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**MALAYSIAN HORTICULTURE PERSPECTIVES: EDUCATION,
RESEARCH AND EXTENSION**

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Abstract

Horticulture has become a commercial venture during the Eighth Malaysia Plan period (2000-2005) due to improved productivity, higher value-added and exports of horticultural commodities. These were achieved through utilization of new technologies, wider adoption of group farming system, redevelopment of alienated agriculture land, increased market accessibility and better commodity prices. Approximately 30% of the agricultural production in Malaysia is in horticultural crops including fruits, vegetables and ornamentals. The Ministry of Agriculture and Agro-based Industry is focused on training graduates with certificates and diplomas in commercialization of agricultural activities, modern farming practices, postharvest handling, processing and marketing of horticultural commodities. Presently, the Universiti Putra Malaysia is the only university in the country offering the Bachelor of Horticultural Science degree. It is a full-time program, with emphasis on the fundamental understanding of scientific, technical and management aspects in the field of horticulture. The other universities deal with only a few courses in horticulture. The main focus of horticultural research carried out by government agencies and academic institutions have been concentrated on advanced cultivation technologies, pest and disease control, improvement of postharvest handling practices and mechanisation. Funding for research in horticultural crops is provided by the government through the Ministry of Science, Technology and Innovations and the Ministry of Higher Education. The Department of Agriculture carries out extension activities by dissemination of information on new cultivation technologies to farmers and entrepreneurs through the National Agricultural Skills Training Programme. These measures are undertaken to increase the income of small holders and farmers in the rural areas. The higher growth rate achieved by the agriculture sector during the Eighth Malaysia Plan resulted in more intensified agriculture development programmes for the Ninth Malaysia Plan (2006-2010), thus making agriculture the third engine of growth in the country.

INTRODUCTION

Malaysia is made up of Peninsular Malaysia (which lies between Thailand and Singapore) and East Malaysia (which lies on the island of Borneo). The combined land area of both regions is about 330,400 sq km (Ministry of Plantation Industries and Commodities). The Main Range (Banjaran Titiwangsa) divides Peninsular Malaysia into the East and West Coast. East Malaysia is covered with a series of mountain ranges in the interior regions of the states of Sabah and Sarawak. Mount Kinabalu, Sabah, is the highest peak (4,093 m. above sea level) in South East Asia.

The country is warm throughout the year with temperatures ranging from 21 - 32° C in the lowlands but is as low as 16 - 20° C in the highlands. Generally, Malaysia has two distinct seasons. The dry season occurs during the south-west monsoon from May to September. The north-east monsoon brings the rainy season to the country during October to March. Rainfall is approximately 2,500 mm per year and the relative humidity level is 80% throughout the year.

Thus, Malaysia is a tropical country blessed with a diversity of climatic and geographical regions. This diversity allows many horticultural crops to be introduced and grown successfully. Production of horticultural crops namely cut flowers and ornamentals, fruits and vegetables has contributed significantly to the Malaysian economy and it will continue to do so. This paper gives brief insight into the horticultural crop production in Malaysia as well as highlights the country's horticultural education, research and extension with respect to policies and thrusts of the agriculture programmes.

HORTICULTURAL CROP PRODUCTION

Ornamentals

In 2006, an estimated 2000 ha of land (Table 1) were used for cut flowers and ornamentals production. The production of these crops were 153 thousand tonnes (Table 2), with an estimated crop value of more than RM100 million or about 0.33% of the world market share of RM 30 billion (DOA, Malaysia, 2007). The ornamental horticulture industry in Malaysia produces four types of products: temperate flowers, orchids, ornamental foliage and dried flowers. Temperate flowers comprise of chrysanthemum, rose, carnation, gerbera, liliium, anthurium, aster, solidago and limonium, which together account for 60% of the total ornamental area (FAMA, 2006). The remainder 40% comprises lowland orchids and ornamental foliage.

Orchid flowers currently being produced include dendrobium, mokara, oncidium, vanda, aranda and phalaenopsis. Orchids are mainly planted under netted structures to control pest damage, with the largest structure being approximately 35 ha. Ornamental cut foliage includes cordyline (fire brand), pleomele (Song of India) and ferns while potted foliage includes araceae and codiaeam. Potpourri and dried leaves and branches are in the dry flower category. Nurseries produce rooted, poly-bagged and potted ornamental plants both for local and export markets especially to Singapore. The turfgrass industry is expanding to supply sods for parks, golf courses, highways, erosion control along terrain and for home and commercial landscape.

