มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา
Rajamangala University of Technology Lanna

Smart Farm, Plant Greenhouse Production, Organic Seed Collection, Agricultural Adaptation and Food Security

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and Miss Pimrumpa Samran

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Rajamangala University of Technology Lanna,
Lampang, Thailand

Rajamangala University of Technology Lanna



RMUTL has six campuses located in Chiangmai, Chiangrai, Lampang, Nan, Tak and Pitsnulok.

The university provides higher education (certificates, bachelor and master degrees) in several fields.

There are 4 faculties;

1. Faculty of Business Administration and Liberal Arts
2. Faculty of Science and Agricultural Technology
3. Faculty of Engineering
4. Faculty of Arts and Architecture

There is College of Integrated Science and Technology.

LOCATION: 6 CAMPUSES OF RMUTL

CHIANG MAI
(Head Quarter)

"Innovation and Excellence Center"



TAK

"Technology and Management for Community"



LAMPANG

"Agro-Industry"





CHIANG RAI

"Trade and Service Technology Management"



NAN

"Biodiversity"



PHITSANULOK

"Green Agriculture"



Research and Academic Service



1. Institute of Research and Development



2. Agricultural Technology Research Institute



3. Community Technology Transfer Center

สถาบันวิจัยเทคโนโลยีเกษตร
Agricultural Technology Research Institute

Vision

The institute of excellence and value creation in research, technology and innovation in agricultural business to produce graduates who are practitioners and entrepreneurs with high potential.

Mission

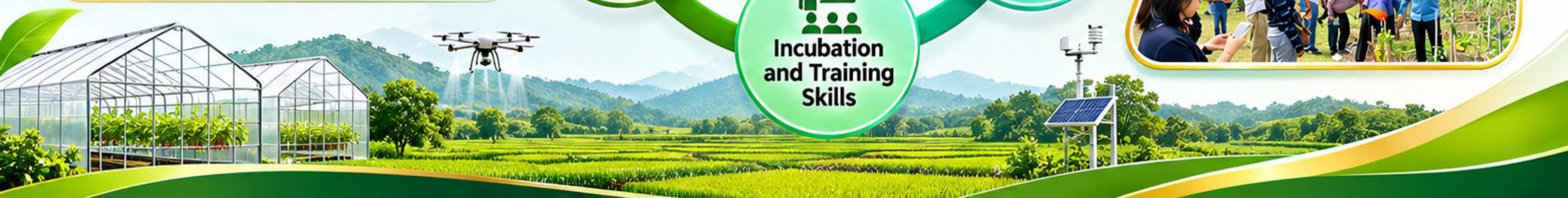
- Support education management
- Conduct researches
- Transfer technology
- Develop incubation and training skills
- Operate an analytical unit
- Build research and community networks











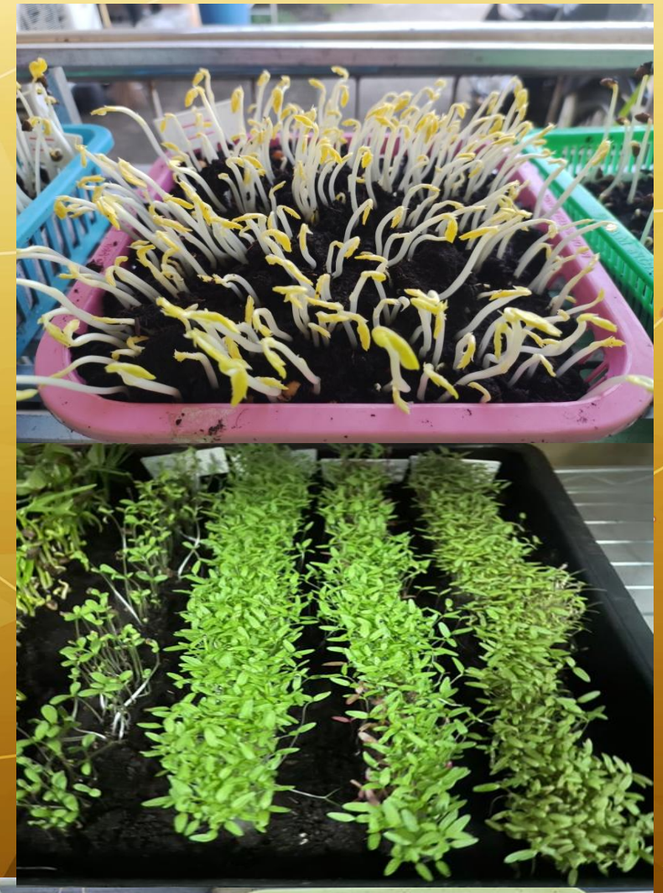
Microgreen or sprout production : Sunflower, Morning glory, Green & Red Amaranth,

Garden Pea and Broccoli











Plant physiology and plant tissue-culture











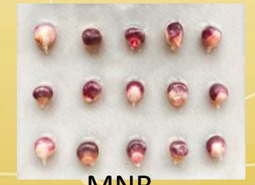




Micro nano bubbles for seed germination, growth and development of plant and herb





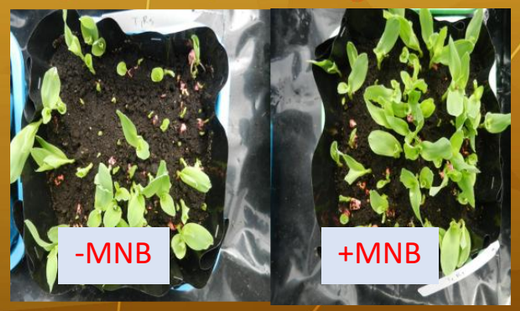


-MNB



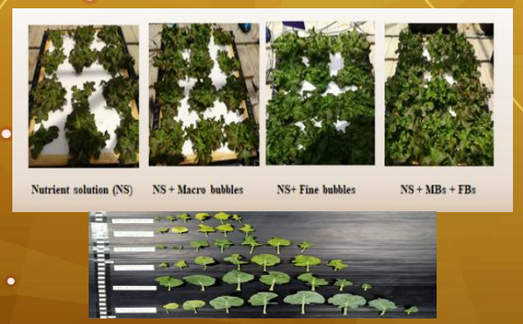
+MNB





-MNB

+MNB



Nutrient solution (NS)

NS + Macro bubbles

NS+ Fine bubbles

NS + MBs + FBs









MNB can clean banana fruit





Product processing and development

การพัฒนาและสร้างความเข้มแข็งเครือข่าย

Climate Change for Crop Production in Lampang Province

Climate Profile in Lampang
(January – December 2024)

Temperature (°C)

