CHAPTER 8

INNOVATION AND CHALLENGES IN MALAYSIAN AGRICULTURE
TOPIC 1

RESEARCH and INNOVATION TECHNOLOGY
Technological innovations in agriculture achieved through local research findings from:

1. government agencies such as MARDI, MPOB, MCB, MRB, FRIM and

2. private sector such as plantation agencies like Golden Hope, Sime Darby, Guthrie, IOI
1.1 Oil Palm

- Malaysia’s **golden crop** contributing RM30 billion to GNP annually. Equals to petroleum (Star, 17 Sept 2007)
- Malaysia is currently the **major world producer** of palm oil
- Cultivated in excess of **3.8 million ha**
- Malaysian companies **reverse investing** in Indonesia, New Guinea, West Africa and Latin America in oil palm cultivation
• Research improved yield of oil palm to 35 tonnes fresh fruit bunches/hectare/yr, using the Tenera hybrid (bred from the crossing of Dura and Pisifera varieties in early years)

• In the near future, the yield is expected to reach 40 tonnes with newer hybrids from biotechnology research
• Applied Agricultural Resources Sdn. Bhd. (KL Kepong Group) has developed:

1. **Dumpy.Yamgambi.AVROS** semi-dwarf oil palm hybrid which helps harvesting, has high yield potential and longer economic life

2. Potential **high yield** clones from **tissue culture**.

• In the near future **new hybrids** will be bred (including **transgenic**) that can produce more than 50% oleo-fatty acids.
• Palm oil is processed for food, oleochemical or biofuel

• ‘Zero waste industry’:

1. Trunk used as biocomposite material, pulp and paper, or decomposed for fertiliser

2. Leaves used for cattle feed

3. Palm oil mill effluent (POME) used as an organic fertilizer.

• Integrated farming with livestock in oil palm plantations also practised
Setting a good example

A plantation firm undergoes checks to verify that its operations are green.

By HILARY CHEW
hncchiew@thestar.com.my

HAVING palm oil production as its core business surely invites the microscope on Sime Darby Bhd’s corporate behaviour, especially now with heightened awareness of the crop’s environmental and social impacts.

However, the country’s biggest public-listed plantation company – after the merger exercise involving Sime Darby, Guthrie and Golden Hope last year – is ploughing ahead with certification of its operation under the first global initiative for sustainable palm oil, the Roundtable on Sustainable Palm Oil (RSPO).

With a total planted area of 329,470ha in Malaysia and 105,356ha in Indonesia, Sime Darby is aiming for 10 SOU (standards operating unit) certificates by June. (A SOU refers to one mill and its contributing estates.) Of the 10, eight will be from Malaysia and two from Indonesia. It plans to obtain certification for the remaining 55 mills, in stages, by 2010.

To obtain the green certificate, companies must adhere to the eight principles and 39 criteria set out by RSPO. The more stringent requirements include no further clearing of forests for expansion and no displacement of indigenous communities without consultation.

Green practice: The old palms on the estates of Golden Hope Plantation Bhd are shredded mechanically, placed in trenches and left to decompose. – SAM THAM / The Star
1.2 Rubber

- Malaysia is the third largest rubber producer in the world with 1.7 million ha. trees.
• Many technological innovations have been developed in the rubber industry by MRB:

1. **High yield and disease resistant clones** producing >3500 kilo rubber ha-1 yr-1.

2. In the 70s it introduced a high grade rubber named **Standard Malaysian Rubber (SMR)** in the form of **heveacrum**b which is internationally recognized as **high quality raw material**.

3. New tapping method called **puncture tapping** or **microtapping**, with **increased latex** production.

   It produces **yields**, with **hormonal stimulation (etheral)**, comparable to conventional excision tapping.
• Rubber can be turned into many manufactured goods and used for many purposes:

1. Conventionally, rubber can be made into tyres, gloves, shoes, condoms, mats, insulators, erasers, etc.

2. New latex-timber clones (LTC), RRIM 200 series have been introduced of which the trunk can be used for timber

3. Vitamin E has also been extracted from the latex.
• Malaysia has the best system of plantation management in the tropics, all with the support of years of research, especially pertaining to terracing and cover crops.

