**ASEAN IVO FORUM 2020
"ICT FOR FOOD"**

**iCOCOA
Reviving Cocoa Plantation
in South East Asia Utilizing
Internet of Things**

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Agenda Layout

THE BACKGROUND
The reality of cocoa plantation in Malaysia and Indonesia and the challenges faced

01

02
THE AIMS AND OBJECTIVES
The need and target of project

THE PROPOSED SYSTEM
Project IoT-based solution for plantation management to boost production, and deployment planning

03

THE IMPACT
Significance of the project

04

The Background

In ASEAN, Indonesia and Malaysia have been the top cocoa bean producers for many years now, with Indonesia as the third-largest cocoa bean exporter in the world after Ghana and the Ivory Coast.

Malaysia used to be the third largest cocoa exporter in the world with the cocoa growing area in Malaysia had expanded to 415,000ha at its peak in 1989.
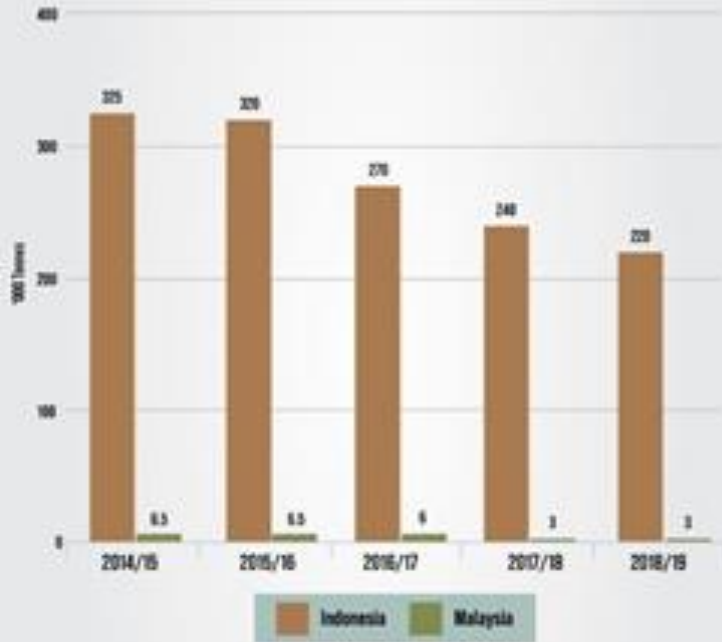
Figure 1: Cocoa Bean Output for Malaysia and Indonesia

Source: International Cocoa Organization, ICCO

- The cocoa bean output has decreased significantly for Malaysia and Indonesia

- According to the Malaysian Cocoa Board, the cocoa growing area has shrunk to an estimated 15,000ha in 2018, producing only 800 tones of cocoa beans

- Imports also rose by 10 percent to 345,000 MT last year.

The Reality

The **Challenges**

Pest and disease management where World Cocoa Foundation estimates that 30% to 40% of cocoa production losses in major cocoa growing countries is caused by pest and disease infestation

Productivity improvement where many smallholders struggle to meet expected yield and cover production costs. The decline in Malaysia's cocoa farming industry is a great loss as the country has some of the best soil for farming.

1

2

3

The Effect
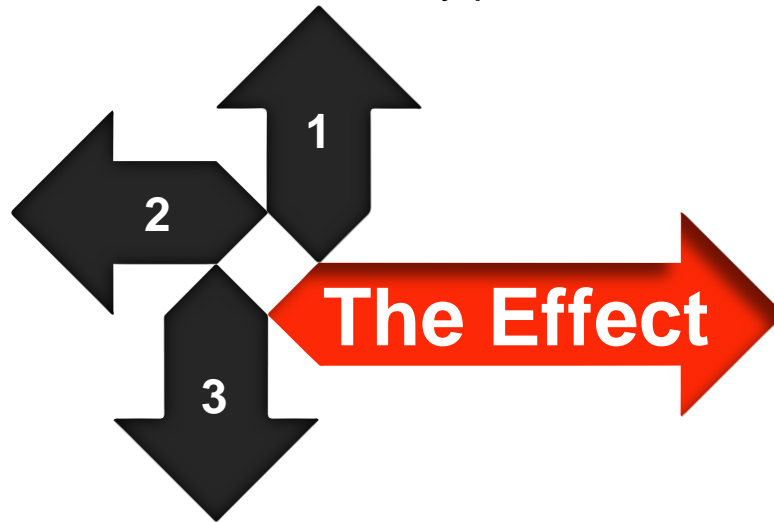
Local farmers suffer from low volume and inconsistent cocoa bean quality

Cocoa bean output in Malaysia has shrunk by half in the past decade as farmers, tired of battling crop diseases and aging trees, switch to more profitable crops.