Maximum (annual mean)	36.34
Mean (annual)	28.83
Minimum (annual mean)	23.33

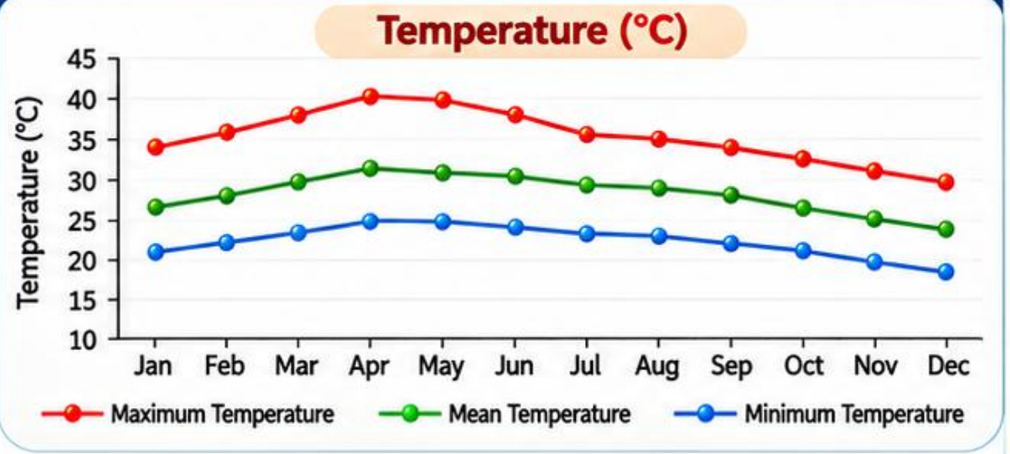
Rainfall

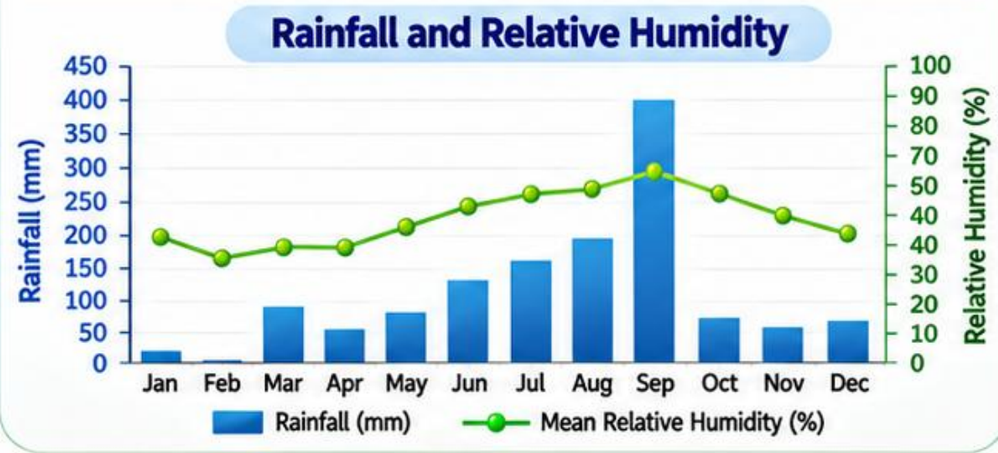
Annual total	1,117.8 mm
Highest (September)	389.4 mm
Lowest (February)	0.0 mm

Relative Humidity (%)

Maximum (annual mean)	62.37
Mean (annual)	49.28
Minimum (annual mean)	35.97

Monthly Climate Trends in 2024





Impacts of Climate Change on Crop Production



Water stress and reduced growth



Increased pest and disease pressure



Abnormal flowering and lower yield



Reduced crop quality (e.g., size and sweetness)

Adaptation Strategies for Farmers

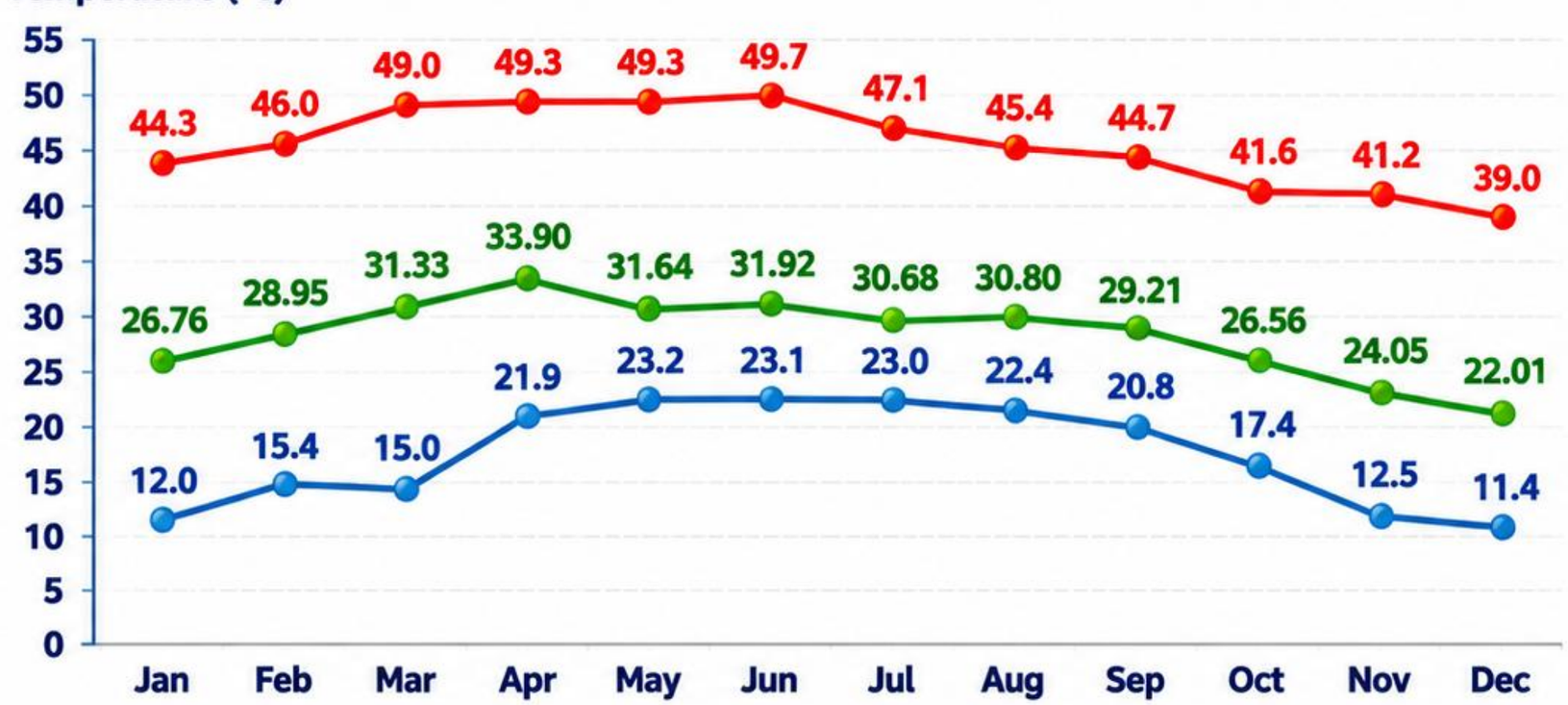
- **Water Management** – Use efficient irrigation (e.g., drip), harvest and store rainwater
- **Crop and Variety Management** – Use heat-, drought- and disease-tolerant varieties
- **Climate-Smart Production** – Use greenhouse, shading and monitoring tools (weather and soil moisture)
- **Soil Health Improvement** – Add organic matter (e.g., compost, cover crops)
- **Risk Management** – Monitor weather forecasts and plan planting to avoid extreme heat and heavy rain

Key Takeaway

Rising temperature, more variable rainfall, and changes in humidity are key climate challenges for crop production in Lampang Province.