• Current rubber production is sustained at 750,000 million tonnes yr⁻¹

• Consolidation of uneconomic-sized smallholdings into estates have achieved economies of scale

• Replanting are undertaken as part of reforestation programmes.
1.3 Cocoa
• Cocoa production: 131,000 tonnes (1995)
  70,000 tons (2000)

Reduction due to:

1. **reduction in planted areas** (1989: 400,000 ha; 2005: 33,313 ha)
2. **low market price**
3. **adverse weather conditions**
4. **labour shortage** and
5. **high production cost due to pests and diseases**

• **Malaysia imports cocoa beans from Indonesia** to fulfill the requirement of the many **processing** factories.
In 2002 a biotechnology division of MCB was established. Research includes:

1. **agrobiotechnology** to improve primary productivity and efficiency

2. improving quality of cocoa products with respect to safety and health

3. new useful **bioactive compounds** (industrial and pharmaceutical) from tree, pod waste and associated microbes
1.4 Padi

- **Malaysia** currently achieves only 70% self-sufficiency in rice. Target is to achieve 90% self-sufficiency in near future.

- Among the **eight granary areas**, the major production centres (rice bowls) are:
  
  1. **MADA** (Kedah-Perlis)
  2. **KADA** (Kelantan) and
  3. **Sawah Sempadan-Tanjung Karang** (Selangor).
• In 1995, the **average national** production: **3.8 tons** per ha

Some areas in **MADA**:  > **5 tons ha**-1

Some areas in **Tanjong Karang**:  > **10 tons ha**-1

• **Government** aims to raise the yield to **10 tons ha**-1 with new technology.
• Commercialization and greater private sector involvement

• Involves:
  1. **Mechanisation** of rice production and
  2. **Consolidation** of small holdings to group farming and **estates** (mini-estates in Hilir Perak)
• Specially formulated chemical fertilizers in trials doubled padi yield and improved quality:

1. Vita-grow® is a foliar fertilizer developed by UPM that contains complete and balanced plant nutrients

2. Zappa® is another UPM product that enhances rapid germination and tillering.
1.5 Livestock

• Livestock industry:
  1995: RM953 million
  2000: RM 1.1 billion (3.1% growth/yr)
• **Integration of livestock** rearing in oil palm and rubber plantations increased greatly beef and mutton production.

• Integration reduces management cost by allowing livestock to eat away weeds and having animal dung distributed all over as fertilizer.

• Land development agencies, namely FELDA, RISDA, FELCRA and State governments have participated in this integration programme.
• Cattle have also been raised in feed-lots, a concept introduced from overseas in early years

• **Malaysia** has developed new breed of beef cattle named **Brahmas**, a cross-breed between imported **Brahman** and local **Kedah-Kelantan** breed.

• **Buffaloes** are also now selected for meat purposes.
• A sheep named Malin, a cross between Australian and Indonesian breeds was also developed to increase local supply of mutton.

• The Boer goats, a South African breed, are raised in large numbers for the same purpose.
• Our Malaysian poultry industry is very advanced

• We are able to produce broilers (meat) and eggs to meet not just the nation’s demand but also for export
• Much research has been conducted on chicken diseases locally.

• The fowl pox and the Newcastle disease vaccines designed at UPM are now marketed internationally, while vaccine against the infectious bursal disease is expected to be available soon.
• Researches on deer and ostrich have been undertaken by UPM and MARDI to provide alternative meat resources.
1.6 Fisheries

- **Aquaculture (aquafarming)** is the cultivation of natural produce of water such as fish, shellfish, prawns, crabs, algae and other aquatic organisms.

- Distinguished from fishing by the idea of active human effort as opposed to simply taking them from the wild.
• Aquaculture includes:

1. Fish farming - raising of fresh water (carp, catfish, prawn, tilapia) and brackish water (sea bass, tiger prawn, crabs) fishes in ponds, net cages on land or river

2. Mariculture - aquaculture in the ocean which includes raising of mollusks (oysters, clams), cultured pearls, algae and seaweeds.
The fisheries industry has received government incentives to further commercialise, consolidate small ventures for economy of scale, and venture into export markets.

Mega-fishing ports that manage integrated processing complexes have been constructed in Penang and Sarawak.

