



Course Outline

Annual International Training Course

1. Course Title:

Indoor and Greenhouse High Value Crop Cultivation

2. Duration:

2 Weeks

3. Background:

Thailand International Cooperation Agency (TICA)

TICA is a national focal point for Thailand's international development cooperation. It was established in 2004 to realize Thailand's aspiration to be a contributor to international development cooperation. Believing that global challenges are best addressed through international cooperation and global partnership, TICA continues to work closely together with its development partners to realize the global development agenda through various capacity-building and human resources development programmes. In response to the recent changes in the global landscape of development cooperation, TICA has strengthened its partnerships to harness the synergy of South-South and Triangular Cooperation to tackle global development challenges, including expediting the implementation of Sustainable Development Goals (SDGs). It also continues to realign our focuses in order to deliver Thailand's commitments as a global reliable partner.

Since 1991, TICA, in collaboration with educational institutions in Thailand, has offered short-term training courses under its Annual International Training Course (AITC) programme. The number of courses offered each year varies between 25 to 35 courses for 20-35 participants per course. AITC not only fosters good and friendly relations which Thailand has already enjoyed with recipient countries across regions, but also helps Thailand to reach out to those countries with which we desire to engage more closely. The courses offered by TICA in 2023-2025 are categorized into 5 themes: Sufficiency Economy Philosophy (SEP), food security, climate change and environmental issues, public health, BCG Model related.

High Value Crops

High value crops are generally defined as crops that can provide higher profit per unit of area of cultivation than staple crops. These includes but not limited to fruit crops such as strawberry, medicinal crops such as cannabis and ornamental crops such as gloxinia. The value of

these crops is usually high due to their unique properties and the difficulty in some aspects of their cultivation and management making the supply of these crops in the market low. For example, cannabis, a crop requiring specific growing conditions to produce certain active compounds, was estimated to have a global market value of 20.47 billion USD in 2020. Thus, the ability to produce high value crop in a country could create positive impact on agricultural sector and overall economic of the country.

Greenhouse and Indoor Crop Cultivation

Greenhouse and indoor crop cultivation system is known as the types of protected agriculture which involve modification of environmental factors in order to maximize the yield and quality of agricultural produce. These types of crop cultivation are expected to play an important role in food production amid the ongoing global climate change. Greenhouse crop cultivation has been developed since 1960s aiming to shield the crop cultivation system from outside environment and control some environmental factor inside the system to extend the crop growing season. General features of the greenhouse include plastic or acrylic cover materials, evaporative cooling system and soilless plant cultivation equipment. During the past two decades, greenhouse has increasingly become a major system for producing many high value and important horticultural crops such as strawberry, tomato and sweet pepper. Indoor crop cultivation, on the other hand, is much more extreme than the greenhouse in terms of trying to create artificial environment where all the factors, including light, are tightly regulated for crop cultivation. This makes establishing and operating costs of indoor crop cultivation system higher than those of greenhouse. Indoor crop cultivation system is widely applied in a form of vertical farm for commercial leafy vegetable production. The ability to produce high quality and pesticide-free crops regardless of climatic condition and location of the indoor system currently attracts multiple major investments on startups involving this technology.

Organization/Institution

Interdisciplinary Agriculture Curriculum, Faculty of Agricultural Production, Maejo University.

4. Objectives:

The program is designed to:

1. To understand the importance and impact of greenhouse and indoor crop cultivation technology on agricultural sector
2. To understand how greenhouse and indoor crop cultivation system works and be able to develop concept paper for research project

5. Course Contents:

Part 1: Indoor high value crop cultivation

- 1.1. Past, present and future of indoor farming
- 1.2. Overview of indoor crop cultivation system

- 1.3. Location and chamber structure
 - 1.4. Light
 - 1.5. Temperature, humidity and carbon dioxide
 - 1.6. Fertigation
 - 1.7. Case study: Indoor seed production
 - 1.8. Case study: Indoor strawberry production
- Part 2: Greenhouse high value crop production
- 2.1. Overview of greenhouse crop cultivation
 - 2.2. Greenhouse design
 - 2.3. Ventilation, heating, and cooling system
 - 2.4. Case study: Cannabis production
 - 2.5. Case study: Leafy vegetable and seed productions
- Part 3: Energy management and automated controlling system
- 3.1. Energy use in greenhouse and indoor crop cultivation system
 - 3.2. Application of solar energy
 - 3.3. Automated fertilizer mixing system
 - 3.4. IoT controlling and monitoring system
- Part 4: Concept paper presentation
- 4.1. Participants present their concept paper and receive comments

6. Participants' Criteria:

Applicants must fulfill the following requirements:

- Be nominated by their respective governments
- Education: bachelor degree related to science or agriculture
- Language: proficiency in English (speaking, reading and writing)
- Candidate should be less than 50 years of age and in good health
- Candidate must be able to create digital media using digital tools such as Microsoft PowerPoint, Canvas or Google Slides for concept paper presentation
- Candidate must be able to use word processor program such as Microsoft Word

7. Attendance and Evaluation

Participants who complete the training will receive a certificate based on:

- Real-time class attendance (not less than 80%)

- Presentation and report (concept paper)
- Evaluation

8. Venue:

International Education and Training Center, Maejo University, Chiang Mai, Thailand

