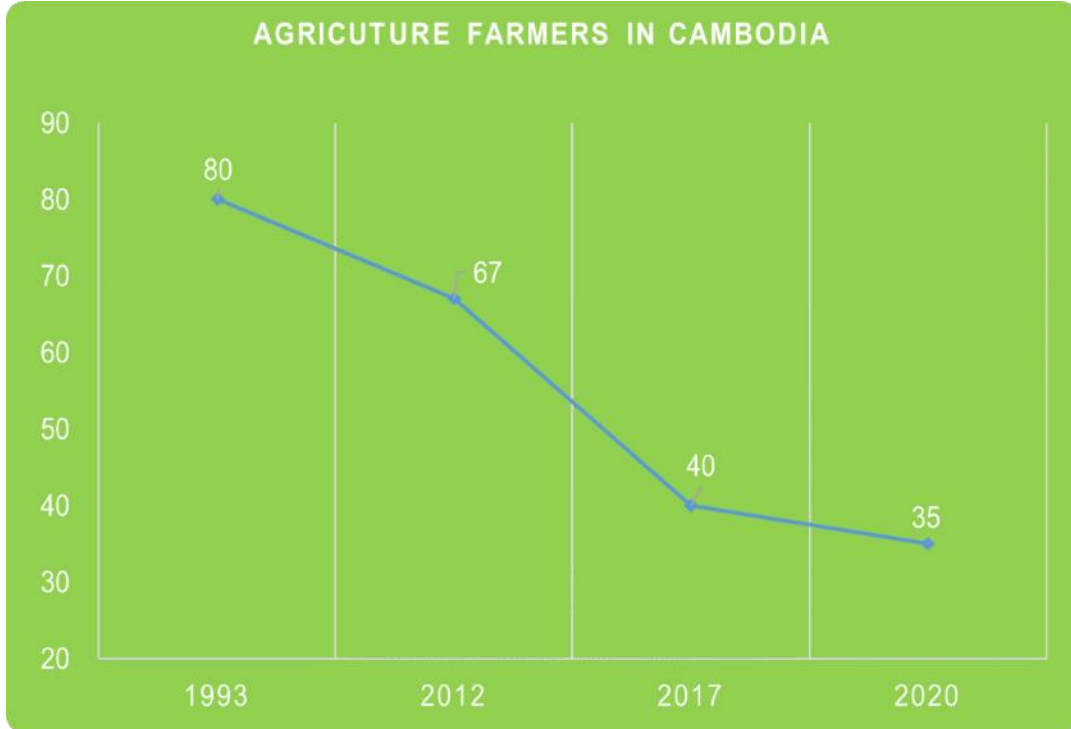




Intelligent-Control System for Agricultural Production under a Greenhouse (I-CAP)

Dr. Phon Sovatna, Dean, Faculty of Agricultural Technology and Engineering (FATE)/NIA