Monthly Maximum, Average and Minimum Temperature

January – December (2024)



Month	Maximum Temp. (°C)	Average Temp. (°C)	Minimum Temp. (°C)
January	44.3	26.76	12.0
February	46.0	28.95	15.4
March	49.0	31.33	15.0
April	49.3	33.90	21.9
May	49.3	31.64	23.2
June	49.7	31.92	23.1
July	47.1	30.68	23.0
August	45.4	30.80	22.4
September	44.7	29.21	20.8
October	41.6	26.56	17.4
November	41.2	24.05	12.5
December*	39.0	22.01	11.4

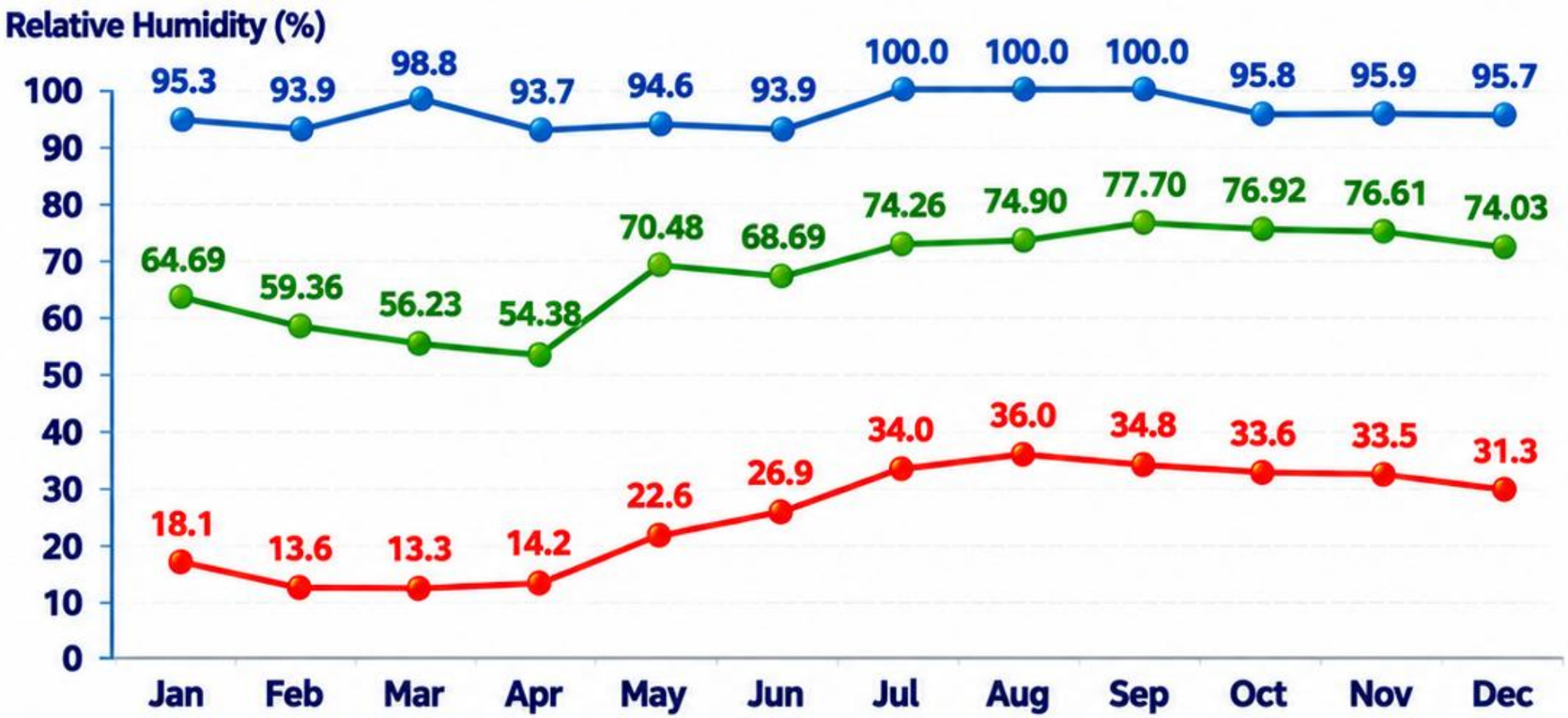
Highest Average Temperature
33.90 °C
(April)

Lowest Average Temperature
22.01 °C
(December*)

Data Period
January – December 2024
(December: data available up to 9 December)

Monthly Maximum, Average and Minimum Relative Humidity

January – December (2024)



Month	Maximum RH (%)	Average RH (%)	Minimum RH (%)
January	95.3	64.69	18.1
February	93.9	59.36	13.6
March	98.8	56.23	13.3
April	93.7	54.38	14.2
May	94.6	70.48	22.6
June	93.9	68.69	26.9
July	100.0	74.26	34.0
August	100.0	74.90	36.0
September	100.0	77.70	34.8
October	95.8	76.92	33.6
November	95.9	76.61	33.5
December*	95.7	74.03	31.3

Highest Maximum Relative Humidity
100.0%
(July – September)

