WIMARC Platform for Know-How Transfer

ไวมาก

ระบบบูรณาการข้อมูลสำหรับการเพิ่มมูลค่าทางการเกษตร

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โอภาส ตรีทวีศักดิ์
ทีมวิจัยเทคโนโลยีเกษตรดิจิทัล (Digital Agriculture Technology)

Contents

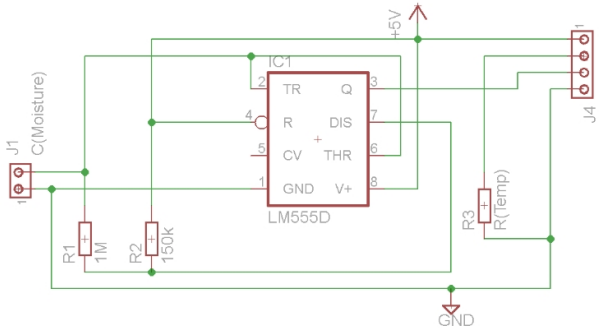
-My Background Knowledge for Device and System Design
-Why know-how Platform?
-Platform Concept : Input & Control
-Platform Concept : Analysis
-Platform Concept: Dashboard

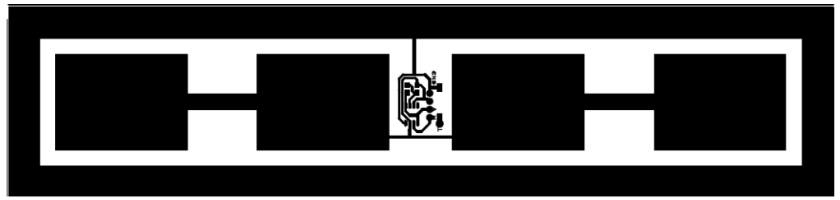
Curriculum Vitae

2004 Graduated PhD : Electrical Engineering Thesis: Ferroelectric Properties of epitaxial BaTiO3 Thin-Film

2005 Work at NECTEC :Thai Microelectronics Center (Etching Process)

2008 Developed System and Grain Moisture Sensor



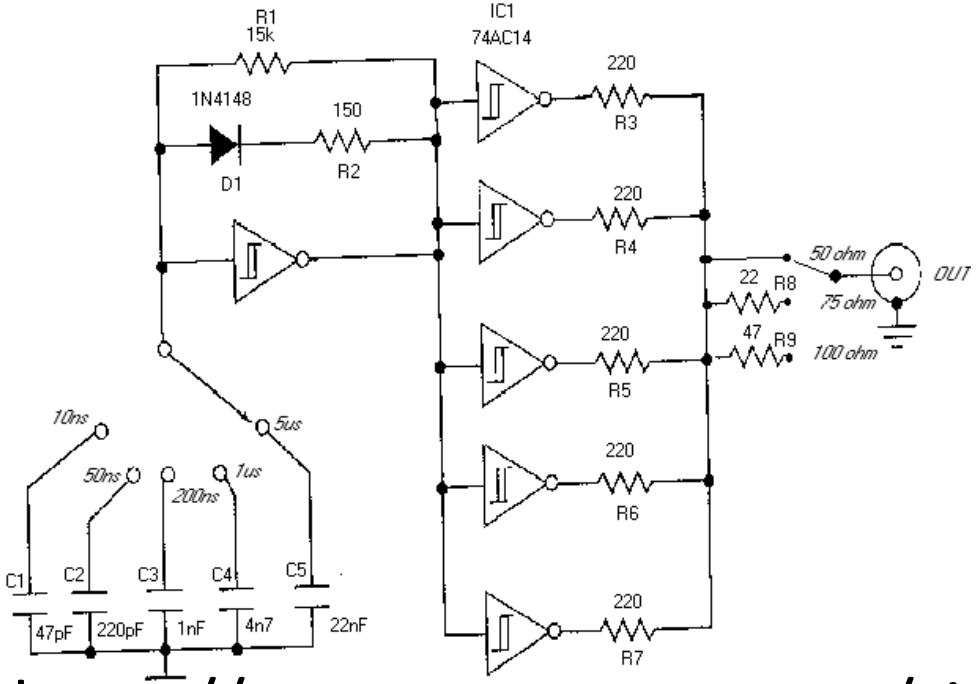


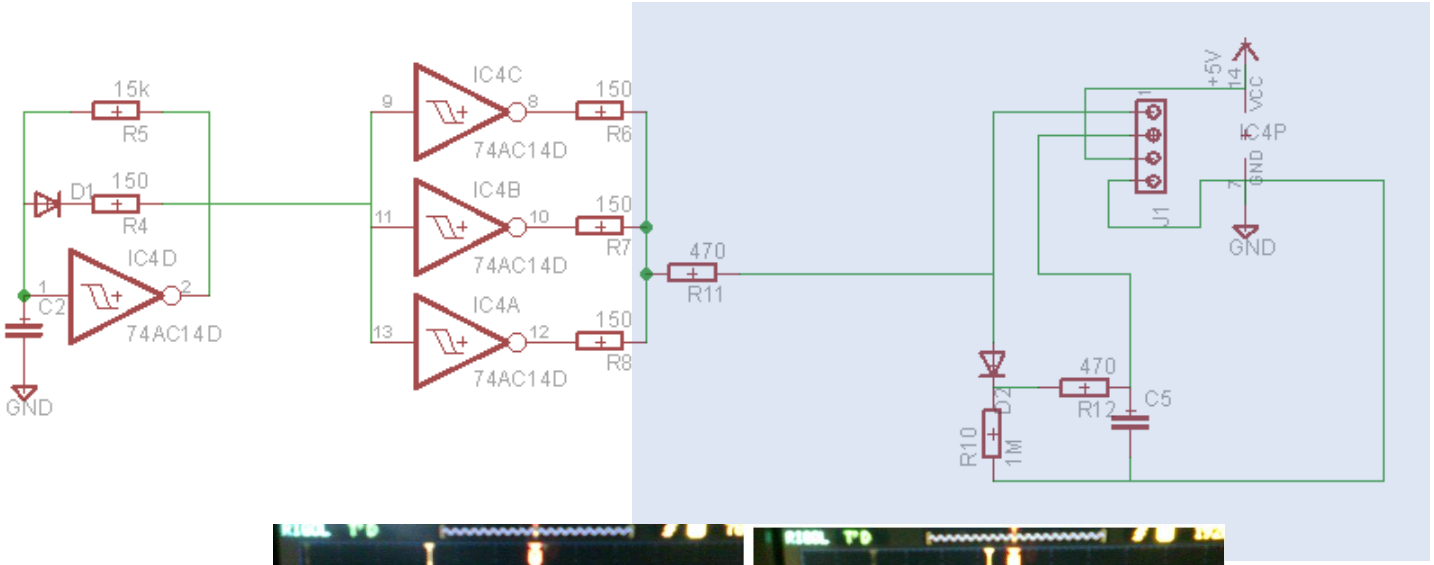
Problem: Condensed Water on Sample

TDR Moisture Sensor

2012 Developed TDR Soil Moisture Sensor

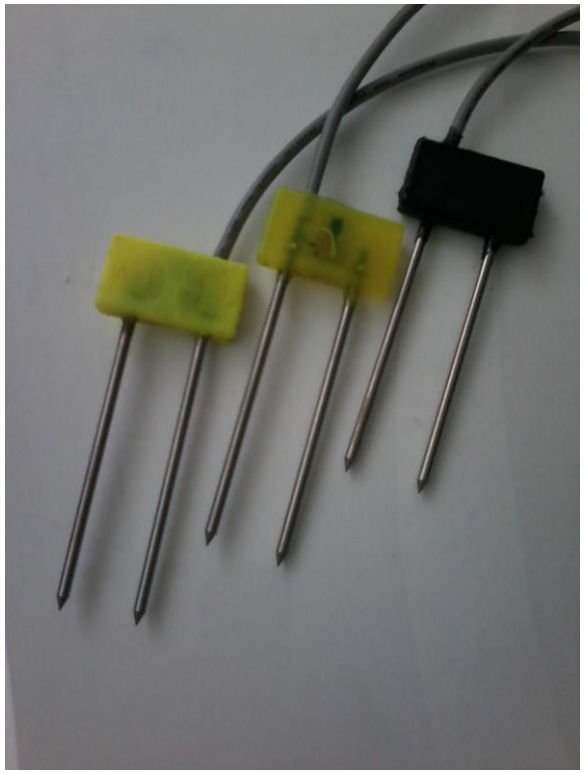
F to V

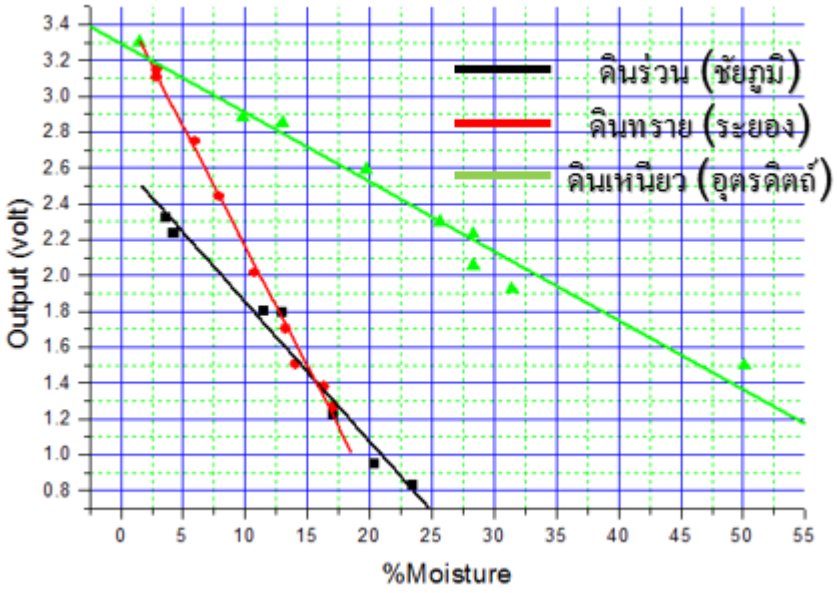




https://www.epanorama.net/circuits/tdr.html

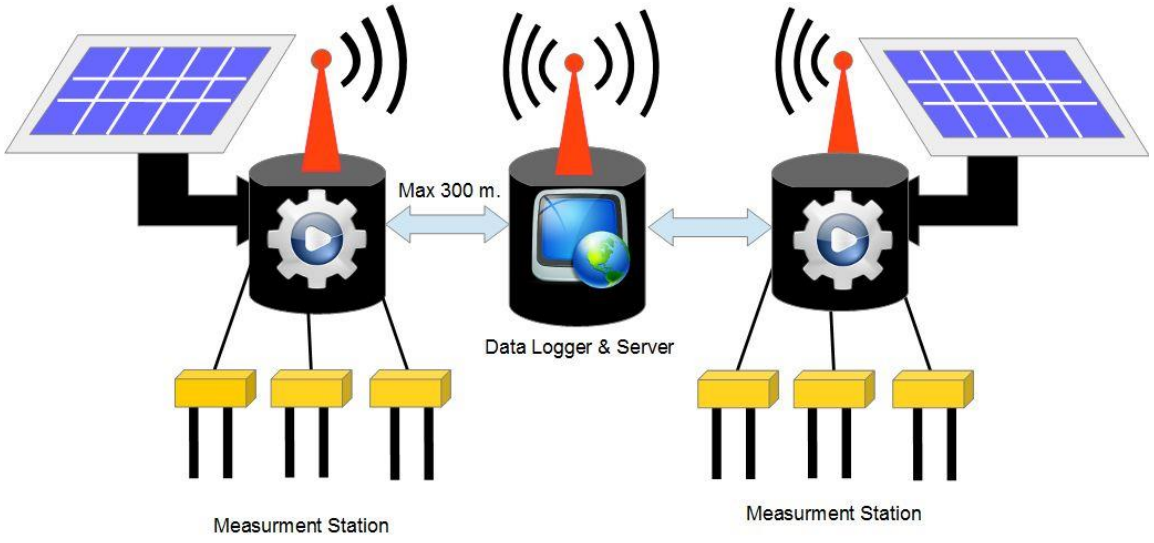
Sensor Calibration





Wireless Sensor Network

2014 Developed Simple Wireless Sensor Network



RF: 433 MHz+PIC MCU

Wireless Sensor Network

2014 Developed Simple Wireless Sensor Network

RF: 433 MHz
Arduino NANO
RPI

Data Logger & Server

LORA

2016 Developed 433 MHz LORA-Wireless Sensor Network

File | D:/OPAS-2008DEC/2016LOR...

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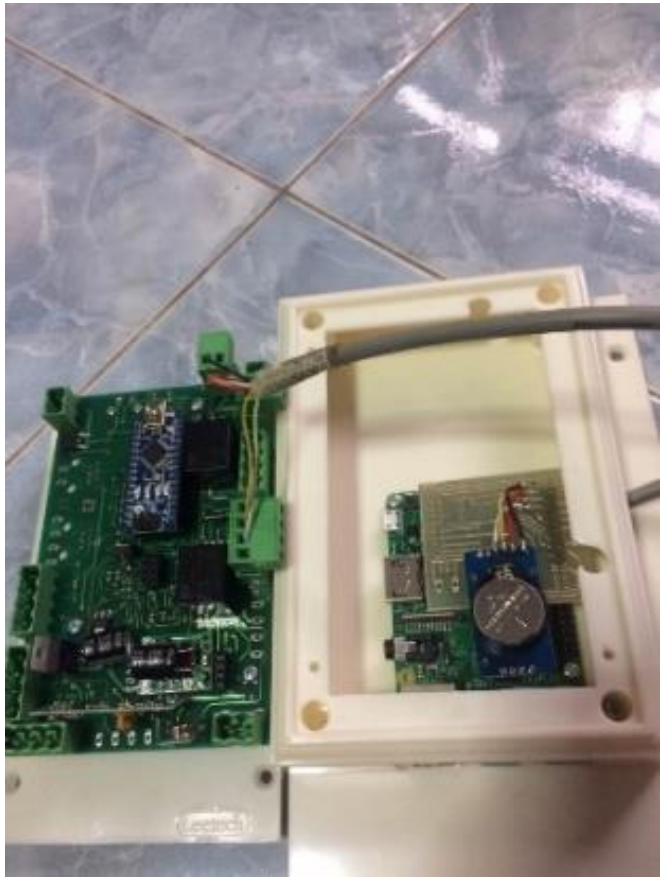
- Fork 43

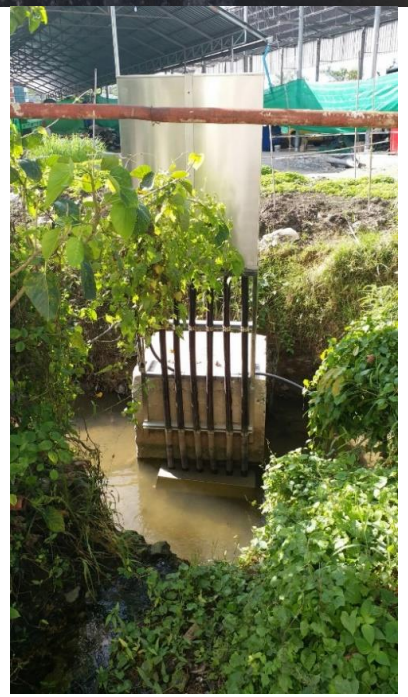
CongducPham/LowCostLoRaGw

Code Issues 33 Pull requests 1 Projects 0 Pulse Graphs
Low-cost LoRa gateway with SX1272 and Raspberry

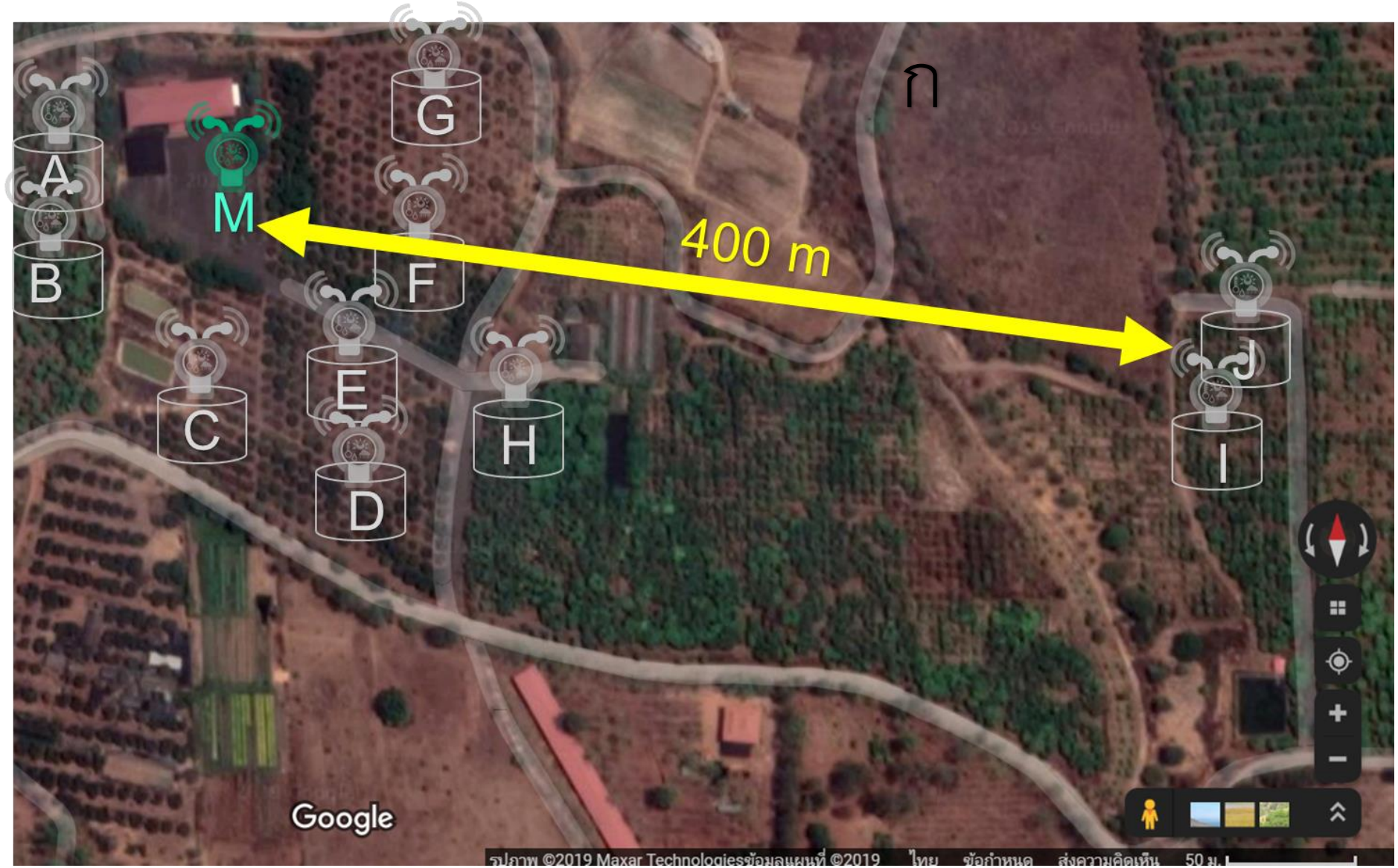
- 80 commits
- 1 branch
- 0 releases
- 2 contributors



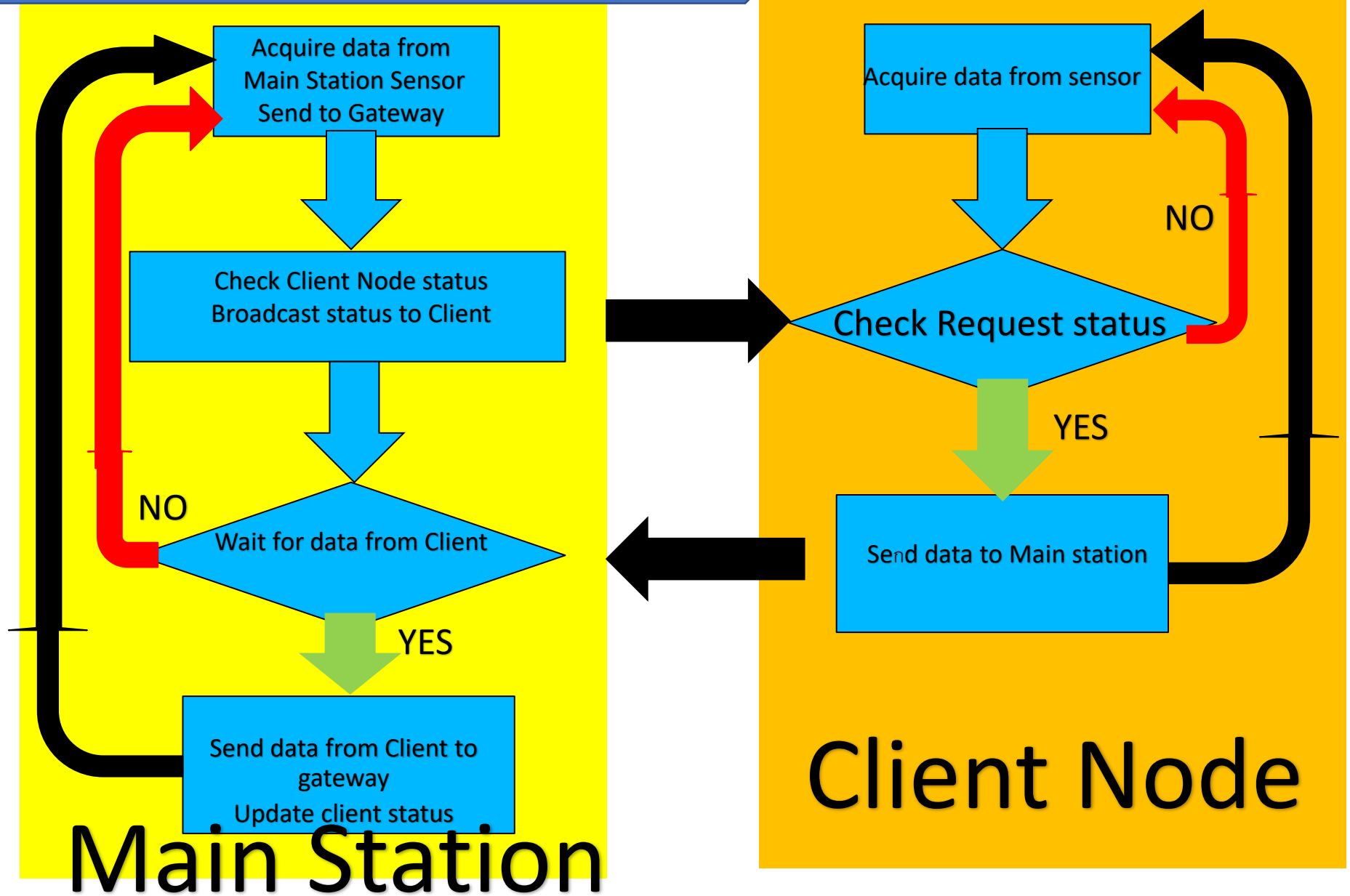
LORA-Network



Network Coverage Area

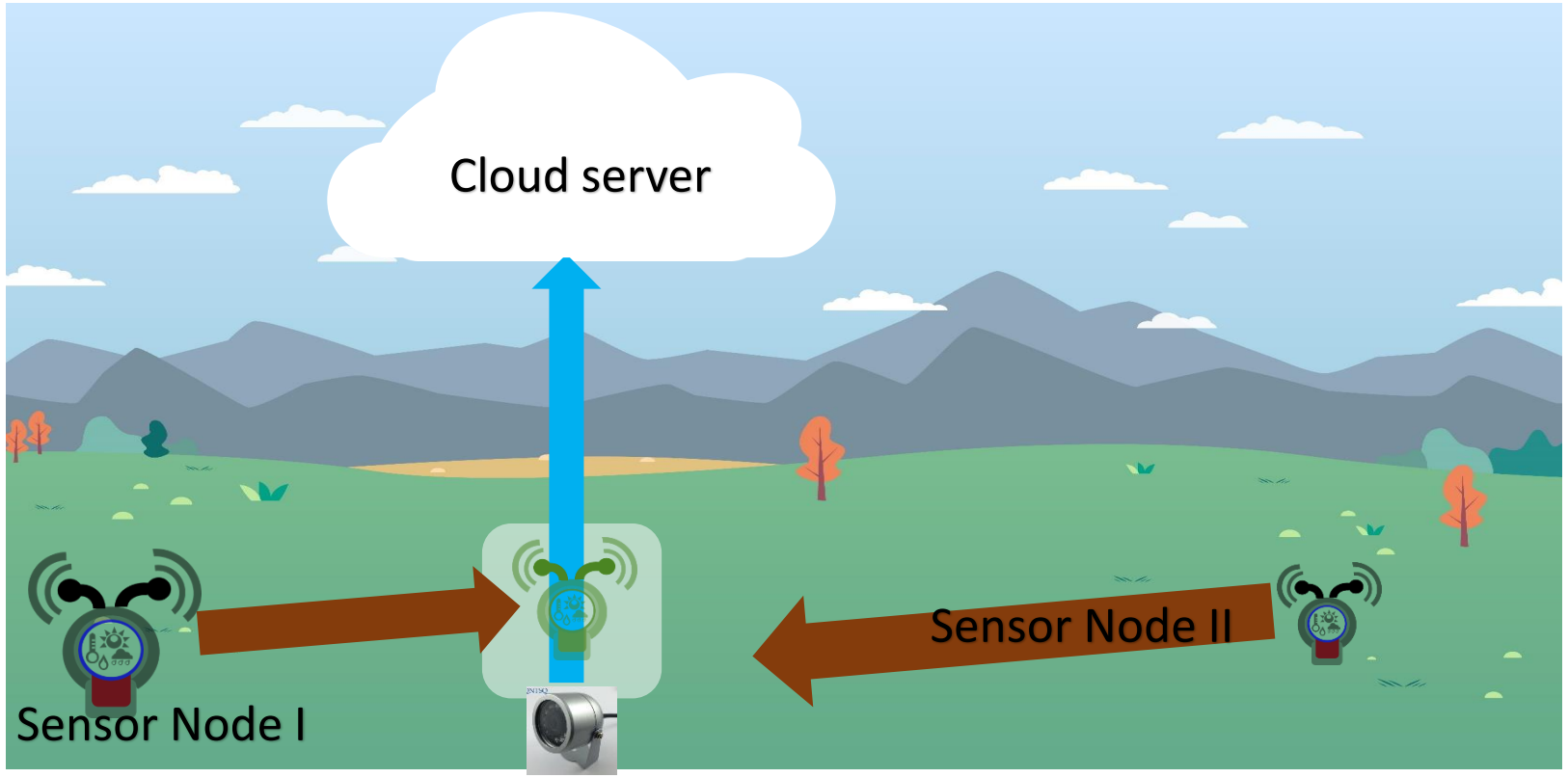


Network Protocol



Network Management

- 2 Libraries :
- #include <SPI.h>
- #include <LoRa.h>
- Source: https://github.com/sandeepmistry/arduino-LoRa



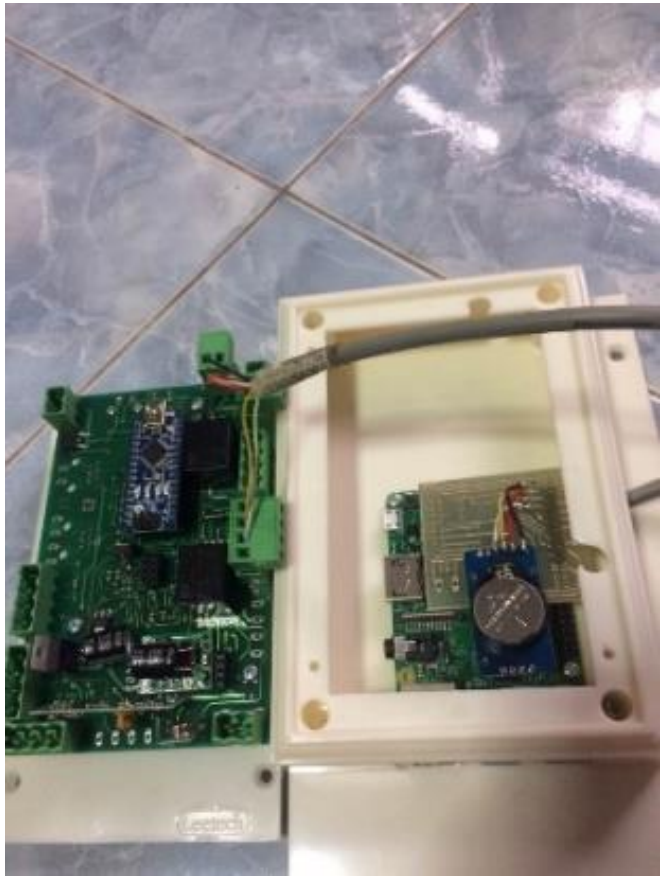
Main

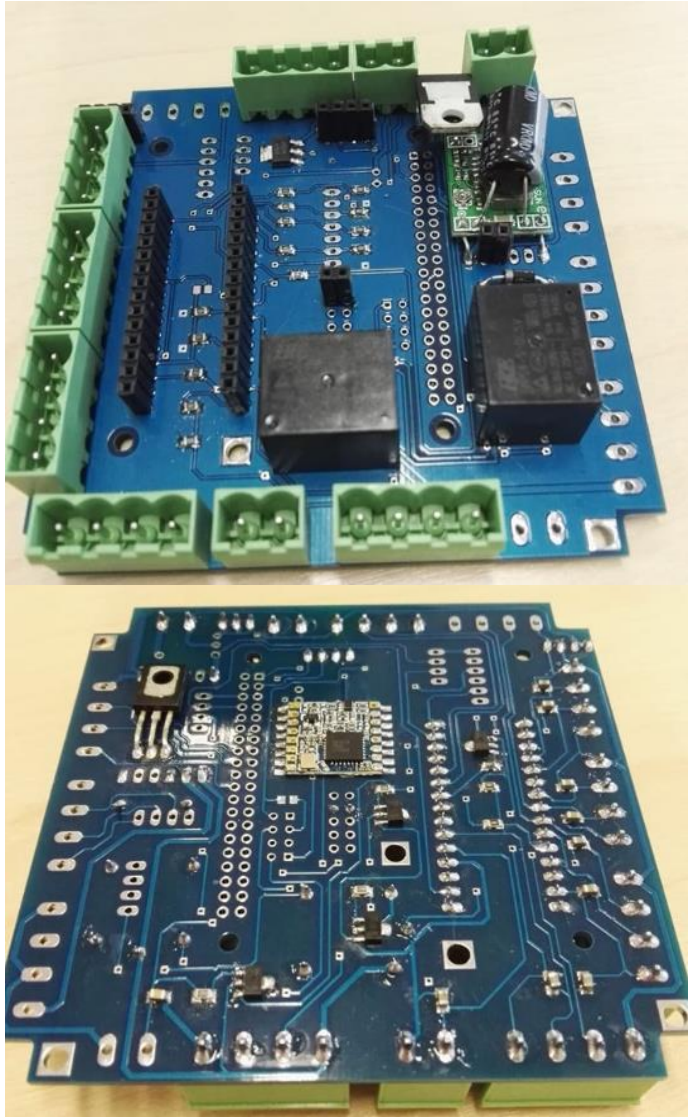
Protocol format for client management: Header+ID-encode+checkbyte

Protocol format for data sending: Header+ID+sensor Data 1.....+SensorData8+checkbyte

