



Capacity Building on Circular Economy,  
Resource and Energy Efficiency for  
Productivity and Sustainability of  
Cassava Chain to High Value Products:  
Cassava Root, Native Starch, and  
Biogas in Mekong Countries (CCC)

# Contents



01

## Project Overview

- Situation prior to the project intervention
- Project initiation

02

## Project Implementation

- Project management
- Challenges faced

03

## Project Update

- Project update and early results
- Plans for exit strategies

01



# Project Overview

# Project Detail



**Project Title:** Capacity Building on Circular Economy, Resource and Energy Efficiency for Productivity and Sustainability of Cassava Chain to High Value Products: Cassava Root, Native Starch, and Biogas in Mekong Countries (CCC)

**Country:** Cambodia, Lao PDR, Myanmar, Vietnam and Thailand (CLMVT)

**Duration:** 2.5 years (1 July 2020 – 31 December 2022)

**Budget:** 394,005 USD

**Objectives:**

1

To strengthen and sustain the development of the CLMVT region's cassava industry by knowledge and technology transfer and research and industrial work cooperation

2

To strengthen the skills and mobility of the CLMVT participants through an exchange of knowledge and experience via 3 training courses (cassava cultivation, cassava starch production, and cassava waste management )

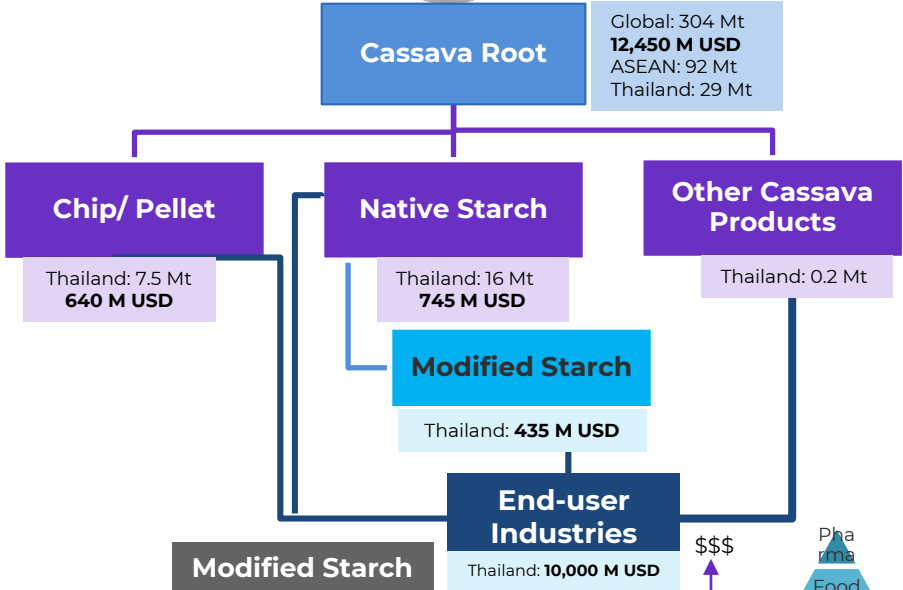
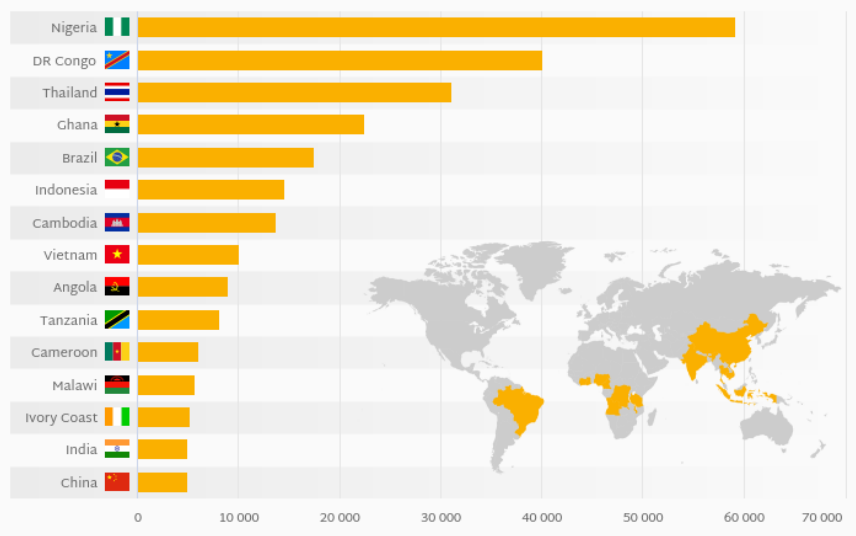
**Executing agency:**