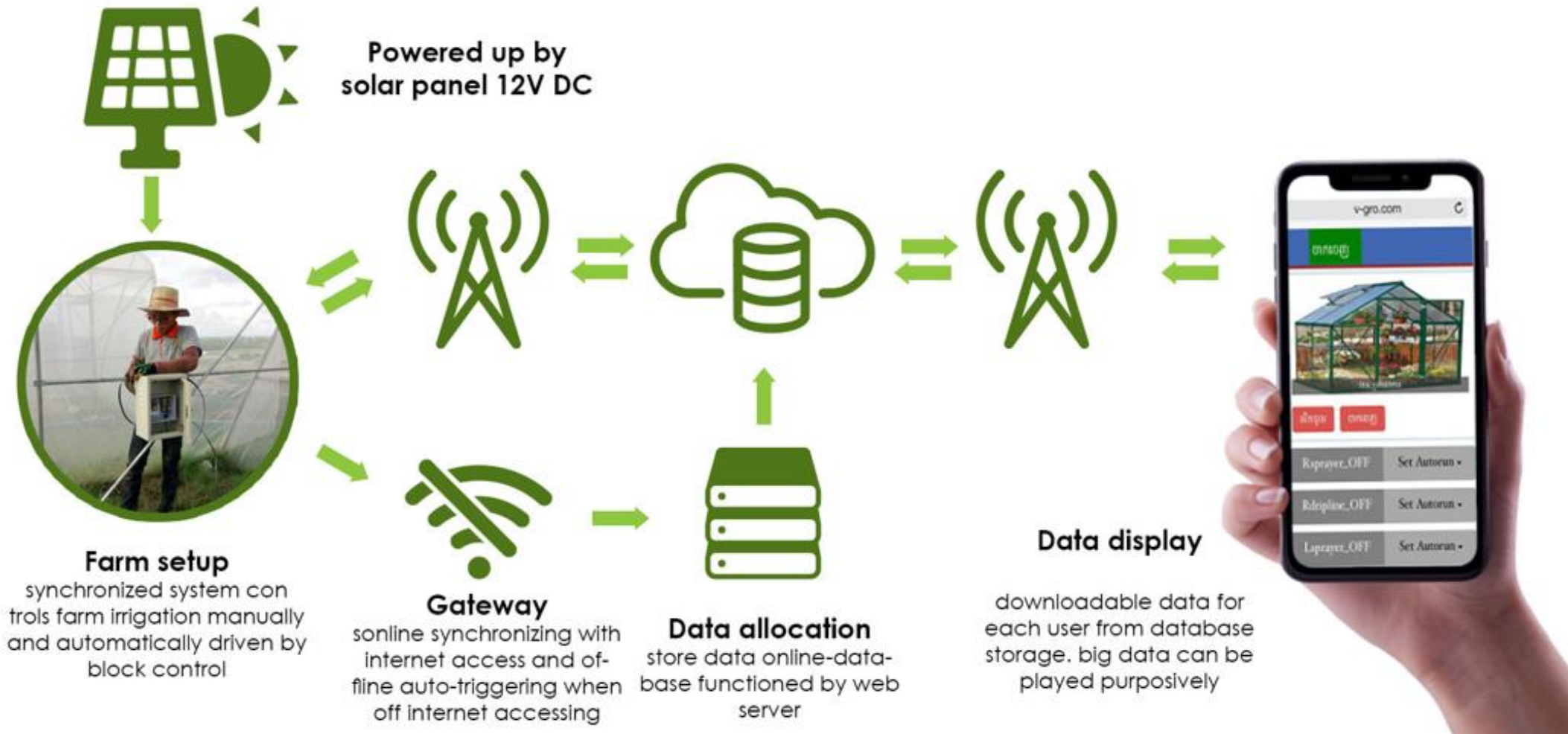
Date: 27/10/2022



Declining of employment means to poorly agriculture-production

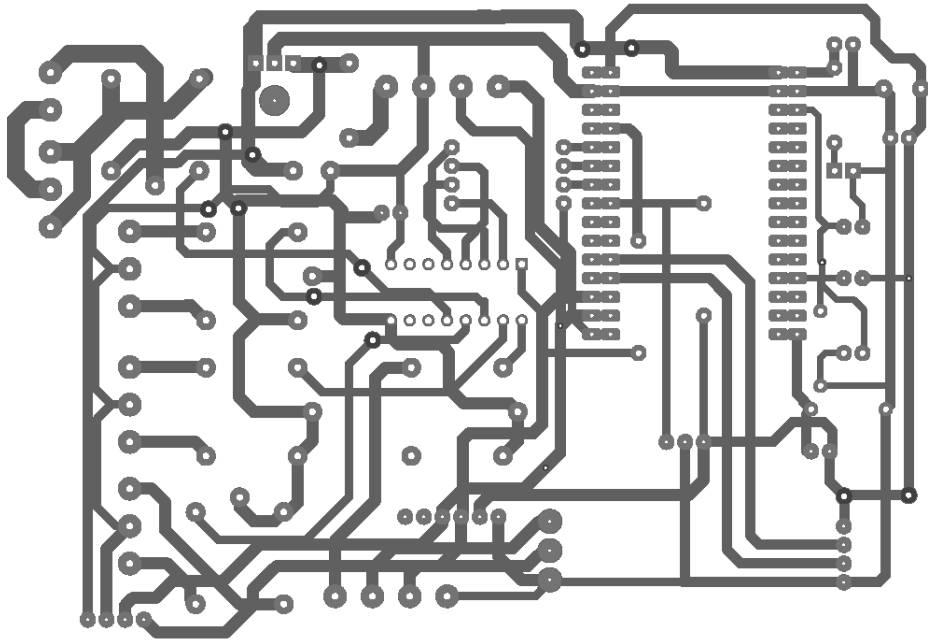






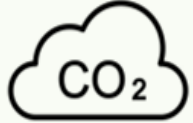





Safe solution to fulfill GAP



Process walkway

Schematic for “I-CAP solution”