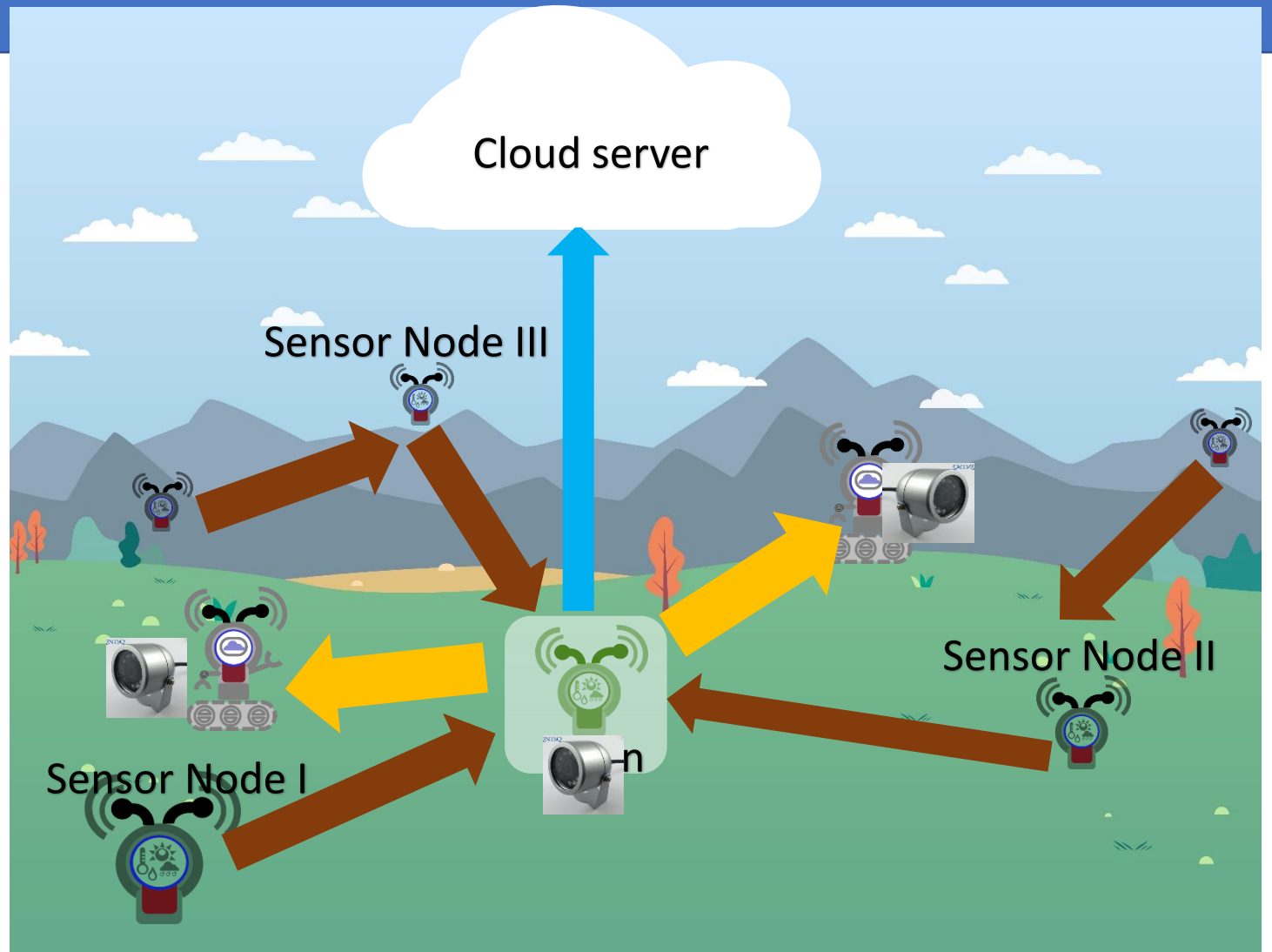
WIMARC-shield : Arduino NANO +ESP32cam

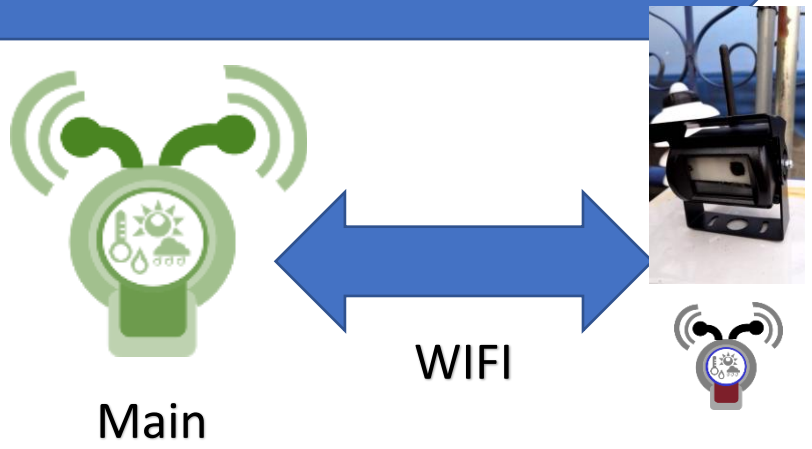
2018 Developed 925 MHz LORA-System





WiMaRC-Wireless Sensor Network for Management and Remote-Control





Design Concepts

- High Reliability(7/24) ← Handshake : Arduino <->RPI/ESP32cam
- OTA (over the air) update ← Online buffer (RPI)
- Low Investment Cost (from 10k-100k Baht) ← Open source Hardware & Software
- Low Maintenance (once per year) ← Repairable Hardware
- Self development ← Open source software

Open Innovation : WIMARC

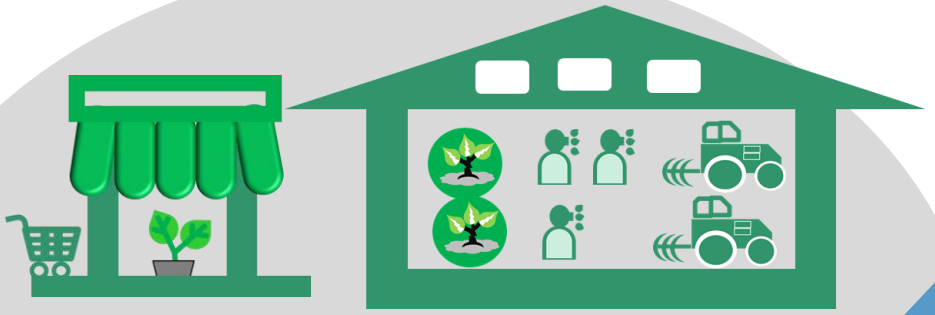
camera

IoT-sensors

Users

ข้อมูล & ควบคุม

Data & Control



Tri-Tra Platform

-Database

-AI

-Data&Image Processing unit

วิเคราะห์ & สั่งการทำงาน

Analysis & Decision

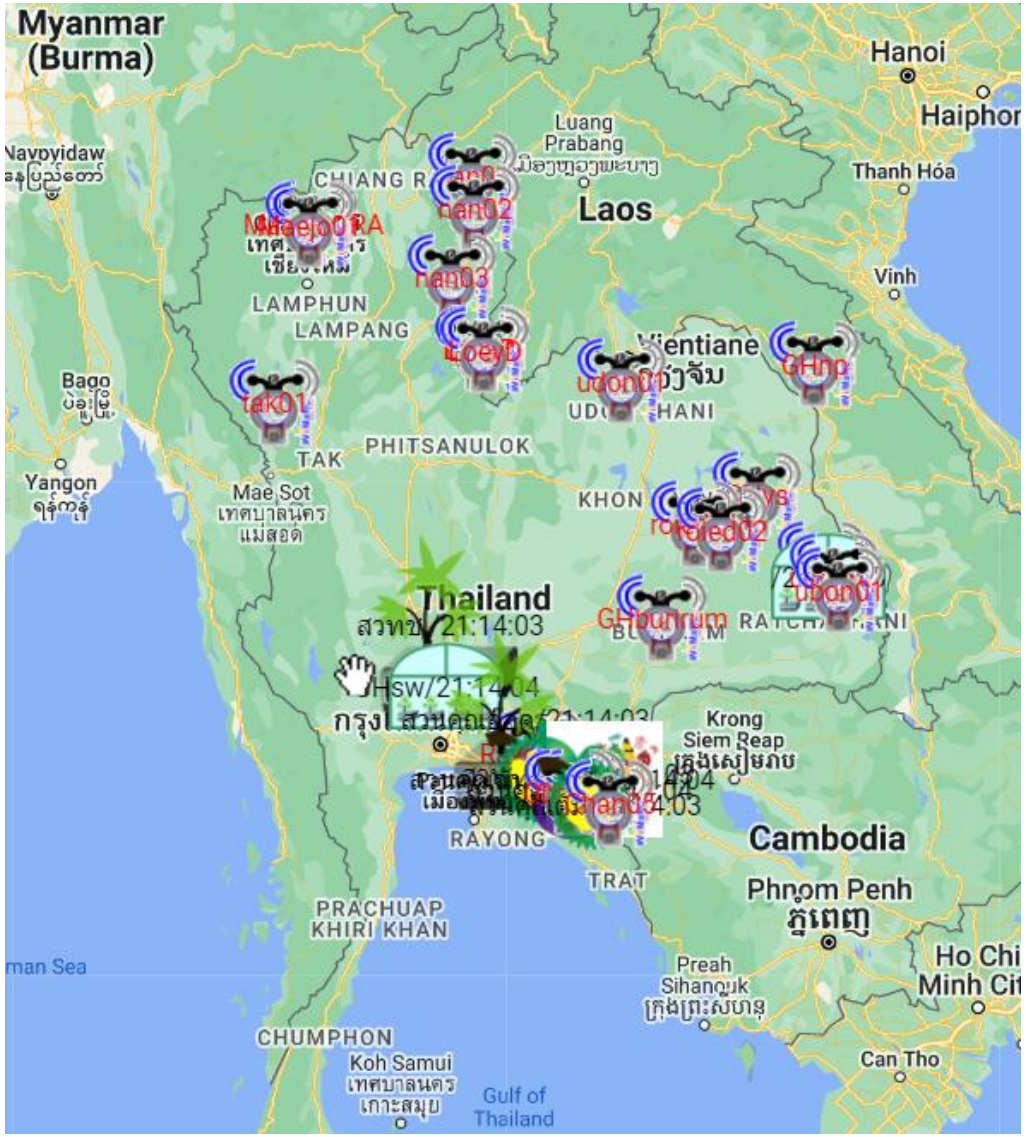
Dashboard

Web+app

ติดตาม&วางแผน

Monitor & Planning

Open Innovation : WIMARC



-More than 100 systems were installed in last 5 years

-95% Cost supported from government agency

-10% still maintained by users

-10% maintained due to research work

-Downward tendency

Failure Causes

Devices

create

Knowledge

Farmer

Image Information

Visible Crop-Management

Time-Series Image

การจัดการแปลง

Farm Management

-Product ผลผลิต

Irrigation การให้น้ำ

-Period

โรคและแมลง

Pest&Pesticide

Fertilization การให้ปุ๋ย

-Response การตอบสนอง

WIMARC: 3 Tra

Trade

-Virtual shop
-Seed
-Fertilizer
-Machine & instrument
-Pesticide

Transfer

-Learning Center
-University
-Agricultural Institutes

Trace

-Food Industry

Trade & Trace

Trade

-Virtual shop
-Seed
-Fertilizer
-Machine & instrument
-Pesticide

Trace

-Food Industry

Data Value-Added with Data

Transfer

- -Learning Center
- -University
- -Agricultural Institutes

Reference Crop รอบปลูกอ้างอิง

Digital Crop Calendar
ปฏิทินการปลูกดิจิตอล

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-My Background Knowledge for Device and System Design
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Technology Trend

Precision Farming

Data Acquisition

Data Analysis

รูปที่ 8 : องค์ประกอบของเทคโนโลยีเกษตรแม่นยำ
ที่มา: ศ.ดร.มรกต ตันติเจริญ

Best Practice

-high yield
-low resource
-low impact
on environment

Technology Trend

Digital Transformation

Real Farming

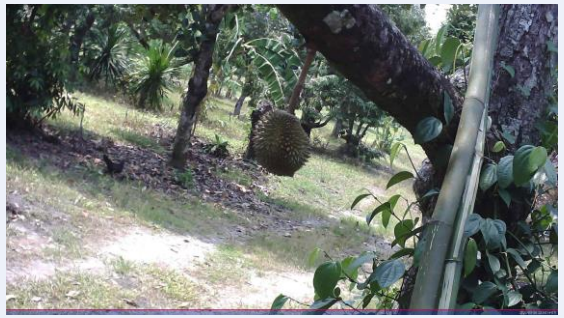


Image Processing, Big Data

Artificial Intelligence
Augmented Reality

Digital Farming

Metaverse

Virtual Reality

-Crop Model

-Pest & Disease Model

Required Data

Farmer

Farming Management
Crop Requirement วิธีการและขั้นตอนการปลูก
Irrigation การให้น้ำ
Pest & Diseases โรคและแมลง
Fertilization การให้ปุ๋ย
Weather Data ข้อมูลอากาศ

Digital Crop Calendar

ที่มา: กรมส่งเสริมการเกษตร

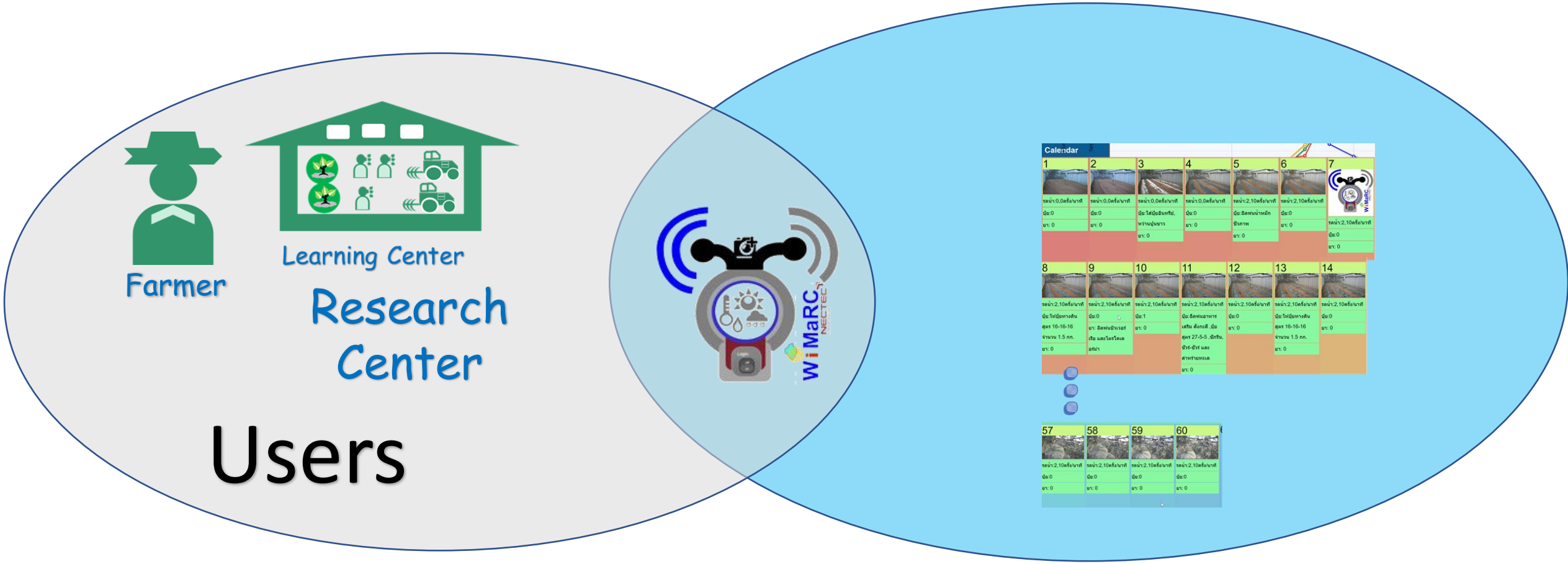
Digital Crop Management Calendar

Farming Management
Crop Requirement วิธีการและขั้นตอนการปลูก
Irrigation การให้น้ำ
Pest & Diseases โรคและแมลง
Fertilization การให้ปุ๋ย
Weather Data ข้อมูลอากาศ

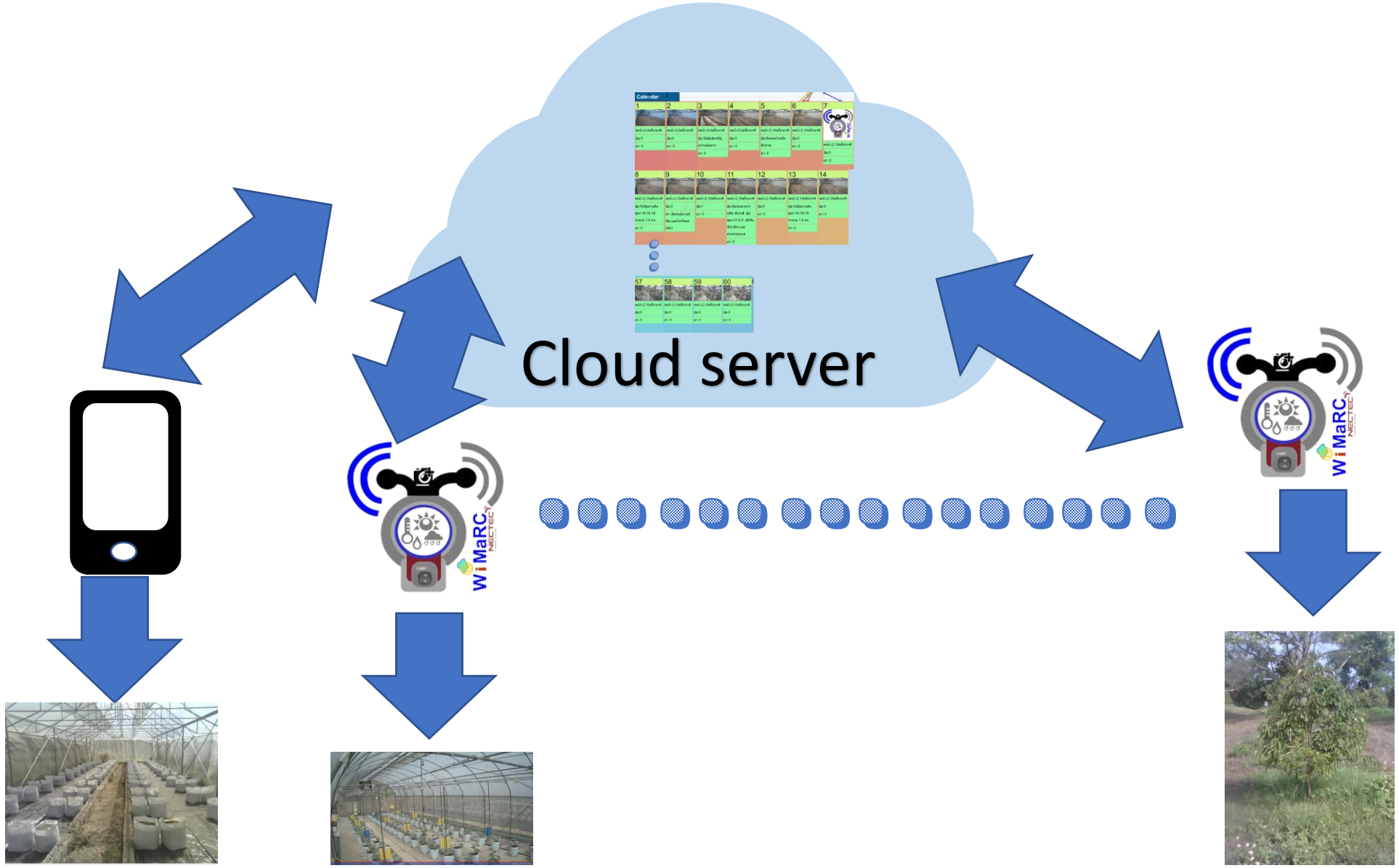
Digital Crop Management Calendar

ปฏิทินการปลูก

WiMarC : Wireless Sensor Network for Management and remote Control



Management & remote Control



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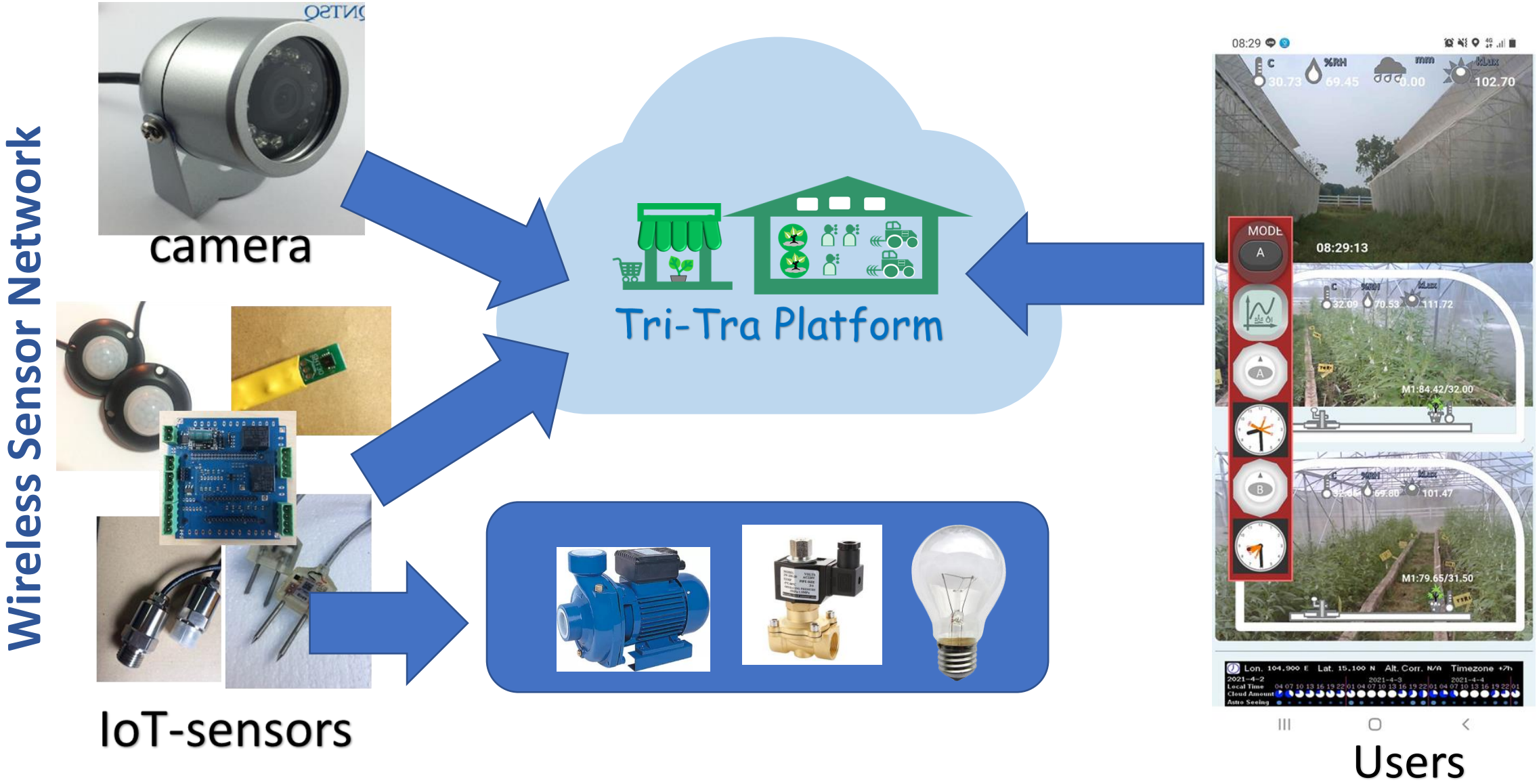
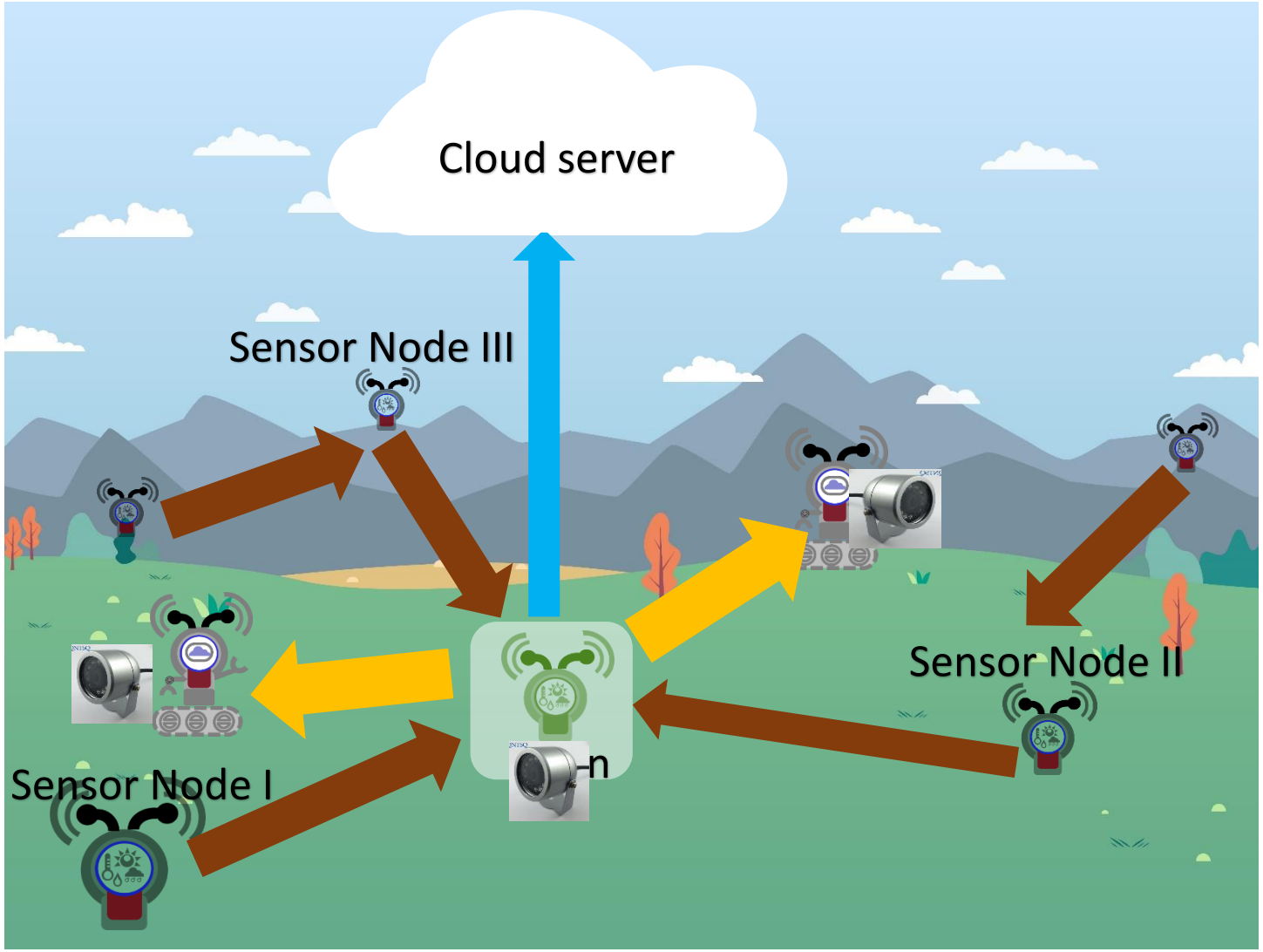
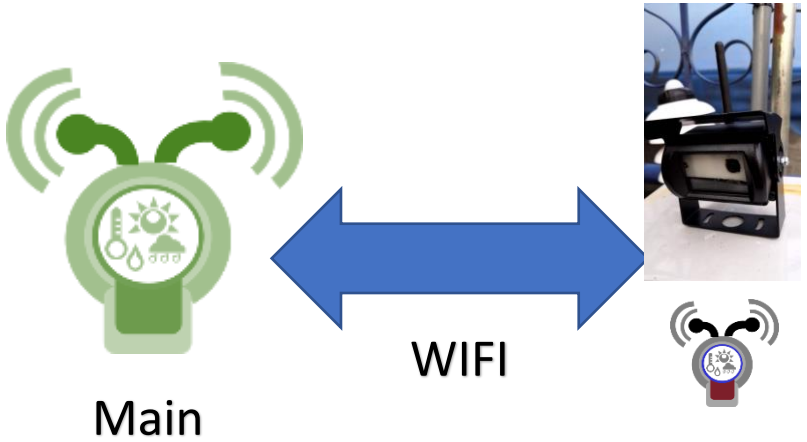
WIMARC : Input & Control



Wireless Sensor Network





WIMARC System

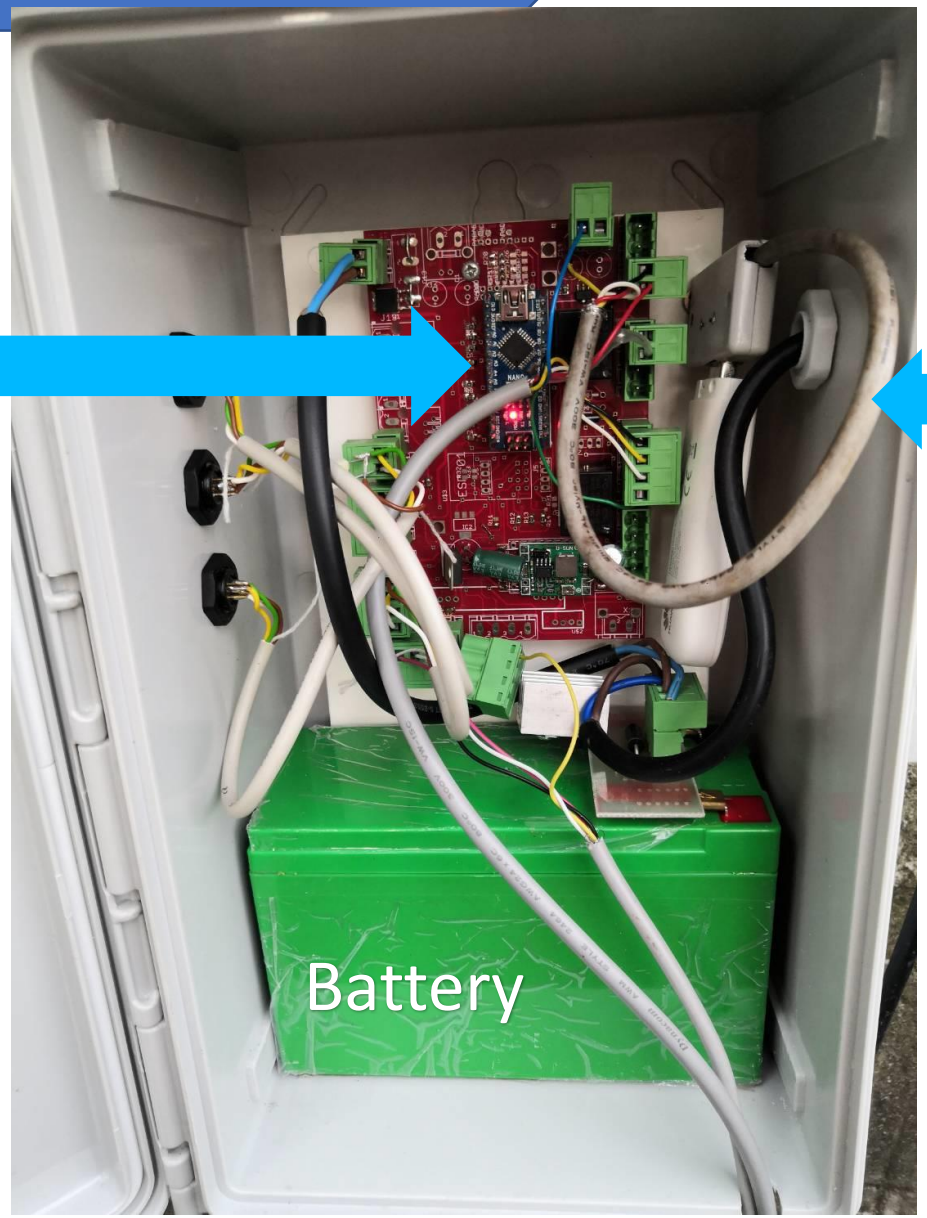
Sensors Node I

Main

Sensors Node II

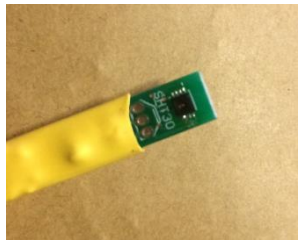
WIMARC: Main

WiMarC shield with Arduino Nano



4G USB Router

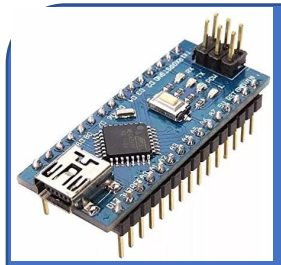
WIMARC-shield for Arduino NANO



Automatic System Recovery

Sensor/Analog

Sensor/



Arduino NANO

Rx/Tx

Raspberry Pi
ESP32

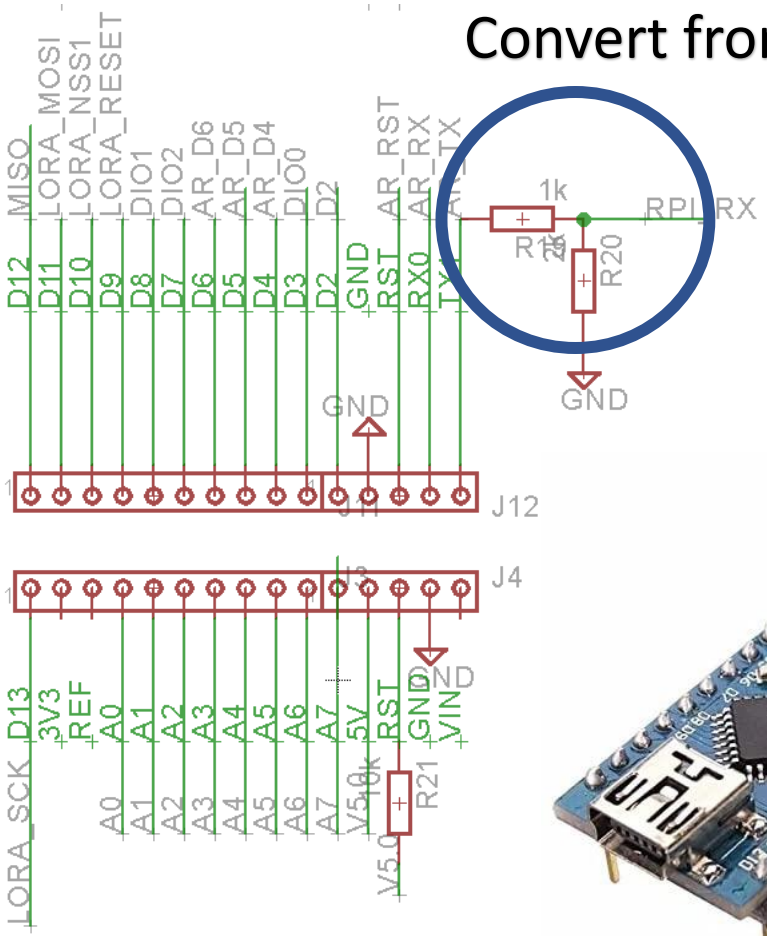
Why NANO?
-open source
-small
-library for every devices