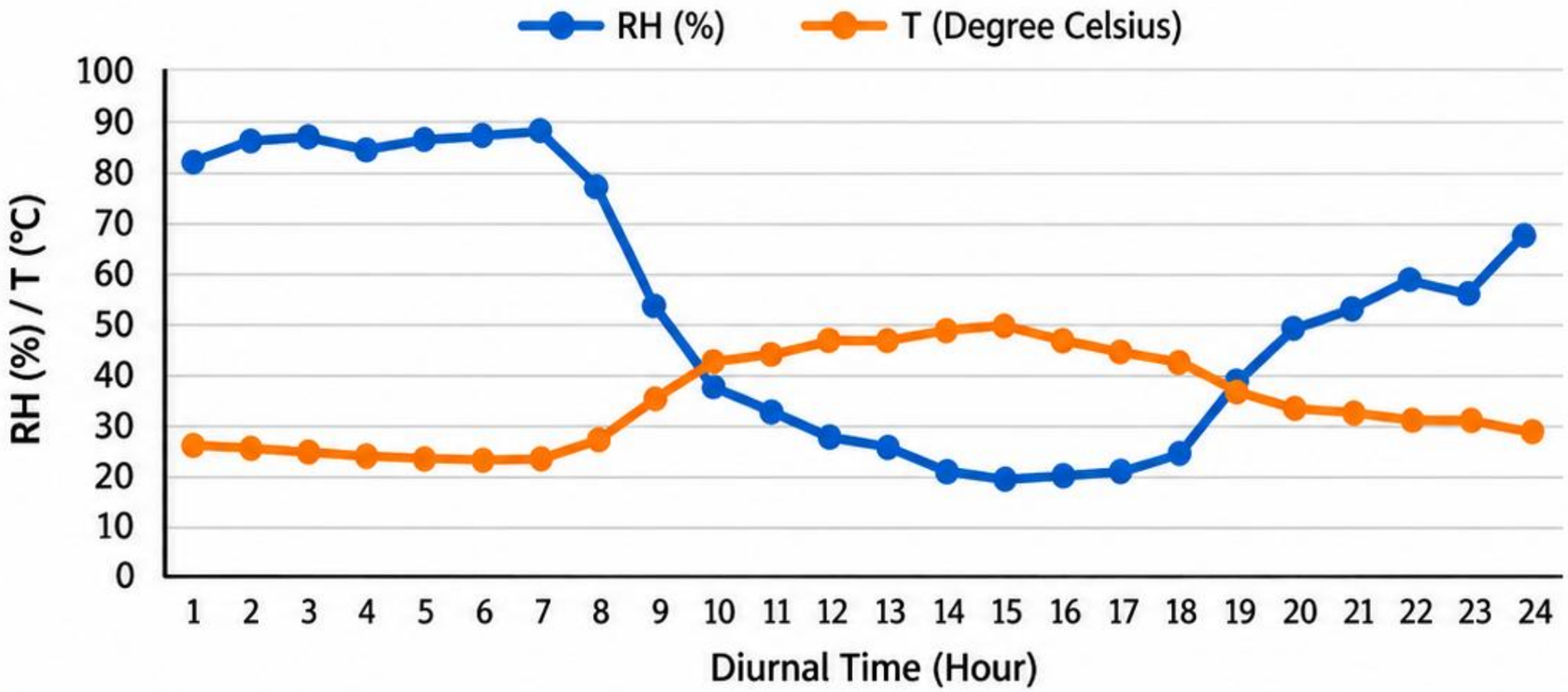
Highest Average Relative Humidity
77.70%
(September)

Lowest Average Relative Humidity
54.38%
(April)

Data Period
January – December 2024
(December: data available up to 9 December)

Change of RH and T in April under Greenhouse, Lampang

Diurnal Variation of Relative Humidity (RH) and Temperature (T) in April (Greenhouse, Lampang)



Key Findings (April)

Relative Humidity (RH)

- High at night and early morning (≈ 82–88%)
- Lowest in the afternoon (≈ 20–22%) around 14:00–16:00)

Temperature (T)

- Lowest in the early morning (≈ 22–23 °C)
- Highest in the afternoon (≈ 49–50 °C around 14:00–15:00)

Summary (April, Greenhouse Lampang)

RH (Max)	RH (Min)	T (Max)	T (Min)
≈ 88%	≈ 20%	≈ 50 °C	≈ 22 °C

The Application of Smart Farming

on Crop Production in Greenhouse System



Objectives

- Optimize crop growth and yield
- Efficient use of resources (water, energy, fertilizer)
- Improve crop quality
- Reduce labor and production costs

Smart Farming System in Greenhouse



- Temperature (T)
- Light Intensity
- Relative Humidity (RH)
- CO_2 Concentration
- Soil Moisture
- EC / pH (Nutrient)

System Architecture

Sensors (Data Collection) → HandySense IoT Controller → Cloud (Data Storage)



- Real-time Monitoring
- Automatic Control
- Alert / Notification

Controlled Devices



Irrigation Pump



Ventilation Fan



Misting System



Shade Screen



Lighting (LED)

Expected Outcomes

- Higher Yield
- Better Quality
- Resource Efficiency
- Lower Production Cost
- More Sustainable Production

Smart Greenhouse for Plant Production: Melon Production in a Greenhouse

Project Partners

- Rajamangala University of Technology Lanna (RMUTL Lanna)
- Lampang Provincial Administrative Organization (Lampang PAO)
- National Science and Technology Development Agency (NSTDA)





Smart Farm Melon

HandySense System

Sensors (Data Collection)

- Temperature (T)
- Relative Humidity (RH)
- Soil Moisture
- Light Intensity

HandySense



IoT Controller (Gateway)

Cloud & Application



- Real-time Monitoring
- Alerts / Notification

Control (Automatic)

- Irrigation Pump
- Valve
- Ventilation
- Misting System



Melon Production Guide for High Quality Using a Smart Farming System (HandySense)



System Preparation and Planting Start

PREPARATION & PLANTING START

HandySense Technology for Precision Control

PRECISE HANDYSENSE CONTROL

Use sensors to monitor environmental conditions and control the greenhouse system in real time via a mobile application.

Seedling Preparation and Transplanting

SEEDLING & TRANSPLANTING

Raise seedlings for 1–2 weeks (about 2 leaves), then transplant to the greenhouse or growth media system.





Select Suitable Melon Varieties

SELECT VARIETIES FOR MARKET DEMAND

Choose varieties that match market demand, such as Green Net, Orange Flesh, or Golden Lady.

Crop Care and Harvest

CARE & HARVEST



Pruning and Canopy Management Techniques

PRUNING & POLLINATION TECHNIQUES

Prune lateral shoots at 1–8 nodes and keep 9–12 nodes, and select 2–3 fruits per plant for good quality.



Fruit Quality and Netting Control

FRUIT QUALITY & NETTING CONTROL

Control plant nutrition and irrigation to prevent fruit cracking, and use a fruit net 7 days after fruit set.



High-Quality Harvest Standards

HIGH QUALITY HARVEST STANDARDS

Harvest 40–50 days after fruit set, with a target soluble solids (TSS) of at least 14 °Brix.

Nutrient Management by Growth Stage



Vegetative Stage (N)

GROWTH STAGE (NITROGEN, N)

Promote vegetative growth and strong plant structure.



Flowering / Pollination Stage (Ca)

FLOWERING/POLLINATION STAGE (CALCIUM, Ca)

Support flower development and reduce flower and fruit drop.