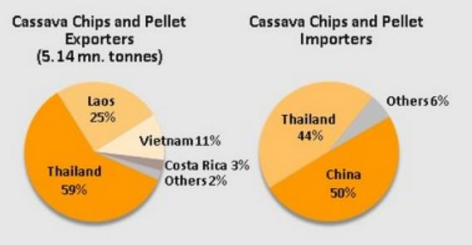
**Partner:**



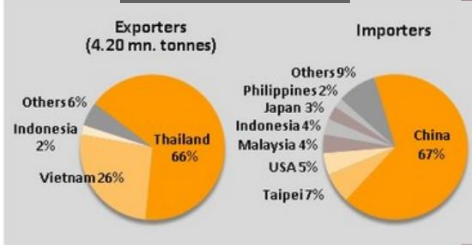
# Cassava Industry Status



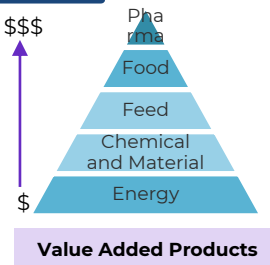
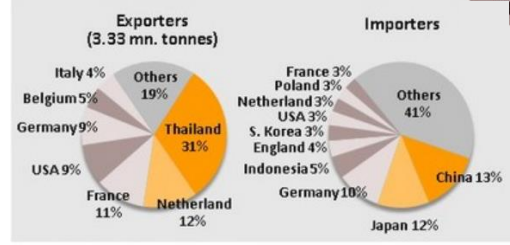
## Chip/ Pellet



## Native Starch



## Modified Starch



# Gaps Exist in Cassava Value Chain in the CLMVT Region



Lack of strengthening the cassava value chain through networking at the regional and international levels



Lack of knowledge of new cultivation methods, ways to combat disease and access to improved varieties



Lack of investment in product-specific cassava cultivation, i.e., starch, energy and resources efficiency and zero waste discharge



Lack of knowledge of modern innovation and technical improvements in cassava starch industry



Lack of awareness of environmental and health issue

**Network & Collaboration, Knowledge & Technology Transfer, Capacity Building, Industrial Standard**

# Excellent Center of Waste Utilization and Management (ECoWaste)



## About ECoWaste

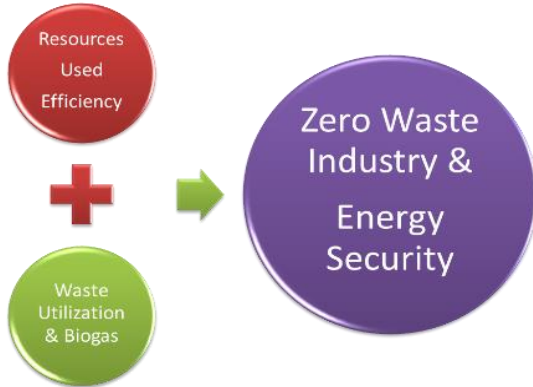
ECoWaste has been established since 1986 as Biogas Laboratory. It is a Collaborative Research Center between King Mongkut's University of Technology Thonburi (KMUTT) and National Center for Genetic Engineering and Biotechnology (BIOTEC), under Ministry of Higher Education, Science, Research and Innovation

## Mission

R&D on high-rate anaerobic digestion processes and biogas technology to treat and utilize wastes from agro- and food industries and animal farms for renewable energy production and environmental benefits

## Research Group

- 3 research thematic groups: (1) Microbial & Biochemical Research (2) Biogas Reactor & Process (3) Zero Waste & Resource Use Efficiency
- 1 Technical Service and Training Unit

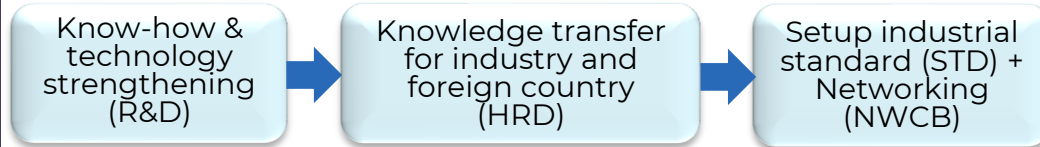


**R&D Framework**

- ❑ Reducing water usage and improving wastewater treatment and management for the most efficient use of water
- ❑ Reducing energy and resource consumption and increasing production efficiency of renewable energy (biogas) in production process
- ❑ Upgrading technology and innovation and increasing resource and energy use efficiency
- ❑ Encouraging entrepreneurship development
- ❑ Optimizing resource & energy for environmentally friendly process
- ❑ Providing R&D support for value-added product development
- ❑ Reducing waste from production process e.g., starch loss
- ❑ Supporting private sector to conduct industrial benchmarking



**Human Resource Development**



**6 CLEAN WATER AND SANITATION**

**7 AFFORDABLE AND CLEAN ENERGY**

**8 DECENT WORK AND ECONOMIC GROWTH**

**9 INDUSTRY, INNOVATION AND INFRASTRUCTURE**

**12 RESPONSIBLE CONSUMPTION AND PRODUCTION**



# Project Highlight



**Research**  
Cassava starch  
research  
project

2003 - present

2004 - 2009

**Capacity Building**  
Starch Engineering  
and Process  
Optimization  
(SEPO) Program  
**(0.17 million USD,  
funded by BIOTEC)**



