Smart and Sustainable Agricultural Mechanization: THAILAND CASE

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Challenges of Thai Agriculture
Thailand Agriculture

OVERVIEW

Agri-labor

12 Million Person = 32% of total labor force

Agri-Households

8 Million HH. = 29% of total HH in Thailand

Land Utilization

24 Million Ha. = 47% of total land in Thailand

Land-owned/HH

3.54 Ha./HH

GDP

% Growth
Thai↓ Agriculture↓

4.2% 2.3% 1.6% 5.8% 2.3% 1.6%
-6.1% -3.4%

% of Agri-GDP (Billion TH) on Thai GDP

Billion THB

1,500 1,250 1,000

2012 2015 2018 2021

1,422 1,463 1,335 1,219 1,237 1,302 1,340 1,375 1,358 1,383

Fruit 191,524
Para Rubber 175,978
Cassava 123,357
Rice 107,758
Sugar 48,996

Agri-Export Value In 2021

Unit: MB.

Source: NESDB Office of the National Economic and Social Development Council, NSO National Statistical Office (NSO), MOAC, OAE Office of Agricultural Economics
Challenges in Agriculture Sector
Tasks towards elevating Thailand farmers to international competitive level

Agriculture Sector (31% of labor) is one of the main job that increases Thailand's GDP
But now only increasing economic value at around 8 - 9% of Thailand's GDP

Onto Aging Society
- 80% of farmers are 45 years old or older

Farmer's household debt
- 230,000 average per household (58% of yearly income)

Low Technology Application
Poor access to innovation regarding increasing productivity

Product Decreases
- Lacks new agricultural technology, new types of plants, new techniques/knowledges

Relies on Exports & High Price Competition
Prioritizing competing with international prices

Lacks negotiability
- 90% of farmers owns less than 1.6 hectares individually

Drought & Poor access to water.
- There are only 23% area with proper irrigation.

Unpredictable weather, weed and pests
Natural factors resulting in efficiency decrease

Lack of information on market’s future demands
Quick crop change following market prices results in overproduction

Overuse of chemicals
Using too much chemicals is harmful to farmer’s, community’s, nature’s well being as a whole.

Source: BangkokPost, OAE Office of Agricultural Economics, PIER Puey Ungphakorn Institute for Economic Research, RID Royal Irrigation Department, BOT GDP 2563
AGRI-TREND In The Next 5 Years

**Government Support**
- Export Endorsement
- Futuristic Plants
- Online Farmers

**Increase Value And Productivity**
- **BCG Model**
  - Apply technology to develop product, increasing product’s quality and farmer’s income
  - Increase production
  - Zoning by Agri-map 134k rai
  - Large Scale Farming 8,319 plots

**Export**
- Jan - Dec
- 2020 vs 2021
- Growth
- Promoted clap as strategy

**Elevate high product quality**
- Organic / GAP
- Increase quality

**Futuristic Plants**
- **“Future Food”**
- Protein Per 100 g.
- Mung bean: 26
- Sesame: 23
- Brown: 17.7
- Straw: 7.6
- Jasmine mushroom: 3.2

**High value added**
- 6 main crop revenue: 1 rai
- Durian: 5.5k
- 500k
- Pineapple: 150k
- Mango: 38k
- Longan: 24k

**Farmer’s usage of social media in 2021**
- 91% Uses Smartphones
- 79% Uses Social Media
- 48% Online Shopping
- 36% Online Banking

**Unit**: Billion
- Durian: 5.5
- 500k
- Pineapple: 150k
- Mango: 38k
- Longan: 24k

**Increase**
- Rubber: +62%
- Cassava: -64%
- Rice: -84%
- Sugar: -7%
- Oil palm: -15%
- Durian: +65%

**Organic / GAP**
- Protein of the Future
- Jasmine: 21.1
- Pineapple: 13
- Tobacco: 25
- Rice: 32
- Maize: 45
- Chilli: 7.6