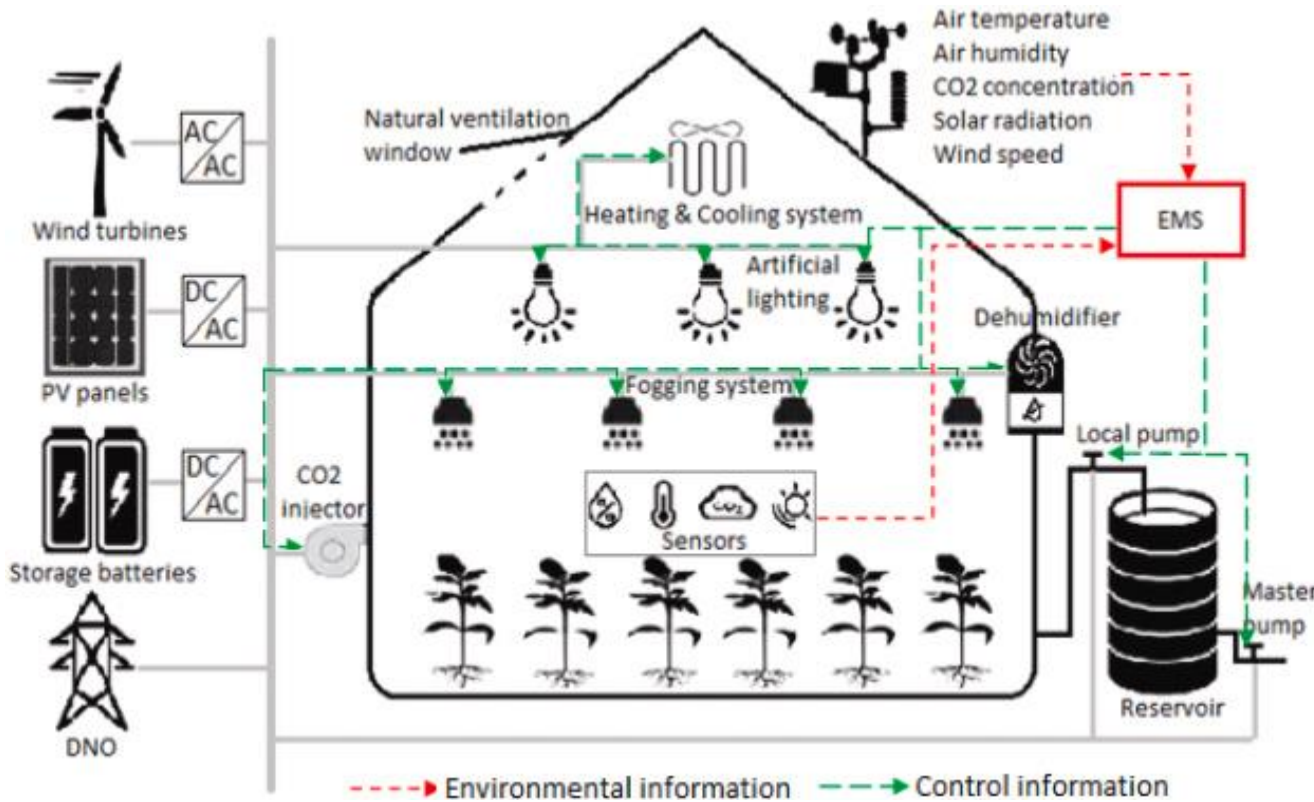


 Realized room temperature: 26 – 28°C	 Water volume in substrate: 25 – 30%	 Relative Humidity: 55 – 70%	 Light intensity	 Carbon measured for crop requirement
 Realized a standard pH for crop: 6.5 – 6.8	 Soil electrical conductivity (EC): (salinity of soil)	 Nitrogen for crop leaves and growth	 Phosphorous for crop root and growth	 Potassium for crop root, fruit and growth

Local-designed control system for crop irrigation and fertigation

A wide range of ground data detection

Proposed Methods (*greenhouse*, website [apps], control system)



Variety of crop production produced under a greenhouse.