2009 - 2011

**Capacity Building**  
Capacity Building on Energy  
and Resource Efficiency for Thai  
Native Starch Industry  
**(0.17 million USD, funded by  
GIZ + 0.19 million USD, funded  
by NSTDA)**



2012

**Implementation**  
Implementation of Near Zero  
Waste Concept for Improvement  
of Process Efficiency in Cassava  
Starch Industry  
**(0.05 million USD, funded by  
NSTDA)**



2012 - 2015

**Capacity Building**  
Productivity and Process  
Efficiency Improvement of  
Tapioca Starch Industry  
through the Capability Building  
Curriculum  
**(0.26 million USD, funded by  
DIP + 0.10 million USD, funded  
by NSTDA)**



2015 - 2019

**Technology Transfer**  
Overcoming Policy, Market and  
Technological Barriers to Support  
Technological Innovation and  
South-South Technology Transfer:  
The Pilot Case of Ethanol  
Production from Cassava  
**(1.33 million USD, funded by GEF)**



2020 - 2022

**Capacity Building**  
Capacity Building on Circular  
Economy, Resource and Energy  
Efficiency for Productivity and  
Sustainability of Cassava Chain to  
High Value Products: Cassava  
Root, Native Starch, and Biogas in  
Mekong Countries  
**(0.39 million USD, funded by  
MKCF)**



**Capacity Building**  
Train-the-Trainer Program under  
Lancang – Mekong Cooperation to  
Enhance Production Capacity and  
People's Livelihood by Improving the  
Value Chain for Cassava Cultivation  
and Application: Clean Cassava Chips,  
Native Starch, Modified Starch,  
Ethanol and Biogas Production  
**(0.46 million USD, funded by LMC)**



02

# Project Implementation

# Project Component

Cassava knowledge and technology hub established for disseminating and supporting the TT

Component 1



Manuals and toolkits developed for the TT (3 modules; cassava cultivation, starch, and waste management)

Component 2



Project lessons learnt and cassava technology widely distributed

Component 3



90 trained operators from CLMVT countries (30 participants/module, 6 participants from each country)