The suitable climate of the country enables continuous production of both temperate and lowland cut flowers and foliage all year round for export to Hong Kong, Japan, Europe and the Middle East. Malaysian flowers have been proven to be of high quality and are comparable to those produced by other leading flower producing countries, such as Thailand, The Netherlands, China and Kenya. The Malaysian Standard specifications on quality, grades and packaging methods for cut roses, chrysanthemum, carnations and orchids have been formulated and implemented by most exporters. These provide good marketing opportunities for Malaysian cut flowers particularly in the export markets.

Fruits

The per capita consumption of fruits in 2005 was 65 kg and is expected to rise to 75 kg in 2010 (DOA, Malaysia, 2007). The expansion in land area (ha) for fruit cultivation led to an increase in production at an average rate of 9.8% per annum (Ninth Malaysia Plan, 2006).

Production is concentrated in 15 types of fruits. In 2006, land under fruit cultivation was 310 thousand ha (Table 1) with a production of 1.8 million tonnes (Table 2) and valued at RM 2.7 billion (Ministry of Plantation Industries and Commodities, 2006). Overall, Malaysia is a net importer of fruits, with total export value of fruits of RM 482.8 million, while import value was RM 657.7 million in 2004 (DOA, Malaysia, 2007). Pineapple, watermelons, papaya, banana, durian, guava, banana and star fruit were the major fruits exported.

Pineapple, the largest export fruit crop, has long been planted for the canning industry and exported as canned products. The Cavendish banana is the second largest fruit being exported (mainly to Japan). In commercial estates, Cavendish banana is planted in newly cleared oil palm areas meant for replanting. In terms of other fruits, there is an increasing trend of planting watermelon as an intercrop among rows of newly planted oil palm or rubber trees. The bulk and continuity of supply for watermelon is achieved through contract farming where farmers are provided with seeds and technologies for production. The demand for papaya as an export crop, especially to China, resulted in the conversion of vegetable areas in the south of Peninsular Malaysia into large scale papaya cultivation. Research is being carried out to determine the best method of controlling fruit flies to meet the quarantine requirements of the export crop. Fruits like guava and star fruit are widely planted in tin-tailing soils that have been improved through the use of organic matter application. Lastly, mangoes are planted in parts of the country that have a distinct dry season.

The Malaysian fruit industry is comprised of mixed and less organized, scattered and small orchards which are inefficient, uneconomical and utilizes low technology and inefficient marketing systems. Fruit collection from these scattered orchards results in high transportation costs and postharvest losses. Fruit production is highly seasonal, thus creating an over-supply of fruits during the peak period followed with virtually no supply during the off-season period.

Vegetables

Per capita consumption of vegetables in 2005 was 55 kg and is expected to increase in 2010 to 65 kg (DOA, Malaysia, 2007). The production of vegetables grew at an average rate of 13.8% in 2006 compared to 2005 (Ninth Malaysia Plan, 2006). Vegetables occupy an area of 53.4 thousand ha (Table 1), with estimated production of 0.7 million tonnes (Table 2), valued at RM 1.3 billion (Ministry of Plantation Industries and Commodities). The total export value of vegetables amounted to RM 462.8 million, while import value was RM 1.5 billion in 2004. Malaysia imports a high proportion of potato, shallot, onion and garlic.

Temperate vegetables such as cabbage, cauliflower, sweet pea, sweet pepper and tomatoes are produced in Cameron Highlands (Peninsular Malaysia) and Kundasang (Sabah). Lowland vegetables include kangkong, leafy Brassica spp., long bean, green bean, okra and lettuce. Vegetable production is a very intensive cropping system and normally occupies an area of less than 1 ha. The demand for low pesticide residues in vegetables calls for the planting of vegetables under netted structures of 1 to 70 ha. Most of these vegetables are exported to Singapore.

Tomatoes and bell peppers have historically been coated with powder resulting from pesticide application during growth. However, these crops are now grown under plastic houses using fertigation and this practice has enabled consumers to enjoy pesticide free tomatoes and bell peppers. In fact, tomato production in Cameron Highlands has increased to the extent of requiring high technology packing-house equipment. Most vegetables are now pre-packed into small packages at the farms before being sent to the supermarkets for sale to sophisticated consumers.