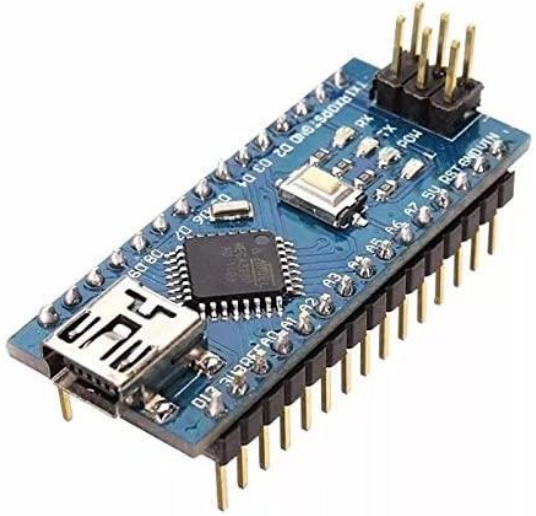
SPI

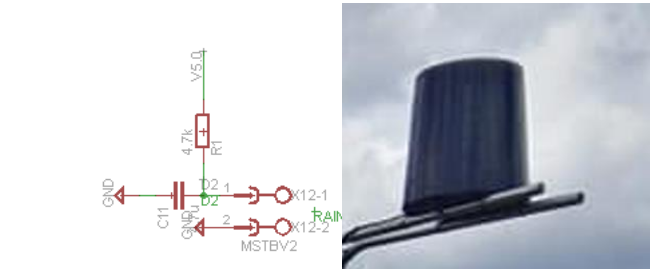
LORA

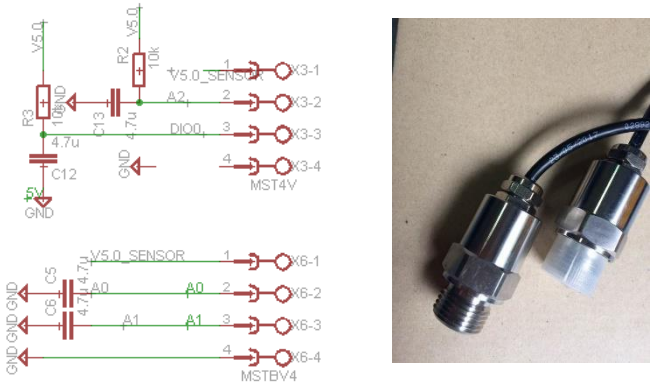
WIMARC-shield : Arduino NANO +Sensors

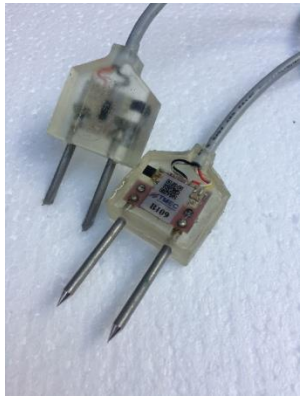
Convert from 5V->3.3V

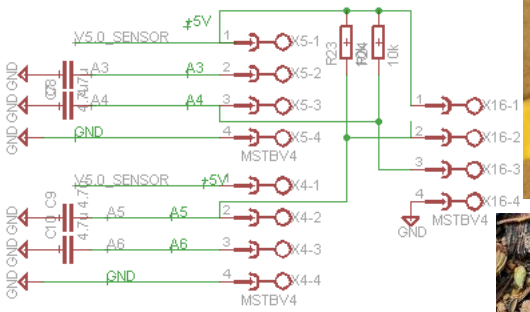


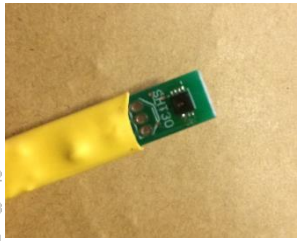






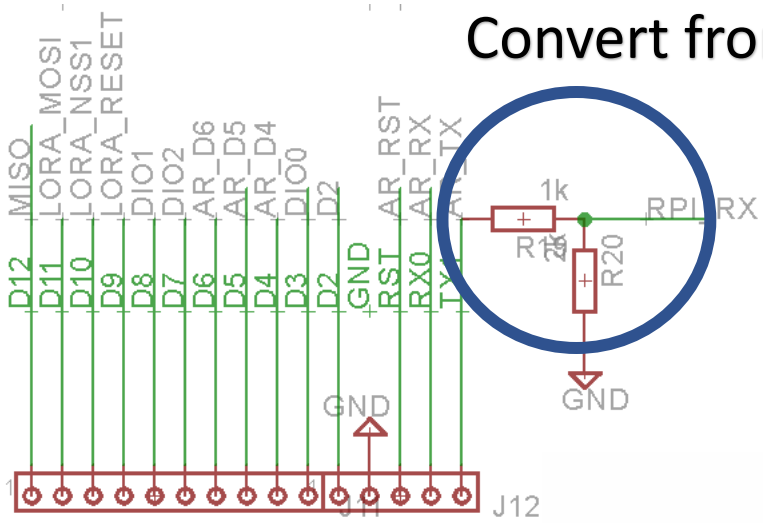


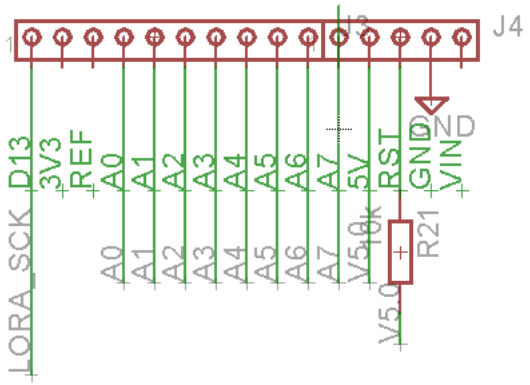


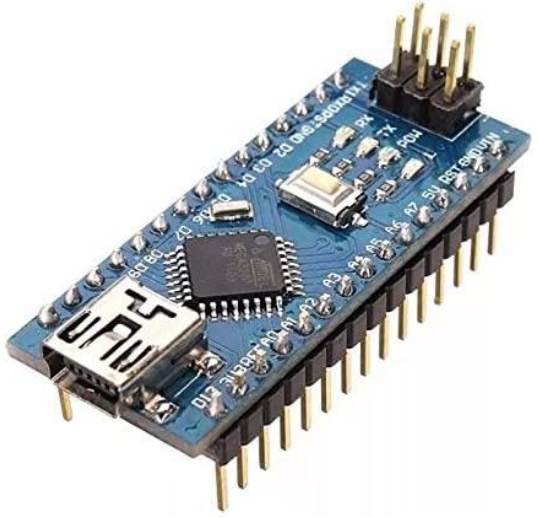


WIMARC-shield : Arduino NANO +LORA

Convert from 5V->3.3V







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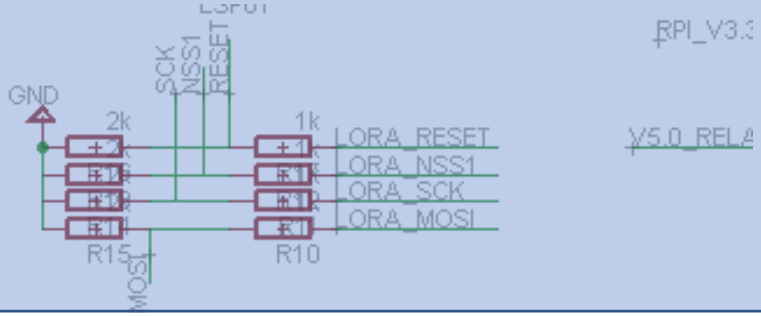
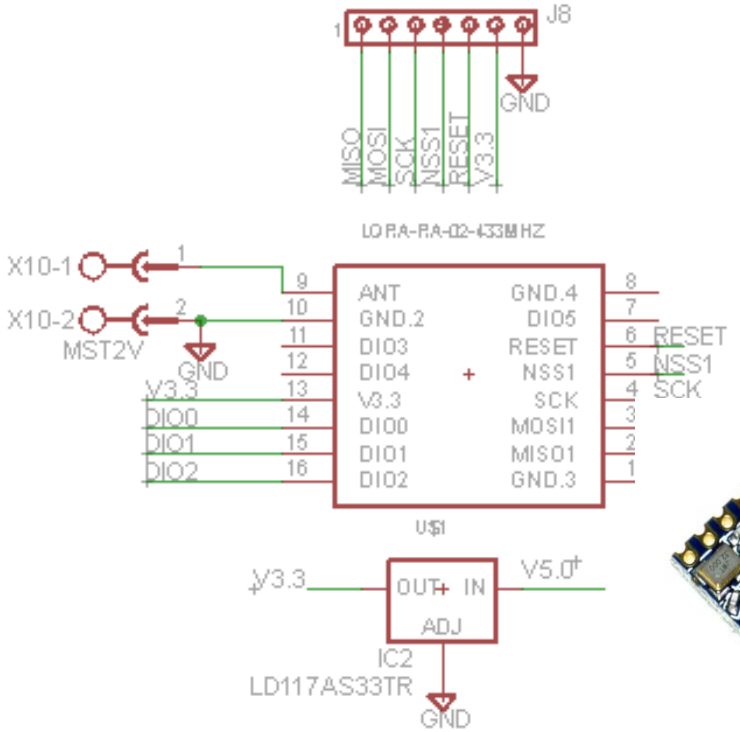
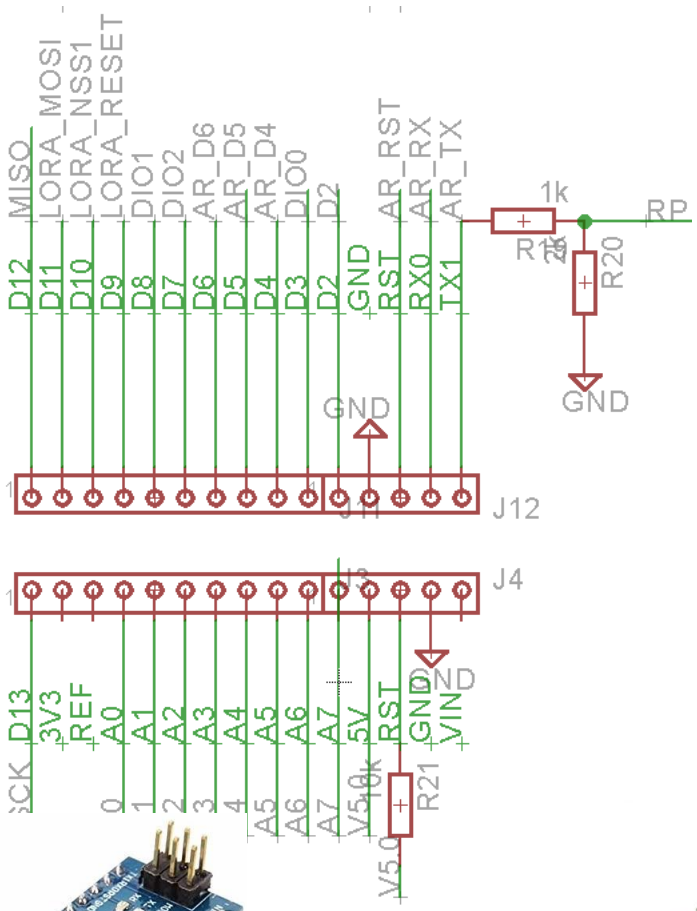
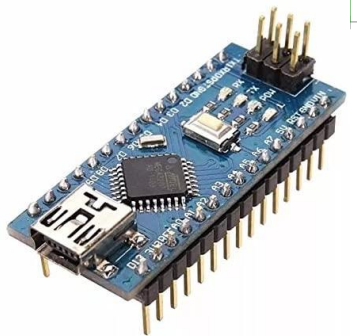
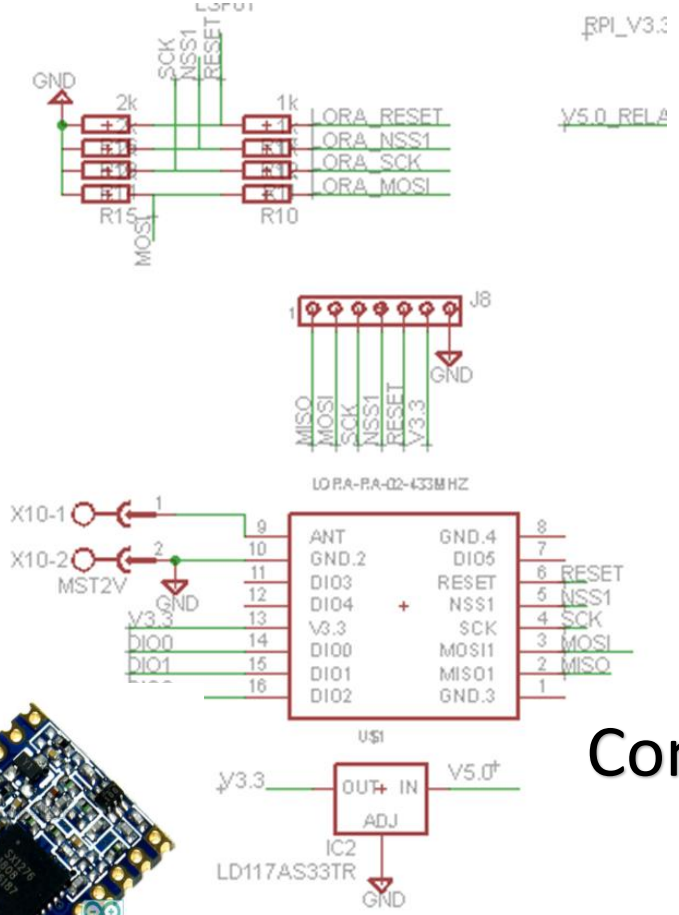


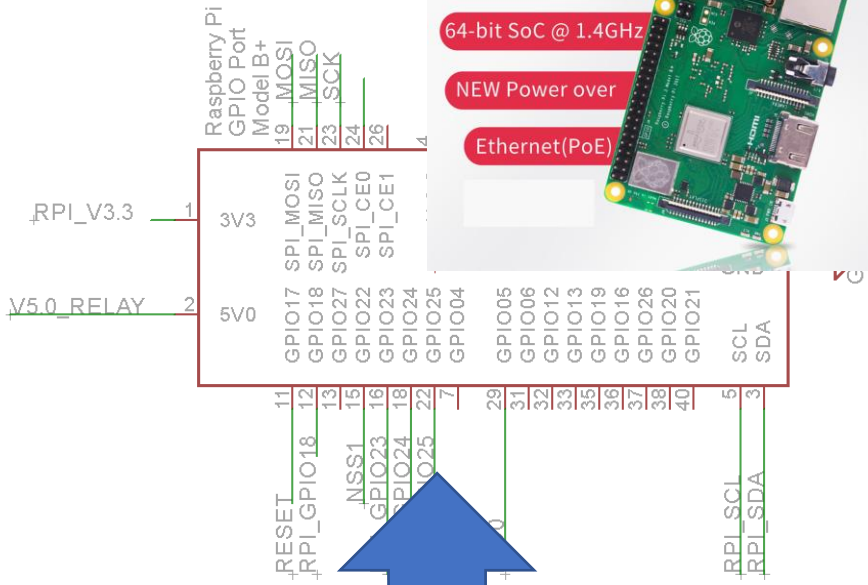


WIMARC-shield : Arduino NANO +ESP32cam



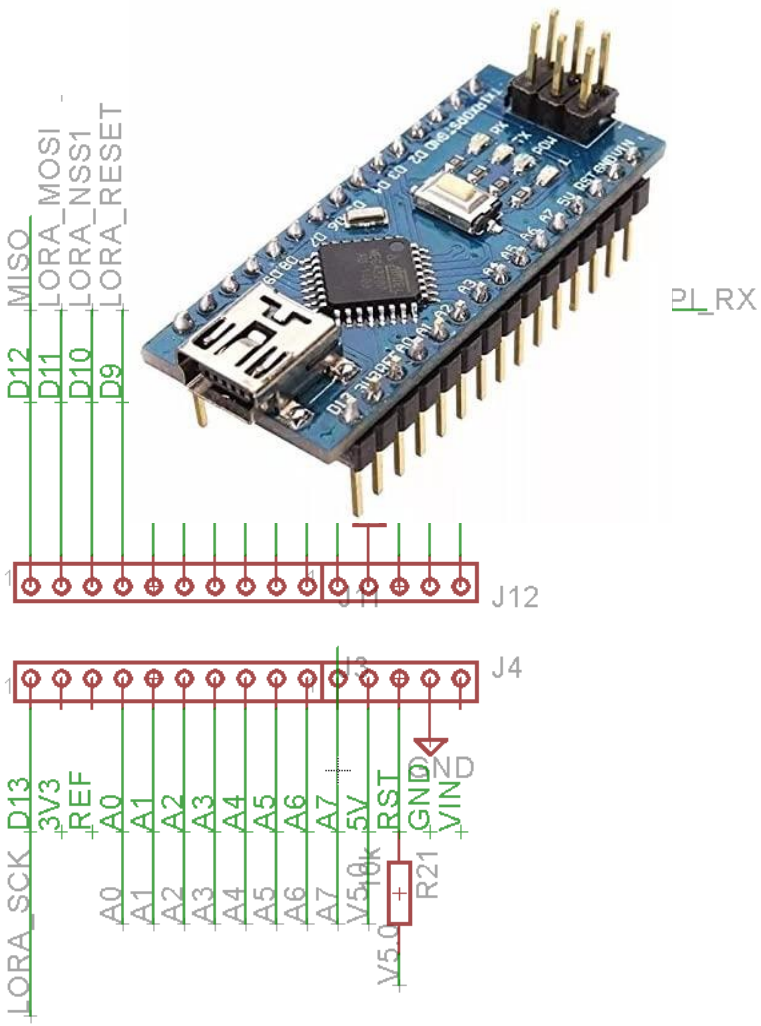


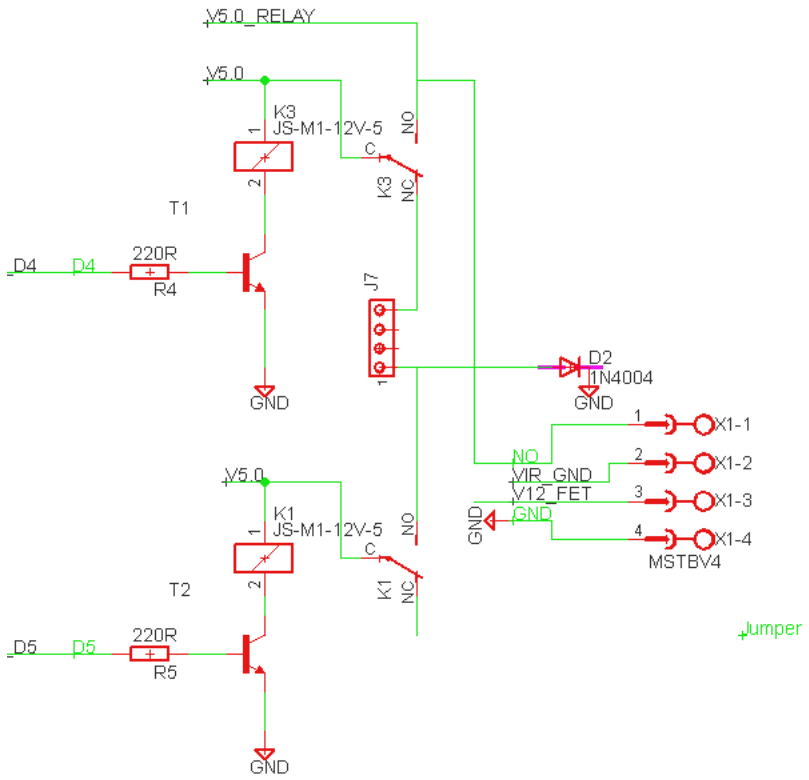


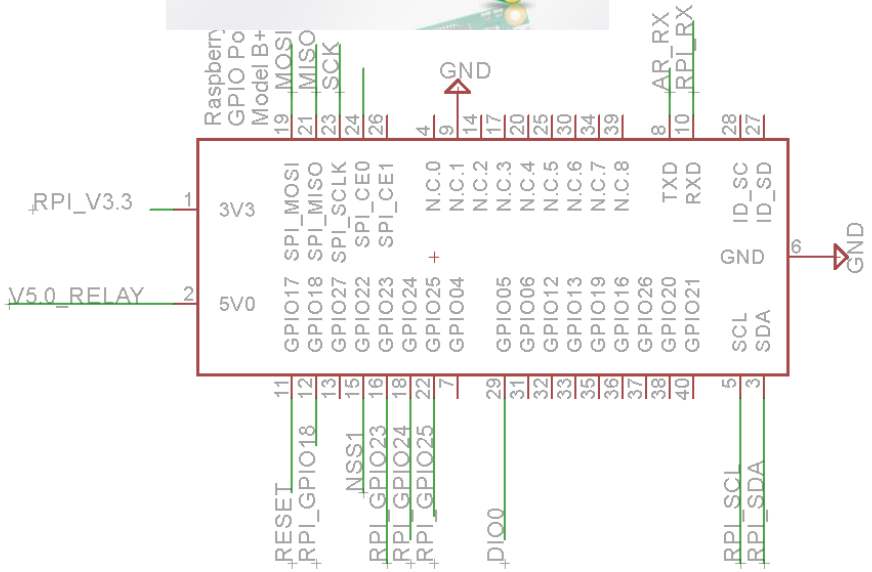


Connect with RPI =>LORAWAN

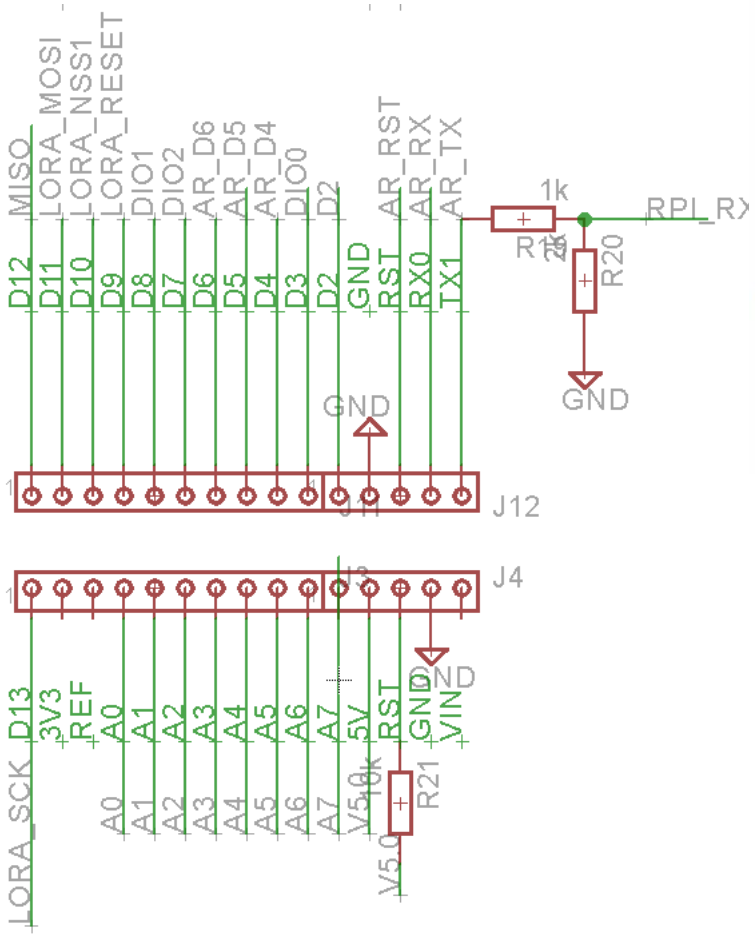
WIMARC-shield : System Recovery

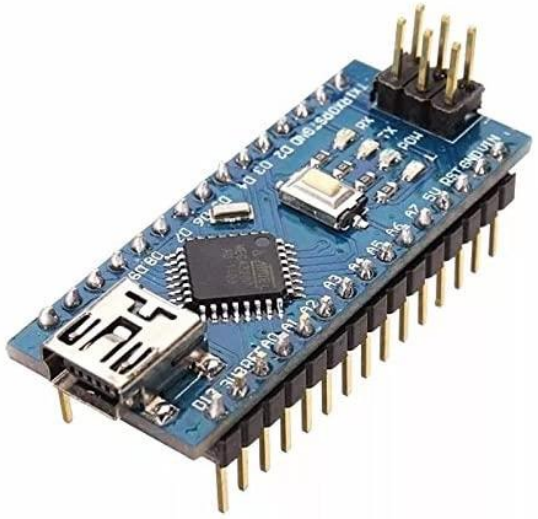


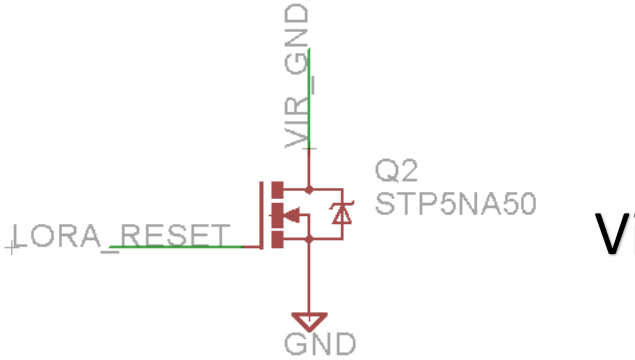




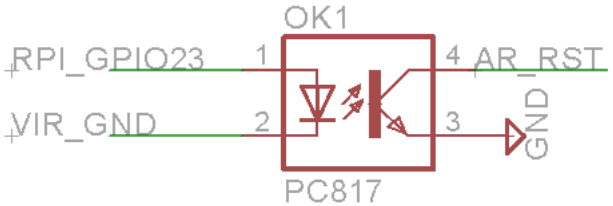
WIMARC-shield : ESP32 Virtual Ground





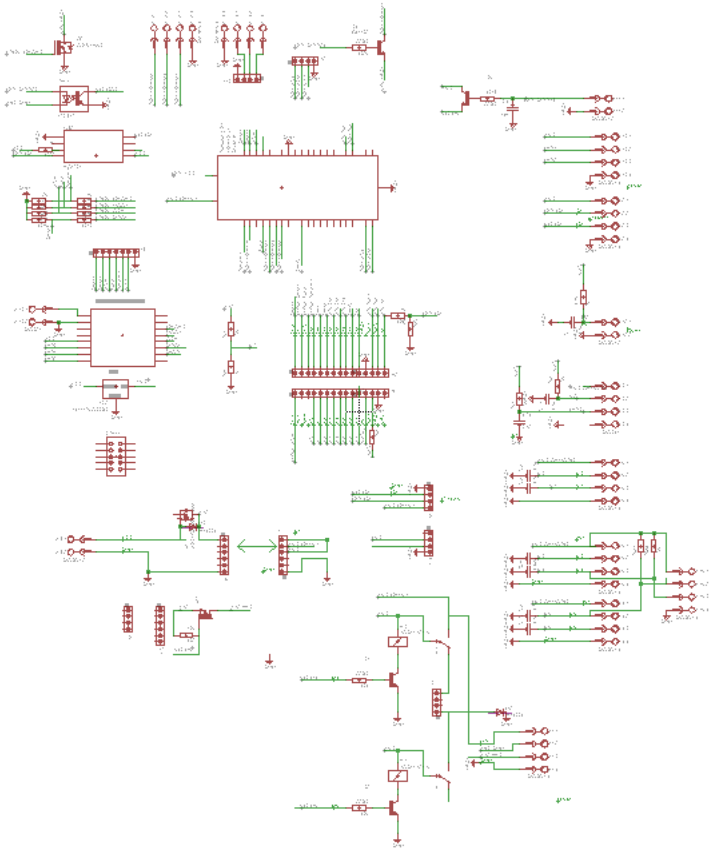


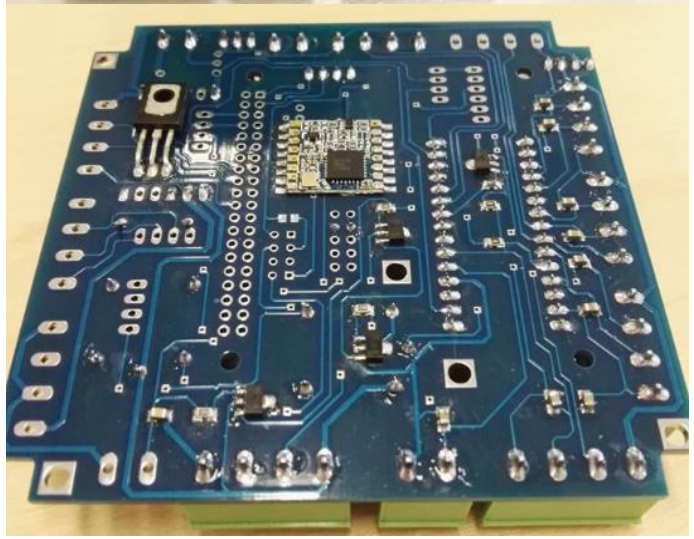
Virtual Ground



System Recovery

WIMARC-shield : Arduino NANO +ESP32cam

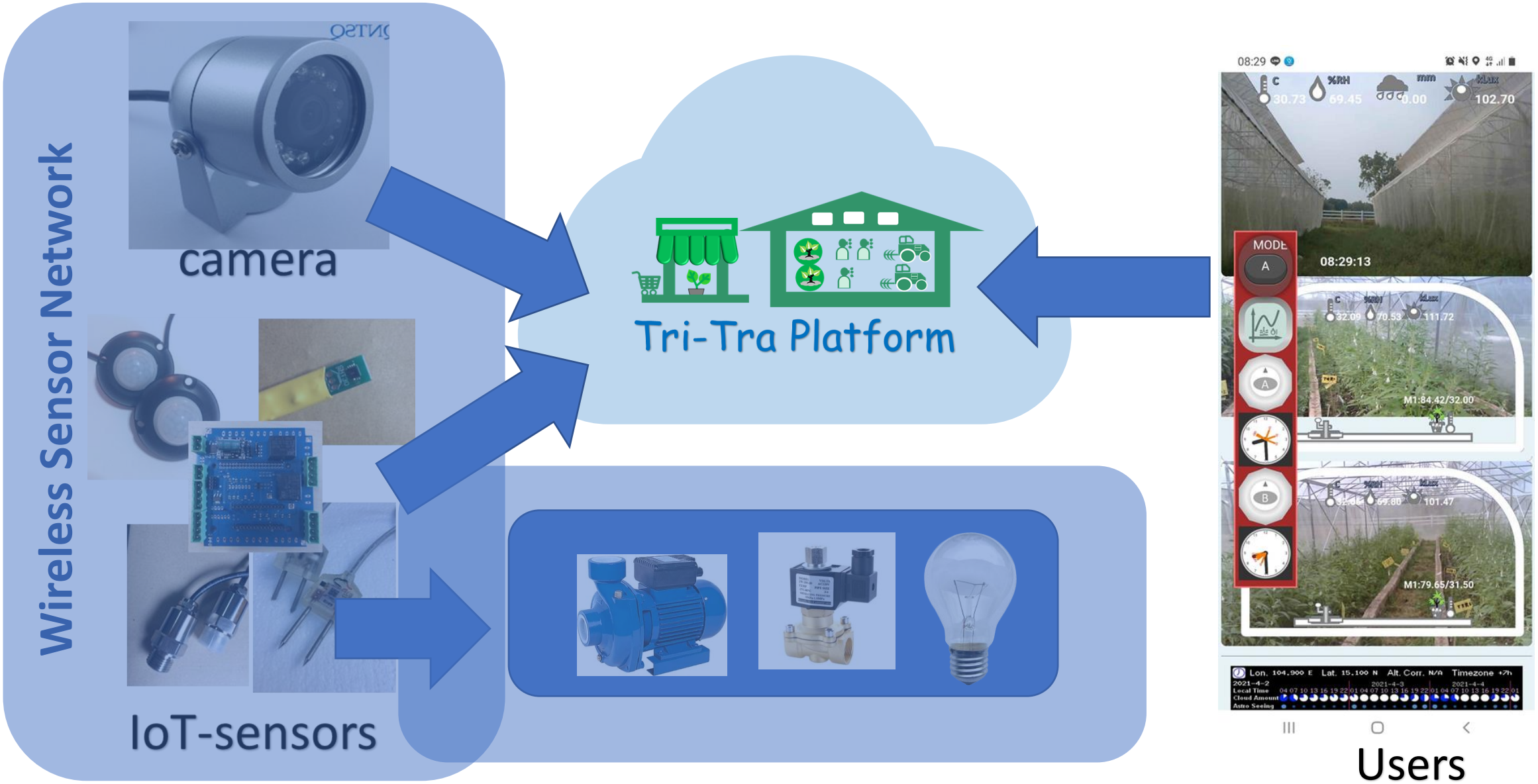




WIMARC-Model

WIMARC	Smart	Slim
	RPI	ESP32
No. of Clients	10	3
No. of Control	6	3
Power consumption	400mA@5V	100mA@5V