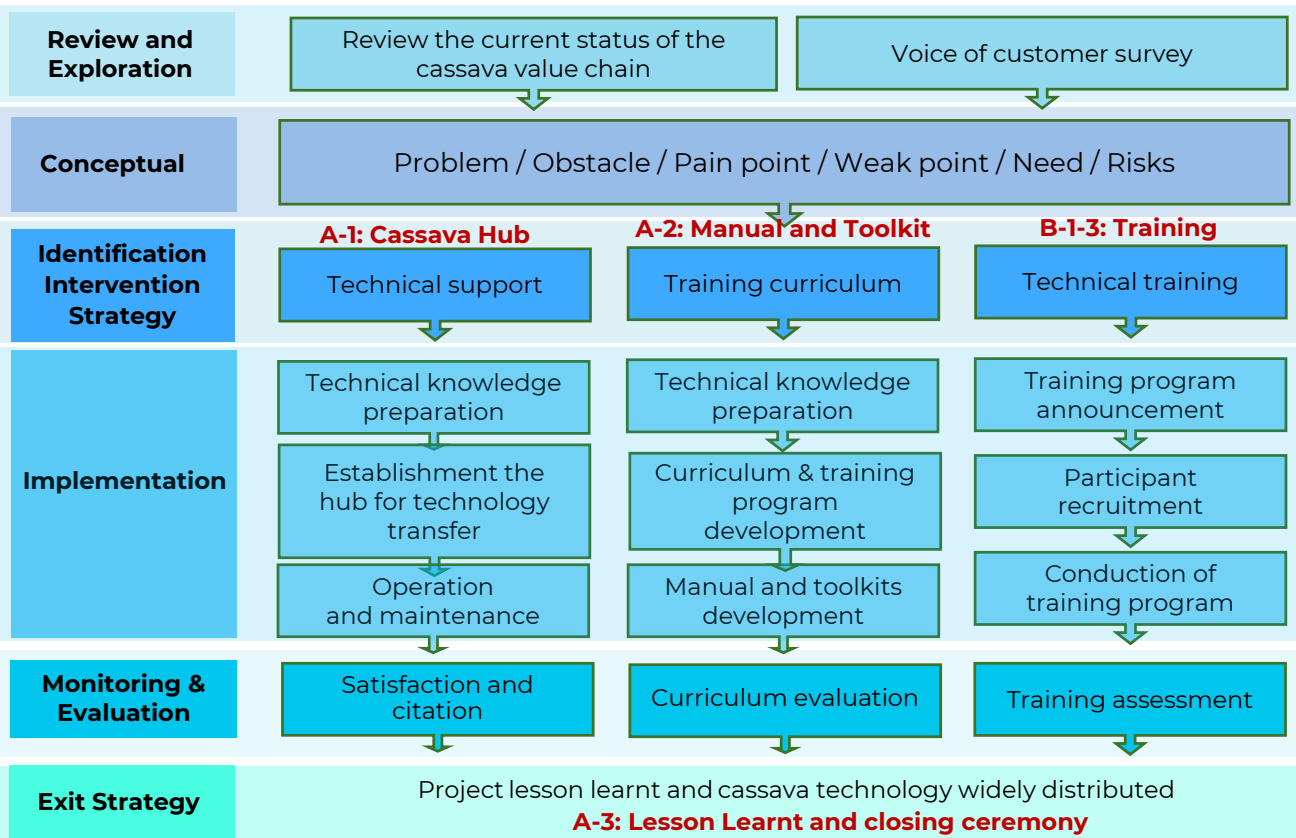
Component 4



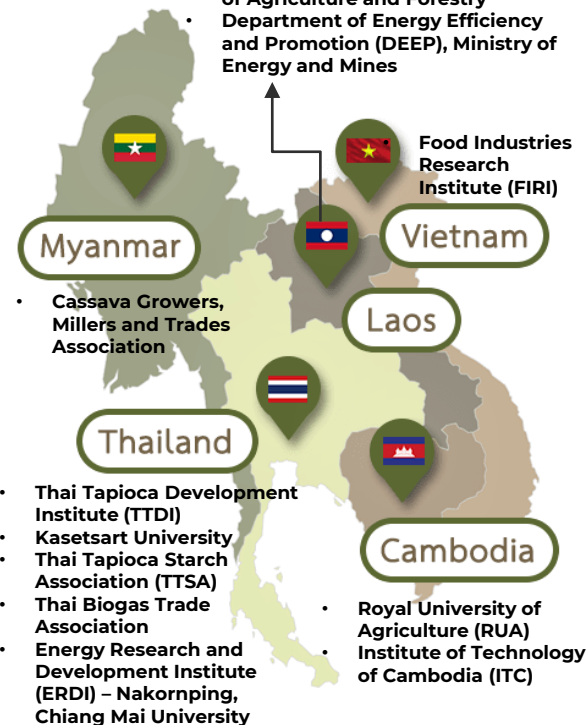
**Enhancing industry network to provide sustainable support of cassava technology  
Strengthening the capacity and skill of cassava value chain actors**

**Strengthening the competitiveness of the cassava value chain in the region**

# Project Management

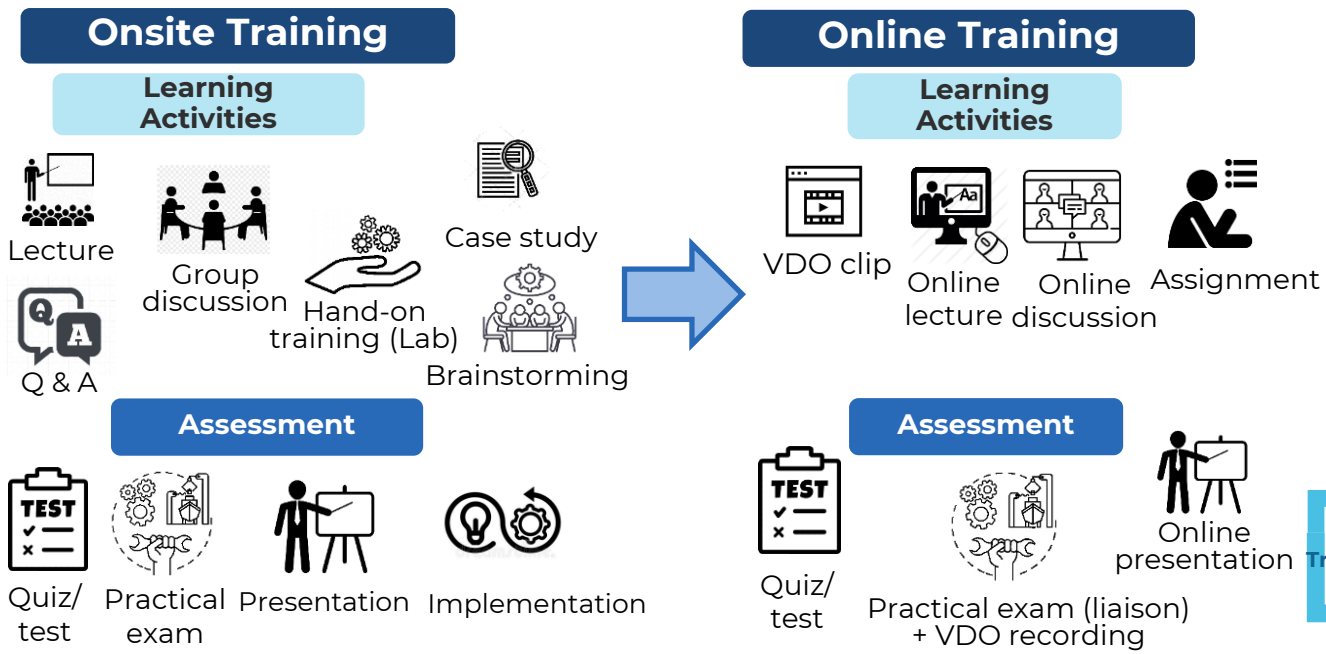
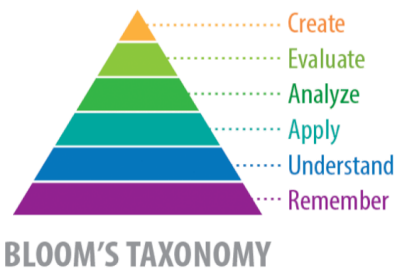