- A smart greenhouse to be constructed
- An array of sensors to be installed
- Irrigation and Fertigation systems to be established
- Temperature and Humidity to be controlled inside the greenhouse
- Clean energy to be installed to power the greenhouse

Sample: Intelligent Greenhouse Constructed equipped with sensors: temperature, humidity, light intensity, CO₂, soil-water volume, pH, EC, NPK and control irrigation and fertigation

Proposed Methods (*greenhouse, website [apps], control system*)

Username

Password

LOGIN **LOGOUT**

Device Password Setting

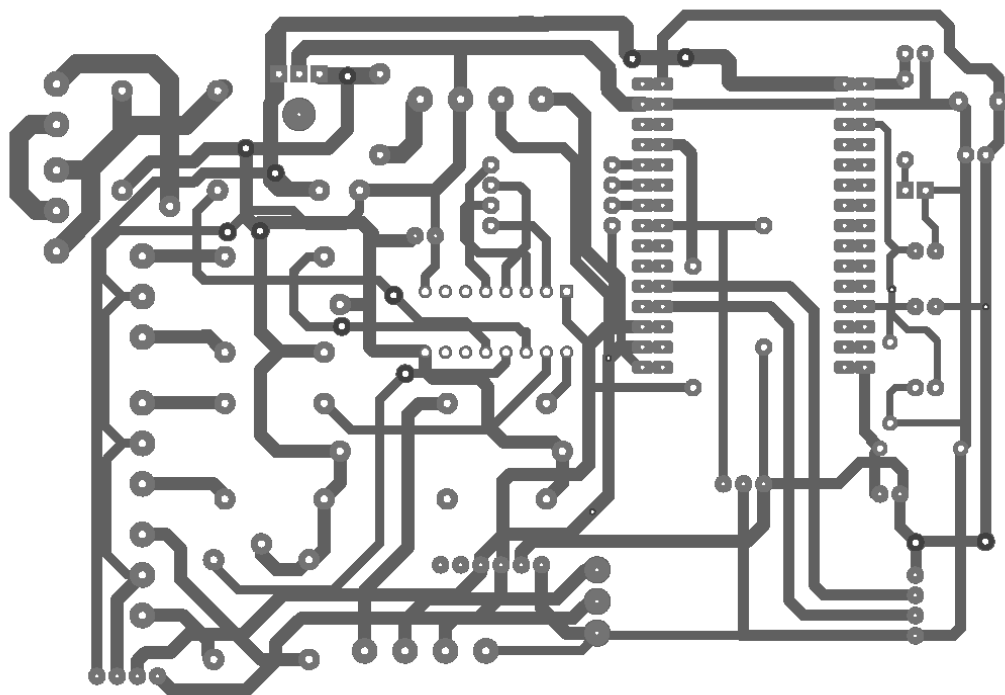
29/10/2023 Sunday

22:00 1:00 4:00 7:00 10:00 13:00 16:00

Less detail Prey Veng, KH

Daily Prediction	Monday	Tuesday	Wednesday	Thursday	Friday
Time and Status	19:00	10:00	10:00	10:00	10:00
Temperature	28.07°C	29.69°C	28.71°C	29.09°C	27.5°C
Humidity	78%	68%	73%	70%	80%
Pressure	1010 hPa	1013 hPa	1013 hPa	1012 hPa	1011 hPa
Wind Speed	2.4 m/s	2.95 m/s	4.81 m/s	1.49 m/s	0.56 m/s

- **Website [apps]** controls multiple users
- **Control** via Smartphone/Computer
- **Functions:** manual and automate controls irrigation and fertigation based on detected ground information and/or requirement
- **Fertilizer** calculates based on retrieved data ratios (nitrogen, phosphorous, potassium) and suggest amount to automatically fertigate
- **Water volume** calculates based on retrieved data from the ground and suggest amount to automatically irrigate



- **Board** can be designed locally
- Except sensors spare-parts: can be available locally
- Design needed electric engineering who is accessibly available in the local.
- **Programming languages:**