WIMARC : User Input Interface

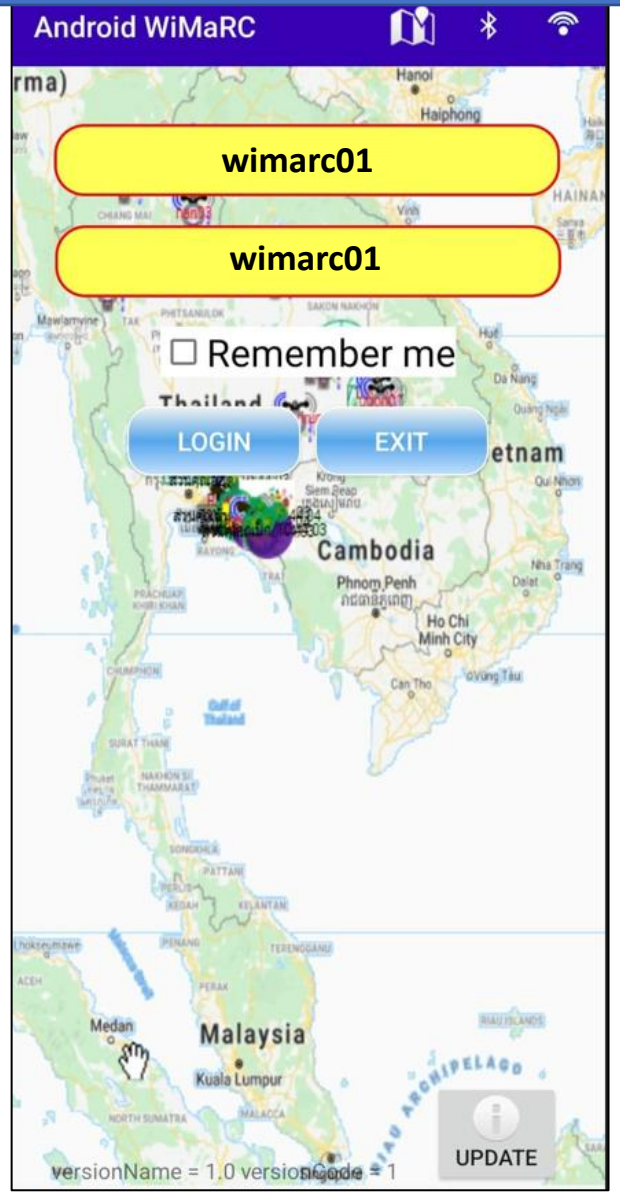


WIMARC : User Input Interface

WiMaRC Android App

Web App

WIMARC Android Application



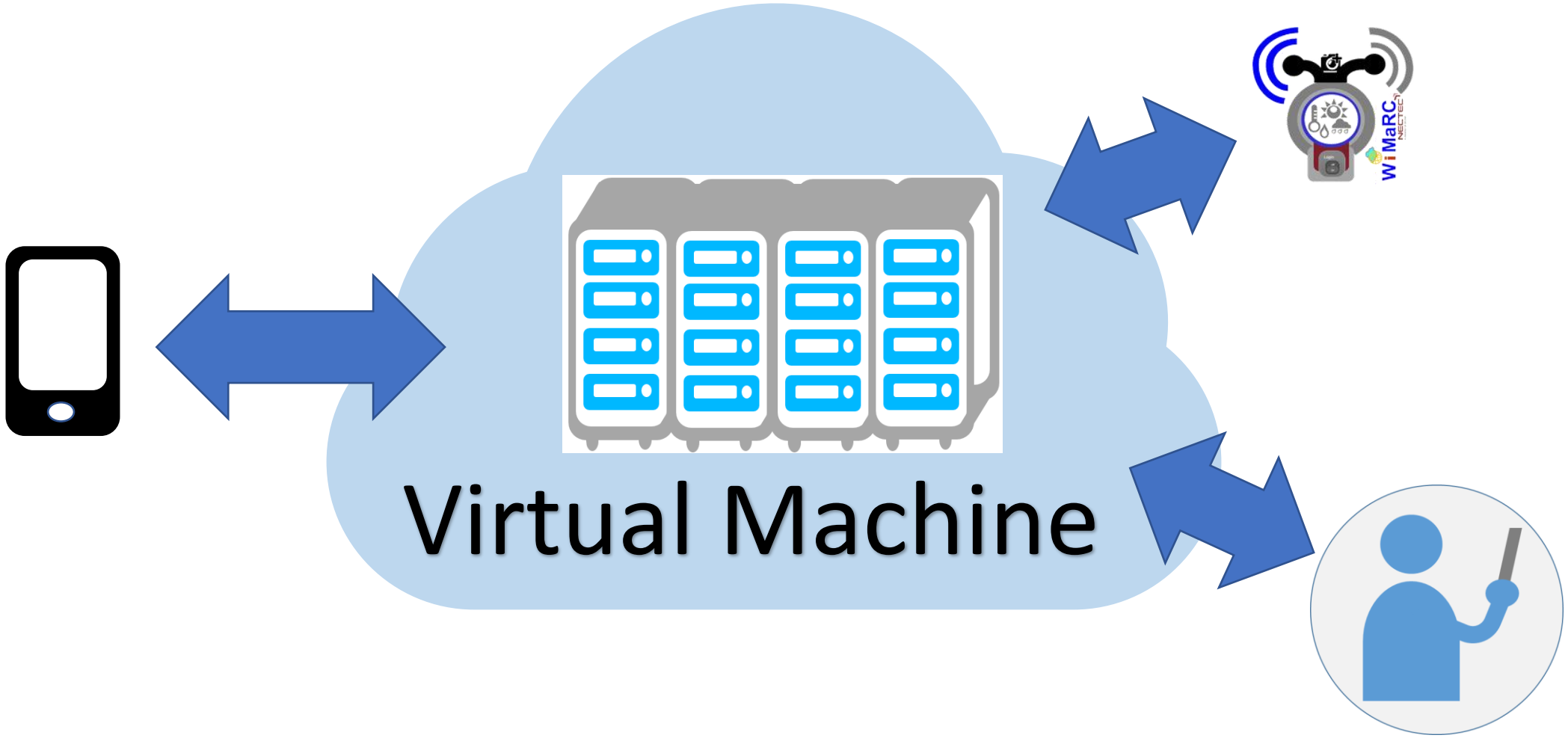
Software skills

- Printed Circuit Board (PCB) Design	Eagle
- Arduino Programming	C++, Arduino IDE
- RPI Programming	python
- Application Programming	Android Studio Javascript

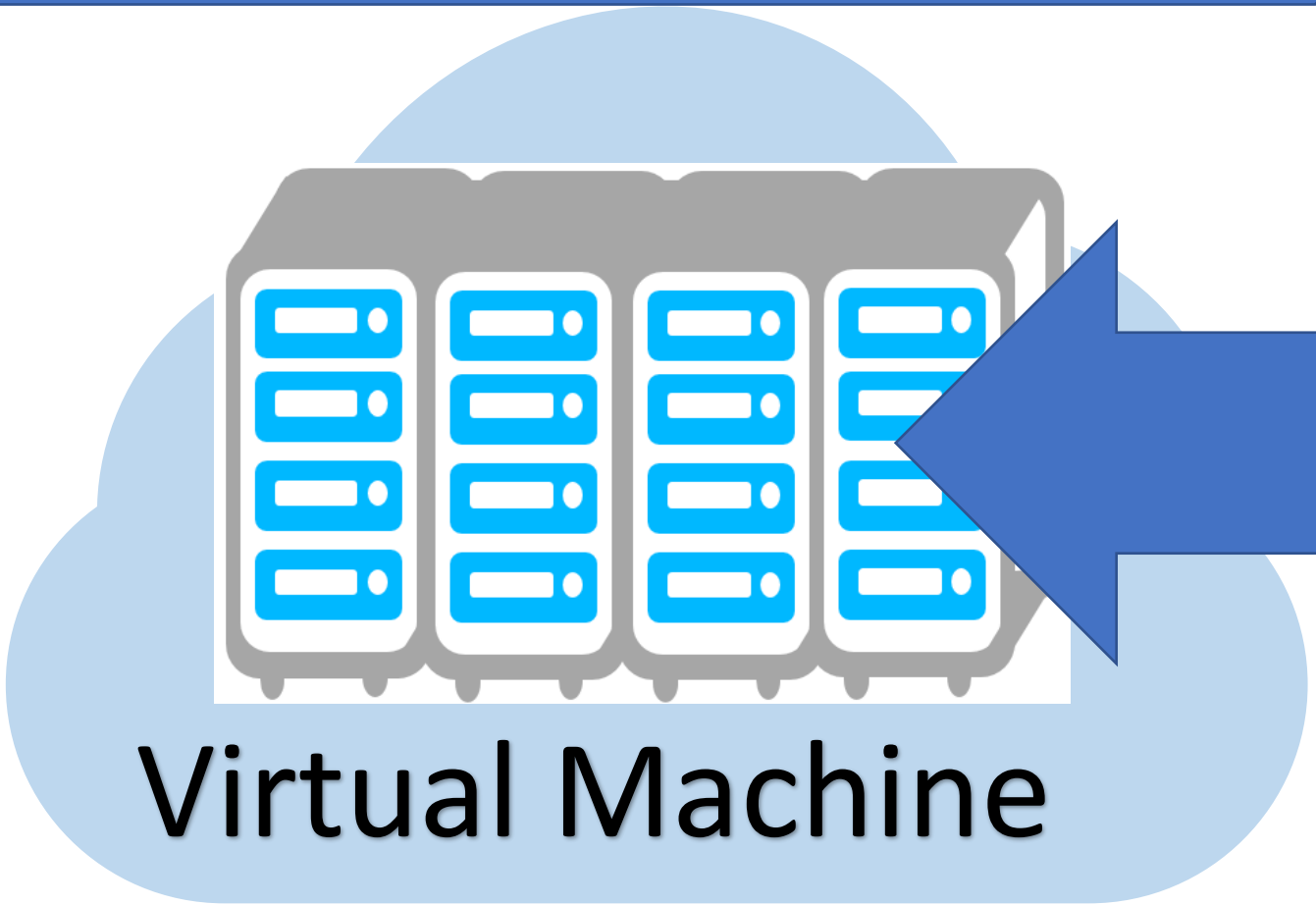
Contents

-My Background Knowledge for Device and System Design
-Why Platform?
-Platform Concept : Input & Control
-Platform Concept : Analysis
-Platform Concept: Dashboard

Infrastructure for Analysis



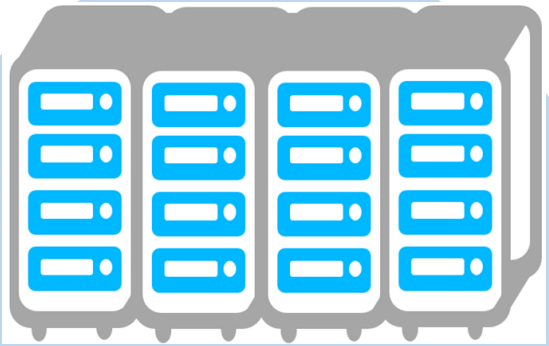
Infrastructure for Analysis

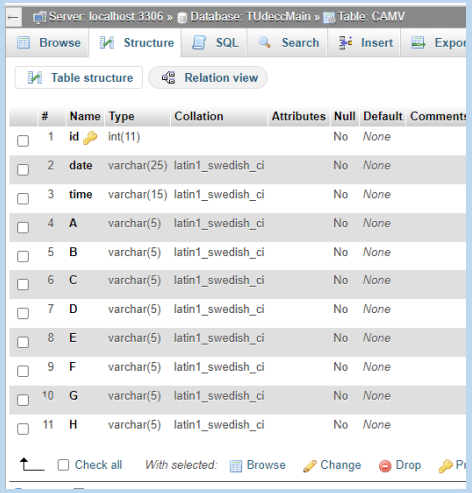


- OS (ubuntu)
- Web Server (php)
- Database (mysql)
- Image Processing (OpenCV)
- AI (Tensorflow)
- Programming (python)
- Schedule Tools (crontab)

Data structure

Database: location





Server: localhost:3306 » Database: TUdecoMain » Table: CAMV

Browse | Structure | SQL | Search | Insert | Export

Table structure | Relation view

#	Name	Type	Collation	Attributes	Null	Default	Comments
1	id	int(11)			No	None	
2	date	varchar(25)	latin1_swedish_ci		No	None	
3	time	varchar(15)	latin1_swedish_ci		No	None	
4	A	varchar(5)	latin1_swedish_ci		No	None	
5	B	varchar(5)	latin1_swedish_ci		No	None	
6	C	varchar(5)	latin1_swedish_ci		No	None	
7	D	varchar(5)	latin1_swedish_ci		No	None	
8	E	varchar(5)	latin1_swedish_ci		No	None	
9	F	varchar(5)	latin1_swedish_ci		No	None	
10	G	varchar(5)	latin1_swedish_ci		No	None	
11	H	varchar(5)	latin1_swedish_ci		No	None	

Check all With selected: Browse Change Drop

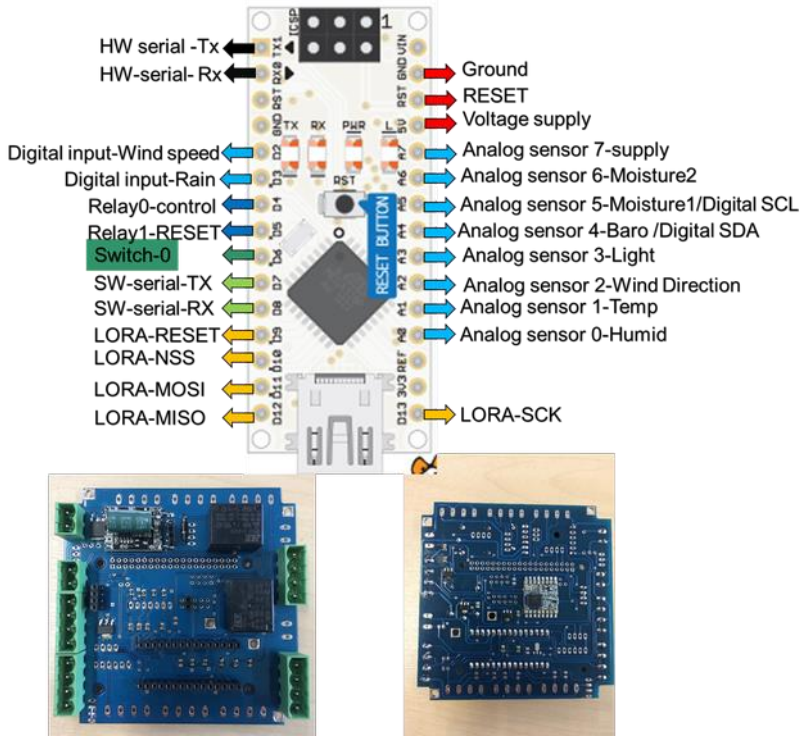
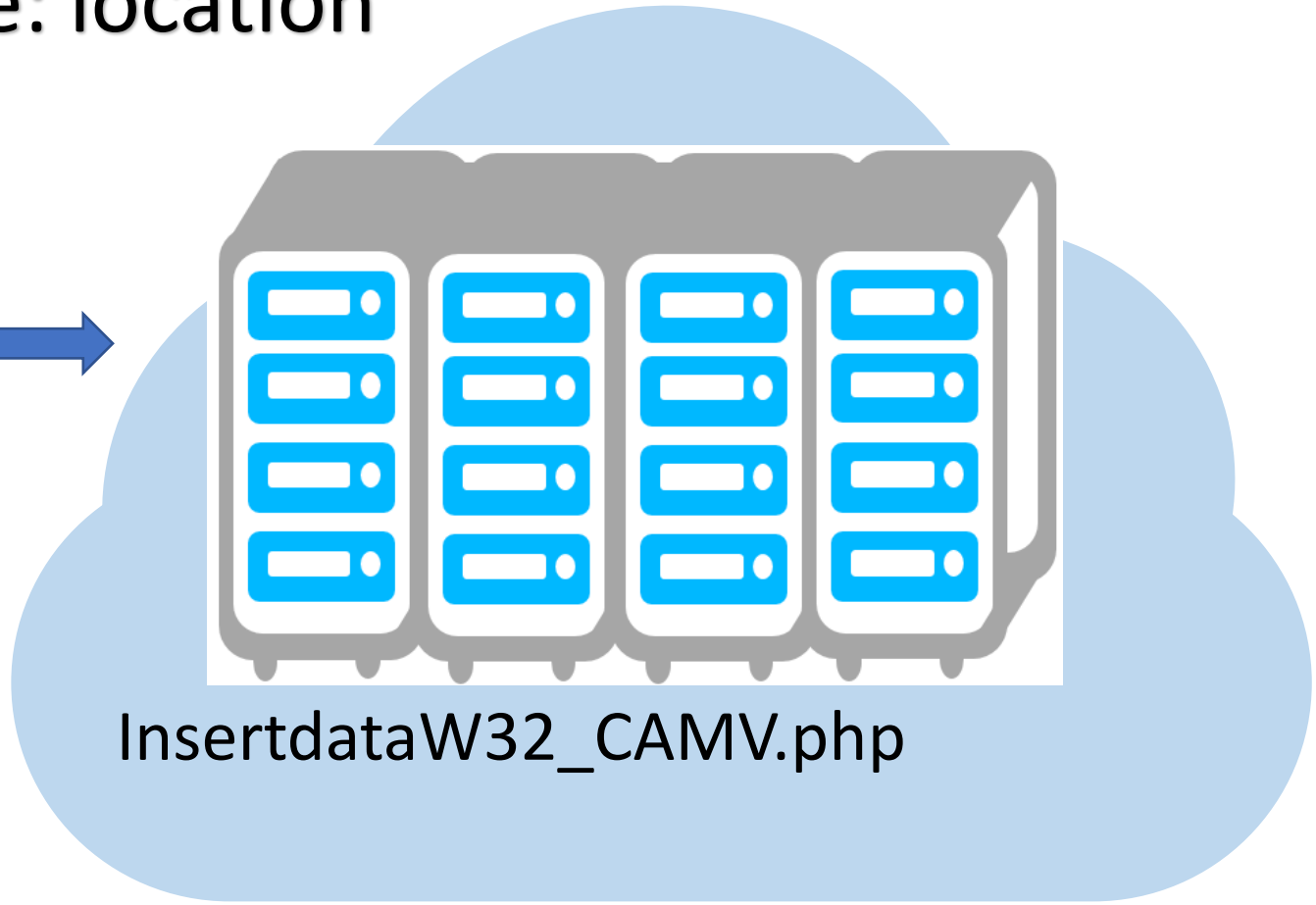


Table structure

Data structure

Databasename: location



Data structure

Databasename: location

Server: localhost:3306 » Database: wimarc01

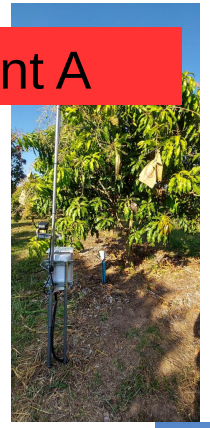
Structure | SQL | Search | Query | Export | Import | Operations | Privileges | Routines | Events

	Table	Action	Rows	Type	Collation	Size	Overhead
	a	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	b	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	c	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMA	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMAcontrol	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMB	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMBcontrol	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMC	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAME	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMV	Browse Structure Search Insert Empty Drop	40	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMVcontrol	Browse Structure Search Insert Empty Drop	17	InnoDB	latin1_swedish_ci	16 KiB	-
	input	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	sensor	Browse Structure Search Insert Empty Drop	40	InnoDB	latin1_swedish_ci	16 KiB	-
	setsensor	Browse Structure Search Insert Empty Drop	13	InnoDB	latin1_swedish_ci	16 KiB	-
	timer	Browse Structure Search Insert Empty Drop	7	InnoDB	latin1_swedish_ci	16 KiB	-
	updatedata	Browse Structure Search Insert Empty Drop	10	InnoDB	latin1_swedish_ci	16 KiB	-
	volt	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	weather	Browse Structure Search Insert Empty Drop	2	InnoDB	latin1_swedish_ci	32 KiB	-
	18 tables	Sum	129	InnoDB	latin1_swedish_ci	304 KiB	0 B

Check all With selected:

Data structure

Databasename: location



Server: localhost:3306 » Database: wimarc01

Structure | SQL | Search | Query | Export | Import | Operations | Privileges | Routines | Events

	Table	Action	Rows	Type	Collation	Size	Overhead
	a	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	b	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	c	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMA	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMAcontrol	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMB	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMBcontrol	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMC	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAME	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMV	Browse Structure Search Insert Empty Drop	40	InnoDB	latin1_swedish_ci	16 KiB	-
	CAMVcontrol	Browse Structure Search Insert Empty Drop	17	InnoDB	latin1_swedish_ci	16 KiB	-
	input	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	sensor	Browse Structure Search Insert Empty Drop	40	InnoDB	latin1_swedish_ci	16 KiB	-
	setsensor	Browse Structure Search Insert Empty Drop	13	InnoDB	latin1_swedish_ci	16 KiB	-
	timer	Browse Structure Search Insert Empty Drop	7	InnoDB	latin1_swedish_ci	16 KiB	-
	updatedata	Browse Structure Search Insert Empty Drop	10	InnoDB	latin1_swedish_ci	16 KiB	-
	volt	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 KiB	-
	weather	Browse Structure Search Insert Empty Drop	2	InnoDB	latin1_swedish_ci	32 KiB	-
	18 tables	Sum	129	InnoDB	latin1_swedish_ci	304 KiB	0 B

Check all With selected:

Console Data dictionary

Data structure

Database: location

Main

Server: localhost:3306 » Database: TUdeccMain » Table: CAMV

Browse | Structure | SQL | Search | Insert | Export | Import | Privileges

	id	date	time	A	B	C	D	E	F	G	H
Edit Copy Delete	1334	2022-06-25	03:00:08	4033	2113	0	0	303	0	12314	19
Edit Copy Delete	1333	2022-06-25	02:40:01	4017	2110	0	0	300	9	12343	601
Edit Copy Delete	1332	2022-06-25	02:30:00	4031	2111	0	0	301	0	12393	2576
Edit Copy Delete	1331	2022-06-25	02:20:04	4030	2113	0	0	298	0	12421	252
Edit Copy Delete	1330	2022-06-25	02:10:01	4027	2112	0	20	297	0	12414	247
Edit Copy Delete	1329	2022-06-25	02:00:03	4022	2108	0	20	297	0	12419	400
Edit Copy Delete	1328	2022-06-25	01:50:00	4019	2107	0	20	295	0	12501	813
Edit Copy Delete	1327	2022-06-25	01:40:13	4020	2105	0	20	294	1	12442	1647
Edit Copy Delete	1326	2022-06-25	01:30:10	4021	2108	0	40	293	1044	12446	1978
Edit Copy Delete	1325	2022-06-25	01:20:02	4015	2110	0	40	290	127	12468	1686
Edit Copy Delete	1324	2022-06-25	01:10:09	4013	2107	0	20	290	106	12516	919
Edit Copy Delete	1323	2022-06-25	01:00:01	4018	2107	0	20	289	0	12469	604
Edit Copy Delete	1322	2022-06-25	00:50:01	4012	2106	0	80	289	0	12497	575
Edit Copy Delete	1321	2022-06-25	00:40:03	3990	2105	0	40	289	0	12477	1850
Edit Copy Delete	1320	2022-06-25	00:30:06	3988	2106	0	40	287	794	12473	2288
Edit Copy Delete	1319	2022-06-25	00:10:09	3982	2107	0	40	284	1160	12519	1123
Edit Copy Delete	1318	2022-06-25	00:00:04	3986	2104	0	20	282	1773	12488	2062
Edit Copy Delete	1317	2022-06-24	23:50:14	3985	2099	0	20	280	1604	12546	2790
Edit Copy Delete	1316	2022-06-24	23:40:05	3982	2100	0	20	278	1367	12526	2394
Edit Copy Delete	1315	2022-06-24	23:30:00	3978	2099	0	60	279	1107	12551	1578
Edit Copy Delete	1314	2022-06-24	23:20:01	3967	2101	0	20	278	1363	12488	1438
Edit Copy Delete	1313	2022-06-24	23:10:02	3941	2099	0	20	277	2470	12525	2207

Check all With selected: Edit Copy Delete Export

Console

Raw Data

Server: localhost:3306 » Database: TUdeccMain » Table: sensor

Browse | Structure | SQL | Search | Insert | Export | Import | Privileges | Operations | Tracking | Triggers

1 > >> Number of rows: 25 Filter rows: Search this table Sort by key: PRIMARY (DESC)

+ Options

	id	date	time	Temp	Humid	Rain	WindS	WindD	M1	M2	Lux
Edit Copy Delete	1299	2022-06-24	20:50:06	25.09	85.43	0.4	1.43	136.94	12590	136.94	0.00
Edit Copy Delete	1298	2022-06-24	20:30:05	24.79	84.35	1.6	2.24	140.83	12607	140.83	0.00
Edit Copy Delete	1297	2022-06-24	20:20:03	25.14	81.88	0.8	3.87	72.72	12624	72.72	0.00
Edit Copy Delete	1296	2022-06-24	20:10:04	25.49	83.95	0.8	0.25	14.11	12602	14.11	0.00
Edit Copy Delete	1295	2022-06-24	20:00:15	25.49	83.88	0.4	1.51	167.40	12639	167.40	0.00
Edit Copy Delete	1294	2022-06-24	19:50:04	25.40	83.98	0.2	2.95	81.94	12676	81.94	0.00
Edit Copy Delete	1293	2022-06-24	19:40:03	25.75	83.30	0	1.06	111.67	12713	111.67	0.00
Edit Copy Delete	1292	2022-06-24	19:30:10	25.84	83.15	0	0.85	67.75	12722	67.75	0.00
Edit Copy Delete	1291	2022-06-24	19:20:03	25.44	83.78	0	4.56	116.78	12713	116.78	0.00
Edit Copy Delete	1290	2022-06-24	19:10:01	25.57	84.18	0.2	2.54	228.10	12684	228.10	0.00
Edit Copy Delete	1289	2022-06-24	19:00:09	25.53	83.20	0.6	3.08	145.22	12734	145.22	0.00
Edit Copy Delete	1288	2022-06-24	18:50:06	25.84	82.38	0.2	4.02	126.50	12722	126.50	0.00

Console

Data structure

Database: location

Main

Every x minute

Server: localhost:3306 » Database: TUdeccMain » Table: CAMV

Browse | Structure | SQL | Search | Insert | Export | Import | Privileges

	id	date	time	A	B	C	D	E	F	G	H
Edit Copy Delete	1334	2022-06-25	03:00:08	4033	2113	0	0	303	0	12314	19
Edit Copy Delete	1333	2022-06-25	02:40:01	4017	2110	0	0	300	9	12343	601
Edit Copy Delete	1332	2022-06-25	02:30:00	4031	2111	0	0	301	0	12393	2576
Edit Copy Delete	1331	2022-06-25	02:20:04	4030	2113	0	0	298	0	12421	252
Edit Copy Delete	1330	2022-06-25	02:10:01	4027	2112	0	20	297	0	12414	247
Edit Copy Delete	1329	2022-06-25	02:00:03	4022	2108	0	20	297	0	12419	400
Edit Copy Delete	1328	2022-06-25	01:50:00	4019	2107	0	20	295	0	12501	813
Edit Copy Delete	1327	2022-06-25	01:40:13	4020	2105	0	20	294	1	124[illegible]	647
Edit Copy Delete	1326	2022-06-25	01:30:10	4021	2108	0	40	293	1044	12446	1978
Edit Copy Delete	1325	2022-06-25	01:20:02	4015	2110	0	40	290	127	12468	1686
Edit Copy Delete	1324	2022-06-25	01:10:09	4013	2107	0	20	290	106	12516	919
Edit Copy Delete	1323	2022-06-25	01:00:01	4018	2107	0	20	289	0	12469	604
Edit Copy Delete	1322	2022-06-25	00:50:01	4012	2106	0	80	289	0	12497	575
Edit Copy Delete	1321	2022-06-25	00:40:03	3990	2105	0	40	289	0	12477	1850
Edit Copy Delete	1320	2022-06-25	00:30:06	3988	2106	0	40	287	794	12473	2288
Edit Copy Delete	1319	2022-06-25	00:10:09	3982	2107	0	40	284	1160	12519	1123
Edit Copy Delete	1318	2022-06-25	00:00:04	3986	2104	0	20	282	1773	12488	2062
Edit Copy Delete	1317	2022-06-24	23:50:14	3985	2099	0	20	280	1604	12546	2790
Edit Copy Delete	1316	2022-06-24	23:40:05	3982	2100	0	20	278	1367	12526	2394
Edit Copy Delete	1315	2022-06-24	23:30:00	3978	2099	0	60	279	1107	12551	1578
Edit Copy Delete	1314	2022-06-24	23:20:01	3967	2101	0	20	278	1363	12488	1438
Edit Copy Delete	1313	2022-06-24	23:10:02	3941	2099	0	20	277	2470	12525	2207

Check all With selected: Edit Copy Delete Export

Console

Raw Data

Real time

Server: localhost:3306 » Database: TUdeccMain » Table: updatedata

Browse | Structure | SQL | Search | Insert | Export | Import | Privileges | Operations | Tracking

Showing rows 0 - 11 (12 total, Query took 0.0002 seconds.)