- National University of Laos (NUoL)
- Department of Agriculture, Ministry of Agriculture and Forestry
- Department of Energy Efficiency and Promotion (DEEP), Ministry of Energy and Mines



# Project Challenges Faced

Training adjustment from on-site to online training due to the COVID-19 pandemic





# 03

## Project Update



# Project Update and Results



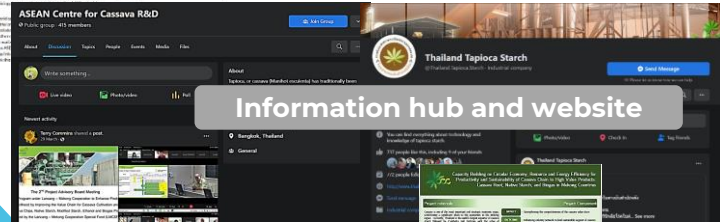
Key project outputs

- 1 Knowledge and technology hub
- 2 Training curriculum and materials
- 3 Training
- 4 Lesson learnt



Prepared technical knowledge

Established an information hub



Project poster and brochure

Designed a project structure

Developed curriculum & training structure

Developed manuals and toolkits

Organize training (Jul-Aug 22)

Conduct project lesson learnt

2020

2021

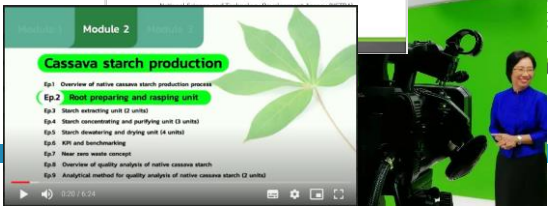
2022

Conducted a VOC survey

Reviewed the current status

Development of online learning materials

Finalizing all the training materials



# Knowledge and Technology Hub

1



**Website**  
www.asean  
cassava.info

- help establish our presence as a leading cassava research network/institute online
- Promote our research/works/ services
- Establish our credibility
- Provide key data

- Help us connect with audience
- Help build our identity
- Let us reach new audience with various backgrounds
- Encourage interactions between us and audience

2



**Social  
Networking  
Sites (SNSs)**  
Facebook, Twitter,  
LinkedIn, YouTube

Home Researchers Articles News & Events Cassava in ASEAN Bioethanol Project Activities

**ASEAN Centre for Cassava Research and Development**

About  
Cassava, or tapioca (Manihot esculenta) has traditionally been grown in tropical countries of the world as a domestic food source. While this remains important for lower income countries, over the last decade cassava has grown as an important industrial crop as new uses are found for this versatile tuber. Current industrial uses include: animal feed, alcohol, starch used in food production, bioethanol, sweetener for food, glue, mining pharmaceutical materials, textiles, MSG and mixing with bio-degradable polymers.

ASEAN member countries provide a significant portion of the world cassava supply, with Indonesia and Thailand being two of the larger producers. With increasing importance as an industrial crop, the focus remains on yield (i.e., basically tubers with the highest starch content). There is good opportunity for collaboration within ASEAN on cassava as the major producers have limited land resources due to competition with other crops, but they could contribute much to improving

**Sign in**

Email address  
Enter email

Password  
Password

**Sign In** or Register

Home Search Network EN TH

About Us Activities & News Technology & Knowledge Newsletters & Download Tapioca Community Agro-Industry Practice School FAQs Contact

**Tapioca Community**

**About us**

"Thailand Tapioca Starch Network" the benefits you will receive include: (1) the opportunity to exchange information within the industry (2) PR for your company or organization (3) or receive free (in proper) period, if you are interested, please leave your contact details here.

**Project**

Starch Engineering and Process Optimization  
Starch has collaborated with IMATT to research development of the agribusiness.

Special Publication on Genes and Domestication of the Tapioca Starch

## ASEAN Centre for Cassava R&D

Public group · 397 members

About Discussion Rooms Topics Members Events Media Files

Create a public post...