Fruit Development Stage (B)

FRUIT DEVELOPMENT STAGE (BORON, B)

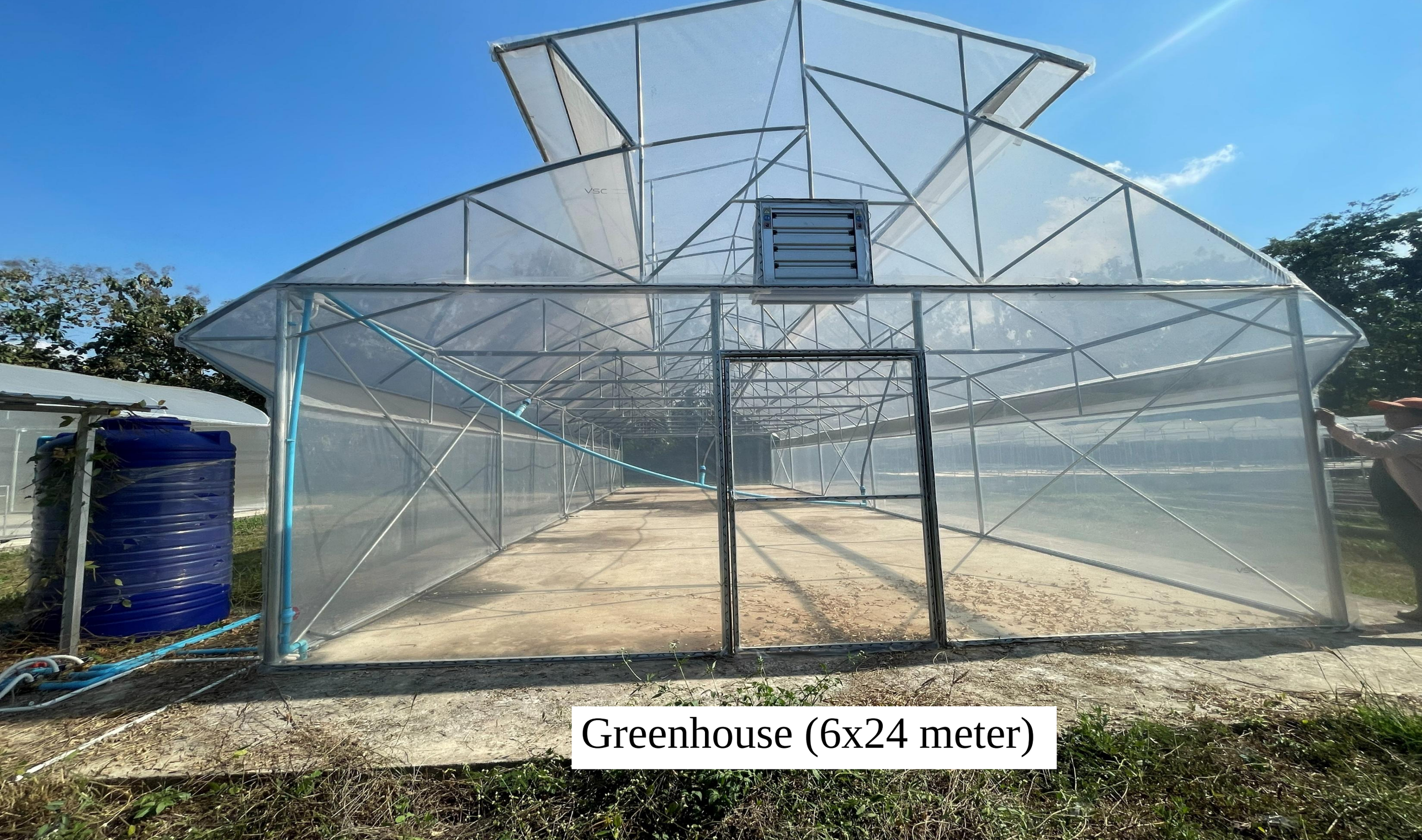
Support fruit set and fruit quality.



Fruit Quality Improvement Stage (K)

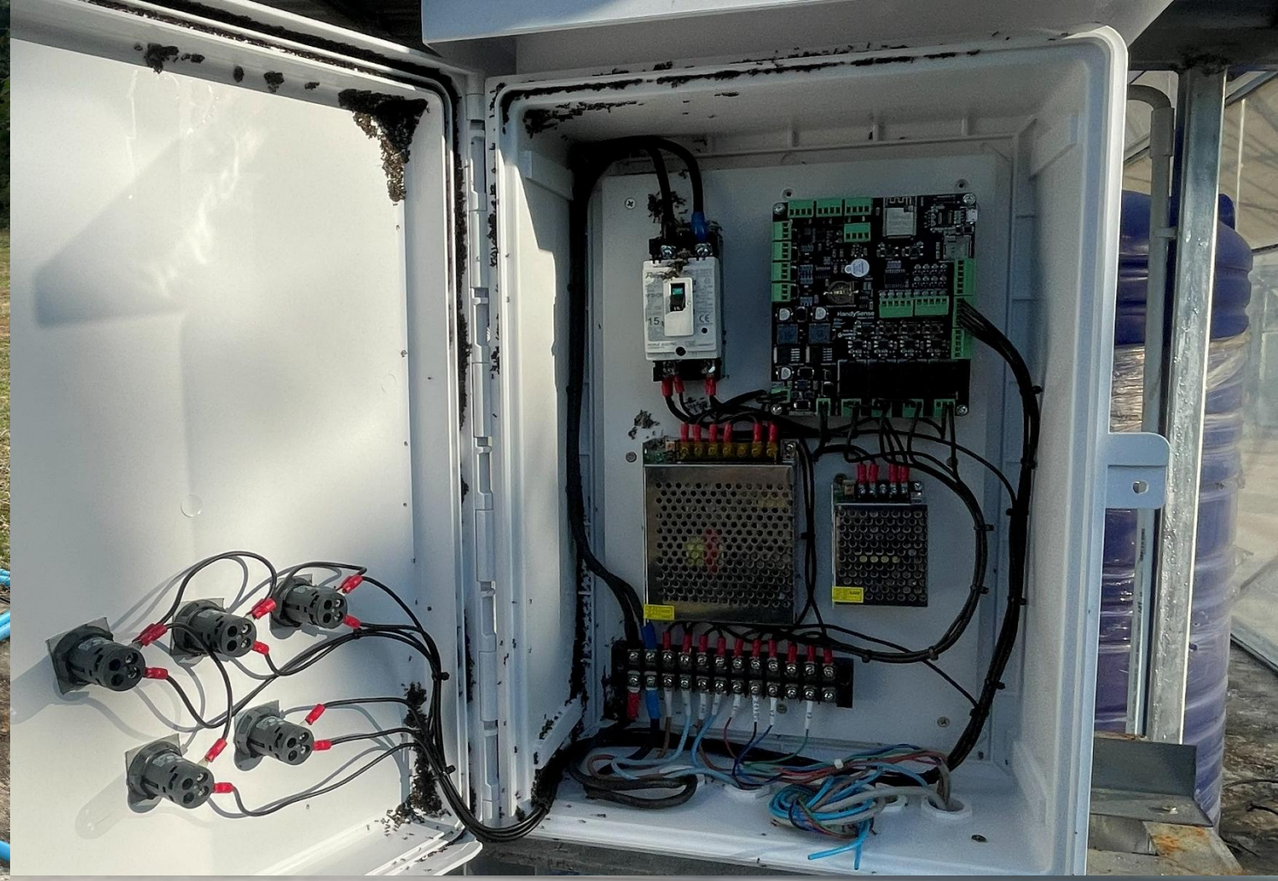
FRUIT QUALITY INCREASE STAGE (POTASSIUM, K)

Increase sugar content and improve flavor.