Marketing challenges due to the lack of market information, poor knowledge in cocoa quality and low volume production.

On the other HAND..

While Malaysia lags in cocoa bean production, the nation is still a well-known manufacturing hub for chocolate products.

RM5.5b

Malaysia's export of cocoa beans and cocoa products for 2018 (Malaysian Cocoa Board)

Interestingly, although the production of cocoa beans has dropped significantly, Malaysia's export of cocoa beans and cocoa products have been growing steadily over the past 20 years. The Malaysian Cocoa Board recorded exports for 2018 at RM5.5bil, with cocoa beans and cocoa butter making up the biggest portions of exported cocoa products. But note that the cocoa beans were mainly re-exported products.

5% p.a

GROWTH

Asia's market for chocolate confectionery has grown **(Cocoa Association of Asia)**

To revive cocoa plantation in South East Asia
ICT TECHNOLOGICAL INTVENTION IS NEEDED

"Right crop, right impact"
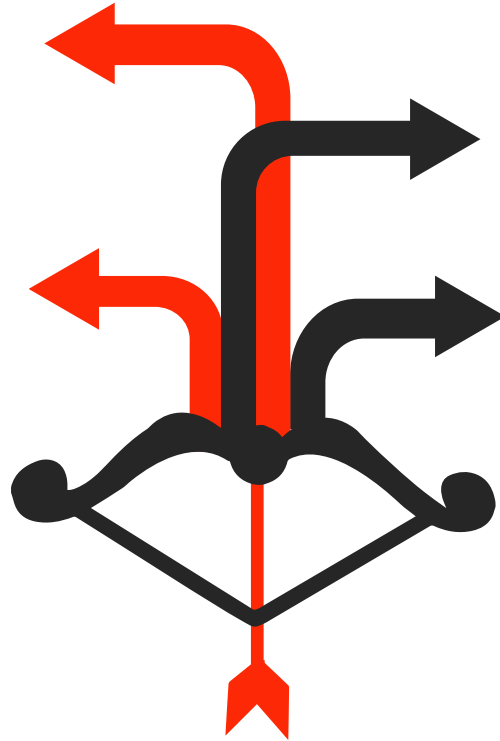
The **Objectives**

Objective 1

To design IoT based cocoa plantation management systems focusing on soil and tree conditions, aging trees, irrigation and resource management) by incorporating cyber-physical systems.

Objective 2

To deploy and pilot test the system on selected farmer site

Objective 3

To study the biochemical and nutritional composition of cocoa bean samples for pre and post deployment of the IoT system