**Organic as strategy**
- generated as strategy

**Uses Social Media**
- Uses Smartphones
- Uses Social Media

**Online**
- Shopping
- Banking

**Per 100 g.**
- 23
- 22
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**Sales from Research**
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What is the Agri-Innovation?
FARM MACHINERY EVOLUTION IN THAILAND

1980

(-) Early recession (1980)

1990

(-) Asian Financial Crisis (1997)

2002

(-) Subprime Mortgage Crisis (2007-2010)

2004

Move to Modern Farm Machinery

2008

(+)(-) Rice-pledging (2011-2014)

(-) SKCN Flooding (2011)

2020

COVID-19 Pandemic (2020)

2021

TT&CH Production in Thailand 2010

2023

NEW Era Smart Farming

Set up KUBOTA FARM (2019-2020)
“End to End Solutions”

**Upstream**
- Open Farm Plantation
- Max. Revenue Farm Design Service
- Farm building Service
- Farm IoT Management System
- Market matching solutions

**Downstream**
- High value added service
- Market matching solutions

**Livestock Solutions**
- Smart livestock farm design service
- Animal feed and nutrition solutions
- IoT and smart monitoring System
- Market matching solutions

**Key Concept Driver**
- Max Revenue
- Smart & Precision
- BCG Model
Examples of Modern Innovations For Farmers

1. Solution: Growing vegetables in greenhouses and outdoors
2. Solution: Digging well and IOT/Software to manage water use
3. CROP CALENDAR Applications
4. Digital platform providing agricultural services
5. Agriculure SMEs.
6. Shared machinery use.
7. Increasing income stability
8. การปลูกพืชผสมผสานพืชหมุนเวียน

- Major Farmer accounts for only 5% of all farmers
- Focuses on business planting, can invest in innovation on their own
- Middle Level accounts for 25% of all farmers, they get together (as LSF) to be able to use smart farming
- Economic sharing: Renting, Hiring
- Minor farmers are the majority (over 70%)
- Uses new theory agriculture, Khok Nong Na Model, to achieve sustainable life.
- If they can get together as LSF, they can also use smart farming

Pieces of land per household

<3.2 ha (~70%)
3.2-16 ha (~25%)
>16 ha (<5%)
End to End “BCG in Agriculture”

1. Soil Preparation
   - Precision Land Preparation (Laser, soil testing) (G)
   - Water management System (C)

2. Planting & Seedling
   - Zero Broadcast (C)
   - New Theory Agriculture ทฤษฎีใหม่ (C & G)
   - Sugarcane seedling small stalk (B)

3. Maintenance
   - KAS crop calendar & Organic practice (C & G)
   - Crop analytics system (Farm management by IoT, Blockchain) (C & G)
   - Precision Farming (Variable rate, Drone) (C)

4. Harvest
   - Precision farming (C)
     - Crop production analytics
   - Reduce Loss during harvest process (C)

5. Post harvest
   - Zero Burn Project (G)
   - Add Value to Agriculture Residual (B)
     - such as Biomass, Bioplastic, Bio packaging

6. Sharing Economy
   - Matching Platform (C)
   - Rental Platform (C)
   - Market place & E-commerce (C)
•ZERO BURN & WASTE MANAGEMENT

To reduce PM2.5 pollution and additional benefit from soil improvement & income

**Source of Air Pollution (PM2.5)**
- Industry: 17%
- Transport: 13%
- Energy: 8%
- Residence: 7%

**Economics value of waste >67 Billion/Yr.**
- Reduce cost
  - Fertilizer
  - Organics Matter
- Value-Added
  - Rural,
  - Energy
- Increase Income
  - Selling waste
  - Contractor
  - Animal Feed

**Agri- Waste Quantity**
- Rice: 67 MT/Yr. (70%)
- Cassava: 17 MT/Yr. (17%)
- Maize: 6 MT/Yr. (9%)
- Sugarcane: 5 MT/Yr. (4%)

**Zero burn solution**
- Use only 17 MT/Yr. (37%)

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• ZERO BROADCASTING

To reduce Seed and Fertilizer in Rice Planting process and increase yield

- **Primary Crop (2020/2021)**
  - Broadcasting (Wet): 28%
  - Broadcasting (Dry): 57%
  - Transplanting: 13%
  - Seeding: 2%

- **Secondary Crop (2020/2021)**
  - Transplanting: 1%
  - Broadcasting (Dry): 4%
  - Broadcasting (Wet): 95%

- **Rice**
  - 68.54 M.Rais
  - 46% of Total Agri-landuse

- **SEED use for planting**
  - 1.61 MT*.
  - *on average 30 kg./Rais

- **SEED Value**
  - 32.3 MB. / Yr. @ 20 B/Kg.