SELECT * FROM `updatedata`

Show all | Number of rows: 25 Filter rows: Search this table Sort by key: None

+ Options

	id	name	date	time	A	B	C	D	E	F	G	H	status	netpie
Edit Copy Delete	1	CAMA	2022-06-25	22:36:44	3689	2184	0	244	355	322	11853	1003	0	
Edit Copy Delete	2	CAMB	2022-02-01	17:07:00									1	/NectecFarmControl/X
Edit Copy Delete	3	CAMC	2021-07-08	12:39:19	2383	2631	766	230	874	825	11650	1631		/PIENODEfarmB
Edit Copy Delete	4	CAMD	2021-07-08	12:39:24	673	296	307	249	340	285	12227	417		/NectecFarmControl
Edit Copy Delete	5	CAME	2021-07-08	12:39:27	4521	1326	937	2511	778	454	13428	1809		/NectecFarmControl
Edit Copy Delete	6	CAMF	2021-07-08	10:27:56	313	294	353	249	254	259	11457	348		/NectecFarmControl
Edit Copy Delete	7	CAMV	2022-06-25	22:36:22	3822	2169	0	0	300	0	12469	1450	0	/PIENODEfarmB
Edit Copy Delete	8	CAMG	2021-07-08	12:38:37	2280	3053	788	753	780	750	12054	485		
Edit Copy Delete	9	sensor	2022-06-25	22:36:22	28.02	83.05	0.00	0	300	0.00	12469	104.40	0	
Edit Copy Delete	10	a	2022-06-25	22:35:35	3688	2182	0	243	356	323	11840	1005		
Edit Copy Delete	11	b	2022-06-25	22:31:00	0	0	0	0	0	0	0	0		
Edit Copy Delete	12	c	2022-06-25	22:33:15	4036	2178	0	332	371	319	11786	316		

Average daily Data

Database: location

Main

3306 » Database: TUdeccMain » Table: sensor

ucture | SQL | Search | Insert | Export | Import | Privileges | Operations | Tracking | Tri

Number of rows: 25 | Filter rows: Search this table | Sort by key: PRIMARY (DESC)

	id	date	time	Temp	Humid	Rain	WindS	WindD	M1	M2	Lux
Edit Copy Delete	1299	2022-06-24	20:50:06	25.09	85.43	0.4	1.43	136.94	12590	136.94	0.00
Edit Copy Delete	1298	2022-06-24	20:30:05	24.79	84.35	1.6	2.24	140.83	12607	140.83	0.00
Edit Copy Delete	1297	2022-06-24	20:20:03	25.14	81.88	0.8	3.87	72.72	12624	72.72	
Edit Copy Delete	1296	2022-06-24	20:10:04	25.49	83.95	0.8	0.25	14.11	12602	14.11	
Edit Copy Delete	1295	2022-06-24	20:00:15	25.49	83.88	0.4	1.51	167.40	12639	167.4	
Edit Copy Delete	1294	2022-06-24	19:50:04	25.40	83.98	0.2	2.95	81.94	12676	81.94	
Edit Copy Delete	1293	2022-06-24	19:40:03	25.75	83.30	0	1.06	111.67	12713	111.6	
Edit Copy Delete	1292	2022-06-24	19:30:10	25.84	83.15	0	0.85	67.75	12722	67.75	0.00
Edit Copy Delete	1291	2022-06-24	19:20:03	25.44	83.78	0	4.56	116.78	12713	116.78	0.00
Edit Copy Delete	1290	2022-06-24	19:10:01	25.57	84.18	0.2	2.54	228.10	12684	228.10	0.00
Edit Copy Delete	1289	2022-06-24	19:00:09	25.53	83.20	0.6	3.08	145.22	12734	145.22	0.00
Edit Copy Delete	1288	2022-06-24	18:50:06	25.84	82.38	0.2	4.02	126.50	12722	126.50	0.00

Console

Average, max, min

Server: localhost:3306 » Database: TUdeccMain » Table: weather

Browse | Structure | SQL | Search | Insert | Export | Import | Privileges | Operations | Tracking | Triggers

Showing rows 0 - 13 (14 total, Query took 0.0005 seconds.)

```
SELECT * FROM `weather`
```

Profiling [Edit inline] [Edit] [Expla

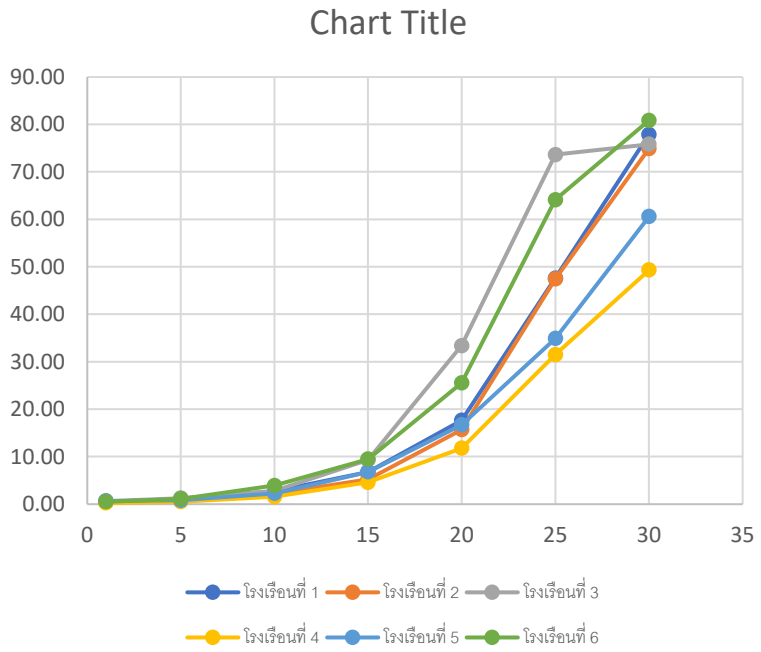
Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

+ Options

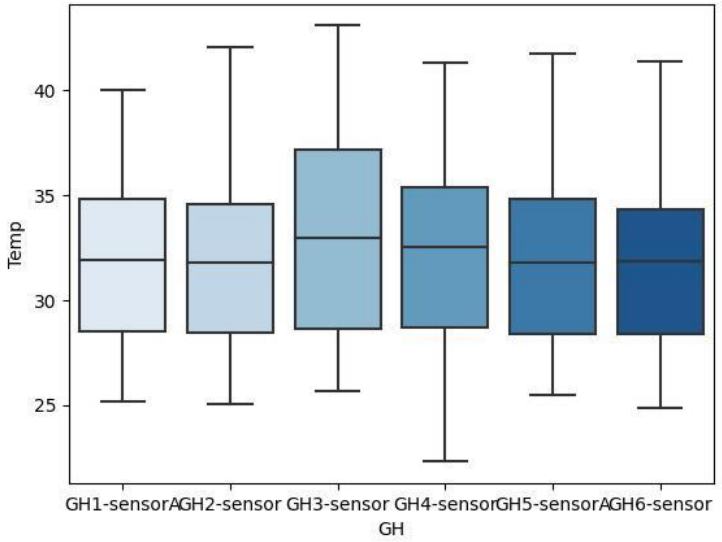
	id	day	date	TempAve	TempMax	TempMin	HumidAve	HumidMax	HumidMin	Rain	WindSpeedAve	WindSpeedMax	WindSpeedMin	LuxAve	LuxMax
Edit Copy Delete	1	1	2022-06-06	31.06	31.22	-65.51	63.60	64.10	-9.95	0	0.085	0.17	0.00	nan	0.00
Edit Copy Delete	4	2	2022-06-07	39.48	688.21	1,234.61	65.59	68.33	62.73	0	1.1437393042264E-9	0.31	0.00	247.48	454.77
Edit Copy Delete	5	3	2022-06-08	35.72	346.87	27.06	72.00	474.78	57.25	0.6	0.10614927812587	29.20	0.00	77.29	994.95
Edit Copy Delete	9	4	2022-06-09	30.68	37.61	1,506.34	71.51	276.00	54.40	0	0.15418221061078	7.97	0.00	53.21	187.50
Edit Copy Delete	14	5	2022-06-10	29.82	37.43	1,025.96	77.35	494.23	55.05	36	0.0046629527590087	72.37	0.00	52.01	97.80
Edit Copy Delete	50	6	2022-06-11	27.84	33.36	25.71	83.75	89.85	64.98	0.2	2.5568469285965	4.62	0.00	84.51	723.09
Edit Copy Delete	51	7	2022-06-17	33.83	52.96	1,200.57	64.06	75.88	1,357.90	0	3.3064874164795	79.70	0.01	54.25	98.07
Edit Copy Delete	59	8	2022-06-18	34.10	423.79	1,009.38	78.43	901.25	53.78	0.6	2.4369444644857	44.49	0.00	69.90	927.32
Edit Copy Delete	68	9	2022-06-19	27.84	31.04	26.67	77.92	80.58	74.35	0	0.81854057133198	3.43	0.00	nan	0.00
Edit Copy Delete	78	10	2022-06-20	47.08	717.26	1,944.19	91.64	871.90	51.08	539.4	0.38364309933058	66.62	0.00	54.89	478.61
Edit Copy Delete	89	11	2022-06-21	36.08	866.41	25.31	76.05	89.68	55.40	2179.8	0.15003648831233	8.24	0.00	53.43	98.25
Edit Copy Delete	101	12	2022-06-22	30.52	56.02	26.14	72.53	88.65	53.18	44.8	0.00053775909917803	5.66	0.00	57.21	97.93
Edit Copy Delete	114	13	2022-06-23	30.70	178.22	1,994.06	74.23	88.98	1,166.90	0	1.3602090798905	5.43	-397.00	71.31	985.52
Edit Copy Delete	128	14	2022-06-24	29.89	37.43	24.79	73.77	87.13	54.13	11.6	2.2037721025223	6.69	0.00	57.89	97.80

Schedule Tools => crontab

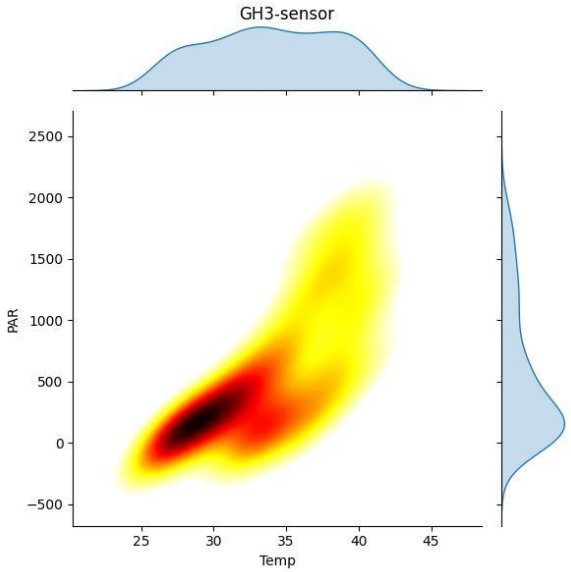
Data Visualization



Graph

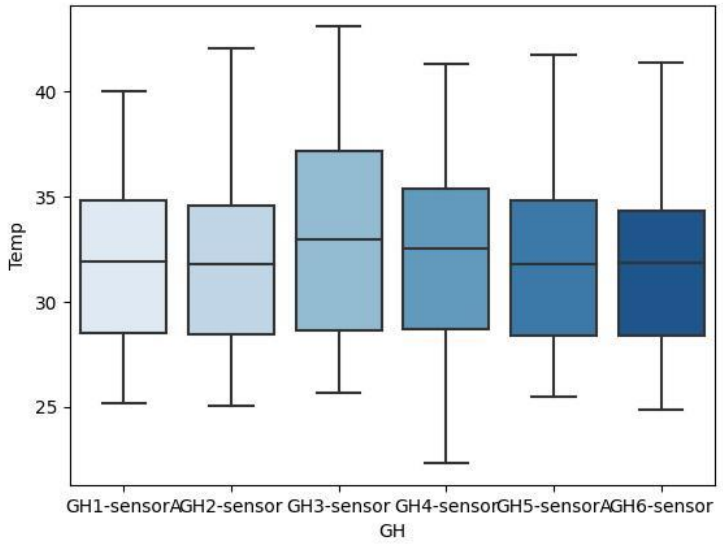


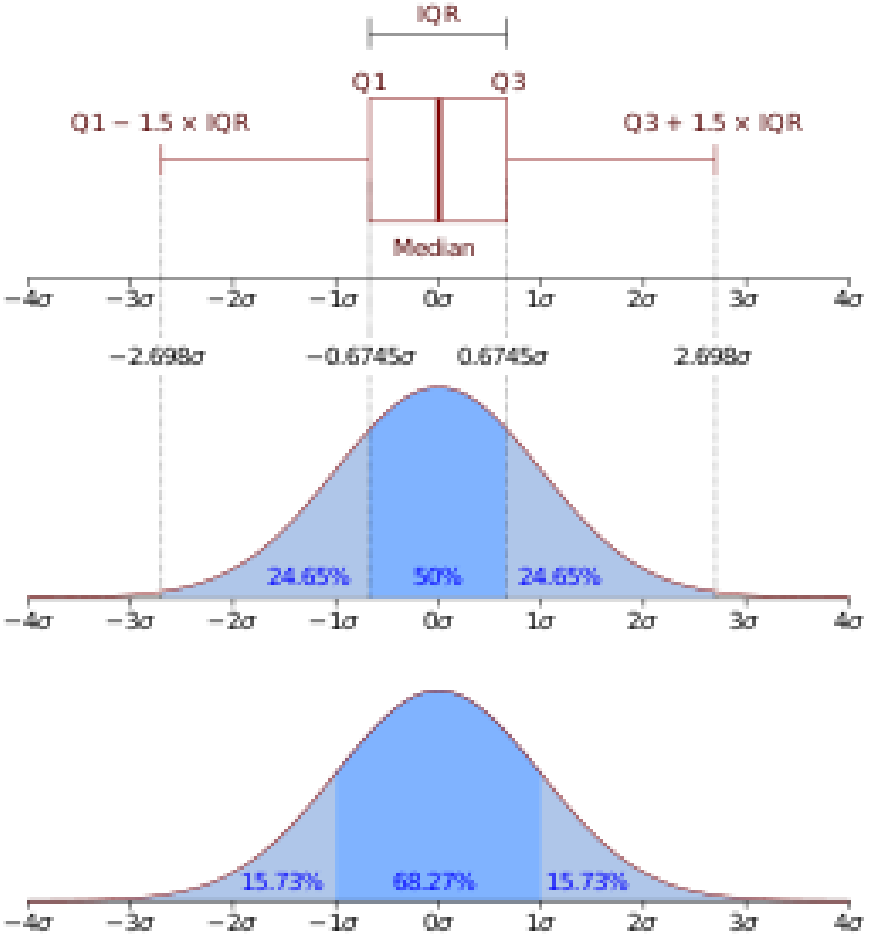
Box plot



Joint plot

Data Visualization

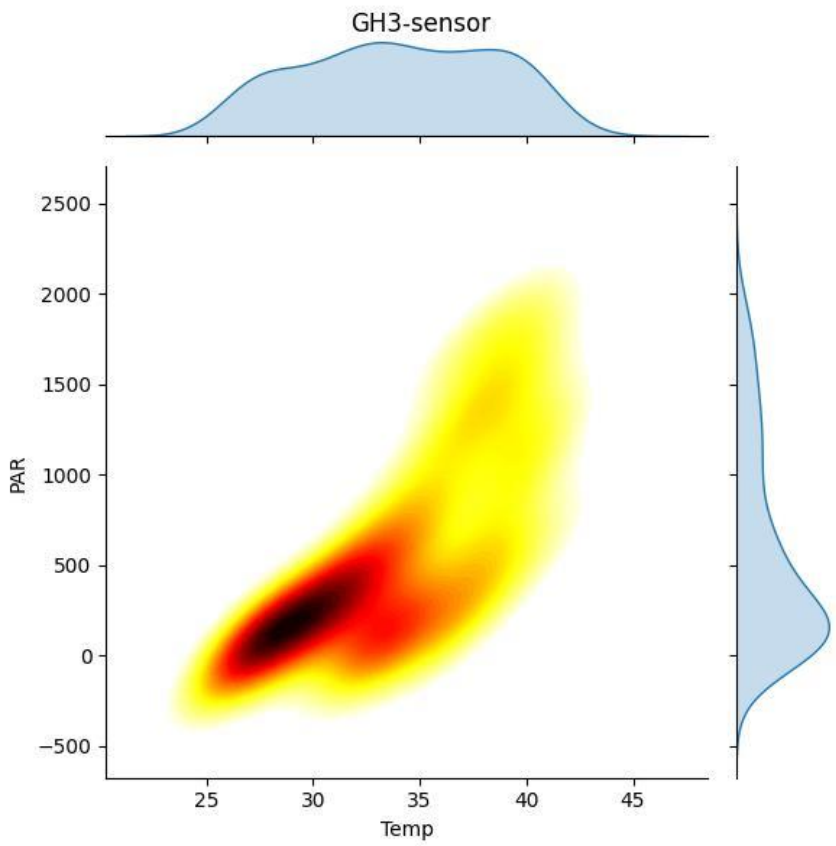


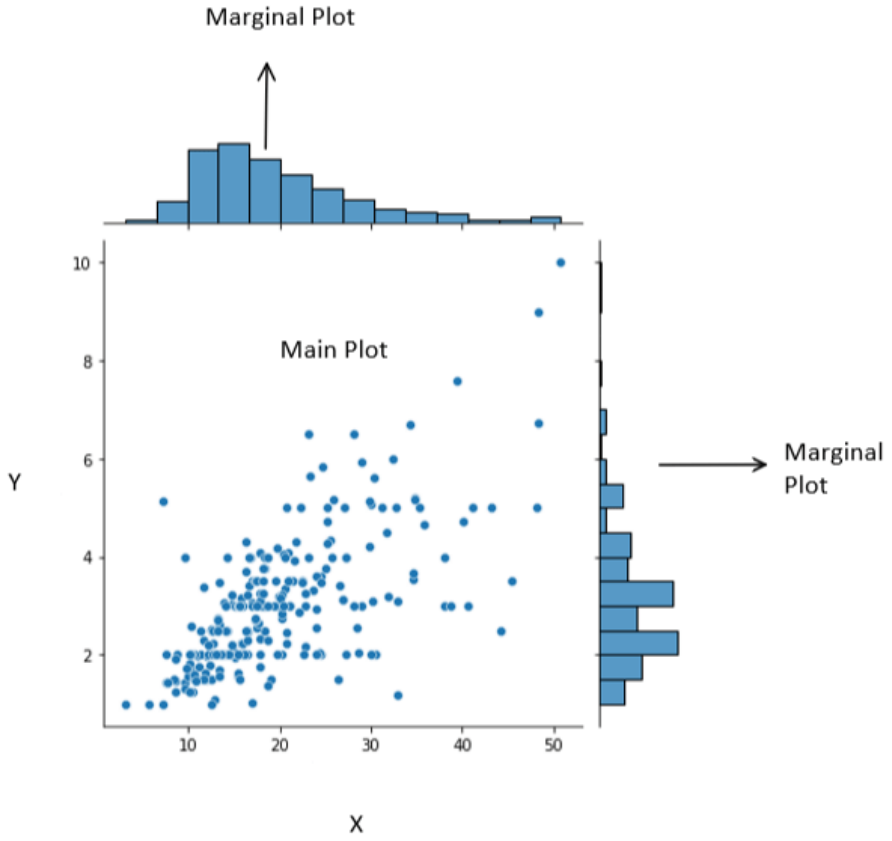


Box plot

https://en.wikipedia.org/wiki/Box_plot

Data Visualization





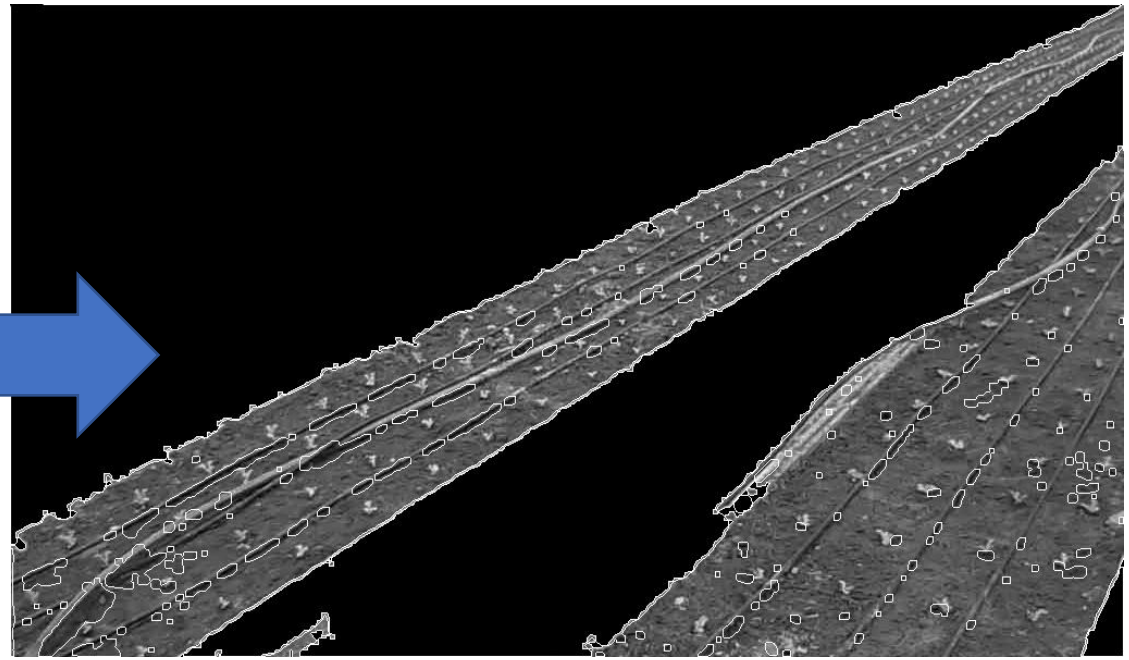
Joint plot

Image Processing

Database: location

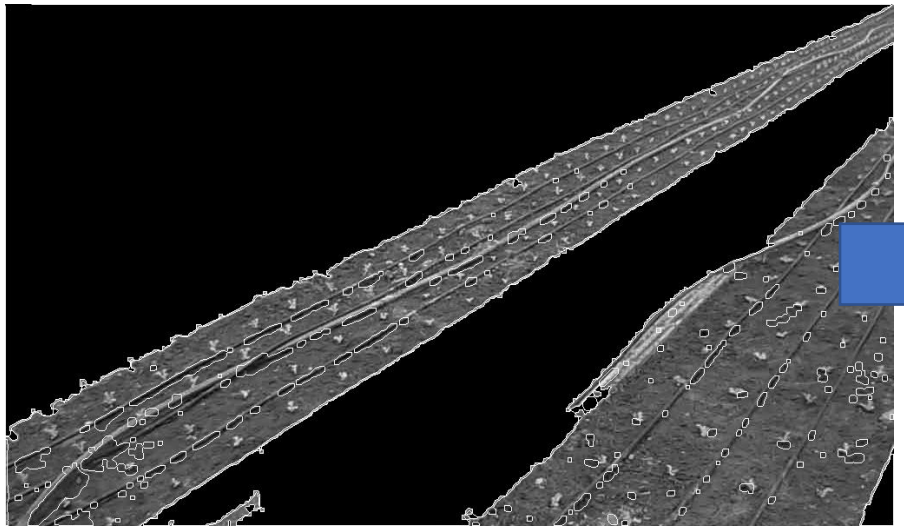
Main

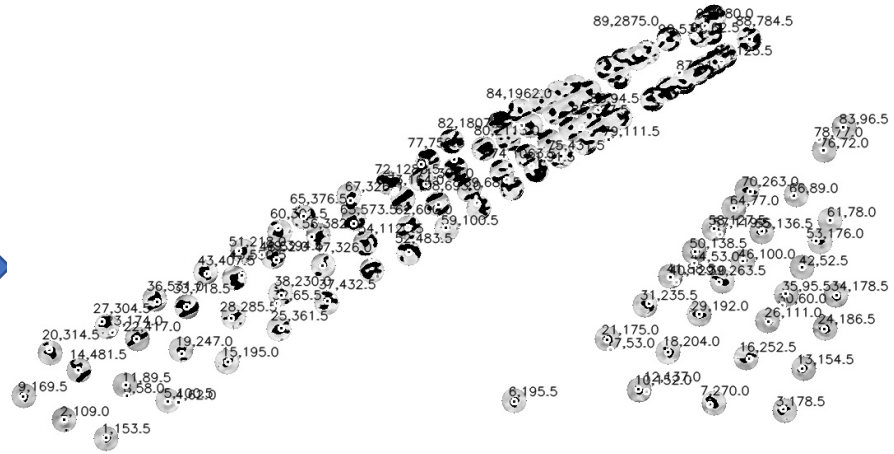
Image Processing



Area Selection tools: python +opencv

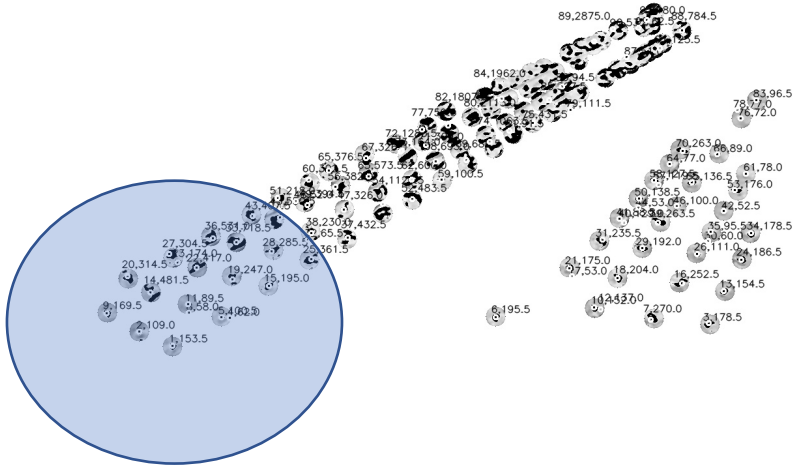
Image Processing

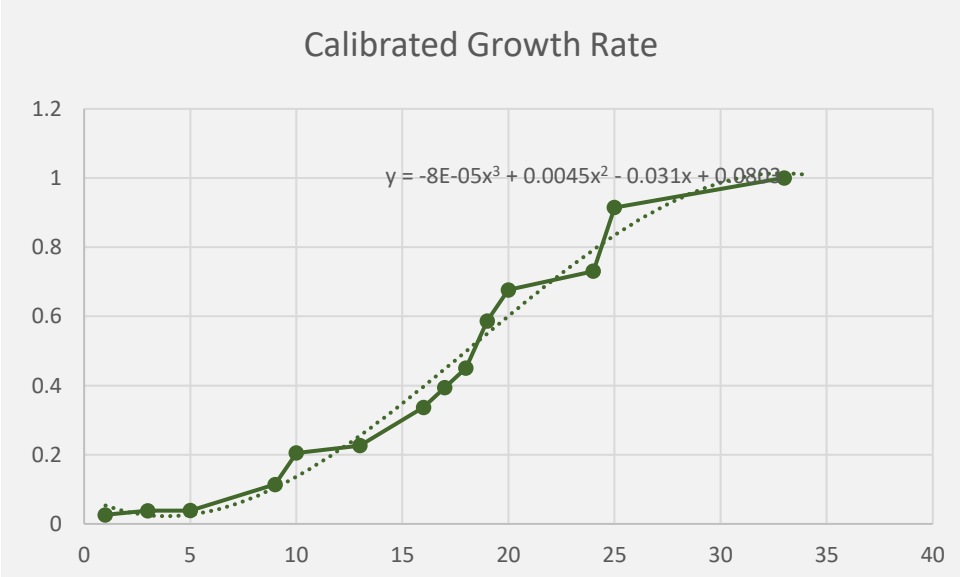




index	ContourArea	x	y
1	153.5	120.5625	593.5625
2	109	69.59091187	571.5908813
3	178.5	943.5	558.5
4	62	208.5	550.5
5	100.5	195.5	549
6	195.5	616.7098999	549.6542969
7	270	854	553
8	58	145.5	542
9	169.5	19.5	543.5
10	152	767.8043213	534.8043213
11	89.5	144	529.611084
12	137	777.5	537
13	154.5	966.5	509.5

Image Processing

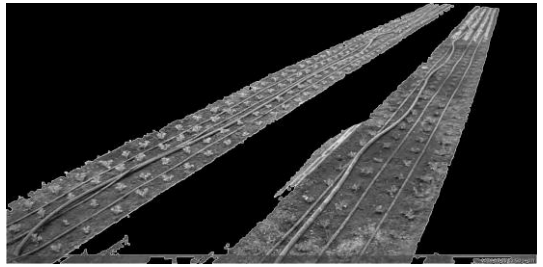


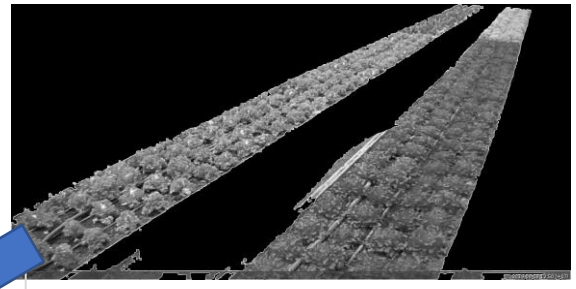


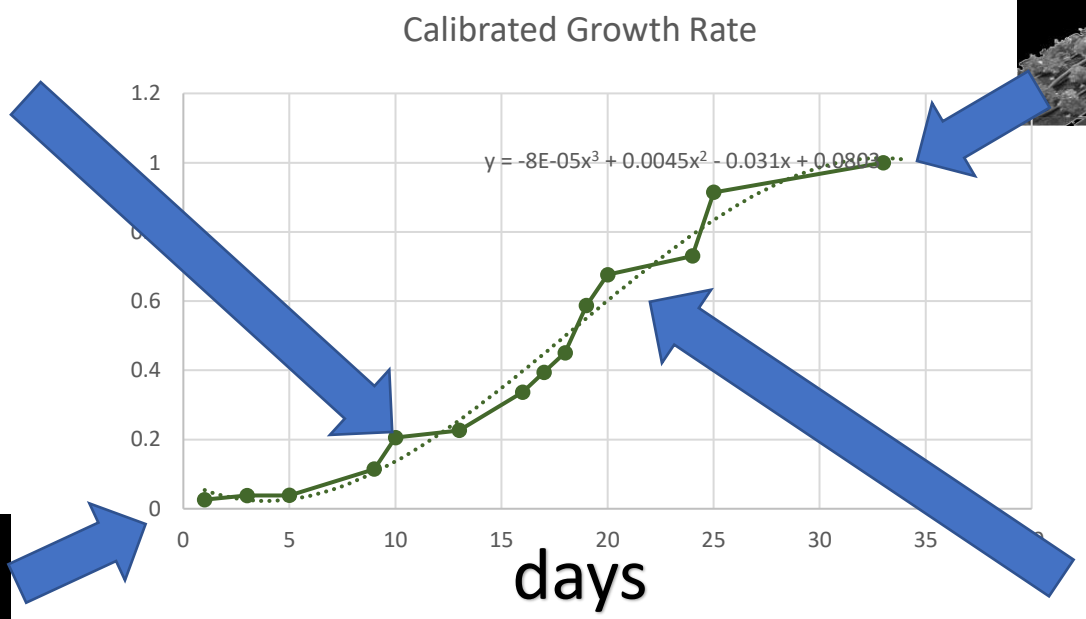
AI Deep Learning : Case Study

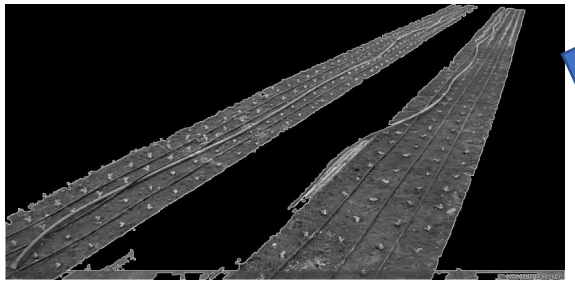
Growth state Detection (Image to Information)

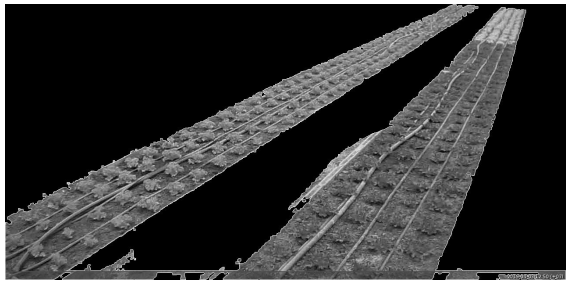
Reference Point







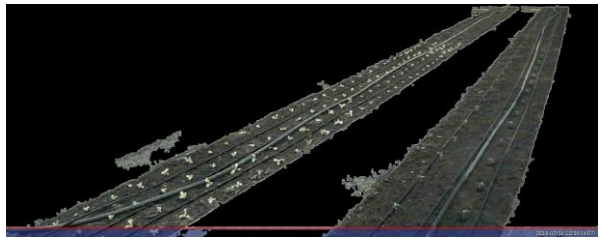


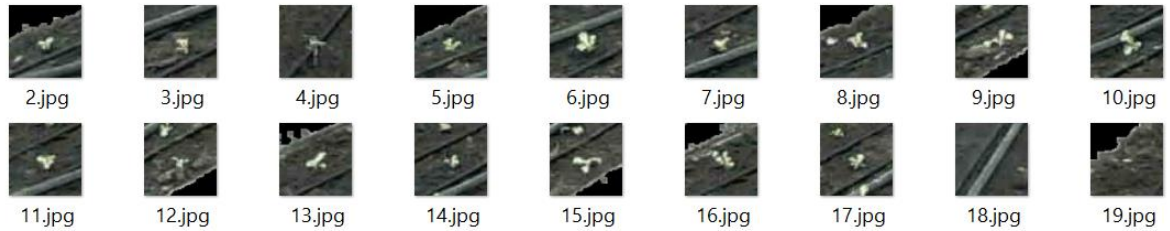


Model Training

Deep Learning -Transfer Learning with Tensorflow

A





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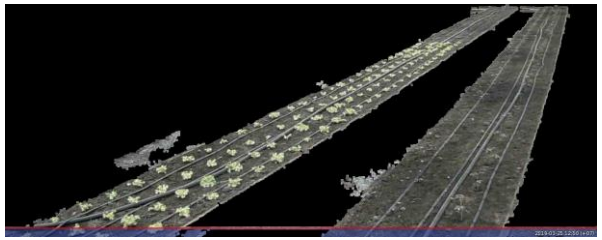