Objective 4

To evaluate the impact of the IoT systems on the cocoa plantation by having data-driven IoT solution in place towards the management of cocoa production
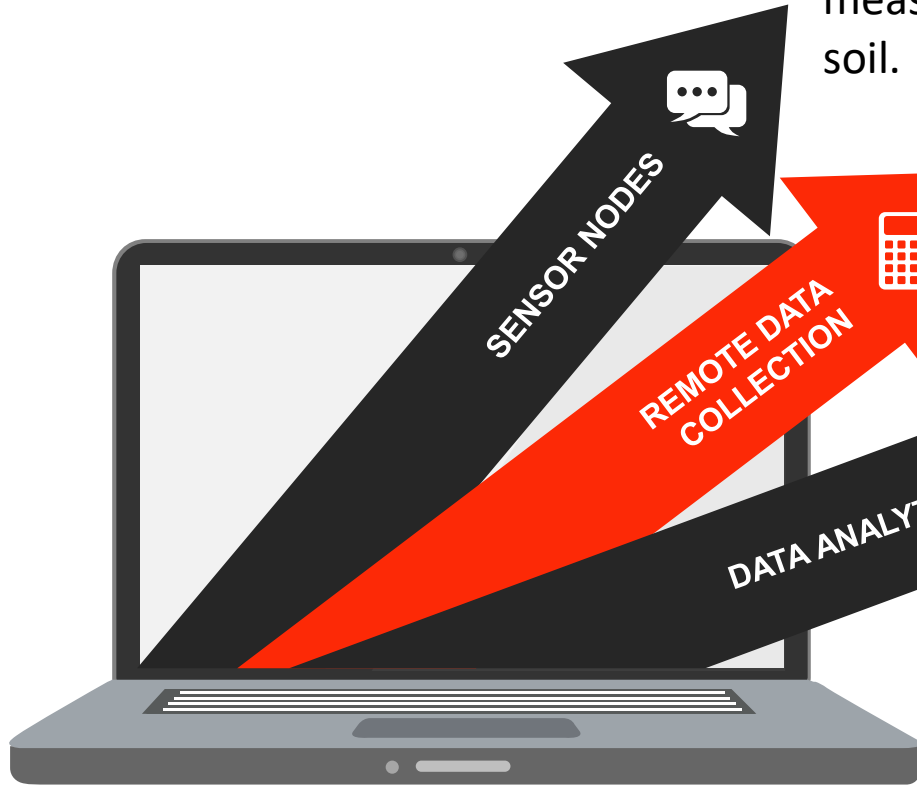
System Concept for iCocoa
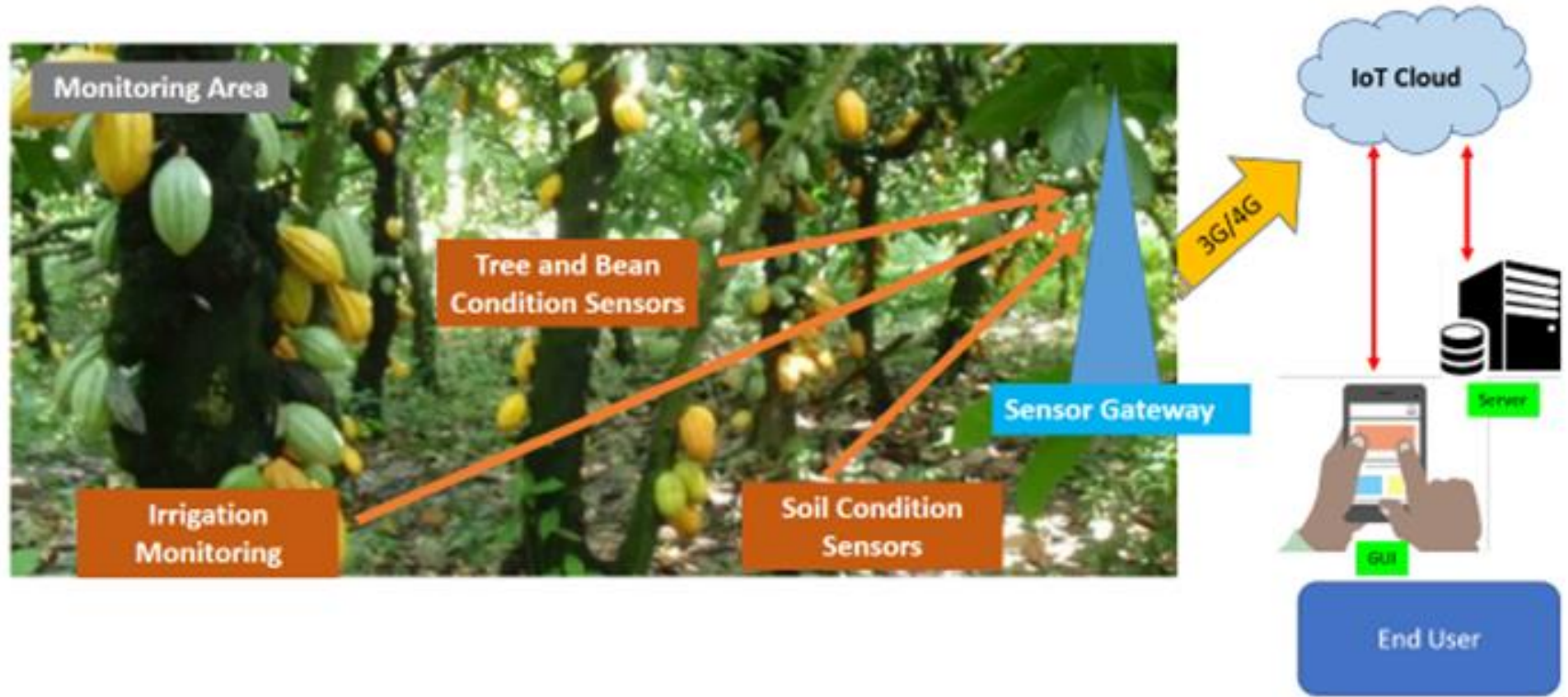
The Proposed System

SYSTEM FEATURES

SENSOR NODES

Fully equipped with suitable sensor nodes to measure the condition of tree, bean quality and soil.