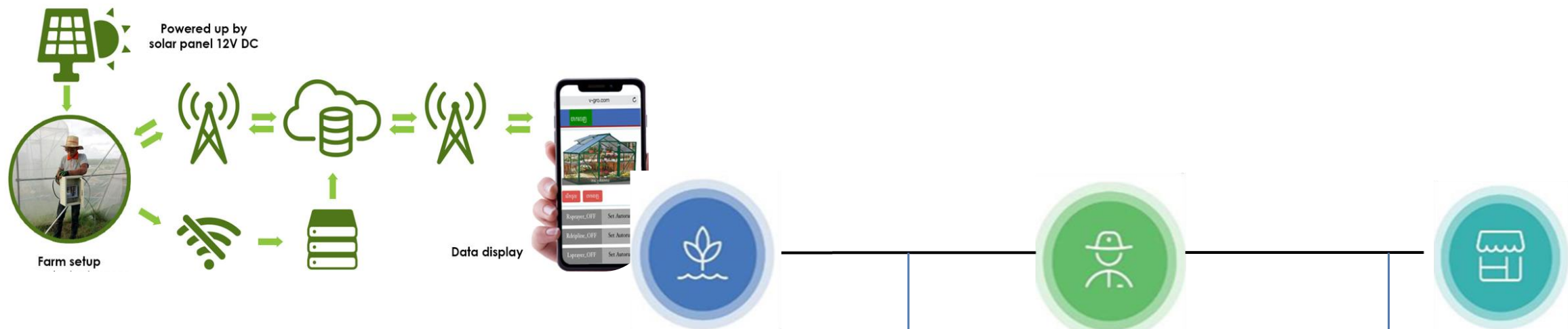


Schematic for “I-CAP solution”

Implementation and Replication: the method to be implemented directly in the greenhouse and extended to farmers at the rural areas under greenhouses.



Impact: (Scientific and technological)



- *Collecting ground data*
- *One-click operation*
- *Economic Efficiency*
- *Market product driven*

Ground data

- Detect ground information
- Display data
- Record data
- Analyze and recommend for automated production and/or visible farm requirement

One-click Operation

- Manually/Automatically operation – irrigation and fertigation
- Offline/Online control
- Computer/Smartphone

Economic Efficiency

- Reduce water by at least 50%
- Reduce fertilizer by at least 30%
- Reduce labor(time) by at least 50%
- Reduce chemical pesticide by at least 50%

Market Product-driven

Impact: (Society)

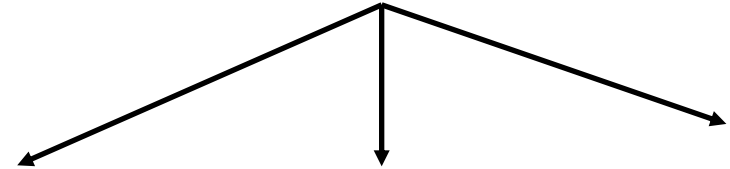


Time required:

- Irrigation & fertigation
- Control soil
- Diseases and pests
- Weeding



High technologies with hand-on experiences



Relative hard without skillset

Hybrid technology handling

Impact: (Collaborative)



Co-funded by the European Union



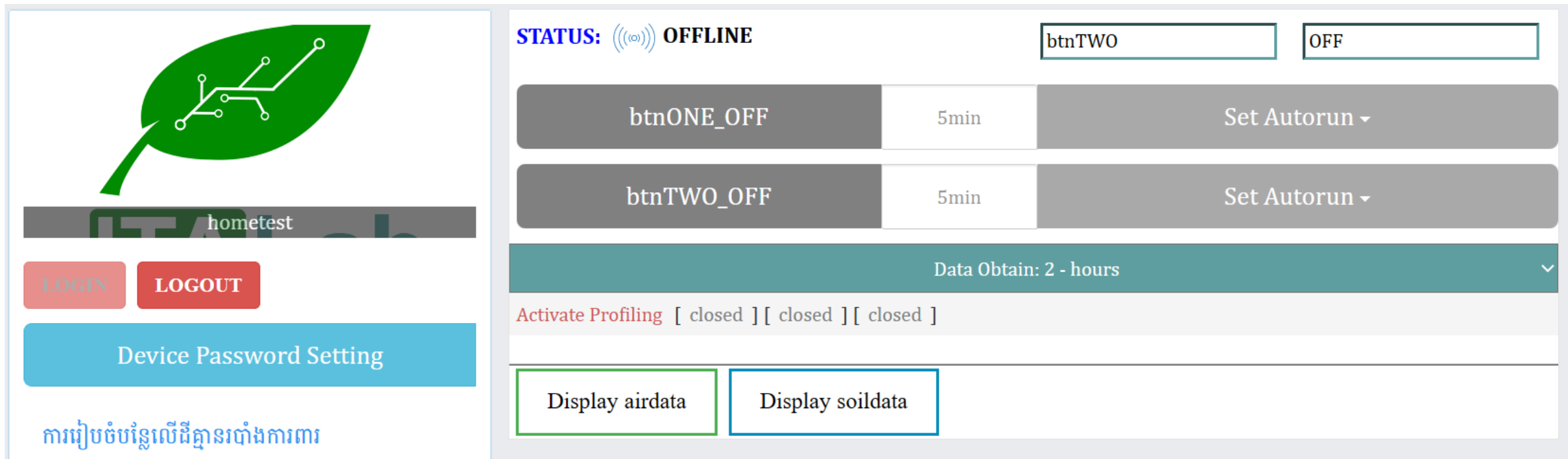
(EU) – (Asi@Connect) – (Organization)