Greenhouse (6x24 meter)
















3000-SD
土壤水分传感器
Soil Moisture Sensor

Melon2 Dashboard (HandySense)

HandySense

https://dashboard.handysense.io/c/P71166582228a/a92833/abc-157a913d-1b799-9olaa83du17U6

SmartfarmLP01 > Melon2

Melon2 online

Graph | Record | Settings | Devices

last update : 14/11/2024 17:27

Temperature 34.78 °C

Air Humidity 64.08 %

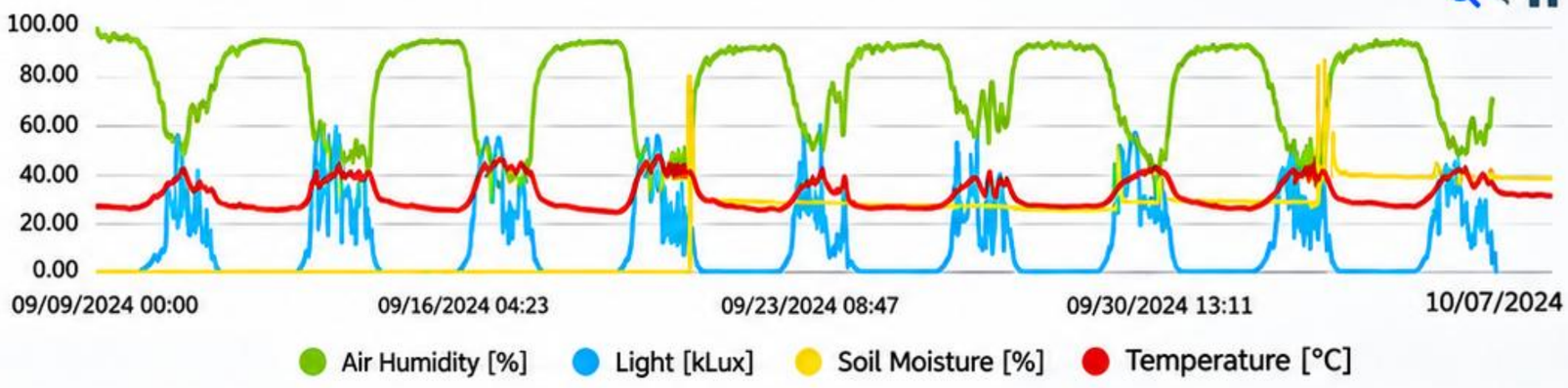
Soil Moisture 34.80 %

Light Intensity 5.30 kLux

Historical Data

Download

From Date 2024-09-09 ~ 2024-10-11 | Minute | Hour | Day | Week | Month | Apply



Smart Switch Control

Switch 1
สวิตช์
ปลดการทำงานแบบอัตโนมัติ

Switch 2
สวิตช์
ปลดการทำงานแบบอัตโนมัติ

Switch 3
สวิตช์
ปลดการทำงานแบบอัตโนมัติ

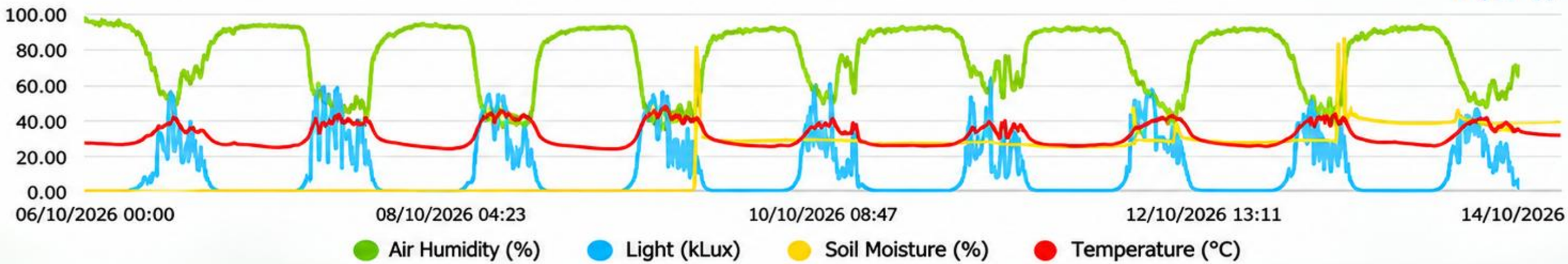
Switch 4
สวิตช์
ปลดการทำงานแบบอัตโนมัติ

Historical Data Comparison: Inside vs. Outside Greenhouse

History Inside Greenhouse

Download

Date Range 2026-10-06 – 2026-10-14 | Minute | Hour | Day | Week | Month | Apply



History Outside Greenhouse

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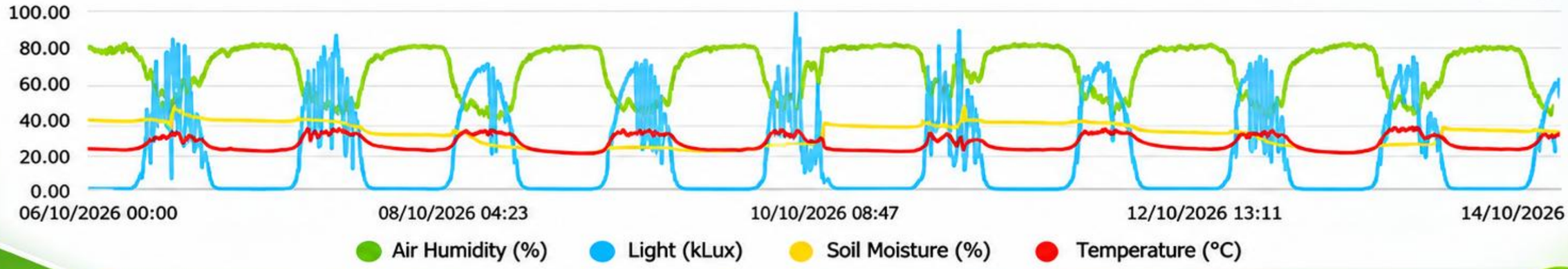