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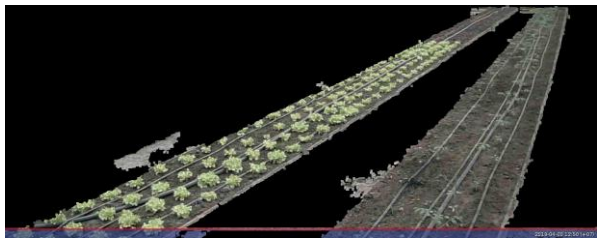
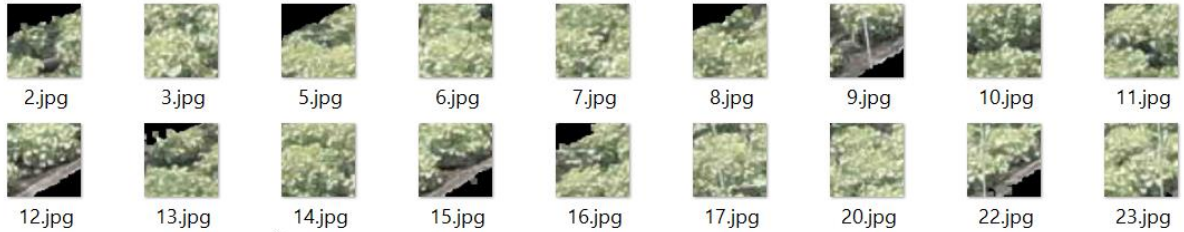
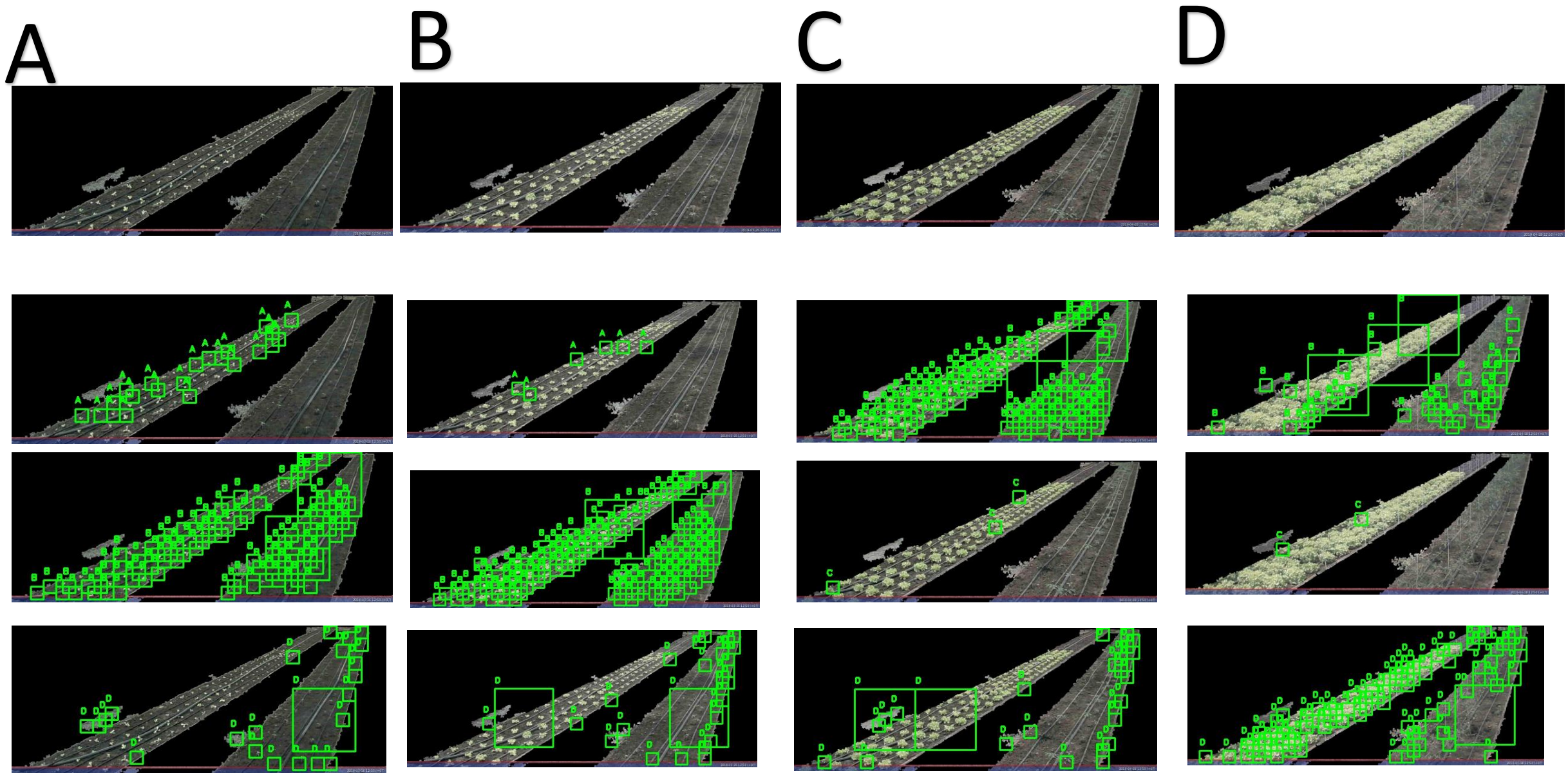


D



Model Validation : Crop Prediction



Contents

-Introduction of WiMarC Platform
-Platform Concept : Input & Control
-Platform Concept : Analysis
-Platform Concept: Dashboard

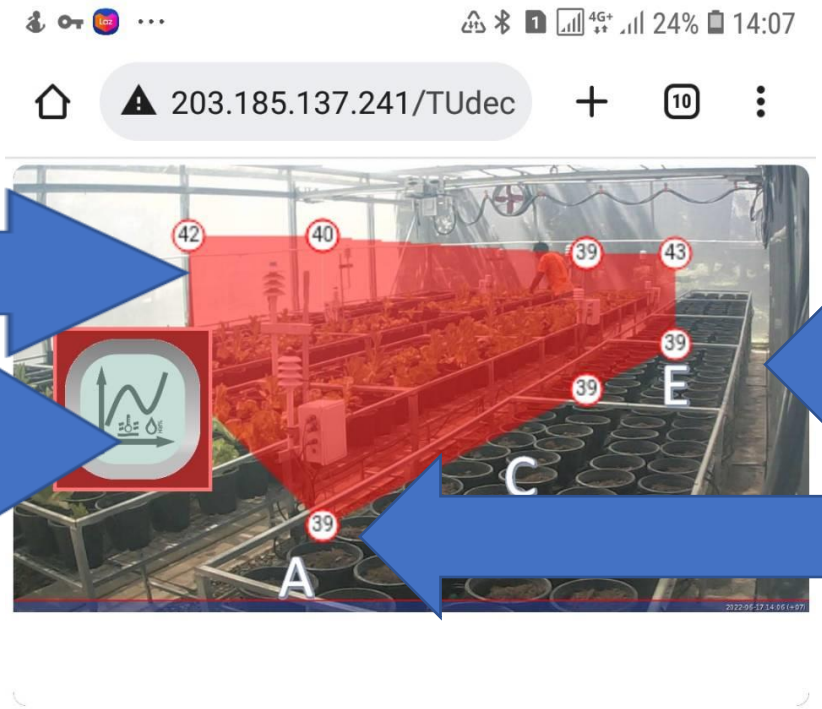
Dashboard

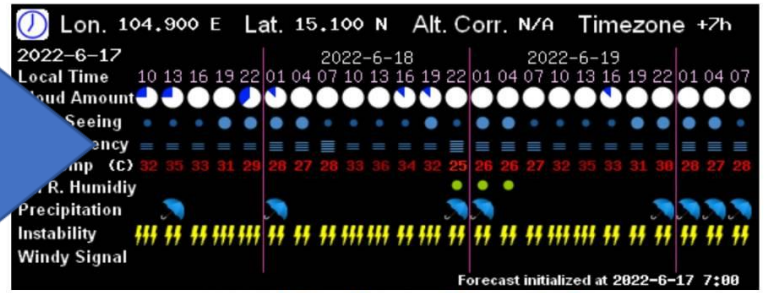
Data to Image

Link to old data

Image Data

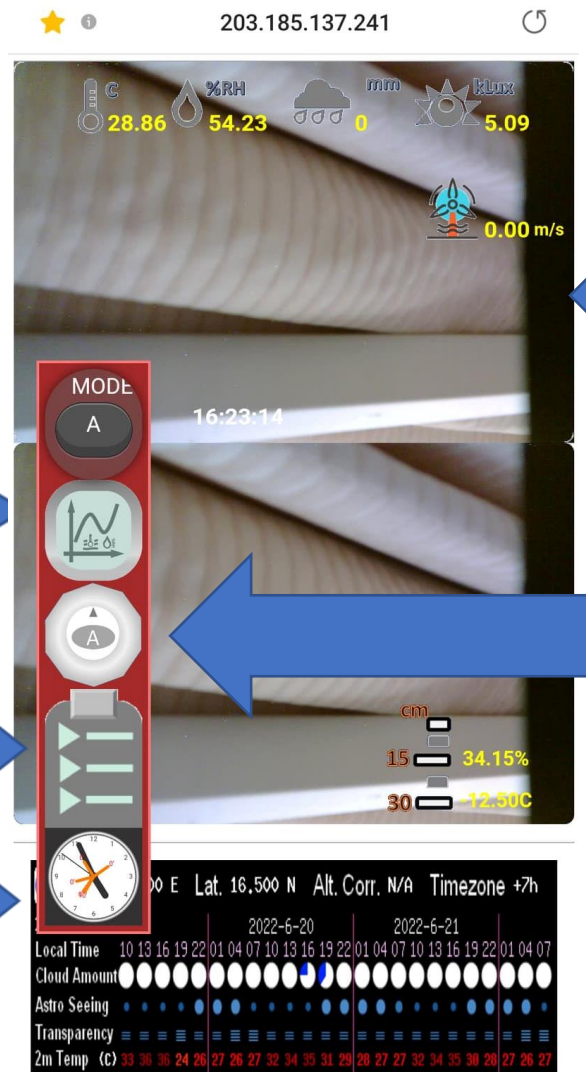
Weather forecast





source:http://www.7timer.info

Dashboard



Image

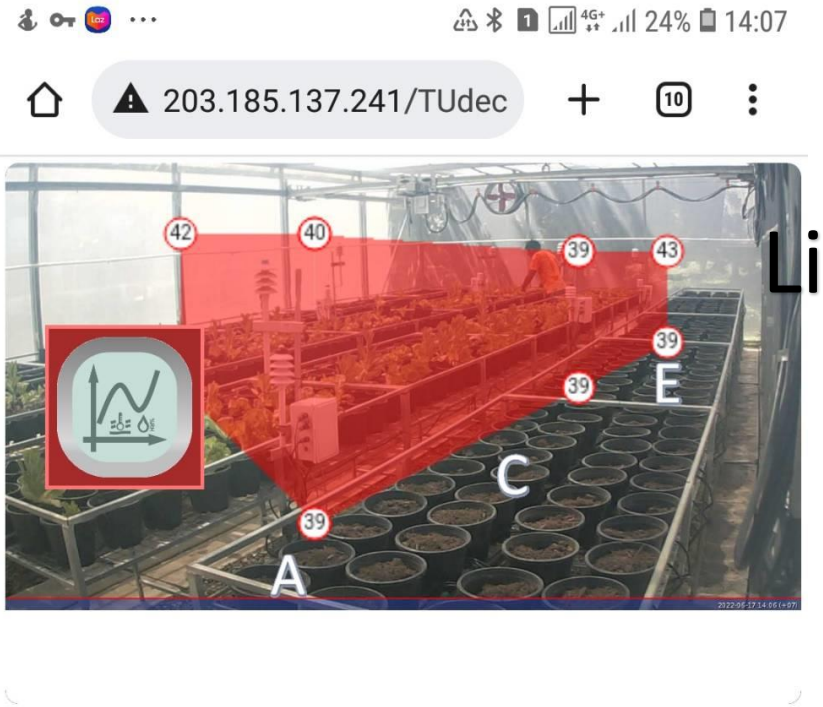
Link to old data

Control setting

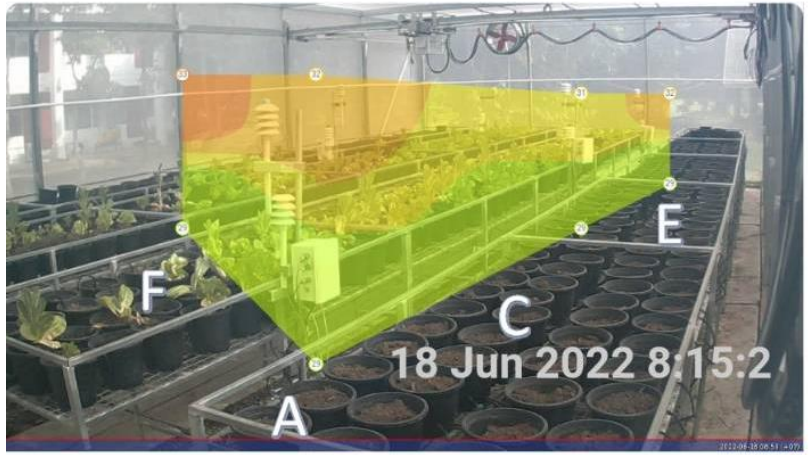
User record

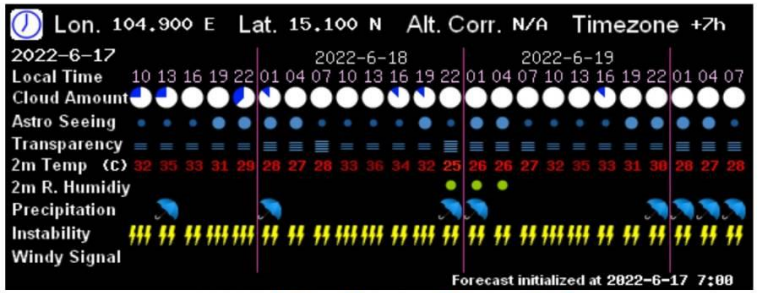
Time with setting

Dashboard



Link to old data





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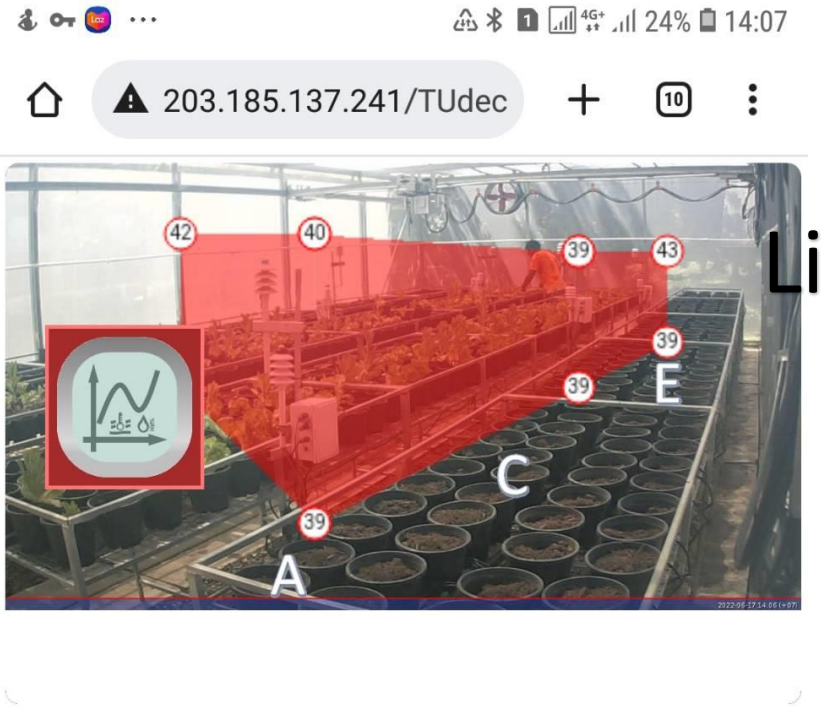
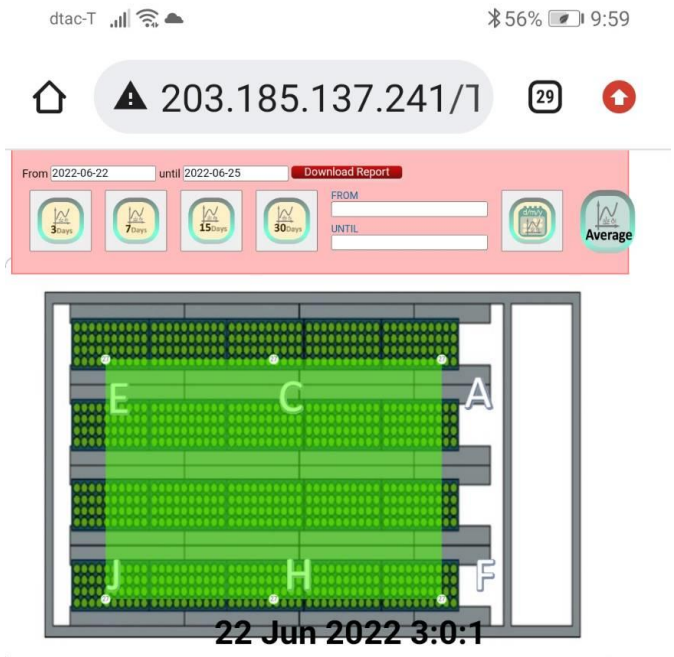
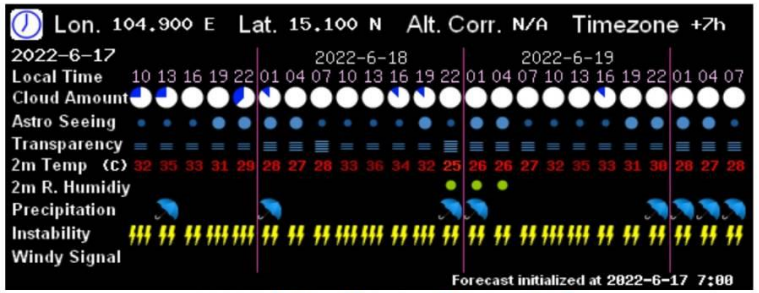
Dashboard



Link to old data





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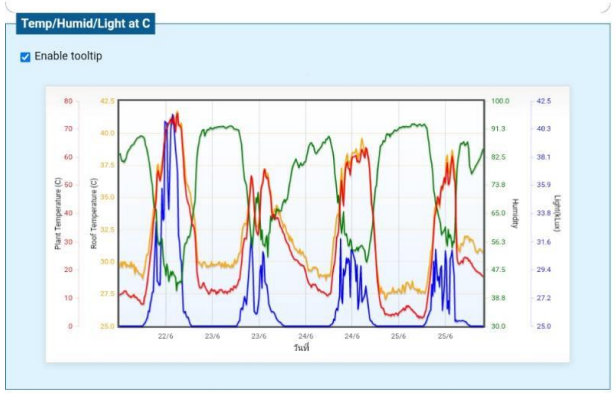
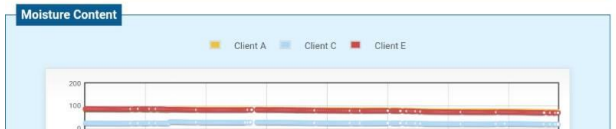
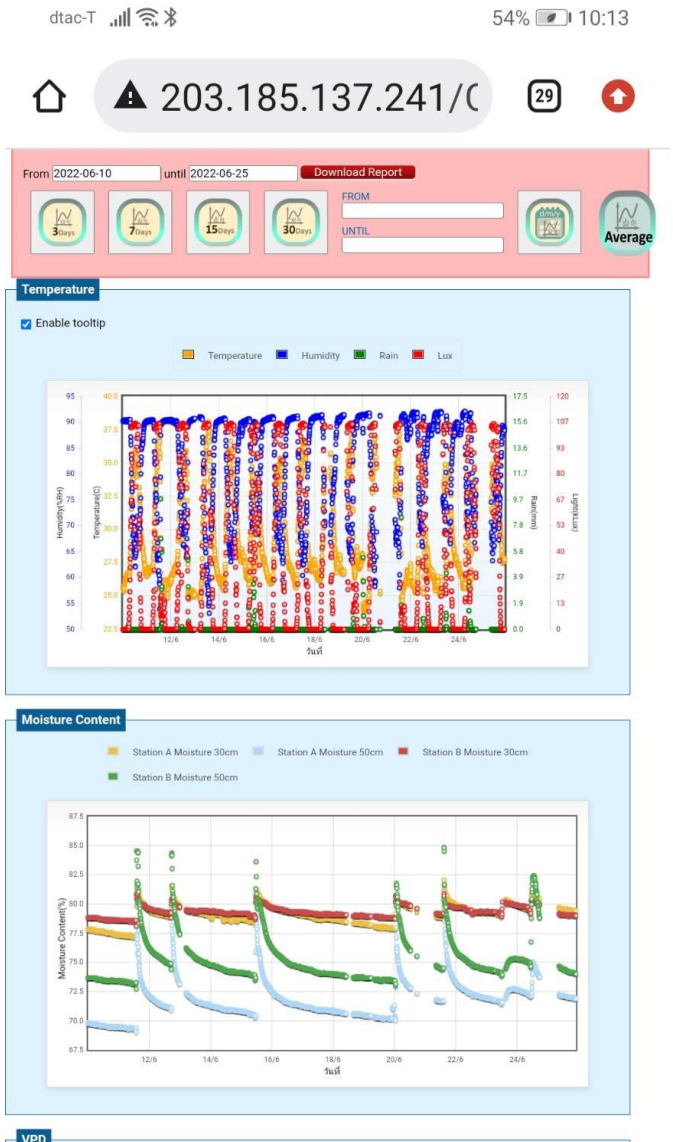




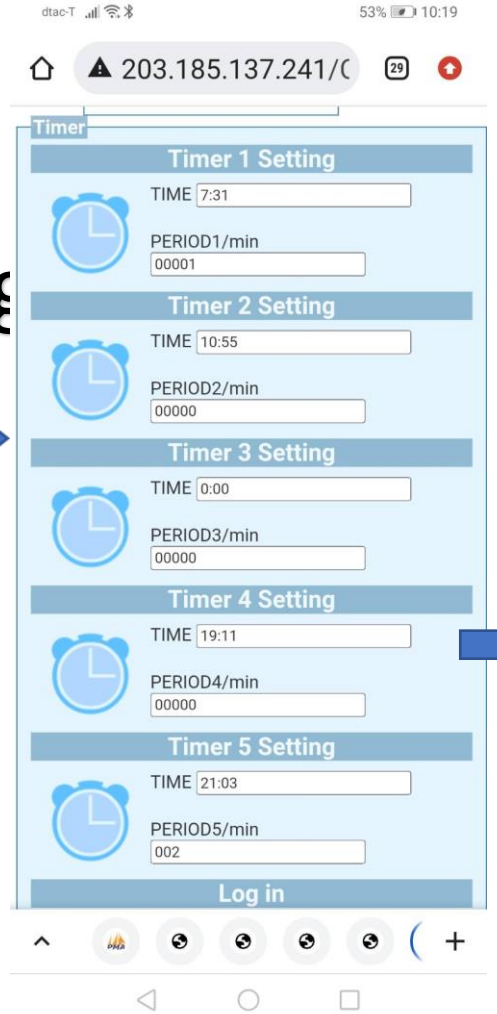
Dashboard

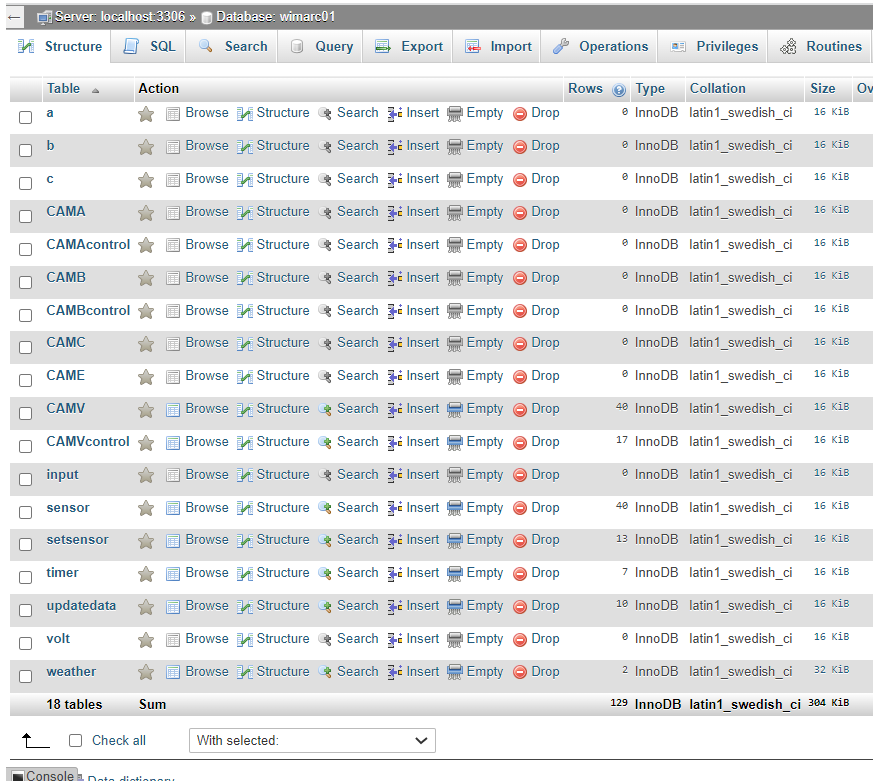


Link to average data

Dashboard

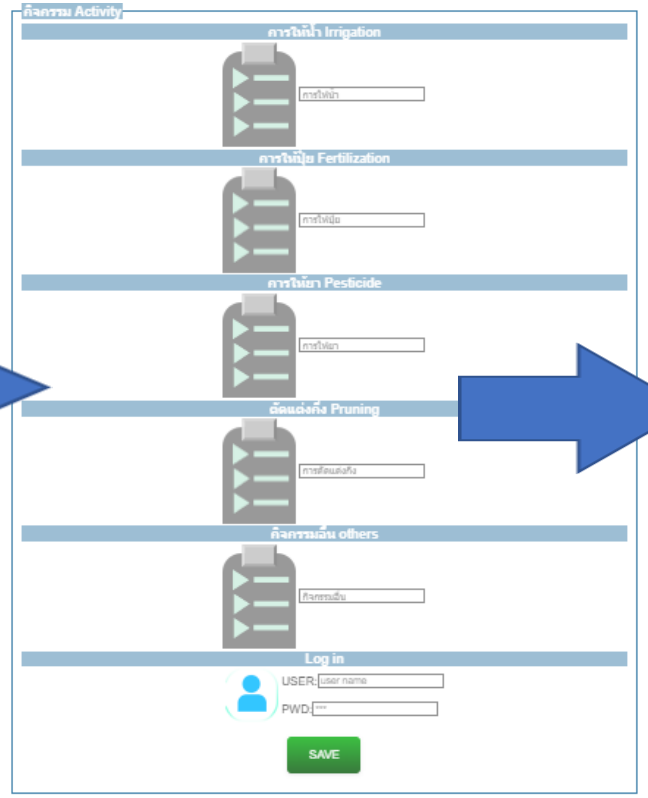
setting

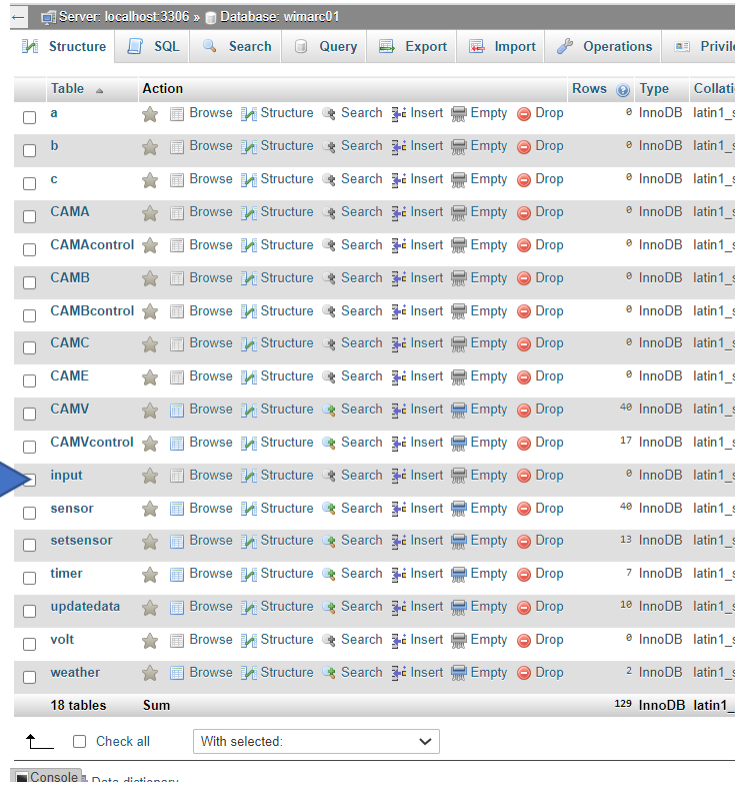




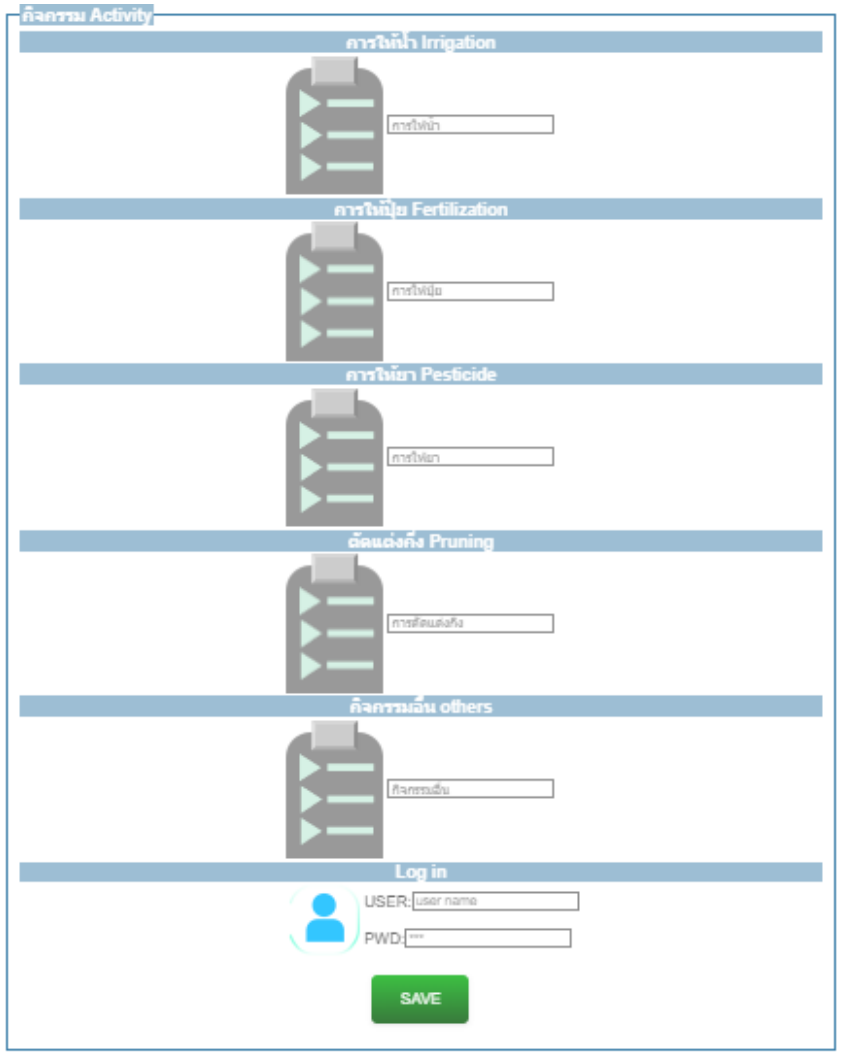
Dashboard

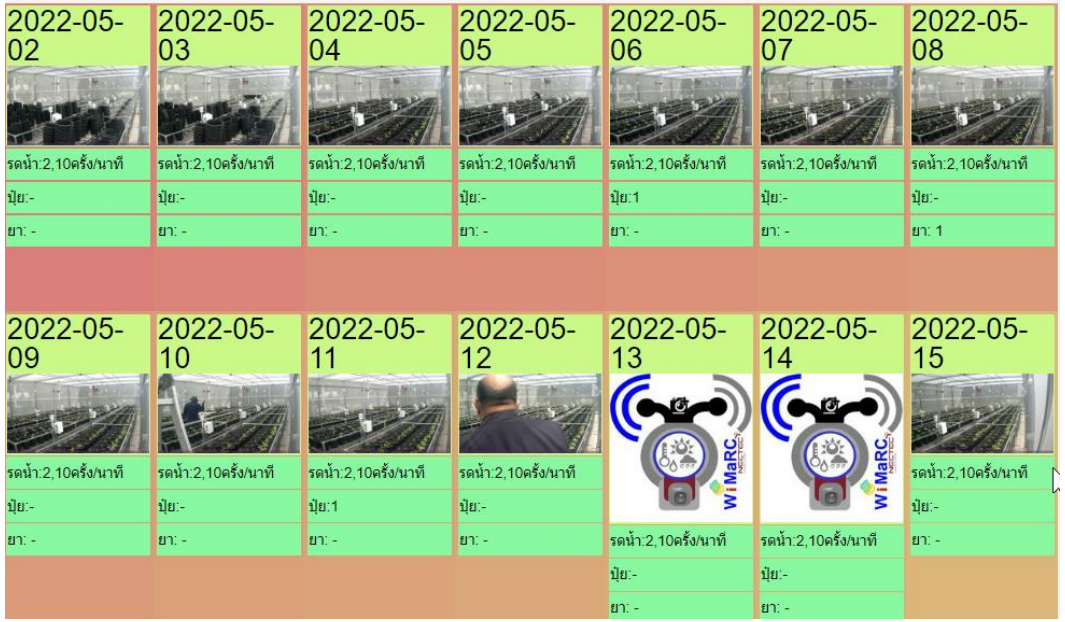
User Activity





Dashboard : Calendar





Dashboard : Crop Information

ที่มาของเมล็ดพันธุ์

หจก.ไทยล้านนาเมล็ดพันธุ์

Red Oak	Green Cos	Butterhead	Frillice Iceberg

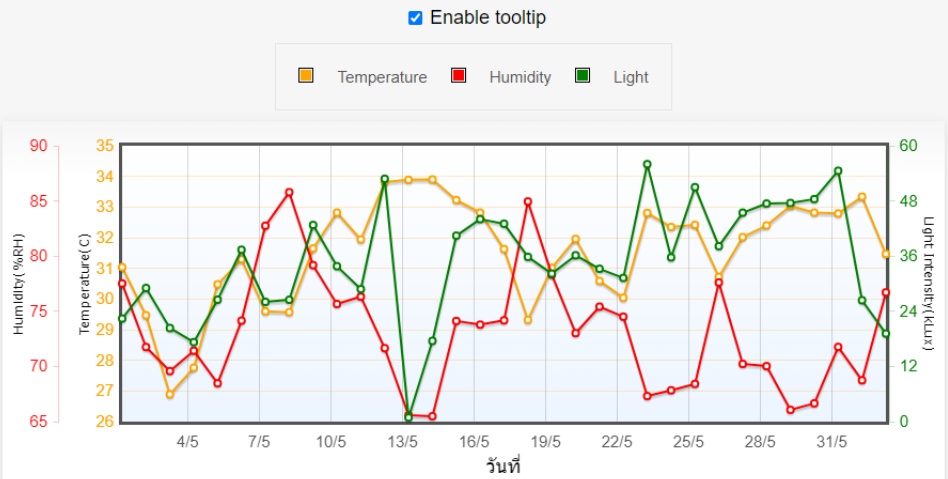
การเพาะกล้า

หยอดเมล็ดผักกาดหอมจำนวน 4 พันธุ์ ได้แก่ Red oak, Green cos, Butterhead และ Frillice iceberg จำนวน 2 เมล็ดต่อหลุม ลงในหลุมเพาะขนาดเท่ากับ 2.4 x 2.4 x 4.0 เซนติเมตร ที่บรรจุวัสดุเพาะเป็นพีทมอส วางถาดเพาะกล้าในตู้เพาะที่ควบคุมอุณหภูมิ 25 องศาเซลเซียส และแสง 16 ชั่วโมง/วัน รดน้ำทุกเช้าเย็นด้วยอัตราที่เท่ากัน รดน้ำทุกวัน และเมื่อต้นกล้ามีอายุ 7 วันหลังเพาะ ทำการถอนแยกให้เหลือ 1 ต้นต่อหลุม และเมื่อต้นกล้าอายุ 14 วัน นำออกจากตู้เพาะไปวางไว้ในโรงเรือนเพื่อให้ต้นกล้าปรับสภาพก่อนการปลูกลงในกระถางบนโต๊ะปลูกเป็นเวลา 1 วัน ซึ่งทำให้ได้ระยะการเพาะกล้าอยู่ที่ 15 วัน