Live Video Photo/video Room

New activity

Terry Commins shared a link.  
November 8 at 4:44 PM  
https://www.pharmtimes.com/.../thailand-trade-preval.../

ASEAN member countries provide a significant portion of the world tapioca supply, with Indonesia and Thailand being two of the larger producers. With increasing importance as an industrial crop, the focus remains on yield (i.e., basically tubers with the highest starch content). There is good opportunity for collaboration within ASEAN on tapioca as the major producers have limited land resources due to competition with other crops, but they could contribute much to improving yields in the lower volume countries who are more likely to have available land. Considerable resources have been expended on tapioca research and the opportunity now exists for ASEAN members to share their knowledge and experience. The FB group is one step

Thailand trade prevails despite barriers

www.thailandtapiocastarch.net

ASTDA BIOTECH EPO THAILAND TAPIOCA STARCH

About News & Activities SEPO Newsletters & Download Tapioca Community & Webboard Technology & Knowledge FAQs Contact

**Thailand Tapioca Starch**  
@ThailandTapiocaStarch - Industrial Company

Home About Photos Videos More

Liked

About  
You can find everything about technology and knowledge of Tapioca starch.

14 people like this including 118 of your friends.

Thailand Tapioca Starch  
Thu 20 at 12:04 PM



# Publication on Website

ขอยุโรปวงฝึกอบรม **PR**

**ความเข้าใจข้อกำหนด และแนวทางปฏิบัติ ตามเกณฑ์อุตสาหกรรมสีเขียว**

วันพุธที่ 23 กุมภาพันธ์ 2565 เวลา 09.00 - 16.30 น.  
ผ่านระบบวีดิทัศน์ทางไกล (Zoom)

- กิจกรรม**
- 09.00-09.15น. เปิดกรรมา
  - 09.15-10.30น. เวทีอภิปรายเรื่อง "อุตสาหกรรมสีเขียว: ความสำเร็จและความท้าทายของอุตสาหกรรมสีเขียวระดับ 1-5"
    - \*\*\* 3 ภาคฯ: กลุ่มพัฒนาชุมชน
  - 10.30-10.45น. พิธีเปิด
  - 10.45-12.00 น. เวทีอภิปรายเรื่อง "ความสำเร็จของเกษตรกรผู้ปลูกมันสำปะหลังอุตสาหกรรมสีเขียวระดับ 1-5 (สอ) และเส้นทางในการรับรองอุตสาหกรรมสีเขียว"
    - \*\*\* 3 ภาคฯ: กลุ่มพัฒนาชุมชน
  - 12.00-13.00น. สัปดาห์ถามคำถาม
  - 13.00-14.00น. อบรมเชิงปฏิบัติการ
  - 14.00-15.00น. อบรมเชิงปฏิบัติการ
- ผู้ดำเนินกิจกรรม**
- \*\*\* 3 ภาคฯ: กลุ่มพัฒนาชุมชน
- วิทยากร**
- \*\*\* 3 ภาคฯ: กลุ่มพัฒนาชุมชน
- ประธานในพิธีเปิด** ศาสตราจารย์ ดร. ประสงค์ อภิชาตธรรมกิจ รองอธิการบดีฝ่ายวิชาการ มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี
- ผู้ดำเนินกิจกรรม**
- \*\*\* 3 ภาคฯ: กลุ่มพัฒนาชุมชน
- ประธานในพิธีเปิด** ศาสตราจารย์ ดร. ประสงค์ อภิชาตธรรมกิจ รองอธิการบดีฝ่ายวิชาการ มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี
- ผู้ดำเนินกิจกรรม**
- \*\*\* 3 ภาคฯ: กลุ่มพัฒนาชุมชน

**วิถีของความมุ่งมั่น การผลิตมันสำปะหลัง ด้วยวิทยาศาสตร์ เทคโนโลยีและนวัตกรรม**

www.ksrta.or.th

**มูลนิธิสถาบันพัฒนามันสำปะหลังแห่งประเทศไทย แยกต้นพันธุ์มันสำปะหลัง "พันธุ์ห้วยบง 100"**

**เงื่อนไขการลงทะเบียน**

- เกษตรกรผู้ปลูกมันสำปะหลังในเขตอำเภอสามชุกและพื้นที่ใกล้เคียง
- ลงทะเบียนภายในวันที่ 1 มีนาคม 2565 โดยแจ้งชื่อที่อยู่ และเบอร์โทรศัพท์ที่ติดต่อได้ **7** วัน เท่านั้น
- จำกัดสิทธิ์การลงทะเบียน คนละ 1 สิทธิ์
- บันทึกข้อมูล สถาบันพัฒนามันสำปะหลัง อำเภอสามชุก จังหวัดนครราชสีมา

