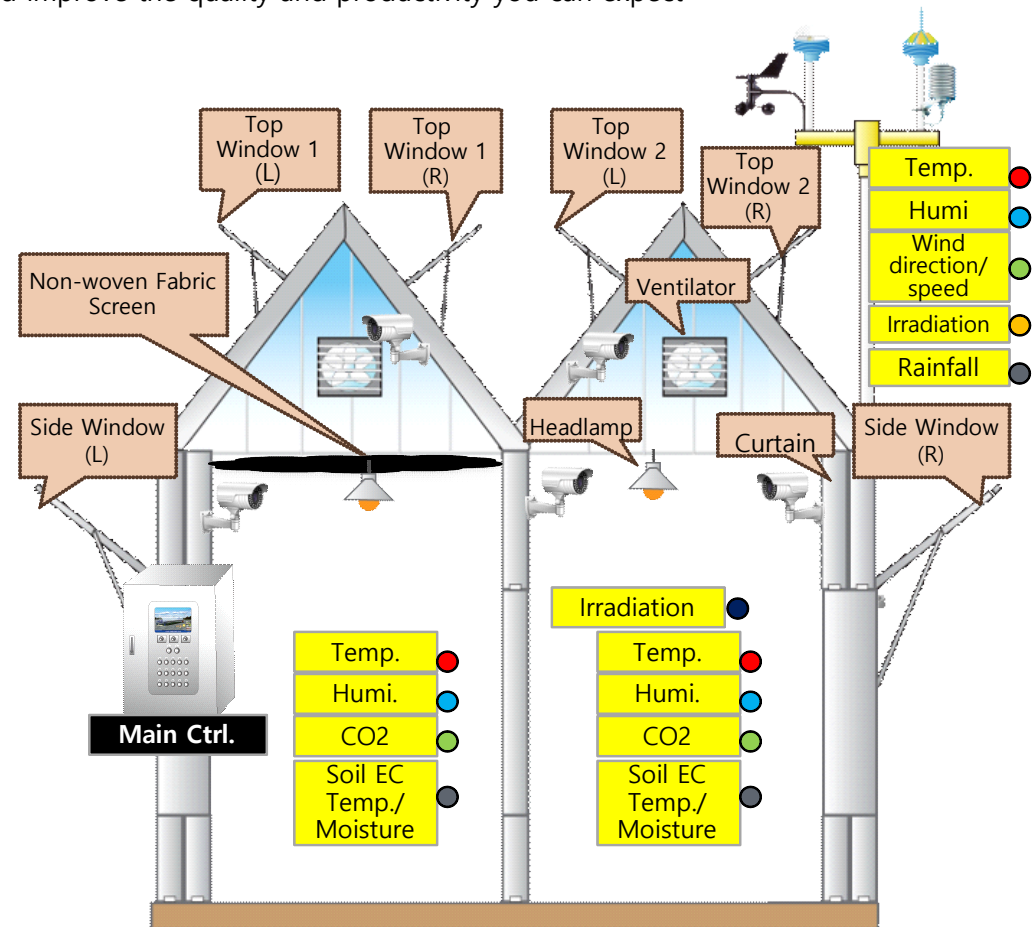
Non-woven Fabric

Screen

Curtain

Headlamp

Ventilator





# Smart Complex Environment Control System

반디불이

## GIMHAE-Smart Complex Environment Control System

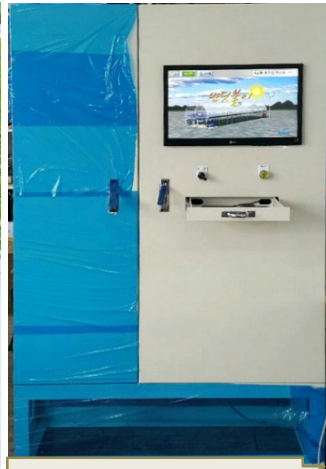
Chrysanthemum



### Installation



Soil sensor & Temp./Humi. CO2

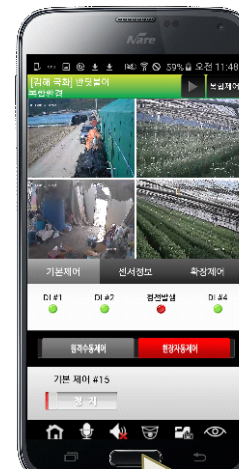


Main Control System

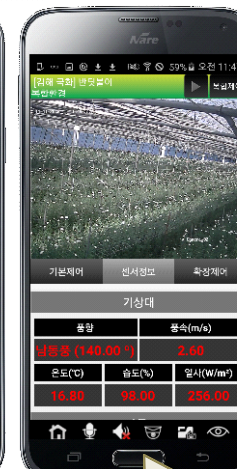


Internal/External CCTV camera

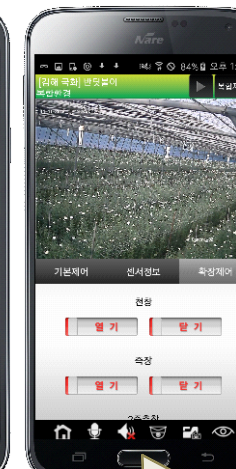
### Monitoring



Video+Ctrl.



