SUSTAINABLE AGRICULTURAL MECHANIZATION IN MALAYSIA

Presented by
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Malaysian Agricultural Research & Development Institute (MARDI)
PRESENTATION OUTLINE

- Introduction of Malaysia
- Malaysian Agricultural Scenario and Policy & Strategies
- Constraints and challenges in Malaysian Agriculture
- How we solve the challenges through Mechanization
Introduction: Country Background

- Consist of 13 states and 3 federal territories
- Total land mass 330,803 square kilometres (127,720 sq mi)
Introduction: Location & Climate

- Malaysia is located in South East Asia.
- Latitudes: $0^\circ$ to $7^\circ$ N
- Longitudes: $111^\circ$ to $122^\circ$ E
- Distance between Eastern and Western regions: 322 km
- Humidity: above 80%
- Equatorial climate: uniform temperatures
- Range from $23^\circ$ C (night) to $33^\circ$ C (day) at coastal area
- Average rainfall: 2500 mm per annum, monthly rainfall distribution depending on the monsoons
Introduction: Social & Economy

- Total Population: 31 million (2016)
- Urban population: 70% (Cities & Towns)
- Rural Population : 30%
- Population involved in Industries: 28%
- Population involved in Agriculture : 16%
- Main exported goods: Electronic Equipment, Petroleum and Liquefied Natural Gas, Wood & Wood-based Products, Oil Palm, Rubber, Textiles and Chemicals
- Major agriculture commodities: Oil Palm, Natural Rubber, Timber & Rice
Malaysia Agriculture Scenario

- Total land area - 33 million ha
- Agricultural area – 7.5 million ha
- Agriculture in Malaysia is divided into two sectors namely **industrial crops** and **agrofood**.

  - **Industrial crops** - Oil palm, rubber, cocoa, tobacco & pepper (86% of total agricultural land)
  - **Agrofood** - Paddy, fruits, vegetables & coconut (14% of total agricultural land)
Malaysia Agriculture Scenario: Paddy

- Rice is staple diet for all Malaysian.
- Top priority crop in agricultural production.
- Set the self-sufficient level of rice production of not less than 75% to meet local consumption.
- Paddy is the only crop in Malaysia that received government assistance in the forms of irrigation & drainage facilities, seeds, fertilizers and other financial aids.
Malaysia Agriculture Scenario: Paddy

- In Malaysia, water source for rice cultivation:
  - Rainfall – Main (52%)
  - Irrigation – additional (48%)
    - Storage dam (28%)
    - Surface runoff (20%)
  - Ground water – less
  - Water recycling pond – less
Malaysia Agriculture Scenario: Paddy

- In Malaysia, had 2 types of condition which were **wetland paddy** and **dryland paddy**.

- **Wetland Paddy** refers to paddy planted on water-logged field during its growing stage.

- **Dryland Paddy** refers to paddy planted on dry areas whether on upland or lowland and depends purely on rainfall for its water requirements.
Total planted paddy area in 2015 – 681,559 ha

Wetland Paddy area: 619,132 ha (91%)
- 521,425 ha of Peninsular Malaysia
- 32,582 ha of Sabah
- 65,125 ha of Sarawak

Dryland Paddy area: 62,427 ha (9%)
- 6,105 ha of Sabah
- 56,322 ha of Sarawak

*source from Department of Agricultural Malaysia, (2015)
## Malaysia Agriculture Scenario : Paddy

**Hectareage of Planted Area For Wetland Paddy By State, Malaysia, 2005 – 2015**

*source from Department of Agricultural Malaysia, (2015)*

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## Malaysia Agriculture Scenario: Paddy

### Hectareage of Planted Area for Dryland Paddy (Upland and Lowland) by State, Malaysia, 2006 – 2015

*Source from Department of Agricultural Malaysia, (2015)*

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Total for Malaysia:
- 2006: 56,907
- 2007: 60,607
- 2008: 66,493
- 2009: 60,347
- 2010: 79,912
- 2011: 70,744
- 2012: 67,775
- 2013: 65,532
- 2014: 62,427

*Note: Data for specific states and years are not provided in the table.*
### Malaysia Agriculture Scenario: Paddy

#### Average Yield of Wetland Paddy By State, Malaysia, 2006 – 2015

*source from Department of Agricultural Malaysia, (2015)*

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## Malaysia Agriculture Scenario: Paddy

### Average Yield of Dryland Paddy (Upland and Lowland) By State, Malaysia, 2006 – 2015

*source from Department of Agricultural Malaysia, (2015)*

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Malaysia Agriculture Scenario: Policy

- Agricultural Policy is a set of laws and procedures established by a government to achieve specific goals.
- The current one is the National Agrofood Policy (NAP) which was developed in 2010. This policy covers the period of 2011-2020.
The National Agro-food Policy (NAP) was developed in 2010 and approved for implementation on 28 September, 2011.

The focus of this policy is to improve the efficiency of agro-food industry in Malaysia in terms of driving productivity and competitiveness across the industry value chain.

Challenges faced by the agricultural sector: competition of land use with other sectors, short of labor, increase of cost production, increase of world population, climate change and the demand of better quality & affordable by the majority of people, which requires a new set of strategic and direction.
Malaysia Agriculture Scenario: Policy

- Objectives of National Agro-Food Policy:
  i. To ensure adequate food supply and food safety;
  ii. To develop the agro food industry into a competitive and sustainable industry; and
  iii. To increase the income level of agricultural entrepreneurs
Malaysia Agriculture Scenario: Policy

- NAP introduced seven strategic directions as follows:
  
i. Ensure national food security;
  
ii. Increase the contribution of the agro-food industry to GDP;
  
iii. Complete the value chain;
  
iv. Strengthen human capital;
  
v. Strengthen R&D activities, innovation and technology use;
  
vi. Create private sector led business; and
  
vii. Strengthen the service delivery system
The emphasis of the NAP is on agricultural development that focuses on production of agricultural products based on market demand and potential, and consumer preferences.