9. Expected Results:

1. Participants understand the concept of greenhouse and indoor high value crop cultivation technology
2. Participants can write a concept paper involving indoor and greenhouse high value crop cultivation project

10. Organization/ Institution:

- **Implementing Agency;**

Interdisciplinary Agriculture Curriculum
Faculty of Agricultural Production
Maejo University

- **Contact Person**

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11. Expenditure/Funding:

Thailand International Cooperation Agency (TICA)
Government Complex, Building B (South Zone), 8th Floor,
Chaengwattana Rd. Laksi District, Bangkok 10210 THAILAND
Website: <https://tica-thaigov.mfa.go.th/en/index>
Email: aitc@mfa.go.th

Schedule for the Training Programme:

Date/ Period /Topic	Time (Thailand time)	Content	Speaker	Note
Day 1: Monday 8 Sep 2025				
- Participant arrival - Welcome Dinner				
Day 2: Tuesday 9 Sep 2025				
Part 1: Indoor high value crop cultivation	9.00-12.00	<u>Lecture</u> 1.1. Past, present and future of indoor farming 1.2. Overview of indoor crop cultivation system	Siriwat Sakhonwasee	
	13.00-16.00	<u>Lecture</u> 1.3. Location and chamber structure <u>Site visiting</u> - Pilot Vertical Farming (Cowboy mall)		
Day 3: Wednesday 10 Sep 2025				
Part 1: Indoor high value crop cultivation	9.00-12.00	<u>Lecture</u> 1.4. Light <u>Workshop</u> - Measuring light intensity - Calculating daily light integral (DLI)	Siriwat Sakhonwasee	
	13.00-16.00	<u>Lecture</u> 1.5. Temperature, humidity and carbon dioxide		

Date/ Period /Topic	Time (Thailand time)	Content	Speaker	Note
		1.6. Fertigation <u>Workshop</u> - Measuring EC and pH of fertilizer solution - Mixing fertilizer		
Day 4: Thursday 11 Sep 2025				
Excursion	9.00-12.00	Royal Project		
	13.00-16.00	Queen Sirikit Botanical Garden		
Day 5: Friday 12 Sep 2025				
Part 1: Indoor high value crop cultivation	9.00-12.00	<u>Lecture</u> 1.7. Case study: Indoor seed production 1.8. Case study: Indoor strawberry production <u>Site Visiting</u> - Prototype indoor strawberry production system (Faculty of Engineering and Agro-Industry)	Siriwat Sakhonwasee	
Part 2: Greenhouse high value crop cultivation	13.00-16.00	<u>Lecture</u> - Overview of greenhouse crop cultivation - Technology and Type of Greenhouse	Preeda Nathewet	
Day 6: Saturday 13 Sep 2025				
Cultural Excursion	9.00-12.00	- Chiangmai City Museums		
	13.00-17.00	- Chiangmai Downtown Temples		

Date/ Period /Topic	Time (Thailand time)	Content	Speaker	Note
		- Night Bazaar		
Day 7: Sunday 14 Sep 2025				
Free time				
Day 8: Monday 15 Sep 2025				
Part 2: Greenhouse high value crop cultivation	9.00-12.00	Lecture - Greenhouse design and irrigation systems	Preeda Nathewet	
	13.00-16.00	Lecture - Greenhouse design -Design consideration <u>Workshop</u> -Greenhouse design -Irrigation system calculation		
Day 9: Tuesday 16 Sep 2025				
Part 2: Greenhouse high value crop cultivation	9.00-12.00	Lecture - Ventilation, heating and cooling system	Preeda Nathewet	
	13.00-16.00	Case study -Cannabis and vegetable seed production under greenhouse		
Day 10: Wednesday 17 Sep 2025				
Part 3: Energy management and automated	9.00-12.00	Lecture - Energy use in greenhouse and indoor farming 1.1 Type of energy use 1.2 Micro-climate controlling technique	Sulaksana Mongkon	

Date/ Period /Topic	Time (Thailand time)	Content	Speaker	Note
controlling system	13.00-16.00	Lecture - Application of solar power generation for greenhouse and indoor farming <u>Workshop</u> 1.1 Type of system 1.2 How to choose a system size for using	Sarawut Polvongsri & Akarin Intaniwet	
Day 11: Thursday 18 Sep 2025				
Excursion	9.00-12.00	Visiting high value crop production greenhouse		
	13.00-16.00	Royal Project Visitation		
Day 12: Friday 19 Sep 2025				
Part 3: Energy management and automated controlling system	9.00-12.00	Lecture - Automated fertilizer mixing system 1.1 Type of fertigation 1.2 Smart control fertigation 1.3 Case study	Thongchai Maneechuket	
	13.00-16.00	Lecture - IoT controlling and monitoring 1.1 Structure and controlling 1.2 Device and system <u>Workshop</u> Software system and deploy	Chawaroj Jaisin	
Day 13: Saturday 20 Sep 2025				

Date/ Period /Topic	Time (Thailand time)	Content	Speaker	Note
Part 4: Concept paper presentation	9.00-12.00	Participants prepare presentation and consulting experts		
	13.00-16.00	Project Presentation		
Day 14: Sunday 21 Sep 2025				
Free time	9.00-17.00	Free time		
	17.00-20.00	Farewell dinner		
Day 15: Monday: 22 Sep 2025				
Participant Departure				