**NEW Method**

- **Transplanter**
  - SEED use for planting
  - 7-8 kg./Rais

- **Direct Seed**
  - SEED use for planting
  - 8-10 kg./Rais

- **TT+Seeder**
  - SEED use for planting
  - 8-10 kg./Rais

**Reduce Seed or Cost Reduction = 21 MB.**
• Reduce Methane (CH₄) in RICE Cultivation
  Cooperate projects with many organization as THAI RICE NAMA project
  To reduce emission e.g. CO₂, CH₄

THAI Rice NAMA

1. Land Laser Levelling
2. Soil Analysis for Fertilizing
3. Wet and Dry Solution
4. ZERO BURN & WASTE MANAGEMENT

Reduce water 43%
Reduce fertilizer 377,000 ton/year
▼ 0.56-56 million ton of carbon
▼ 50 million ton of carbon

▼ 50 million ton of carbon
• Sharing Economy

Make Small Farmers can access to innovation and increase machinery utilization

Machinery Pool:
Utilize Government Budget
Software for operation
e.g. Machinery Management System + GPS telematics
As of 2022: 1677 Groups

Matching Platform:
to match service/machine providers with farmers
e.g. Rental Platform,
Service Matching platform (Driver VS Farmers)
As of 2022: >2000 Users
KUBOTA USE CASE
From Knowledge to Implementation
How to Promote Smart Farmer

Develop
End to End Solutions (KAS)
- Develop an application that standardize planting process to eliminate variability from external factors, resulting in increased productivity and not much difference each year.
- Precision rice farm and crop rotation New theory agriculture zone
- Para rubber, oil palm, wood
- Para rubber oil palm and fruits zone in Modern agriculture, modern field crops farm zone

Transfer
KUBOTA FARM
- The farm creates a modern farming real experience for farmers using agricultural innovation And End-to-End solutions

Role Model
Siam Kubota Community Enterprise (SKCE)
- Strengthen farmers community, SKCE from upstream to downstream.

Scale Up
KAS CROP CALENDAR Applications
- Develop an application that standardize planting process to eliminate variability from external factors, resulting in increased productivity and not much difference each year.

Increase Productivity
Reduce Cost
Increase Profit
Environment Friendly
- ZERO BURN ZERO Broadcasting
**LESSON LEARN AND RECOMMENDATION to be SMART FARMING**

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<th>5 Main Topics</th>
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<td><strong>1. Knowledge Development</strong></td>
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<td><strong>2. Knowledge Transfer to strengthen farmer’s capability</strong></td>
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<td><strong>3. Infrastructure Management</strong></td>
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**Cost reduction, increase productivity**
- Access to agricultural knowledge resource
- Access to essential information on agriculture
- Training agricultural innovation with Local Trainers

**Reduce the risk of external factors**
- Weather station to cover agricultural areas
- Land & Water management to be suitable for cultivation
- Easy access internet and coverage in all areas
4. Access to agricultural machinery and agricultural innovations

- Supporting the integration of large-scale farm (machinery pool) effectively
- Group set goals, have a sense of owner
- Government support initial investment or low interest
- Private sector provides knowledge on machinery and management system
- Promote the agricultural machinery rental & service provider matching platform for small area farmers

5. Market for sustainable income

- Access to market data on quantity, demand and price for accurate cultivation planning.
- Expand new markets for sustainability: Create new opportunities to sell online.
- Create added value and processing agricultural products
Welcome To The Next Decade