The focus is on 15 industries that include paddy and rice, capture fisheries, livestock, vegetables, fruits, coconut, edible birds nest, aquaculture, ornamental fish, seaweed, herbs and spices, floriculture, mushroom, agrobased food and agrotourism.

The strategies provide specific action plans, programs and KPI that are monitored by the Ministry of Agriculture and Agrobased Industry.
Malaysia Agriculture Scenario: Policy

- To strengthen the **paddy and rice** industry through six strategies along its value chains;
  
i. To increase productivity and rice quality
  
**ii. To increase efficiency mechanization and automation**
  
iii. Intensifying the use of by-products from rice
  
iv. Strengthening rice stockpile management
  
v. Restructuring the incentive and subsidy for rice
  
vi. Strengthening the institutional management of paddy and rice.

i. Establish the pathway and coordination in Mechanization and Automation

ii. **Strengthen Research & Development Program/Activity**

iii. Increase Ownership of Agricultural Mechanization

iv. Establish the involvement of Private Partnership/Institutional of Farmer

v. Increase Capacity in Manufacture and Distribution of Affordable Machinery

vi. Human Resource Capacity Development and Capabilities in Mechanization and Automation

vii. Control Pest & Disease
CONSTRAINTS AND CHALLENGES IN AGRICULTURAL SECTOR
Constraints and challenges of CA

- **Unavailability of suitable technology locally**
  Dealers in agricultural and food machinery, for example, are reluctant to supply specialized machinery that are not commonly and widely used in this country due to the uncertainties involved and the high cost of stocking spare parts. Under such situation, it would be impossible to obtain and utilize the most economically optimum agricultural engineering technology packages.

- **Import duty on machinery and equipment is high**
  Machinery parts and components that can be used for both agricultural and non-agricultural purposes tend to be categorized under non-agricultural purposes. Hence tax exemption is denied and this makes their use in agriculture costly and non-viable.
Constraints and challenges of CA

- Research and development contribution urgently needed

Agricultural engineering technologies in general are still in middle stage. The development of sufficient research facilities and training of more skilled personnel including exposure to the latest technologies that are available overseas are urgently needed to accelerate research and development efforts in the generation of innovation technologies to solve the immediate problems besetting the agriculture sector.
Inadequate and poor quality agricultural land

Due to climate change and poor infrastructures & management, Malaysia received more excessive of rainfall and sometimes become drought. The unpredictable weather conditions and short dry period has become a soft soil problems. Many hectares of paddy fields has been abandoned due to soft soil problems. Soft soils problem are growing and this situation is very worrying because it could affect the production of rice cultivation. Soft soil retarded the trafficability of machinery, especially when the process of land preparation and harvesting.
 Constraints and challenges of CA

- **High and increasing cost of production**
  Malaysian agriculture is operating under competitive global environment and is losing grounds due to increasing costs of production especially labour, machinery use and water control. They are related to the high costs of imported technology of agricultural machinery and irrigation equipment.

- **Competition from other sector**
  The input and utilization of agricultural engineering technologies is highly capital intensive investment, requiring long term commitment in the terms of resources such as finance and full management support. In such a situation, the agricultural sector has to compete for the resources with other sectors of economy.
SOLUTION THROUGH MECHANIZATION IN AGRICULTURAL SECTOR
Solution: Utilizing ICT in Agriculture

- Using precision farming technology in paddy production
- Using VRT to apply the seed, fertilization, and pesticide needed systematically
Solution: Rice Precision Farming

CROP ESTABLISHMENT

1. Land Levelling System & Variable Rate Seeding (VRT)

NUTRIENT MANAGEMENT

2. VRT For Fertilizer Application

FARM MANAGEMENT SYSTEM

YIELD MONITORING

3. Yield Monitoring UAV & Combine Harvester

CROP CARE

4. EWS – Early Warning System

Crop Establishment and Management Systems

- Land Levelling System & Variable Rate Seeding (VRT)
- VRT for Fertilizer Application
- Web Portal – Activities & Database
- Early Warning System (EWS)
- Yield Monitoring UAV & Combine Harvester

Yield Monitoring

- SMS – Amaran & Penjadualan
- Web Portal – Aktiviti & Database

Nutrient Management

- GAI Map
- SPAD Map
- Treatment Map
- Early Warning System (EWS)

Crop Care

- Yield Monitoring UAV & Combine Harvester
- EWS – Early Warning System

Agriculture 4.0
Solution: Standardize the machinery according to SOP

- Establish the standard operating procedure (SOP) for every post-harvest handling operation
- Standardize the equipment and machinery according to the SOP
Solution: Controlled Agricultural

- Develop a controlled agricultural environment system
Solution: Suitable Machinery

- Development of 4 half-track tractors

- Advantage: can be operated well in soft soil
Solution: Suitable Machinery

- Development of 4 half-track combine harvester

- Advantages: adapted well in soft soil
Solution: Straw Cutter Mounted on Combine Harvester
Straw Cutter Mounted on Combine Harvester

Result of testing

Comparison of harvesting without and with straw cutter attachment
Conclusion

- The use of mechanization and automation should be intensified to reduce production costs, increase agricultural production, reduce post harvest losses, reduce import of agricultural products to meet current needs and ensure national food sovereignty.

- Malaysia looks forward to collaborating with agencies, private organizations local & international to increase knowledge exchange on Mechanization and Automation in Agriculture.
References

- Statistic from Department of Agricultural Malaysia (2015)