Public Institution



HEKS EPER
Bread for all.



STATUS: ((OFF)) **OFFLINE**

btnONE_OFF	5min	Set Autorun ▾
btnTWO_OFF	5min	Set Autorun ▾

Data Obtain: 2 - hours ▾

Activate Profiling [closed] [closed] [closed]

Fertigation and irrigation tracking systems

STATUS: ((OFF)) **OFFLINE** btnTWO OFF

[Close Subplot] [Add Subplot] [Display Live data]

#Plot	Cropname	Startdate	Length(m)	Action
farm_lolo	lolo.red	2023-05-14	50	[Control [Apply Edit Active]]
farm_lettuce	lett.local	2023-05-19	70	[Irrigation [Apply Edit Active]] [Fertigation [Apply Edit Active]] [Pesticide]

STATUS: ((ON)) **OFFLINE** btnTWO OFF

[Close Subplot] [Add Subplot] [Display Live data]

Enter fertilizer requirement for lolo.red

Based on actual data

N nitrogen	P ₂ O ₅ Phosphorus	K ₂ O Potassium	AREA SM(m ²)
150	150	150	55

CALCULATION AREA

Fertilizer Avaibilities [Maximum 03]

<input type="checkbox"/> 10-0-0 Anhydrous Ammonia	<input type="checkbox"/> 0-0-60 Potash
<input type="checkbox"/> 46-0-0 Urea	<input type="checkbox"/> 0-45-0 Triple Super Phosphate
<input type="checkbox"/> 34-0-0 Ammonium Nitrate	<input type="checkbox"/> 12-32-16
<input type="checkbox"/> 28-0-0 28% UAN	<input type="checkbox"/> 10-26-26
<input type="checkbox"/> 21-0-0-24 Ammonium Sulfate	<input type="checkbox"/> 18-18-18
<input type="checkbox"/> 18-46-0 DAP	<input type="checkbox"/> 15-15-15
<input type="checkbox"/> 10-34-0 Ammonium Polyphosphate	<input type="checkbox"/> 16-16-16

Not in List [OPEN]

Fertigation and irrigation tracking systems

Output/Outcome

STATUS: ((OFF)) **OFFLINE** btnTWO OFF

[Close Subplot] [Add Subplot] [Display Live data]

#Plot	Cropname	Startdate	Length(m)	Action
farm_lolo	lolo.red	2023-05-14	50	[Control] [Apply] [Edit Active]
farm_lettuce	lett.local	2023-05-19	70	[Apply] [Edit Active]

Irrigation
Fertigation
Pesticide

STATUS: ((OFF)) **OFFLINE** btnTWO OFF

[Close Subplot] [Add Subplot] [Display Live data]

Enter fertilizer requirement for lolo.red

Based on actual data

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CALCULATION AREA

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- 28-0-0 28% UAN
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- 18-46-0 DAP
- 10-34-0 Ammonium Polyphosphate
- 0-0-60 Potash
- 0-45-0 Triple Super Phosphate
- 12-32-16
- 10-26-26
- 18-18-18
- 15-15-15
- 16-16-16

Not in List [OPEN]

Calibration status: Auto Calibration Cropname: lolo.red Planting Date: 05/14/2023