REMOTE DATA COLLECTION

Periodic reading the sensors are collecting information of agriculture field area and are being logged and stored online using cloud computing.

DATA ANALYTICS

Users make use of data-driven analytics in decision making Towards producing healthy and good quality crops

Having such systems would spur more research into cocoa plantation which includes pest and disease control.

DEPLOYMENT PLAN

Suggested Site in Bagan Datuk, Perak, Malaysia (owned by Malaysian Cocoa Board)

SUGGESTED SITES

1

Centre for Cocoa Research and Development, Malaysian Cocoa Board, Bagan Datuk, Perak, Malaysia

2

1-hectar of selected farmer site in Bagan Datuk, Perak, Malaysia registered under the Malaysia Cocoa Board

Conducting research in pest and disease, fertilizers and plantation technology as well as provide advisory services to farmers

Pilot testing and impact evaluation

The Team

Malaysia

Japan
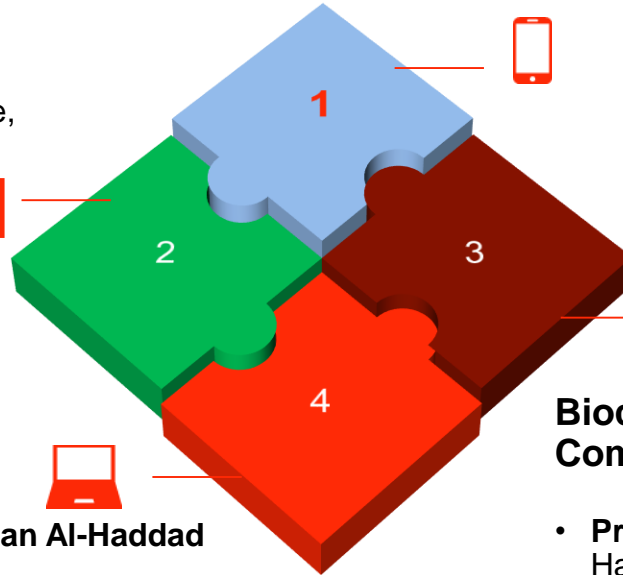
Indonesia

Calling for partnership

Calling for partnership

The Malaysian Team

Cocoa Plantation Group

- **Dr. Tee Yei Kheng**
Research And Development Centre, Malaysian Cocoa Board, Malaysia

Internet of Things Group

- **Prof. Dr. Alyani Ismail (Project Leader)**
- **Assoc. Prof. Dr Siti Barirah Ahmad Anas**

Wireless and Photonics Network Research Centre of Excellence (WiPNET)

Data Analytics Group

- **Prof. Dr. Syed Abdul Rahman Al-Haddad Syed Mohamed**
- **Madam Roslizah Ali**
- **Madam Siti Mariam Shafie**