Historical Data: Inside vs. Outside Greenhouse

Inside Greenhouse

Download

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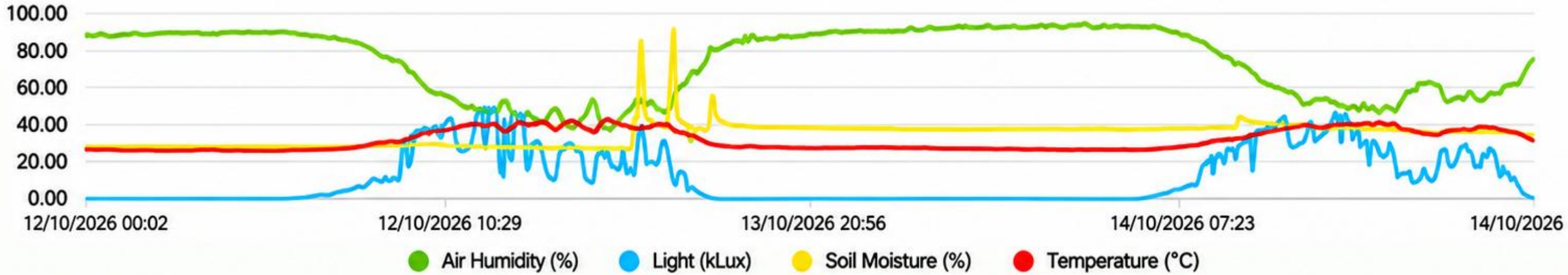
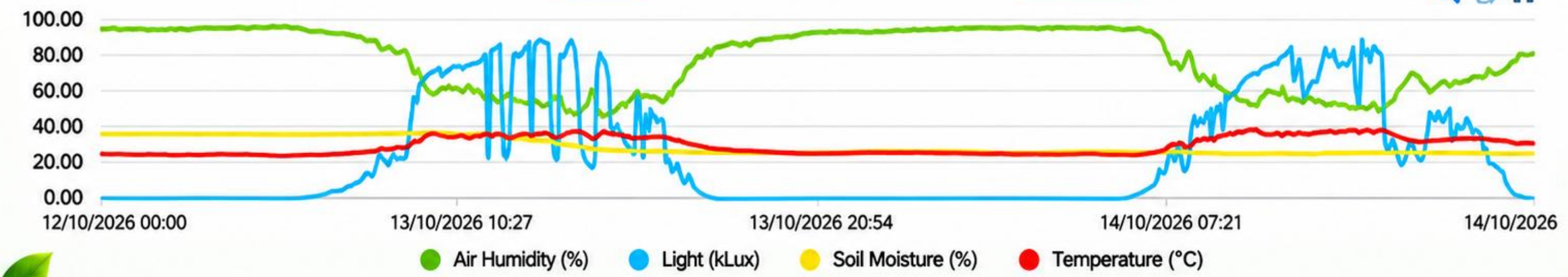


Outside Greenhouse

Download

Date Range 2026-10-12 — 2026-10-14 | Minute | Hour | Day | Week | Month | Apply



Germinating melon seeds at 27/05/2026









Melon transplanting about 2 weeks after germination (14/06/2026)

The growing medium consists of coconut husks and coconut coir.