การปลูกและการดูแลรักษา

เมื่อต้นกล้ามีอายุ 15 วัน หรือมีใบจริงจำนวน 2-4 ใบ ทำการย้ายปลูกลงในกระถางขนาดเส้นผ่านศูนย์กลาง 30 เซนติเมตร บรรจุวัสดุปลูกที่ประกอบด้วย หน้าดิน : ใบก้ามปูหมัก : ขี้เค้กหมัก : มูลไก่หมัก: ขุยมะพร้าว: กาบมะพร้าวสับ: ขี้เถ้าแกลบ: หน้าดิน อัตราส่วน 1: 0.25: 0.5: 0.5: 0.1: 0.1: 0.1 โดยปริมาตร (เปรียบเทียบกับวัสดุปลูกที่ประกอบด้วย แกลบดิบ แกลบเผา ขุยมะพร้าวและมูลวัว อัตรา 1:1:1:1 โดยปริมาตร ซึ่งเป็นวัสดุปลูกที่ใช้ในการทดลองก่อนหน้า) บรรจุกระถางละ 3 กิโลกรัม และใส่ปุ๋ยโดยการใส่ปุ๋ยอินทรีย์ผง อัตรา 20.90 กิโลกรัม N ต่อไร่ (57 กรัมต่อกระถาง) ในวันปลูก ทั้งนี้ในการคำนวณอัตราการใส่ปุ๋ยเป็นการคำนวณจากอัตราการใส่ต่อต้น (ที่กำหนดระยะปลูกในสภาพแปลงคือ 25 x 25 เซนติเมตรต่อ 1 ไร่ ซึ่งสามารถปลูกผักกาดหอมได้ 25,600 ต้น) วางกระถางที่ปลูกผักกาดหอมแต่ละพันธุ์แบบสุ่มตามบล็อก (แถวโต๊ะปลูก) โดยทุกแถวจะประกอบด้วยพันธุ์ผักกาดหอมทุกพันธุ์ ให้น้ำด้วยระบบน้ำหยด หรือมินิสปริงเกลอร์ที่กำหนดอัตราการให้น้ำที่เท่ากันทุกกระถาง ในส่วนการควบคุมอุณหภูมิภายในโรงเรือนกำหนดการใช้ระบบเรียงลำดับดังนี้คือ การพ่นหมอก การเปิดพัดลม และการพรางแสง ตามสิ่งทดลองที่กำหนด โดยควบคุมอุณหภูมิในช่วงกลางวันไม่เกิน 30±3 หรือ 35±3 องศาเซลเซียส เปรียบเทียบกับสิ่งทดลอง (โรงเรือน) ที่ไม่มีการควบคุมอุณหภูมิ ฉีดพ่นสารสกัดธรรมชาติเพื่อกำจัดโรคและแมลงเมื่อมีการระบาดและกำจัดวัชพืชโดยวิธีกลอย่างสม่ำเสมอ ทำการเก็บเกี่ยวผลผลิตเมื่อผักกาดหอมพันธุ์เรดโอ๊คมีอายุ 30 วันหลังย้ายปลูก

ค่าเฉลี่ยสภาวะแวดล้อม 24 ชั่วโมง



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ปุ๋ย:-	ปุ๋ย:-	ปุ๋ย:-	ปุ๋ย:-	ปุ๋ย:1	ปุ๋ย:-	ปุ๋ย:-
ยา: -	ยา: -	ยา: -	ยา: -	ยา: -	ยา: -	ยา: 1

2022-05-09	2022-05-10	2022-05-11	2022-05-12	2022-05-13	2022-05-14	2022-05-15
รดน้ำ:2,10ครั้ง/นาที	รดน้ำ:2,10ครั้ง/นาที	รดน้ำ:2,10ครั้ง/นาที	รดน้ำ:2,10ครั้ง/นาที	รดน้ำ:2,10ครั้ง/นาที	รดน้ำ:2,10ครั้ง/นาที	รดน้ำ:2,10ครั้ง/นาที
ปุ๋ย:-	ปุ๋ย:-	ปุ๋ย:1	ปุ๋ย:-	ปุ๋ย:-	ปุ๋ย:-	ปุ๋ย:-
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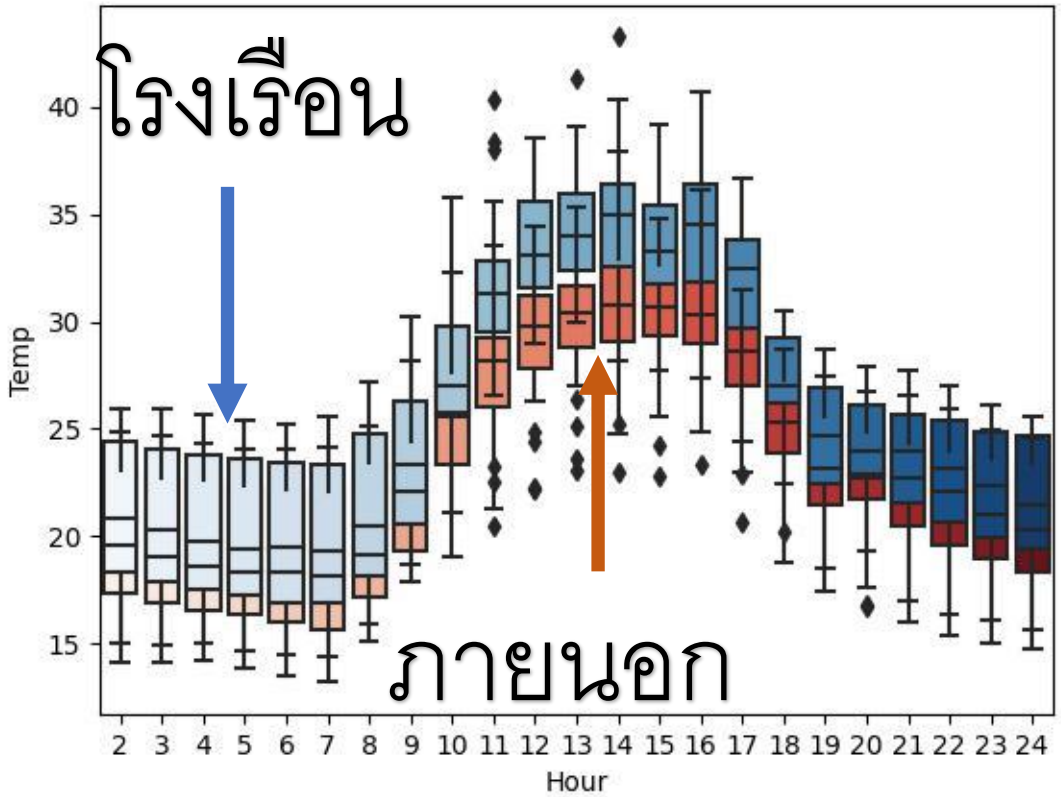
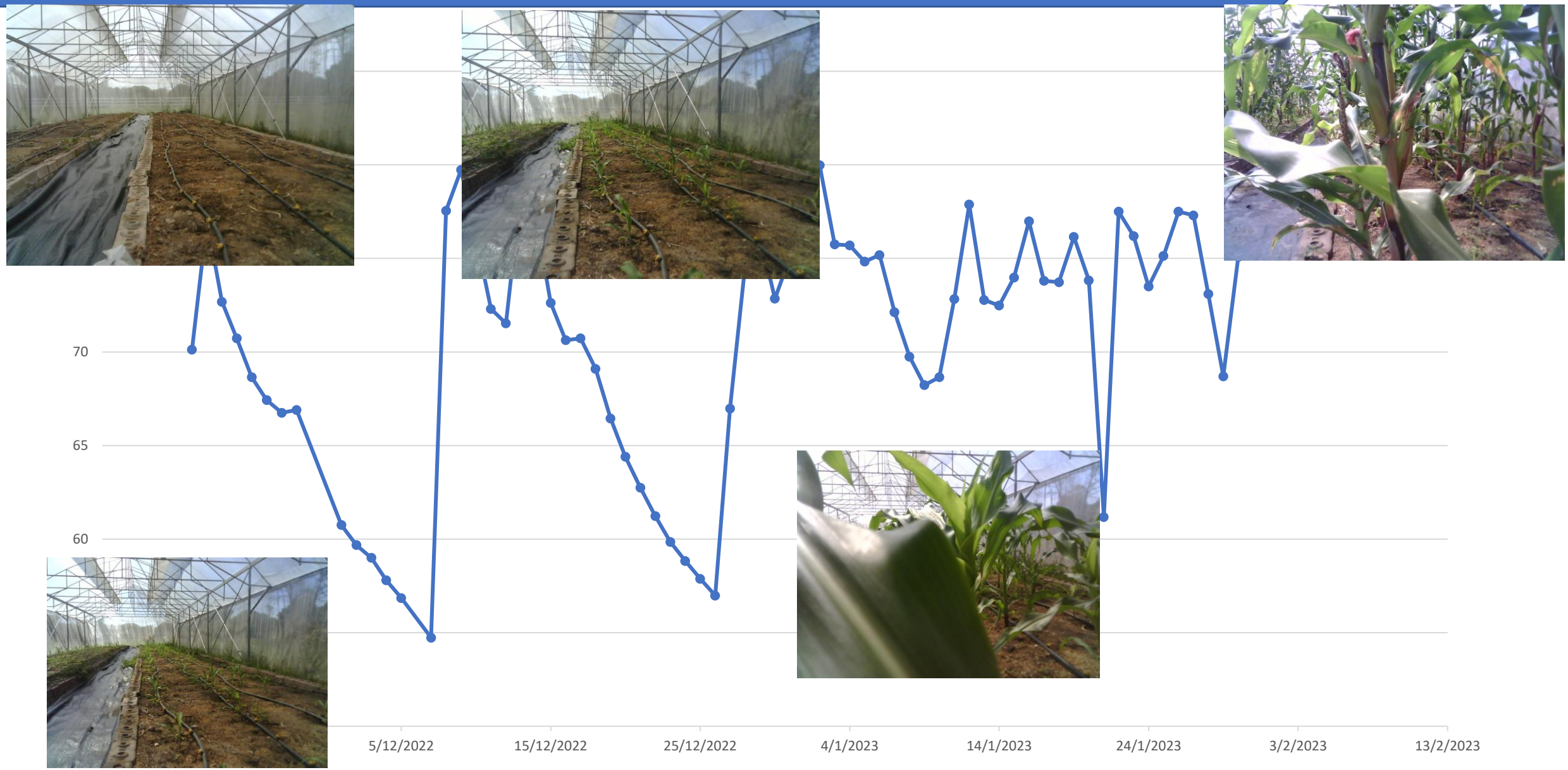
CASE study : GHubon



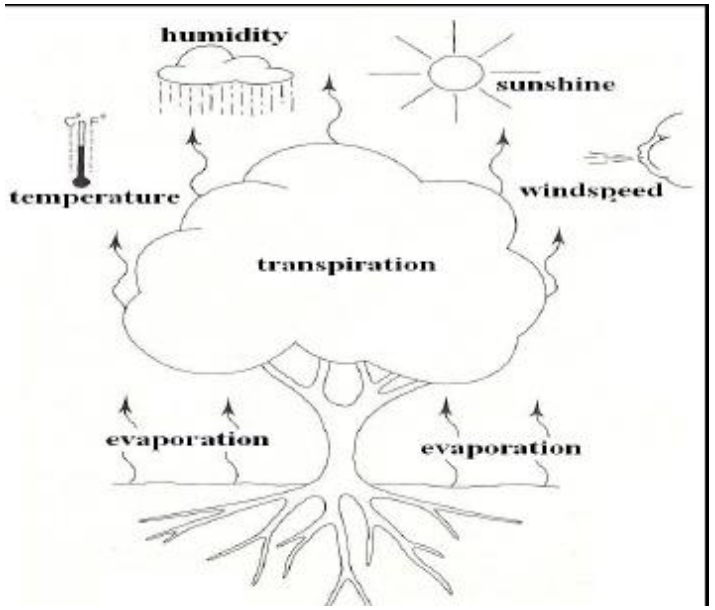
CASE study : GHubon

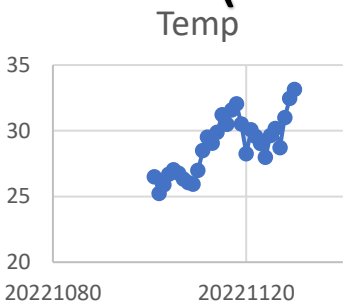


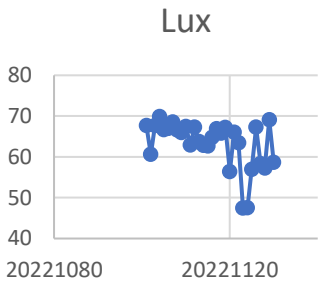
CASE study : Water Requirement with AI

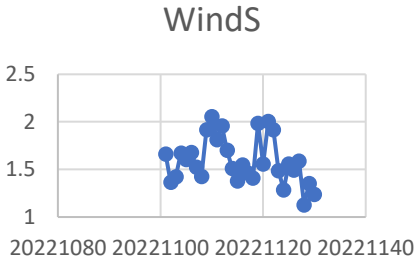
Moisture Content ~ Transpiration, Evaporation

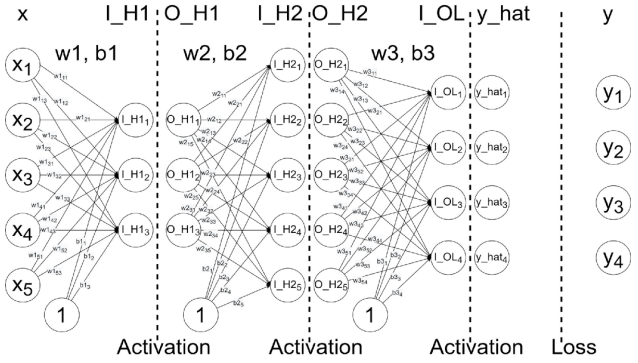
MC =f(Temp, Humid, Light, Wind Speed, Crop)

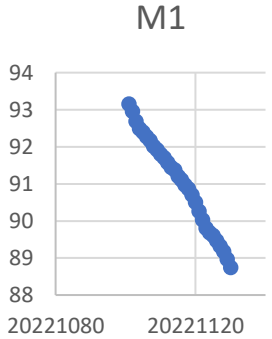


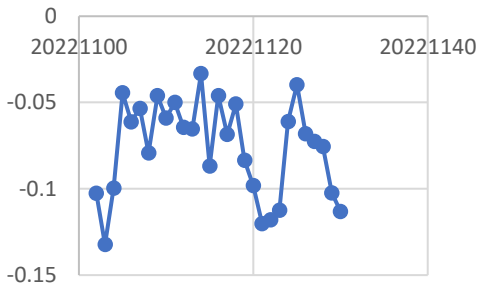










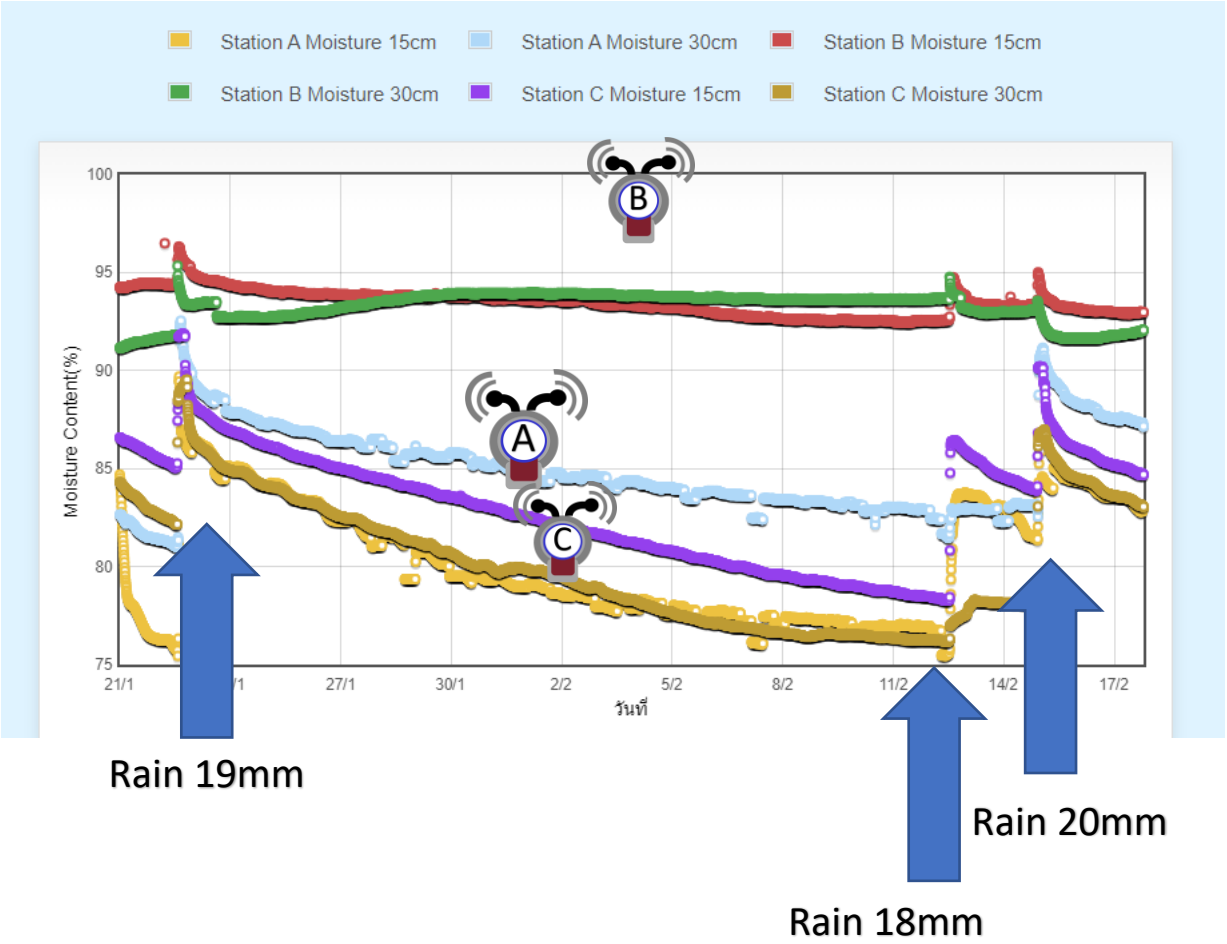


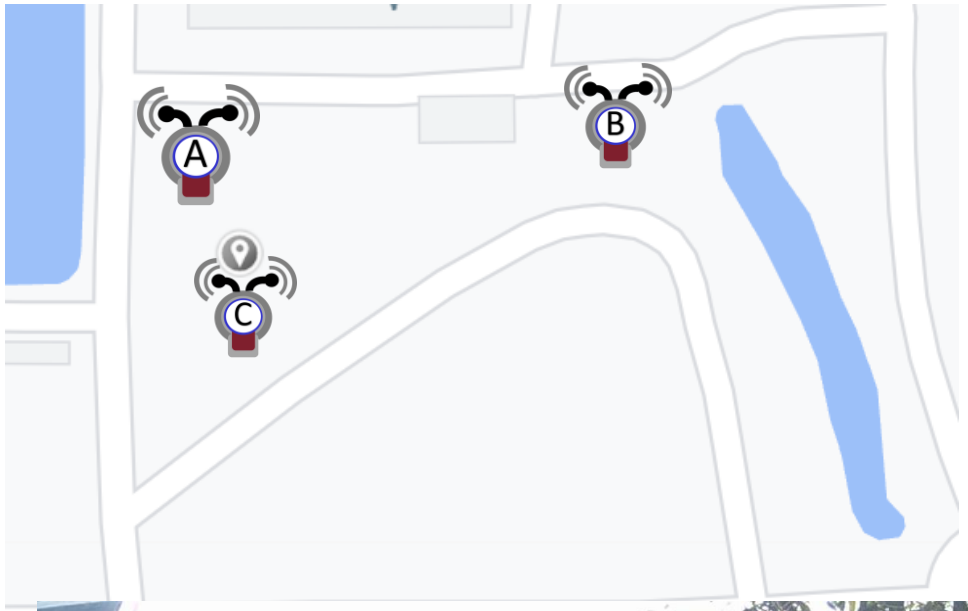
CASE study : Csbangkla ม.ราชภัฏ บางคล้า

Weather Station(MAIN)
-Temp, Humid, Light
-Rain, Windspeed
-Wind Direction

Client Station
-Soil Moisture

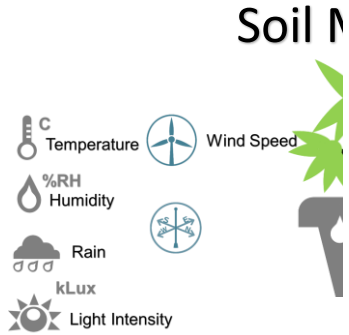
CASE study : Water Management





Management Calendar

ปฏิทินการจัดการการ



ออก

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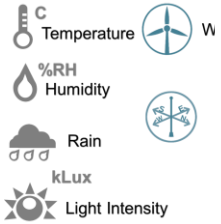
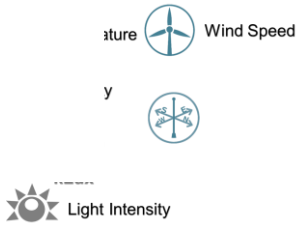
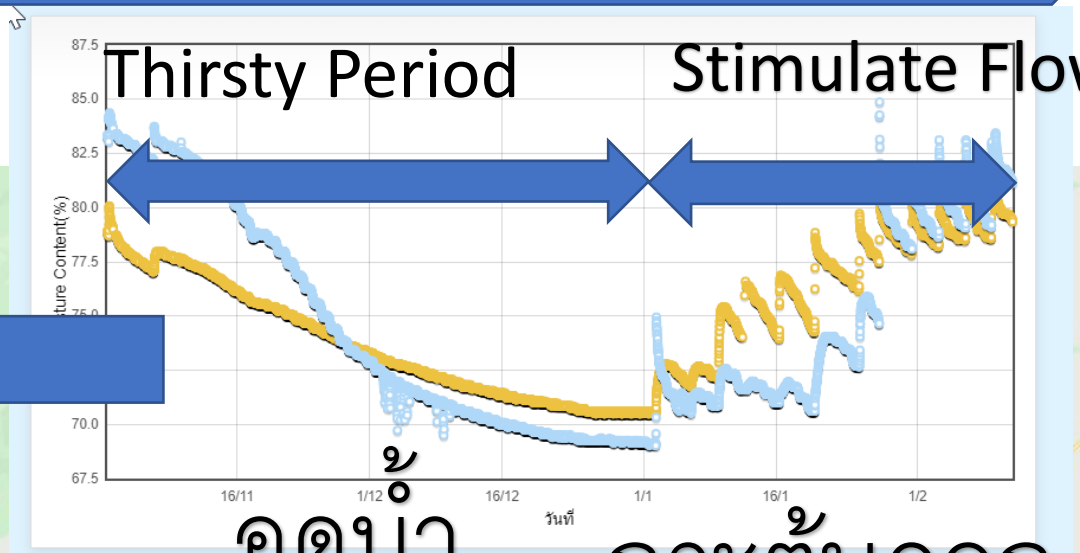
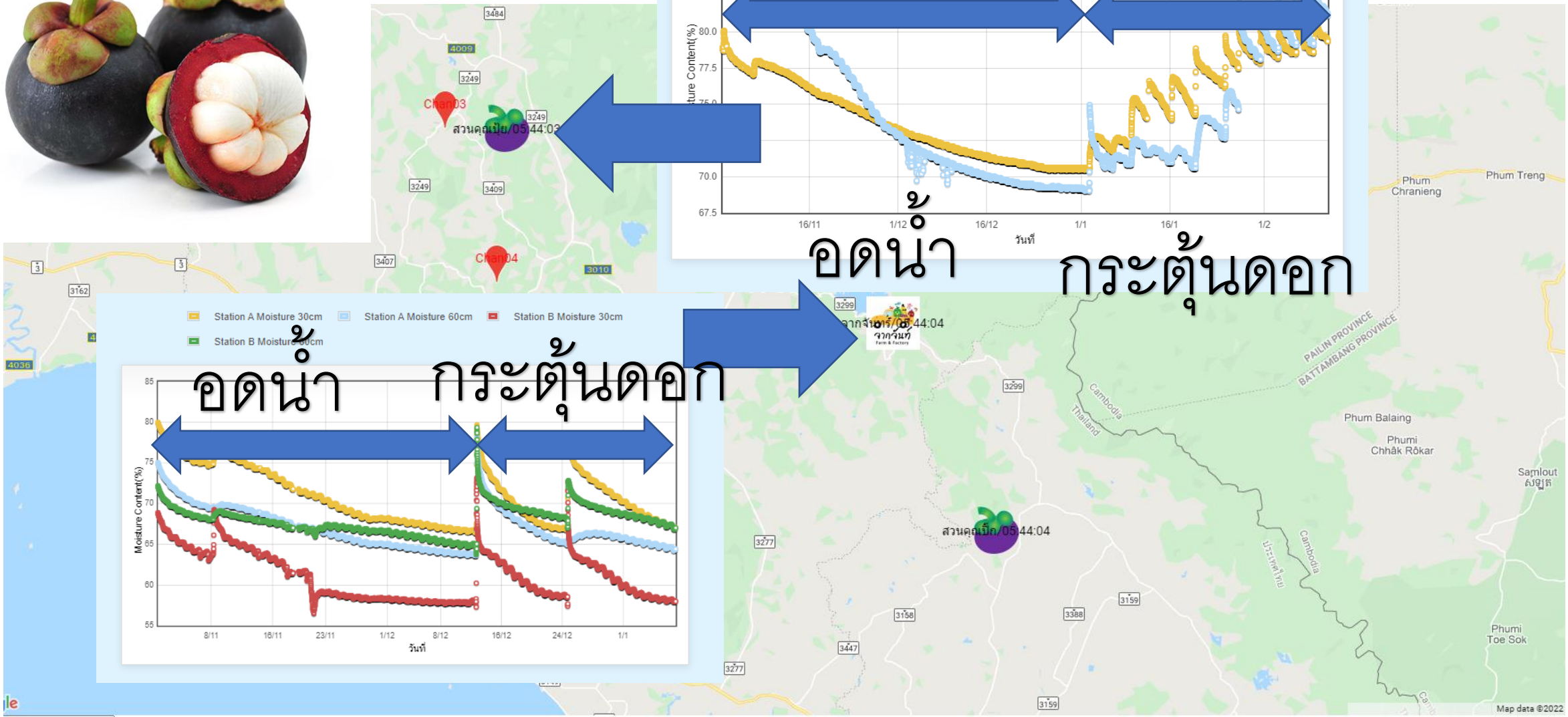