Irrigation Method: Dripline Volume (L/H): 1.5 Spacing: 20 Lateral Space (m): 1.5

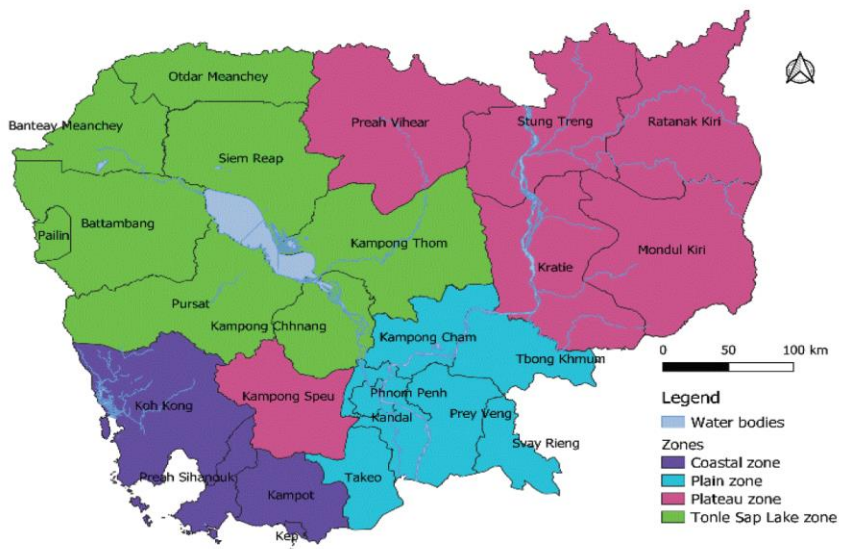
Evaporation [m]: 6 Soil type: CoarseSand Soil_type Value: 30 to 60mm

Irrigation

Schedule	Cropname	Volume	Irrigation Period
6:30AM	lolo.red	0.37 L	15 min
11:30AM	lolo.red	0.28 L	12 min
2:30PM	lolo.red	0.28 L	12 min

Fertigation and irrigation tracking systems

Conclusion



Connect to wholesalers/
Retailers

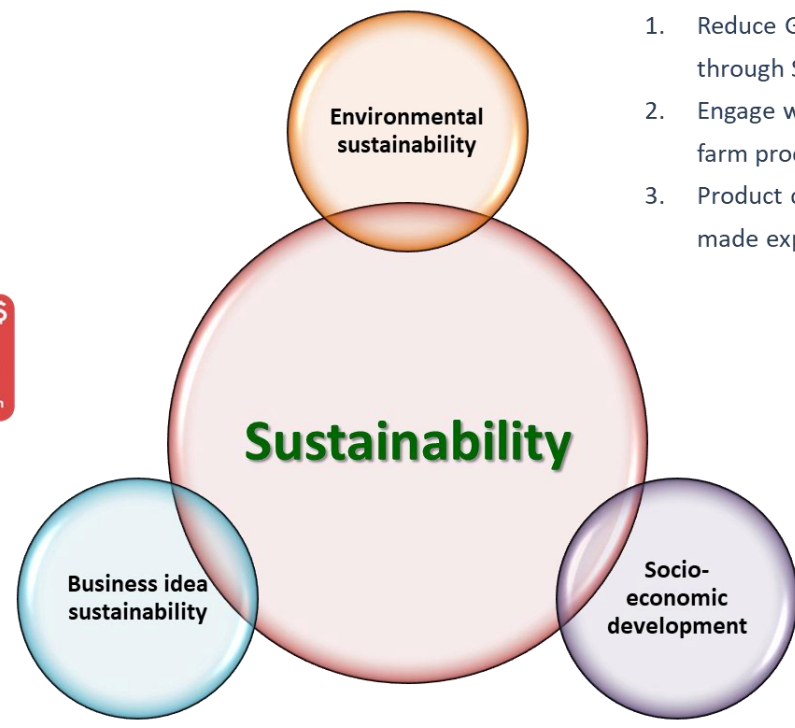


Subscription Fee

If we have 6,000 subscribers

18,000 USD/Month

Targeted: all over the country, having greenhouse production, and it is getting booming



1. Reduce Greenhouse Gases Emission through SOLAR POWERING;
2. Engage with green growing through farm production;
3. Product can be REUSE through local made expert.

ONE CLICK TRIGGERING

1. Gain time for extra work
2. Save water up to 70%
3. Save money up to 6 times to conventional practice
4. BE AS GOOD AS FARMER ASSISTANCE—women, youth, marginalized groups
5. Financial agreement

SUSTAINABILITY