**พันธุ์ข้าวอุตสาหกรรม แป้งมันสำปะหลังไทย**

www.ksrta.or.th

Event and Workshop

VDO clip  
Newsletter

**iCassava (ไอคัสซ่า)**

ดาวน์โหลด iCassava (ไอคัสซ่า) ผ่านช่องทางต่างๆ

Website, Android, iOS

**ชาวไร่มันสำปะหลัง เข้ม หนักยิ่งใบโกลด สลวย**

คิดค้นสูตร "Strip test" ตรวจโรคใบด่างมันสำปะหลังอย่างรวดเร็ว ใช้เวลา 15 นาที

**ภายใต้โรงงานแป้ง 63 ปี ทำแป้งเบเกอรี่สำหรับคนแพ้งูสเม แต่ 1 พาสถ์ ทำโรต่า 1 กู๊ดเทนเนอร์**

Technology transfer

**โครงการ Train-the-Trainer Program under Lancang - Mekong Cooperation to Enhance Production Capacity and People's Livelihood by Improving the Value Chain for Cassava Cultivation and Application: Clean Cassava Chips, Native Starch, Modified Starch, Ethanol and Biogas Production**

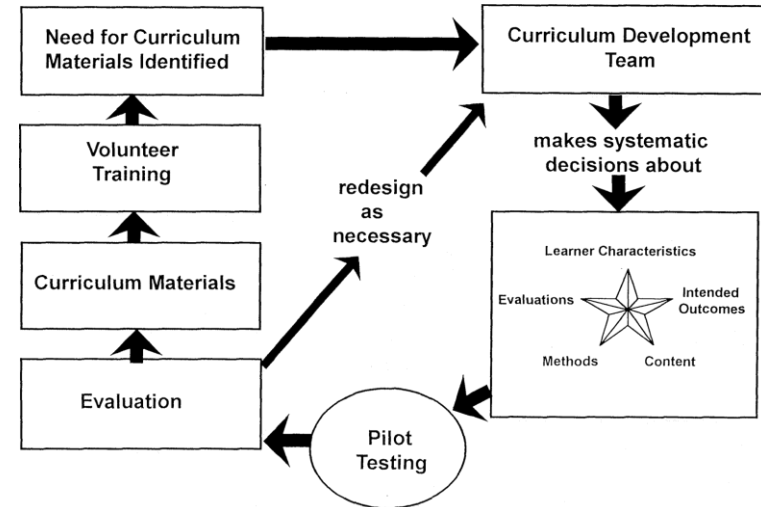
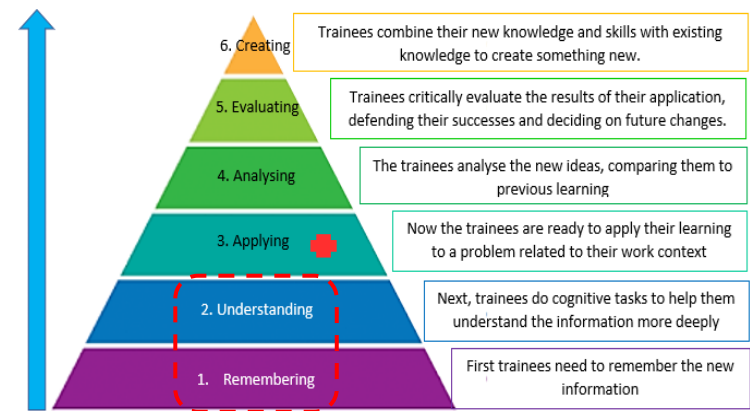
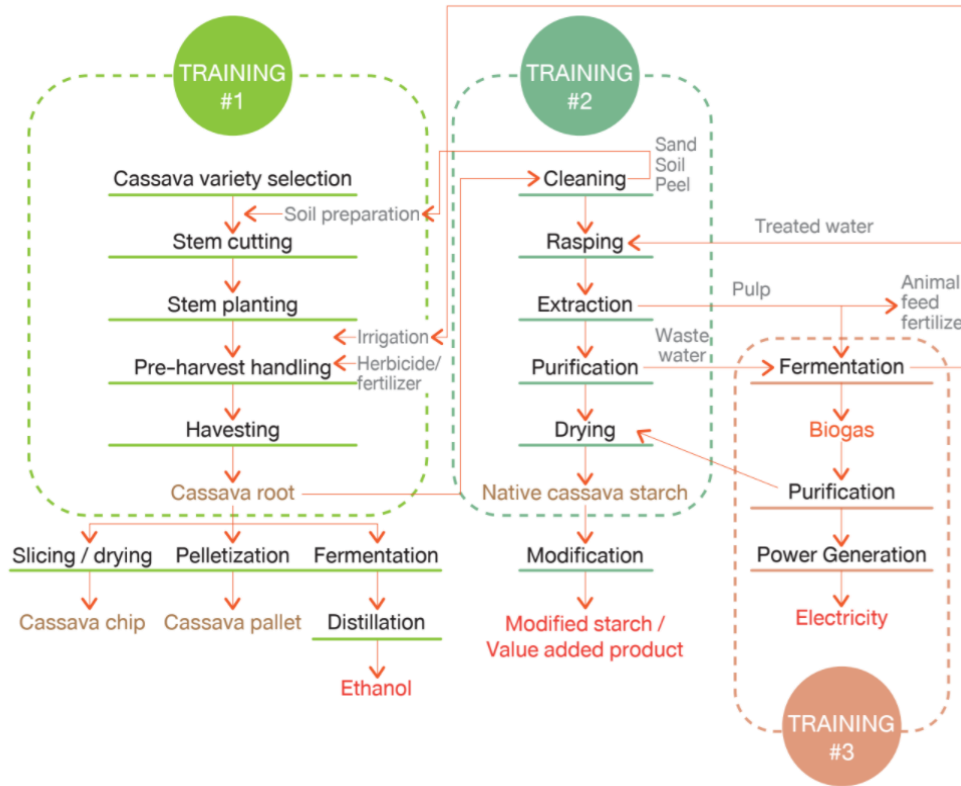
**จำนวน 13,732,488 บาท**