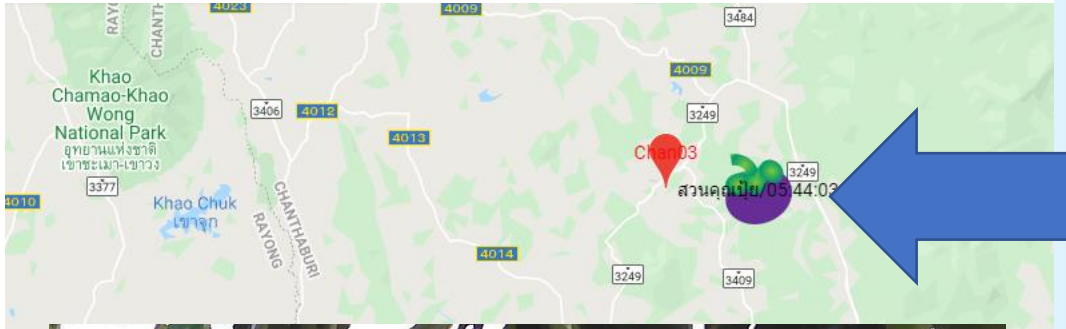
เตรียมการออกดอก

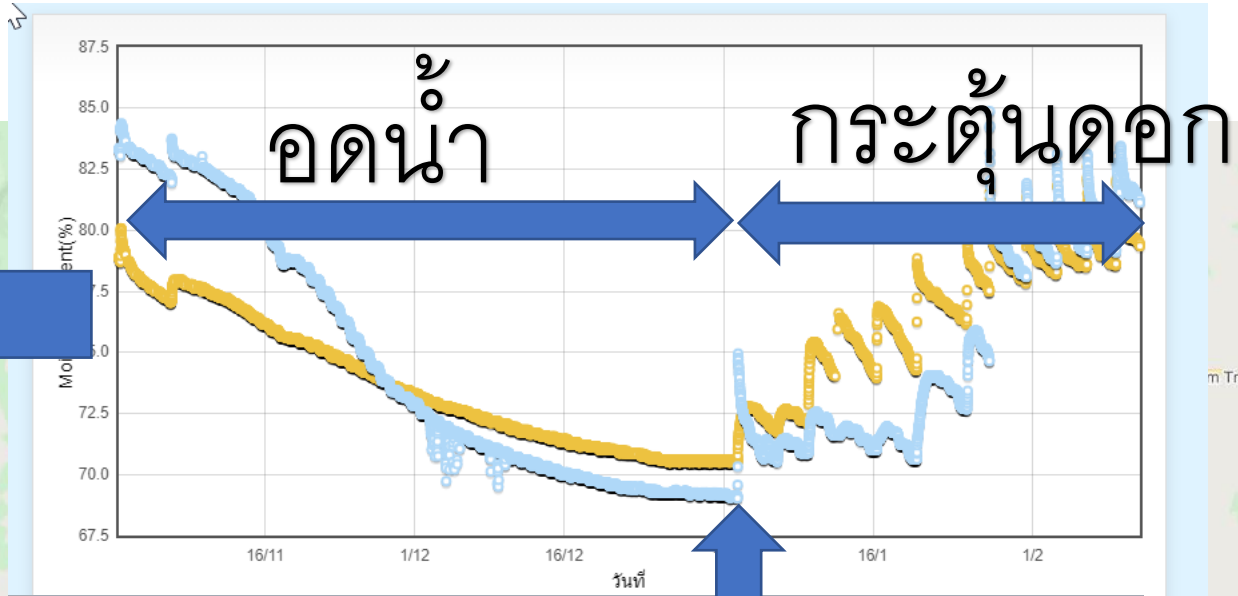
CASE study : Crop Management มังคุด





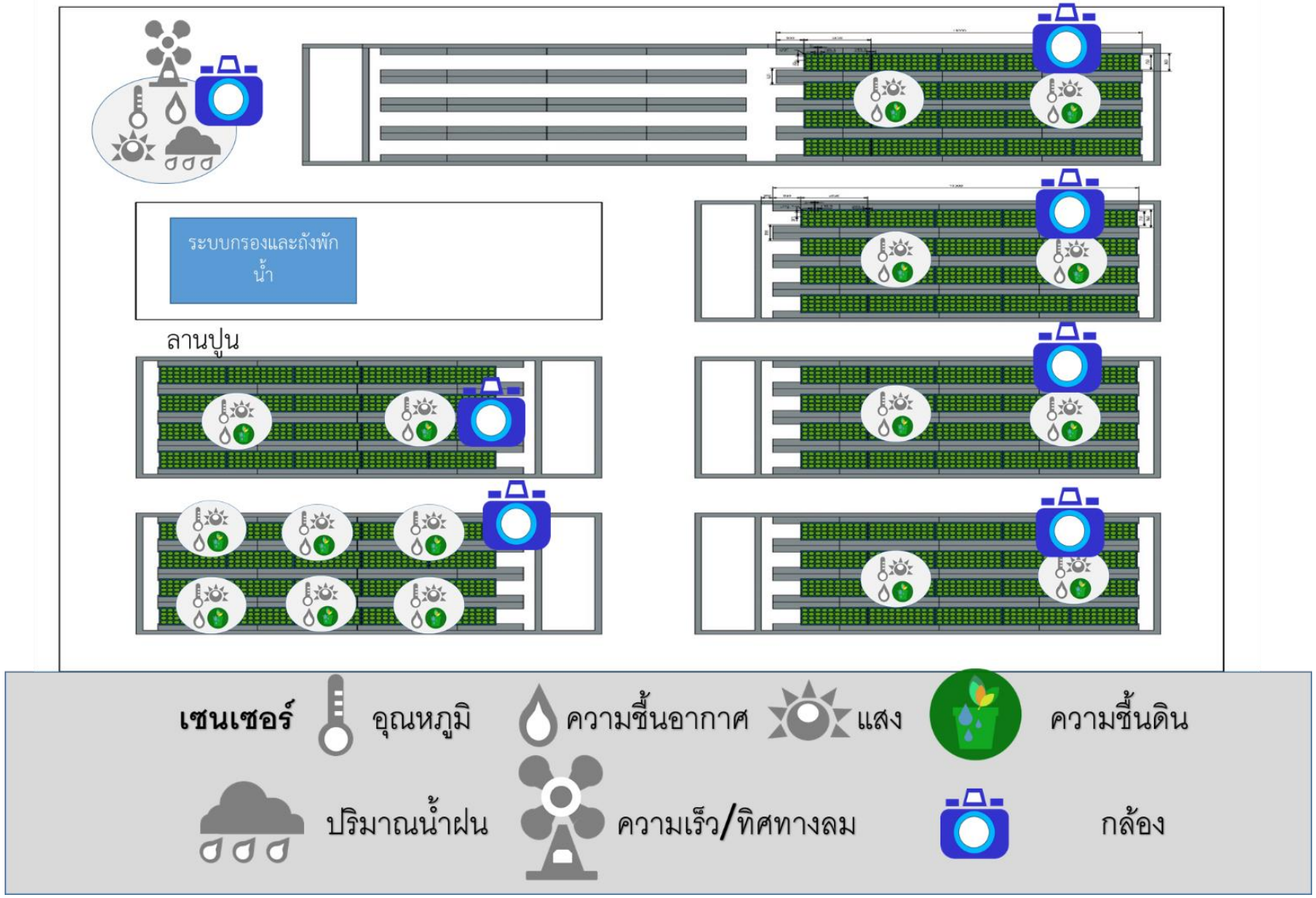
CASE study : Crop Management มังคุด



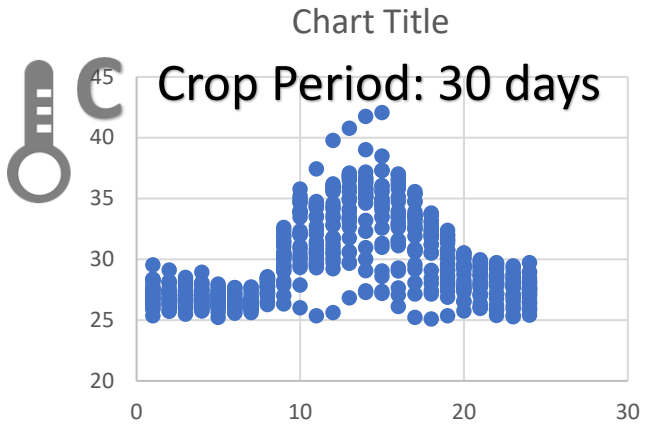


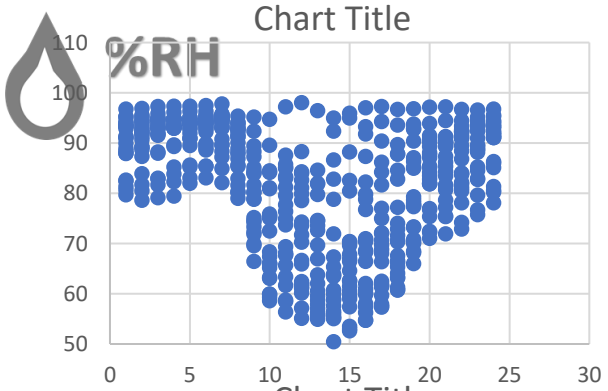
20

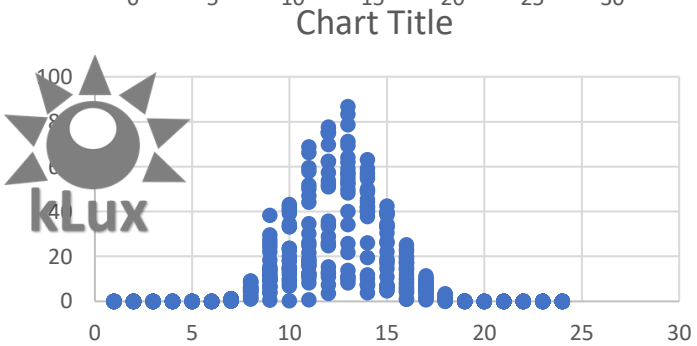
Case study: Crop Requirement

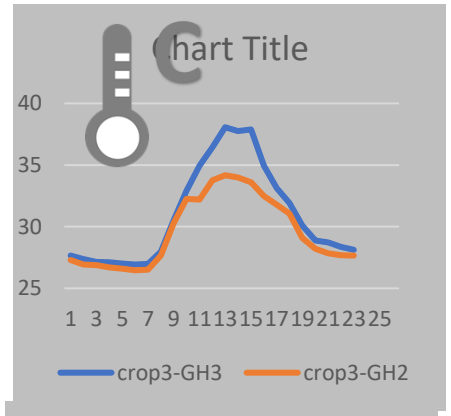


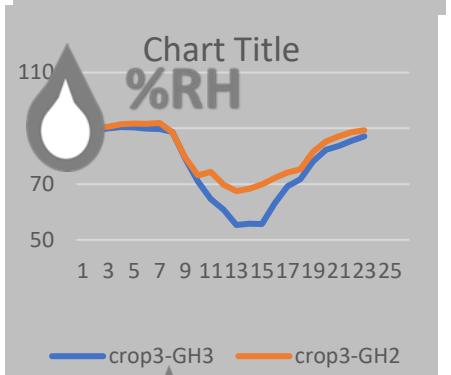
Case study: Crop Requirement

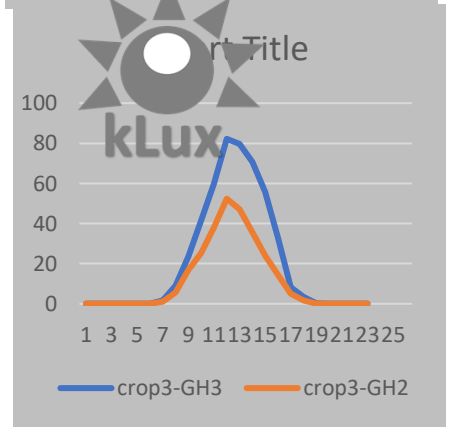




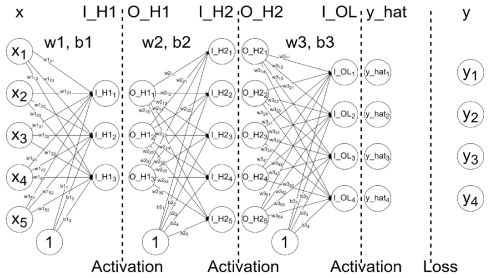








Temp
Humid
Light
VPD
Etc.

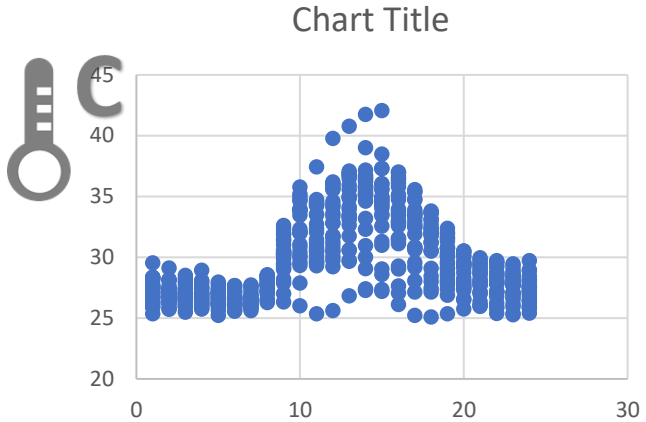


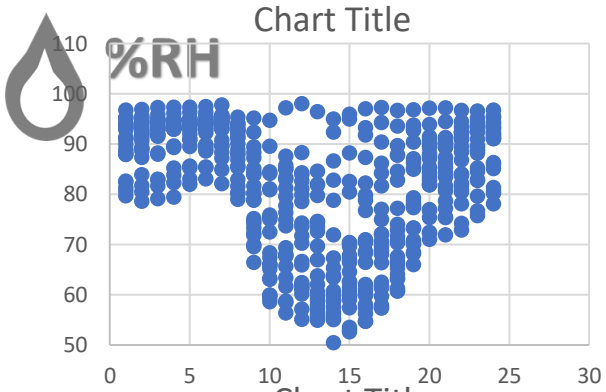
Photosynthesis Rate

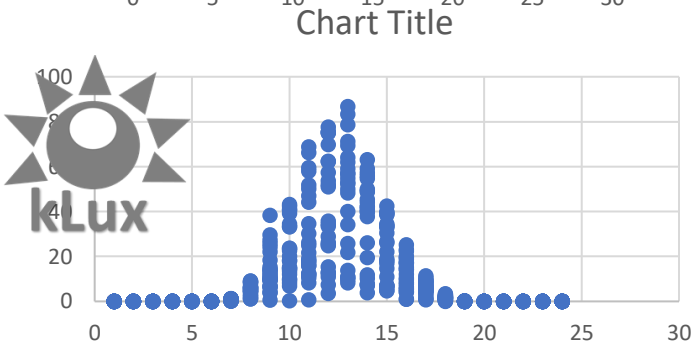
Case study: Crop Requirement

GH3

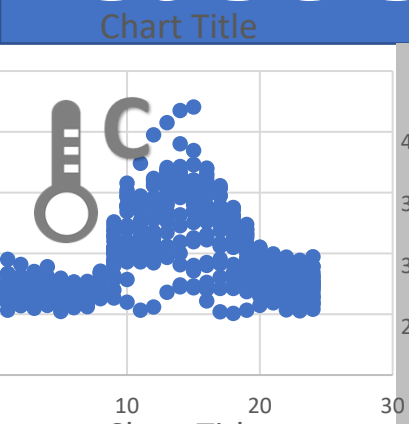
GH2

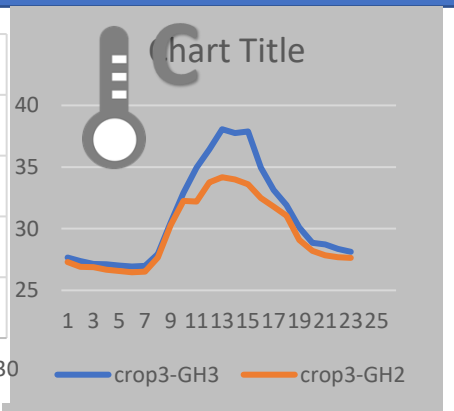


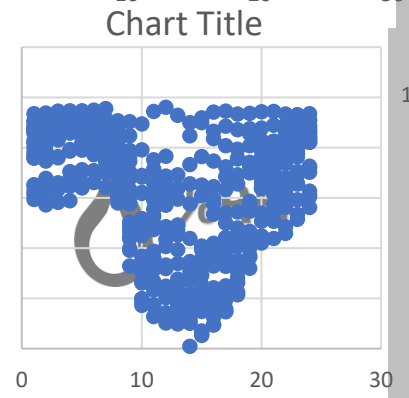


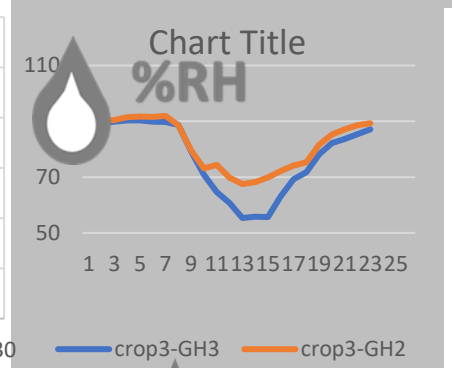


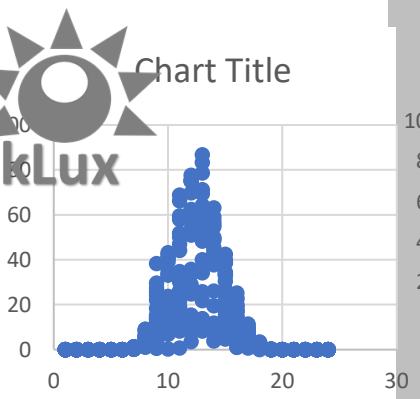
Case study: Crop Requirement with AI

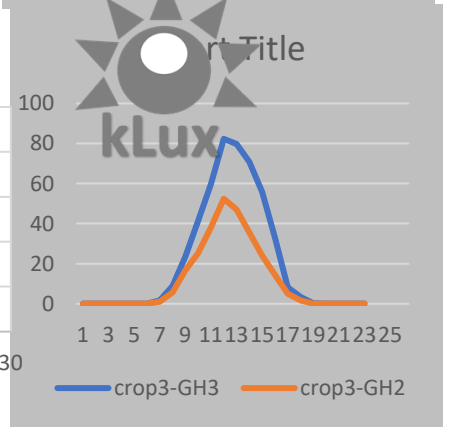


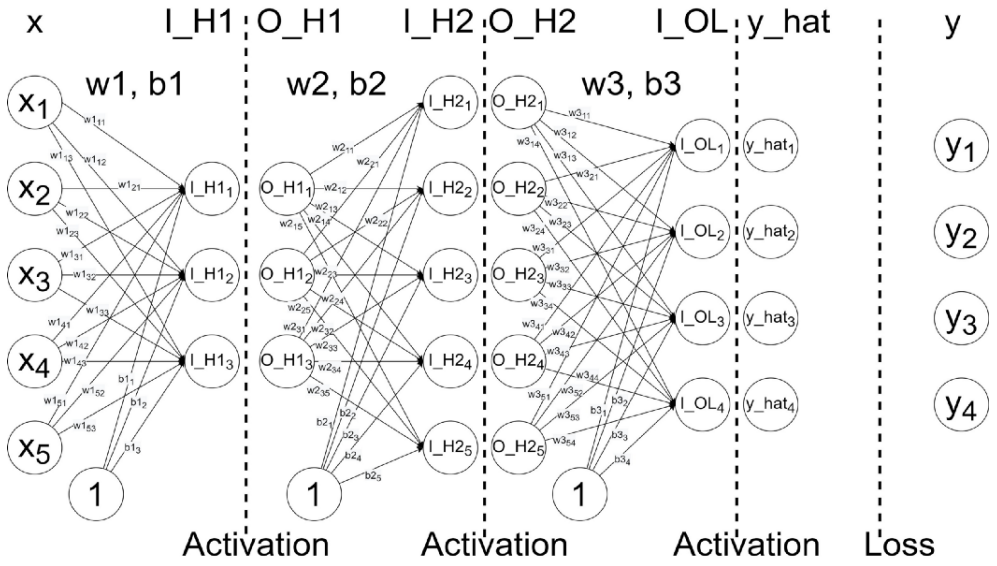


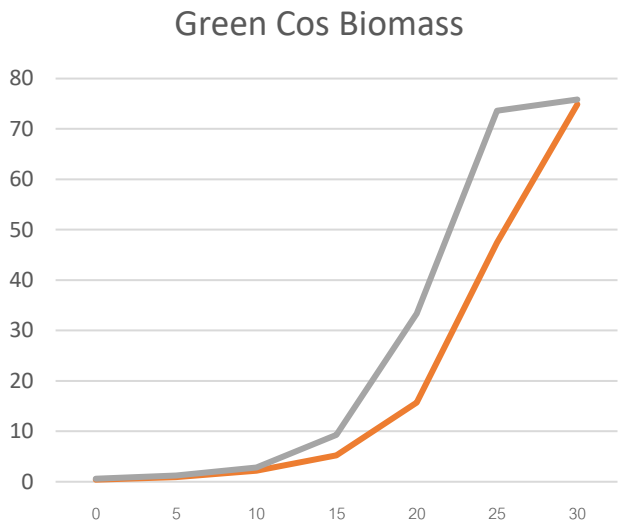












Conclusion

WIMARC next?

Crop Management Calendar

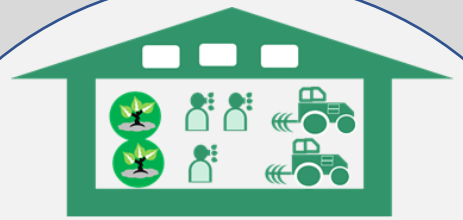
WIMARC

Software Supplier
-Dashboard
-Analysis

Hardware&
Maintance Supplier
-Sensors
-PCB

USERS

Farmer

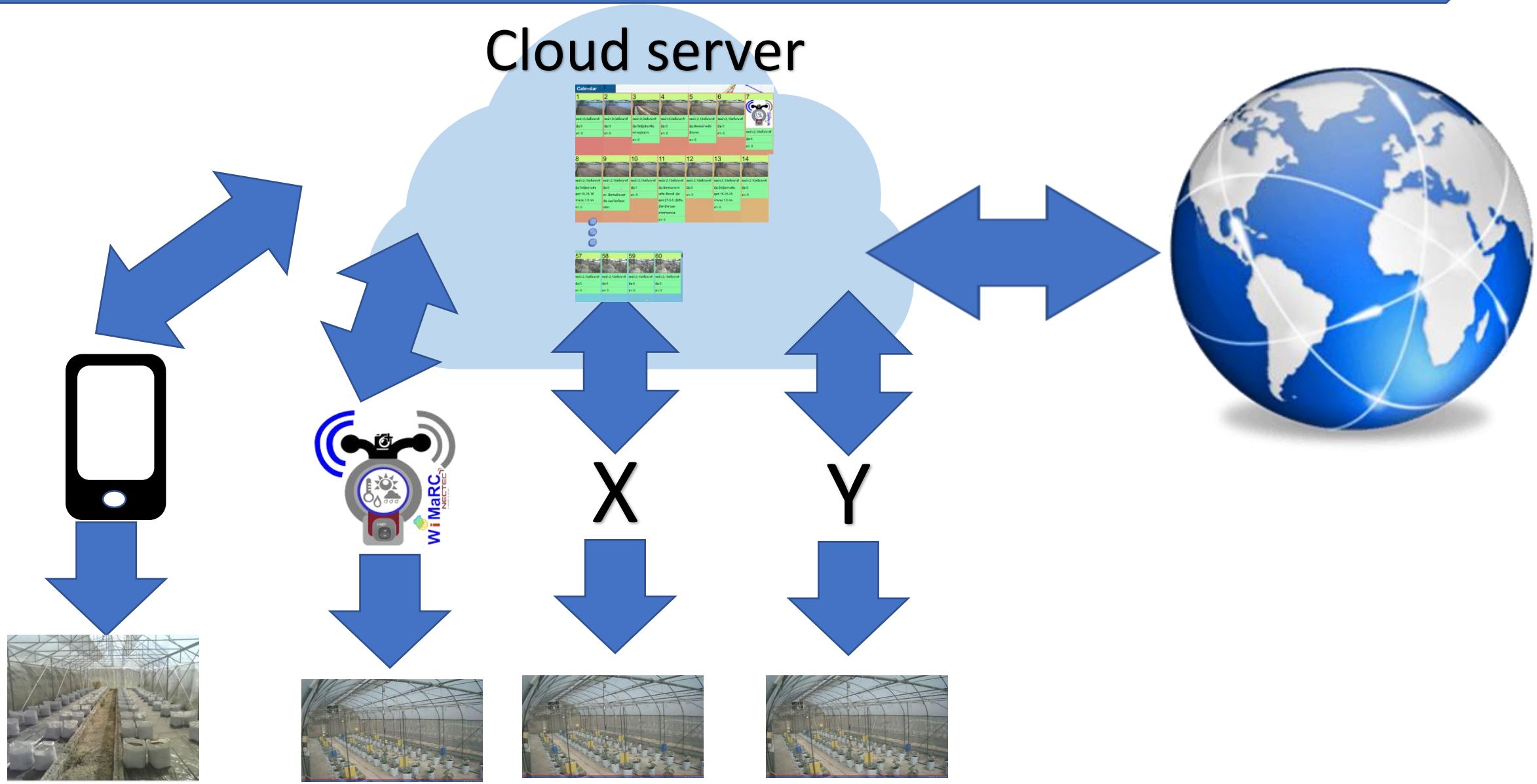


Learning Center

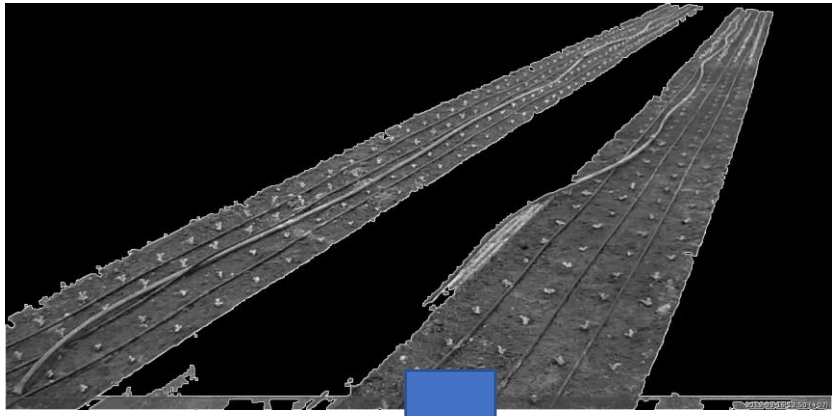
Research Center

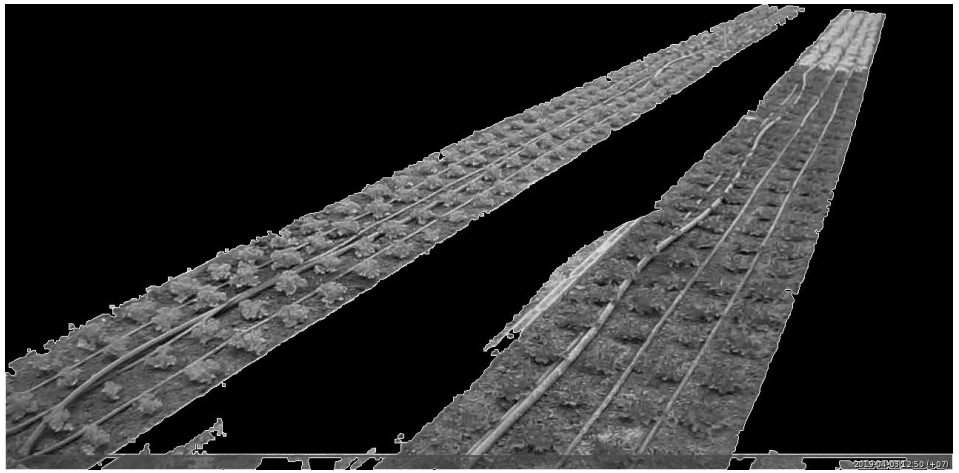
Management Calendar

Management & remote Control



Virtual Farm => Autonomous Farming





WIMARC: 3 Tra

Trade

-Virtual shop
-Seed
-Fertilizer
-Machine & instrument
-Pesticide

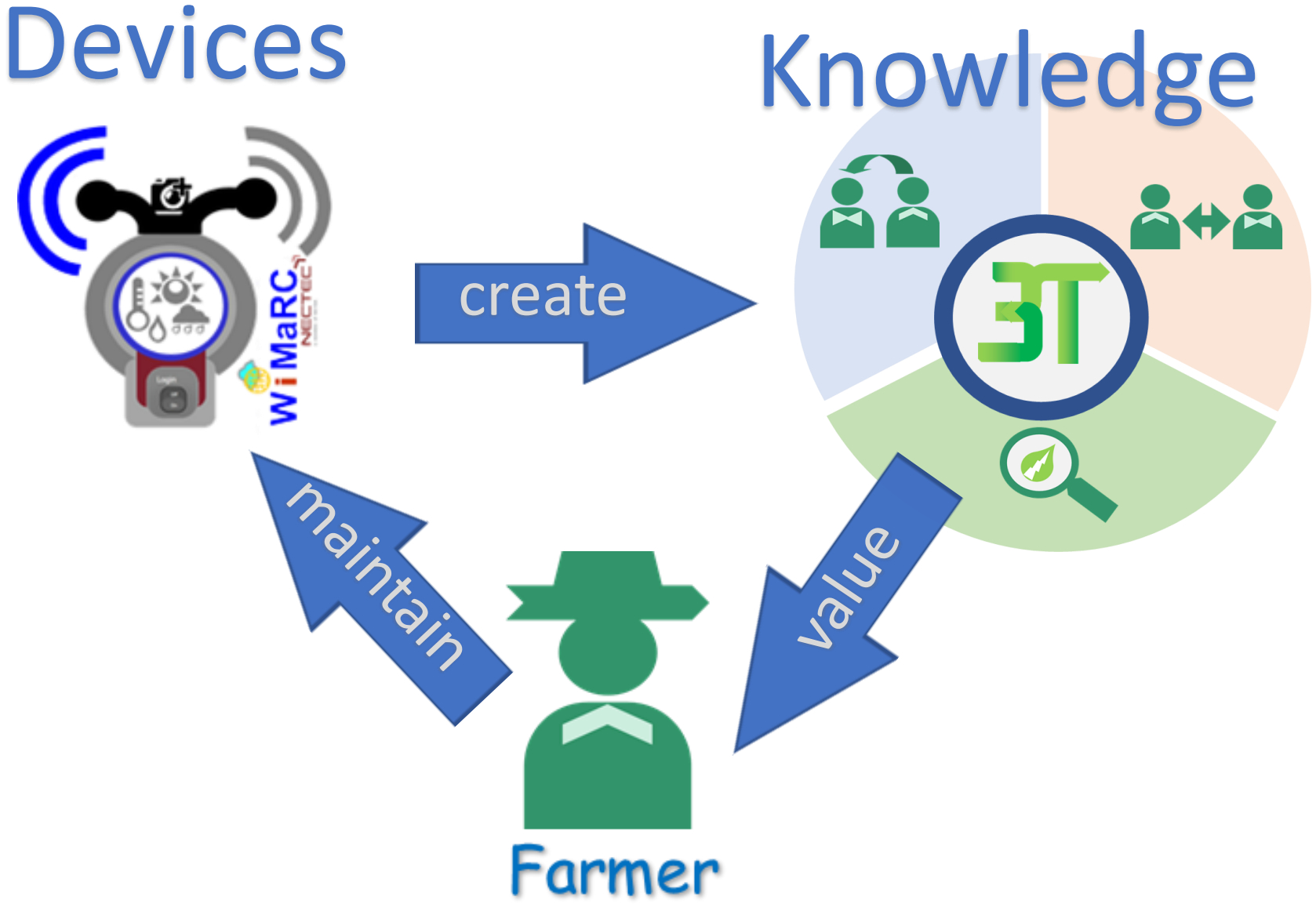
Transfer

-Learning Center
-University
-Agricultural Institutes

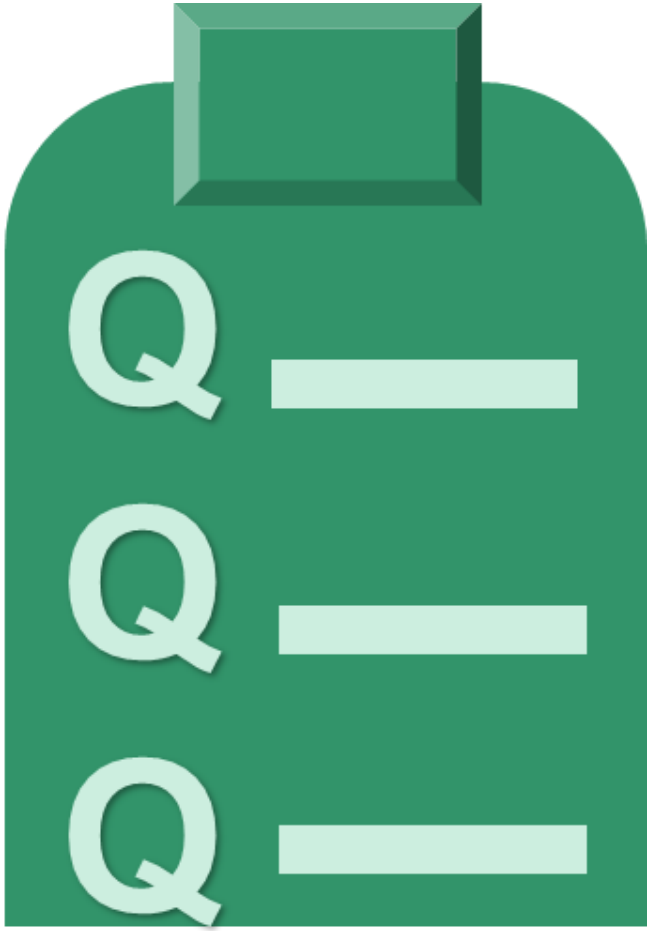
Trace

-Food Industry

Sustainable Development

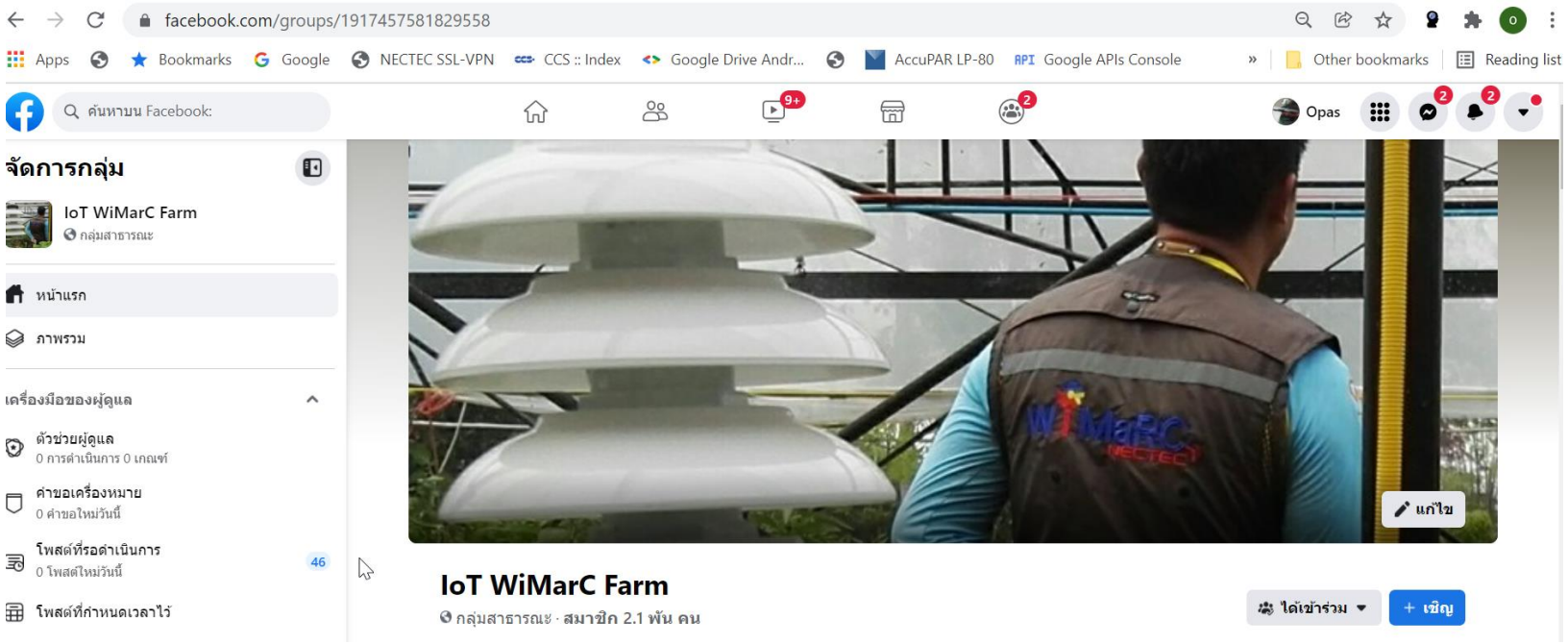


CONTACT DETAILS



opas.trithaveesak@nectec.or.th

opastrith



Link : Moisture Sensor+shemtics: https://github.com/FarmWiMarC/Schematic