The introduction of the Malaysian Organic Scheme in 2004 promoted the production of organic vegetables. Under this scheme, farmers can now sell their produce at premium prices, while consumers can have the confidence of purchasing true organic vegetables. In 2006, a total of 132 ha of organic vegetable farms have been certified under this scheme (DOA, Malaysia, 2006). Organic vegetables that are free of chemicals are sought after by health-conscious customers and cancer patients or survivors.

EDUCATION

The Ministry of Agriculture and Agro-based Industry is focused on training graduates with certificates and diplomas in commercialization of agricultural activities, modern farming practices, postharvest handling, processing and marketing of horticultural commodities.

Presently, the Universiti Putra Malaysia is the only university in the country offering the Bachelor of Horticultural Science degree (Faculty of Agriculture, 2006). It is a full-time program, with emphasis on the fundamental understanding of scientific, technical and management aspects in the field of horticulture. In this program, students are taught basic sciences, applied biology, soil science, economics and resource management, planning and evaluation. The unique features of this program are the requirements for students to take five credit hours of Farm Practice Courses and 12 credit hours of Practical Training. These courses equip students with skills in techniques and practices of horticulture and related industries. The Faculty of Agriculture at the Universiti Putra Malaysia offers BS, MS and PhD degrees in horticulture. Other Malaysian universities offer only limited courses in horticulture.

The Faculty of Agriculture is responsible for developing, evaluating, and disseminating knowledge and information to support the diverse ornamental, fruit and vegetable industries in Malaysia through teaching, research and extension activities. The faculty comprises experts in breeding, crop production, plant nutrition, physiology, genetics, biotechnology, mechanization, weed science, postharvest biology and technology, and marketing. The faculty conducts teaching and research in the Agriculture Technology Park of the university.

In the years 2006-2010, under the Ninth Malaysia Plan, labour productivity is expected to increase at an average rate of 6.2% per annum (Ninth Malaysia Plan, 2006). The government is emphasizing the provision of training to change the mindset and attitude of farmers as well as the younger generation including those with higher education to participate more effectively in modern and commercially oriented agricultural activities. These efforts are carried out to create job opportunities, particularly among unemployed graduates. A total of 657,720 entrepreneurs and farmers are expected to be trained during the Plan period. In this respect, several agricultural training institutions are expected to be upgraded so as to implement the National Agricultural Skills Training Programme. Institutions of higher education have also been encouraged to review existing programmes and develop new curricula to meet market requirements.

RESEARCH

The main focus of horticultural research conducted by government agencies and academic institutions is on advanced cultivation technologies, pest and disease control, improvement of postharvest handling practices and mechanization to increase productivity and improve quality of products (Ninth Malaysia Plan, 2006). The government through the Ministry of Science, Technology and Innovations and the Ministry of Higher Education provides funding for applied and fundamental research, respectively. Research institutions also receive funding directly through their respective institution's annual budget. Agricultural research and development (R&D) continues to be emphasized to further improve competitiveness of the sector.

Funds allocated to agricultural research (including horticultural crops) amounted to RM 614 million for the Ninth Malaysia Plan (2006-2010), which is approximately 5.4% of total development expenditure and allocation for agriculture. The faculty members of the Faculty of Agriculture, Universiti Putra Malaysia are awarded about RM 16 m for 2007-2009 to conduct research in agriculture and approximately 50% of the allocation is for horticultural research (Faculty of Agriculture, 2007).

In the past, contribution of research in fruits, vegetables and ornamentals has been limited because most of the research efforts have concentrated on the plantation crops such as rubber, oil palm and cocoa. There is a lack of research on breeding of new crop varieties (other than chilly and tomato). However, research has been conducted on postharvest packaging of banana and star fruit (MARDI, 1999). Concerted research efforts need to be undertaken to increase productivity

and improve quality of horticultural products either through biotechnology and breeding or any good agriculture practices.

EXTENSION

The main extension services are provided by the Department of Agriculture with smaller extension units provided by different government agencies such as Malaysian Agricultural Research Development Institute (MARDI). For training and extension services, focus was given to commercialization of agricultural activities, modern farming practices, postharvest handling, processing and marketing. By the end of the Eighth Malaysia Plan period, a total of 260,930 entrepreneurs and farmers were trained. In addition, four agricultural training institutions conducted the National Agricultural Skills Training Programme (NASTP) based on the National Occupational Skills Standard (NOSS) beginning in 2004 (Ninth Malaysia Plan, 2006). Since its introduction, a total of 564 trainees have been enrolled in courses related to horticulture and other disciplines of agriculture such as fisheries, livestock, food processing and marketing. Under the Ninth Malaysia Plan, extension workers will also be retrained to deliver effective services to target groups. In relation to extension, the role of higher institutions, mainly Universiti Putra Malaysia, is to train the trainers of the extension workers from the various agencies, as well as updating their extension knowledge.