The government has set the target for fish production of 1.7 million tons by 2010 from the current 0.98 million tons annually.

Fishes produces about 60% of the animal protein intake of the country.
• Research has been done on the use of probiotics in improving cultivation of fish and prawns.

A rapid detection kit has been developed to detect white spot syndrome virus (WSSV) disease in prawns.

• Biotechnology is low-key at the moment but will be promoted extensively in the future.
1.7 Fruits, Flowers and Vegetables

• Much research conducted on fruits such as: banana, pineapple, papaya, starfruit, mango, durian, guava, watermelon, jackfruit, rambutan, citrus, duku langsat, cempedak, ciku and mangosteen.

• Flowers such as orchids is a growing industry. Tissue culture is now used for mass-production of orchid seedlings which are even exported.
• The vegetable industry has recorded a growth of 7.2% annually. Research have focused on yield increase, optimal usage of fertilizers, water, and new strains together with pest and disease control.

• Mushrooms which are strictly fungi but considered as “vegetables” is a growing industry in Malaysia. Research has focused on production biotechnology, cultivation of new species and novel mushroom products.
1.8 Bioagents

- Innovations using biological organisms can be found in the form of biofertilizers such as *Rhizobium* and biocontrol agents.

- UPM has formulated naturally occurring antagonistic fungi effective against fungal diseases of *vegetables*.

Predatory mites have been successfully mass-reared for control of *plant-eating mites*. 
1.9 Precision Agriculture

- This is a new innovation in agriculture. Also known as “site specific management”. Initially attracted the interest of the plantation sector.

- Utilises ICT and electronic tools to determine specific amounts of fertilizer, pesticide, etc. required in specific localities (micro-niches).

- In the long run saves management cost and increases yield.

- Precision agriculture is being practiced partly in oil palm and padi growing areas.
TOPIC 2

FUTURE CHALLENGES IN AGRICULTURE
2.1 Labour

• There is a great shortage of labour with cost rising steadily in Malaysia. In agriculture there is great dependence of foreign labour with some estates employing 100% foreigners particularly those from Indonesia and the Philippines.

• However, as a transitional measure, the government still adopt a liberal policy on the recruitment of foreign workers for the agricultural sector.
2.2 Price

- Increase in the **price** of fertilizers, seeds, tools and equipments has affected the cost of agricultural production.

- **Market price** is also **elastic and problematic** at times especially when there is a **sudden drop** in commodity price.
2.3 Crop Choice

- **Big conglomerates** are not interested in agriculture other than planting oil palm and rubber.

- **Not many large companies** are involved in food crops.
2.4 New Agricultural Technology

Research on new frontier technologies although most still experimental include use of:

1. Cell, tissue culture and genetic engineering techniques to develop new crop varieties

2. Plant cell cultures to develop new products in pharmaceuticals, nutriceuticals and food additives

3. Embryo manipulation technology and genetically engineered vaccines to increase animal productivity

4. Robotics, computer modeling and microprocessor control in machinery and automation equipment to reduce labour

5. Advanced processing and packaging systems to strengthen better post-harvest handling and shelf-life of agricultural products.
2.5 Resources

• There is keen competition for resource use in future between agriculture, industry, residential buildings, wildlife, recreational establishments, and water catchments.

• The main challenge in the future is to enable continuous crop production with high yield per unit area. Unfortunately, excessive agrochemical inputs needed lead to soil degradation. Land development adds to the degradation.
• **Water resource** management is important as only **2.1%** of the country’s heavy rainfall is being used currently. This low rate is due to **seasonal distribution of rainfall**.

• **Excess water** causes **flooding** and need to be drained. More **water storage dams** should be constructed to reduce water losses.

• **Water resources** should also be managed at the **national level** as presently it is under individual **state jurisdiction**.
• Land development therefore has to be properly managed which involves multiple objectives decision making.

• An environmental impact assessment (EIA) has been made mandatory to anyone who intends to develop land commercially, including large scale agricultural development.
In summary, agricultural practices on arable soils must be productive, environmental friendly and sustainable. This calls for efficient water, fertilizer, soil conservation management and new technologies such as precision farming and biotechnology.