Dr. Watsana Engtrakul, Dr. Sathana Sangkai

PR our project



# Curriculum Development



# Training Module



## Module 1: Cassava Cultivation

- Cassava varieties and characteristic
- Soil, water and nutrients preparation, including the fertilizer and irrigation
- Cassava Mosaic Disease (CMD)
- Weed, disease and pest control, including biological control
- Harvesting and post harvesting
- Technology and innovation for cassava cultivation (e.g. smart farm, agricultural machinery, precision farming)
- Best practice for cassava cultivation



## Module 2: Starch Technology

- Native cassava starch: production process concept and technology (root receiving, cleaning, rasping, starch extraction, separation, dewatering, drying and packing)
- Utility system (e.g. boiler, water treatment system)
- Zero waste/Circular economy concept
- Benchmarking and KPI
- Best practice for starch industry
- Chip, pellet and modified starch



## Module 3: Waste Management

- Wastewater and solid waste treatment and utilization
- Biogas production concept and technology
- Affecting factor on biogas production efficiency
- Technique for operation and maintenance of biogas system
- Occupational health and safety
- Systems of algae-based waste water treatment

# Filming of Online Course VDOs for Training Module



Filming at cassava farm, starch & biogas plant



Filming at Technology Promotion Association  
(Thailand-Japan)

# Online Training Model (Organize training on Jul-Aug 22)

## Course Orientation

Project introduction

Module overview

Training procedure

Pre-test

## Self-Learning via CU MOOC

Self-learning by VDO clips/ manual/ PPTs

Lesson quiz

Feedback and question to lecturer

## Online Class via Zoom online meeting

Online discussion, Q&A

Follow up self-learning

Group brainstorming

Experience sharing

Assignment

## Course Conclusion

Assignment delivery

Lesson summary

Recommendation

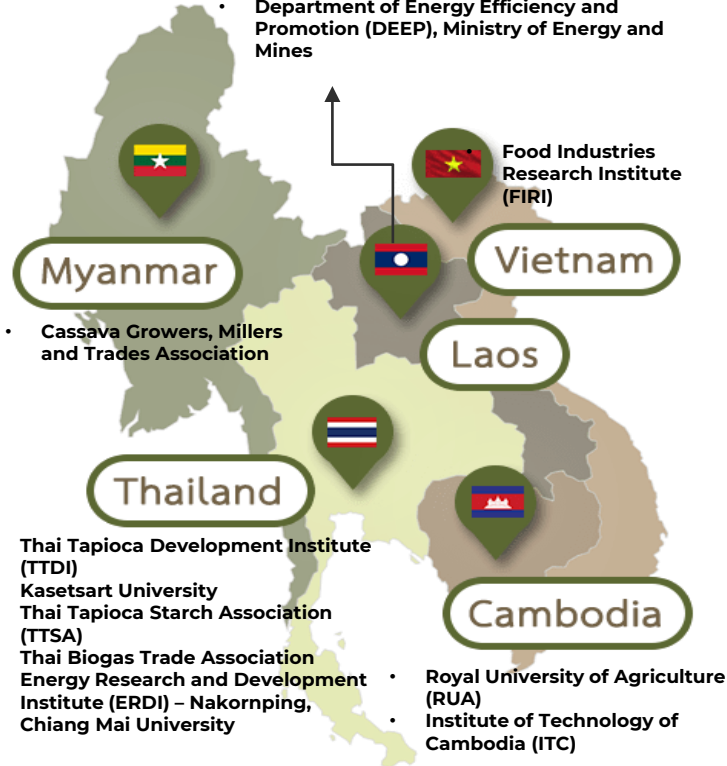
Post-test

Training evaluation

# Plans for exit strategies



- National University of Laos (NUoL)
- Department of Agriculture, Ministry of Agriculture and Forestry
- Department of Energy Efficiency and Promotion (DEEP), Ministry of Energy and Mines



## Plan for exit strategies

Establish national information hub (physical hub/ website)



Adjust the training curriculum to suit the country



Translate the training materials from English into local language



Disseminate the training materials via local training



Publish the training materials on website





**Thank you**

<https://www.mekonginstitute.org/what-we-do/development-fund/mekong-republic-of-korea-cooperation-fund/>