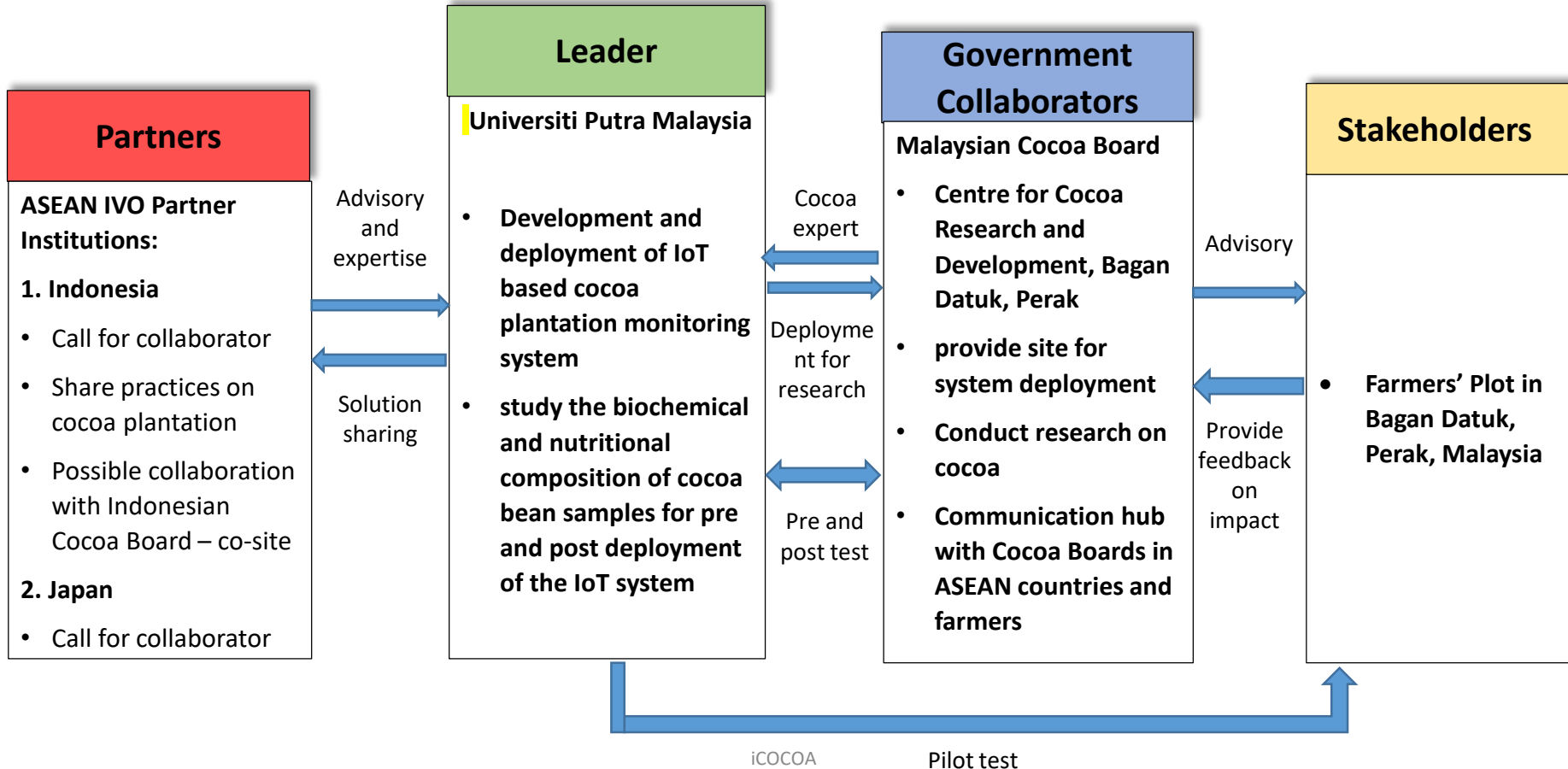Department of Computer and Communications System Engineering, Faculty of Engineering, Universiti Putra Malaysia

Biochemical and Nutritional Composition Group

- **Prof. Dr. Amin Ismail**
Halal Products and Research Institute, UPM
- **Dr Nur Kartinee Abu Kassim**
Department of Chemistry, Faculty of Science, UPM
- **Dr Redzwan Mohd Sabran**
Department of Nutrition, Faculty of Medicine and Health Sciences, UPM)

iCocoa - PROJECT CONNECTIONS

Partners

ASEAN IVO Partner Institutions:

1. Indonesia

- Call for collaborator
- Share practices on cocoa plantation
- Possible collaboration with Indonesian Cocoa Board – co-site

2. Japan

- Call for collaborator

Advisory and expertise

Solution sharing

Leader

Universiti Putra Malaysia

- **Development and deployment of IoT based cocoa plantation monitoring system**
- **study the biochemical and nutritional composition of cocoa bean samples for pre and post deployment of the IoT system**

Cocoa expert

Deployment for research

Pre and post test

Government Collaborators

Malaysian Cocoa Board

- **Centre for Cocoa Research and Development, Bagan Datuk, Perak**
- **provide site for system deployment**
- **Conduct research on cocoa**
- **Communication hub with Cocoa Boards in ASEAN countries and farmers**

Advisory

Provide feedback on impact

Stakeholders

- **Farmers' Plot in Bagan Datuk, Perak, Malaysia**

iCOCOA   Pilot test

The Impact

PRECISION AGRCULTURE FOR COCOA PLANTATION MANAGEMENT

BOOST COCOA BEAN PRODUCTION

INCREASE FARMER'S CONFIDENCE LEVEL

MAXIMISING UTILIZATION OF BEST SOIL FOR FARMING FOR COCOA INDUSTRY

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Thank you

Please do not hesitate to contact us for collaborations

Special thanks to ASEAN IVO 2020 and NICT for accepting our presentation