Hanging melon vines vertically using ropes about 2 weeks old, 29/06/2026,

Sensor-based irrigation control



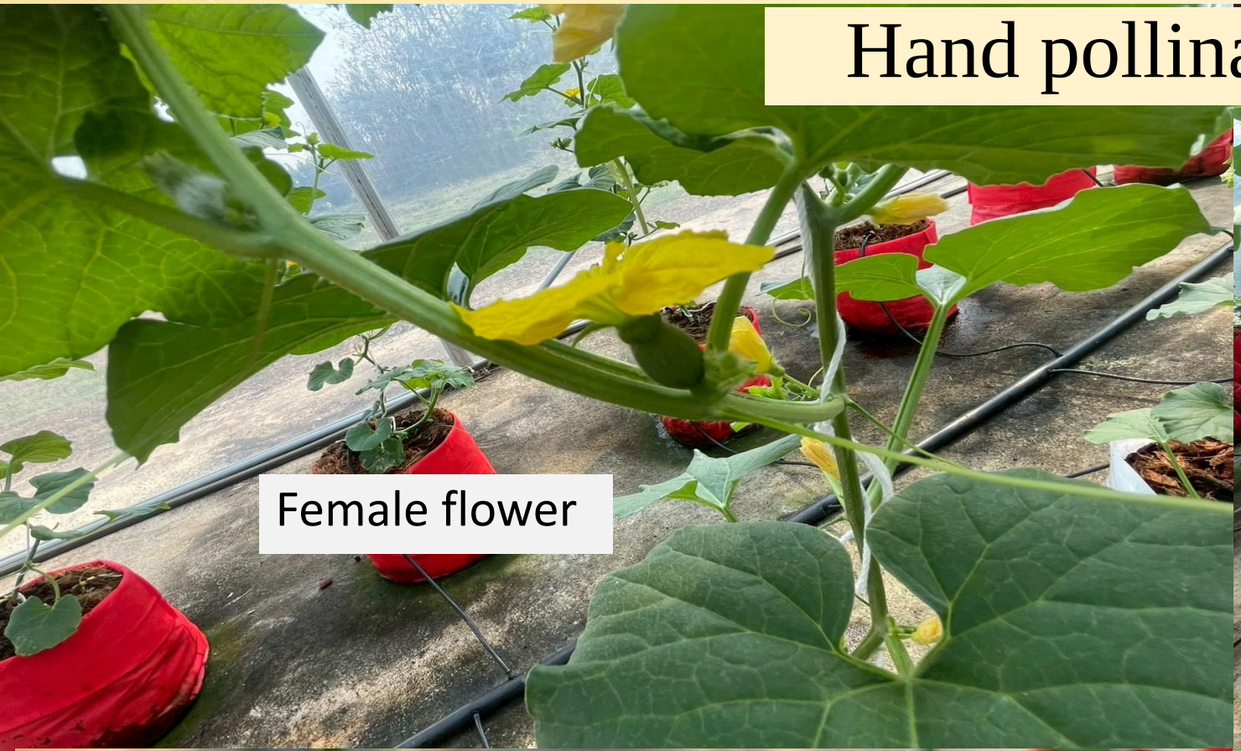


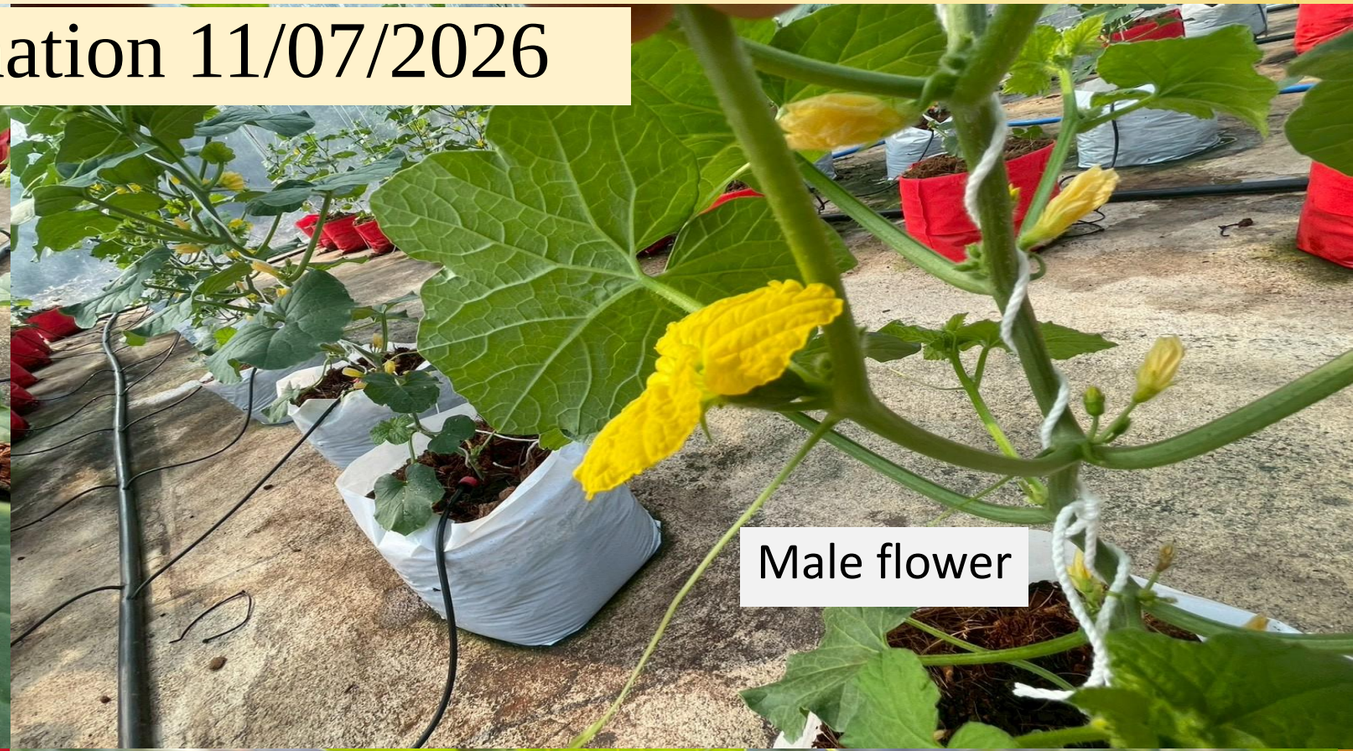
Melon flowers begin to bloom at 3 weeks of age. 7/07/2026





Hand pollination 11/07/2026





Pollination occurs when the male pollen is placed on the tip of the female stigma.





Tying a rope around a branch serves as a marker following pollination.









Pollination using plant hormones







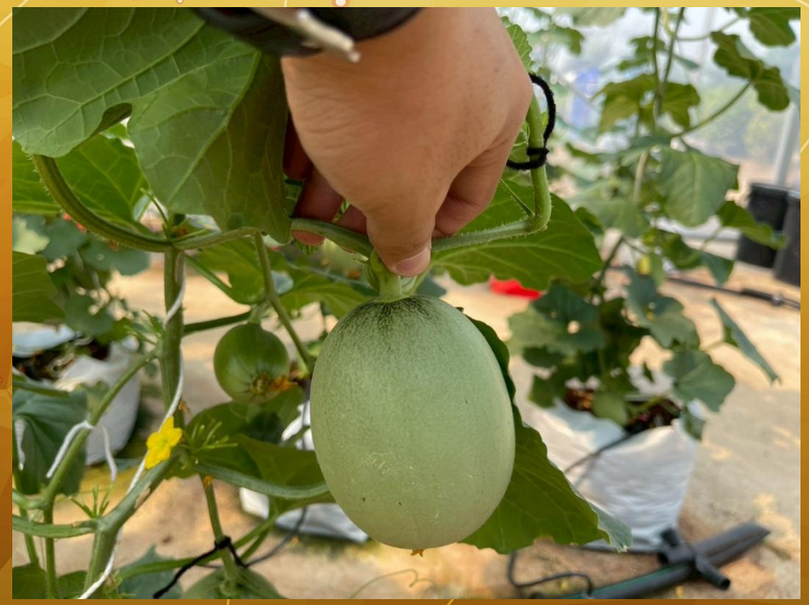


Fruit set at 1 week days after pollination





Fruit set occurs 2 weeks after pollination, or 5 weeks after transplanting.



Green net



Madam orange



Golden

Fruit set occurs 3 weeks after pollination, or 6 weeks after transplanting.







The harvesting after fruit set occurs 6 weeks after pollination, or 9 weeks after transplanting.









Quality Melon Production Using Smart Farming Systems



สายพันธุ์ 2596
ความหวาน 13-14
บริกซ์



สายพันธุ์ กรีนเน็ต
ความหวาน 15-16 บริกซ์



สายพันธุ์มาดาม ออร์เร้น
ความหวาน 15-16 บริกซ์



Vegetable Seedling Production
Seedling Growing Medium






Mix the following materials in the specified ratio:

Coconut coir dust 2 : Burnt rice husk 1 : Soil 1 : Compost 1







Seeds will begin to germinate within 3–7 days. Once the seedlings emerge, thin out the weak seedlings.

Leaving one healthy seedling per planting hole.



Transplant the seedlings when they are 30 days old. Apply 25 g of Trichoderma (1 tablespoon) per planting hole at the bottom of each hole before transplanting.




Research and Development Project to Enhance Chiang Da Vegetables and Lanna Local Plants



The goal of "Conserving, utilizing, and benefiting the Thai peaple”

Economical, benefiting from research, building a strong research team, building a community model.

Home garden → Commercial farm → Community industry











01

Growing native varieties of Chiang Da vegetables for household consumption

02

- Develop Thai varieties of Chiang Da vegetables and increase the planting area.
- Processing Chiang Da vegetables to increase value and sell them commercially.

03

- Establish standards for planting and processing for industry, such as the GACP system.
- Uses of Gymnemic Extract for Medical Benefits
- Building a network of Chiang Da vegetable production in 8 northern provinces







Thank you for your attention