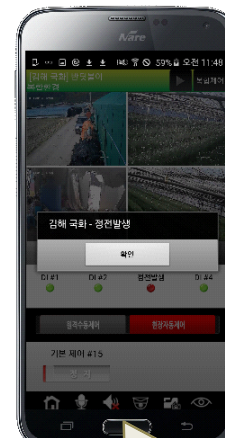
Video+Sensor



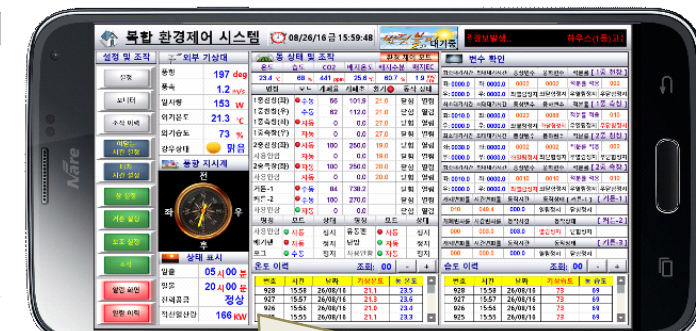
Extended Ctrl.



Graph check



Push alarm



Remote Control Program



# Smart Complex Environment Control System



Ginseng

## Outline

Running a complex environment control system 'BANDIBURRI' in 'PUNGGI Ginseng Test Farm' operated by Korea Ginseng Corporation to build an automation system to automatically control the shade network, side window, exhaust fan, air circulator, etc. according to temperature/humidity, and remote control via smartphone in case of emergency. Temperature/humidity/CO2 sensor and soil temperature/Moisture/EC measurement sensors are installed in each house to be reflected in automatic control. Real-time monitoring is possible through smart phone. Sensor data is stored in DB and can be shown in graphs.

### Temp./Humi./CO2 Sensor Installation



### Data Check Screen

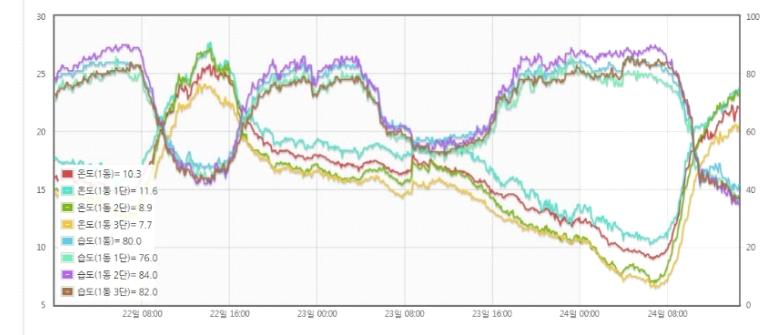
2016-10-24 14:25:26 실시간 데이터

외부기상	온도	습도	CO2	토양온도	토양수분	토양EC	광량
1.1	1.1	16.8	42.0	616			
1동	온도	습도	CO2	토양온도	토양수분	토양EC	광량
1동 1단	22.2	40.0	545				
1동 1단	18.5	48.0		17.0	14.7	0.0	100.0
1동 2단	19.5	44.0		18.8	14.3	0.1	112.0
1동 3단	24.3	40.0		21.1	15.6	0.1	90.0
2동	온도	습도	CO2	토양온도	토양수분	토양EC	광량
2동 1단	23.2	38.0	456				
2동 1단	20.0	43.0		17.5	18.3	0.1	87.0
2동 2단	22.3	39.0		18.9	17.5	0.1	60.0
3동	온도	습도	CO2	토양온도	토양수분	토양EC	광량
3동	23.3	36.0	484				
3동 1단	23.5	42.0		19.1	25.3	0.1	75.0



■ Main Ctrl. System ■ PTZ & Normal camera

■ Weather sensor





# Smart Complex Environment Control System

반딧불이

## RDA-Smart farm Education Center

Strawberry



### Education

### Exhibition



### Greenhouse

#### Main Control System



#### Heating for root collar



#### Inside greenhouse



#### On-site controller



#### Test Equipment



#### Sensor node





## NIAS-Korean Smart farm Model for Education

Tomato/Strawberry



NARE has made a real model for each generation of Korean Smart Farm by the Rural Development Administration and built a demonstration screen and control system so that visitors can see and try devices directly at the exhibition hall or fair. NARE has contributed to the understanding and dissemination of the complex environmental control system of the farm.

### ▼ Demonstration Screen of Complex Environment Control System



### ◀ Monitoring

Implemented as a video by assigning monitors by generation

Kiosks and smartphones enable visitors to manipulate them directly

The model was reduced to 1/4 of the real size and manufactured by reducing the external sensor and the sensor inside the camera and the water tank, the boiler and the curtain at the same ratio, and operated according to the actual control signal.





# **BANDIBURRI!**

## **The Best solution for integrated Automatic control based on IOT technologies**



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