The Department of Agriculture carries out extension activities by disseminating information on new cultivation technologies to farmers and entrepreneurs through the NASTP. These measures are undertaken to increase the income of small holders and farmers in the rural areas. The higher growth rate achieved by the agriculture sector during the Eighth Malaysia Plan resulted in more intensified agriculture development programmes for the Ninth Malaysia Plan (2006-2010), thus making agriculture the third engine of growth in the country.

The Eighth Malaysia Plan of 2000-2005

Malaysia outlines its agriculture policies and key programmes in the National Agriculture Policy (Ministry of Agriculture, 2007). The NAP is aimed at fulfilling the country's thrusts and objectives for every five-year period in the Malaysia Plan. During the Eighth Malaysia Plan (2000-2005), horticulture became a commercial venture due to improved productivity, higher value-added and exports of horticultural commodities. These were achieved through utilization of new technologies, wider adoption of group farming system, redevelopment of alienated agriculture land, increased market accessibility and better commodity prices. Approximately 13% of the agricultural production in Malaysia comprises of horticultural crops including fruits, vegetables and ornamentals (DOA, Malaysia, 2007).

The Ninth Malaysia Plan of 2006 -2010

Presently, the country is in the Ninth Malaysia Plan (2006-2010) period, whereby it is embarking upon a new phase of development in becoming a developed nation by 2020 (Ninth Malaysia Plan, 2006). The *New Agriculture* programmes, one of the thrusts of the National Mission, include the following:

1. Greater orientation towards more modern and commercial scale production;
2. Production of high value added primary and agro-based products;
3. Wider application of information and communications technology (ICT) and biotechnology for wealth creation;
4. Use of product standards and farm accreditation in marketing;
5. Introduce a higher level of professionalism in agriculture;
6. Develop and commercialize high potential industries including herbs and floriculture;
7. Promote greater private sector participation;
8. Designate new production zones for agricultural production;
9. Improve access to financing;
10. Train extension workers, entrepreneurs and farmers in agricultural training institutions;

11. Review existing programmes and develop new curricula to meet market requirements in institutions of higher education;
12. Intensify research and development (R&D) activities; and
13. Accelerate dissemination of information on new technologies to the target groups.

CONCLUSION

Horticulture provides food security and health and is an important sector in Malaysian agriculture. The only way to increase productivity is by using intensive and high precision management coupled with the adoption of high technology and bioengineering. These could only be achieved with the help of professional graduates who can carry out research and extension programmes in horticulture.

REFERENCES

- Department of Agriculture (DOA), Malaysia. 2006.
 Faculty of Agriculture, UPM, Malaysia. 2006. 2006-2007 Prospectus.
 Faculty of Agriculture, UPM, Malaysia. 2007. Awards of Research Fund.
 Federal Agriculture Marketing Authority (FAMA), Malaysia. 2006.
 Government of Malaysia. 2006. Ninth Malaysia Plan 2006-2010.
 Malaysian Agricultural Research and Development Institute (MARDI), Malaysia. 1999. Pengendalian Lepas Tuai Buah-buahan dan Sayur-sayuran Tropica. MARDI, Kuala Lumpur, Malaysia, pp.1-121.
 Ministry of Plantation Industries and Commodities, Malaysia. 2006.
 Ministry of Agriculture. The National Agricultural Policy (NAP). Ministry of Agriculture and Agro-based Industry, Malaysia. 2006.

Table 1: Planted area of selected crops in 2006

Commodity	Hectares ('000)
Rubber	1,218
Oil palm	4,172
Coconut	142
<i>Cocoa</i>	33
Paddy	677
Fruits	297
Vegetables	37
Cash crops	11
Cut flowers	2
Spices	3
Tea	4
Pepper	13
Pineapple	13
Herbs	0.38

Source: Ministry of Plantation Industries and Commodities

Table 2: Production of selected crops in 2006

Commodity	Tonnes ('000)
Rice	1,420
Coconut Oil	6
Crude Palm Oil	15,500
Rubber	1,163
Cocoa Beans	30
(Green Leaves)	2
Pepper	21
Fruits	1,578
Vegetables	560
Cash Crops	112
Spices	45
Cut Flowers	153
Pineapple	297
Herbs	0.8

Source: Ministry of Plantation Industries and Commodities