



A demonstration greenhouse for Malaysian Horticulture

Trip report October 2010

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Picture front cover: a young rock melon plant in the greenhouse at Serdang.

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1 Summary

This report results from the project "Tropical Horticulture in Malaysia", funded by The Netherlands Ministry of Economic Affairs, Agriculture and Innovation with project number BO-10-010-106.

Modernization of the greenhouse horticulture sector in Malaysia is required in order to realize better quality of the product, higher yields and less production costs.

Construction of a demonstration greenhouse on the basis of this design has been started early April 2010 at Serdang by the Malaysian Department of Agriculture (DoA), and was completed by September 2010. Rock melon was planted early October 2010 as a first crop.

The Terms of Reference of the March mission follow directly from the planned activities:

1. Discuss with DoA staff the activities to be conducted in the greenhouse, now the first rock melon crop has been planted.
2. Train DoA staff on crop management.
3. Train DoA staff on crop protection.

The major outcomes of the mission are:

- 1) The rock melon crops had a good start. Various aspects of crop management and crop protection were discussed.
- 2) Differences in drain between the greenhouses will be evaluated.
- 3) Observations on the crop and on pest and diseases will be taken by DoA staff on a regular basis.
- 4) These data will be exchanged with Wageningen UR. Wageningen UR will, on the basis of this, assist where possible. Climate and fertigation information can be obtained from the on-site computer.

Kuala Lumpur, Wageningen, Bleiswijk, November 2010

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2 Introduction

This report results from the project “Tropical Horticulture in Malaysia”, funded by The Netherlands Ministry of Economic Affairs, Agriculture and Innovation with project number BO-10-010-106.

Protected greenhouse horticulture in Malaysia has traditionally been concentrated in the highland regions of the Cameron Highlands, where land is scarce and production competes with tropical rainforest. Protected greenhouse horticulture is a growing activity that has been prioritized by the Malaysian government as an area of cooperation with The Netherlands. Also, the private sector sees business opportunities and initiates modernization. Most relevant crops are currently rock melon, tomato, cucumber, chillies and sweet pepper; however, consumer’s demand or export opportunities may lead to the introduction of other crops. It is desired that these first developments are taken further, also for the highland regions in the Cameron Highlands where the majority of horticultural production is located. Protected greenhouse horticulture is therefore a promising area where public and private partners meet, that can contribute to employment.

Modernization of the sector is required in terms of:

- location-specific greenhouse designs, taking into account climatic conditions and required cooling system, and crop requirements;
- improvement of planting material;
- optimization of cultivation techniques;
- introduction of integrated pest management to substantially reduce use of pesticides and contribute to a lower environmental impact;
- design of above-mentioned components such that they form a well-balanced technology package;
- better quality of the product, higher yields and less production costs;
- an enabling environment (government, research) that is conducive to the further development of the Malaysian horticultural sector;
- a Malaysian training and research capacity that can support the local horticultural industry.

Operating a modern greenhouse requires a high level of knowledge with regards to general management, climate control, water and nutrient application, pest and disease management, crop management, etcetera. A serious training effort is required here. Only then, sustainable modernization of the Malaysian greenhouse horticulture sector can further develop. Close interaction between the Malaysian Department of Agriculture (DoA) and growers is crucial to this development, and is therefore a 2011 focus.

WUR met with a wide variety of stakeholders in 2008 and identified the major obstacles and options for the further development of greenhouse horticulture in Malaysia. Subsequently, WUR designed in 2009 a greenhouse for the tropical lowlands in Malaysia. Construction of three demonstration greenhouses on the basis of this design was started early April 2010 at Serdang by the Malaysian Department of Agriculture (DoA), and was terminated by September 2010 (except for some last finishing touches). Dutch supply industry (Priva) provided the greenhouse installation and computer, and climate and substrate sensors.

Melon crops were planted to the greenhouses early October 2010.

2.1 Terms of Reference Mission

The Terms of Reference of the October mission follow directly from the planned activities:

4. Discuss with DoA staff the activities to be conducted in the greenhouse, now the first rock melon crop has been planted.
5. Train DoA staff on crop management.
6. Train DoA staff on crop protection.

3 The Demonstration Greenhouse

3.1 Greenhouse

The greenhouse construction had started on Friday April 9th., and the first crop of rock melon was sown on October 6th. The prime goal will be to attempt to grow a good crop and achieve a good production with a nice quality. This is most convincing towards growers. This will be supported by a number of measurements on the crop, climate, and fertigation.

Rock melon will be the first crop to be evaluated. This crop is relatively easy to manage, and has a 3 months growth period, which will provide swift results. Other possible crops for the future are: bell pepper, chilli, japanese cucumber, various tomatoes, strawberry.

⇒ Chillies and bell pepper are commercially most interesting crops to be tested from early 2011 onwards

The greenhouses are equipped with a variety of sensors that enable monitoring of the climate, soil moisture content, drain, and fertigation regime.

⇒ Sensor information will be available on-line for both DoA and WUR, which will enable close monitoring.

Three new greenhouses are available, in which different fertigation techniques can be evaluated:

- Greenhouse 1 has a recirculation system, and can for example focus on saving of nutrients. Drain water will be in a underground tank a pumped back to pump house to be used and mixed in the next irrigation.
- Greenhouse 2 is a more simply type than greenhouse 1 and can focus on the minimization of the amount of irrigation water drained.
- Greenhouse 3 pumps water through the system (to flush previous warm irrigation water) and can evaluate the effect of a lower temperature of irrigation water.

In order to keep the first demonstration trail manageable, all systems follow system 3. Variation in for instance drain can be evaluated.

⇒ A decision on differences in drain still has to be taken.

Cooperation with growers is absolutely welcome, and can be organized fairly soon to ensure that both sides profit from each others' knowledge. Some sort of long-term interaction can then be developed.

⇒ Cooperation with growers will be a 2011 focus.



Figure 1. Newly planted rock melon in pots filled with cocopeat in one of the greenhouses at Serdang, shown by KC Chong.

3.2 Crop management

The intention was to compare the production in the new greenhouses with production in an traditional greenhouse, and with production in the open field. However, only one new greenhouse was planted to rock melon, and no plantings were realized in a traditional greenhouse and in an open field. The lack of sufficient pump capacity for a traditional greenhouse and the open field was the main reason for this.

⇒ In the future, it is useful to make comparisons with production in a traditional greenhouse and in the open field, to quantify and understand differences between cultivation systems.

The rock melon crops should be grown in a normal manner, similar to current practices in Malaysia.

⇒ Two stems per plant can be maintained.



Figure 2. Rock melon plants are topped, inducing the formation of two stems per plant.

Staff of WUR Greenhouse Horticulture is most keen to assist in crop management. It is therefore necessary that information on the crop (recorded data, general observations) are shared weekly with Wageningen staff. They can then provide feed-back.

This concerns observations on the crop and pest and disease development (see paragraph 3.4). Information on climate and fertigation can be accessed from Wageningen at the computer located on-site.

⇒ Luuk Runia enables that WUR can access the on-site computer.

⇒ DoA staff weekly shares recorded data and other observations with Wageningen.

⇒ Wageningen will provide support with regards to crop management, crop protection, and other issues.



Figure 3. A weather station recording the indoor climate (left); climate data displayed by the greenhouse installation.

3.3 Crop protection

One of the major reasons to produce crops in a protected environment is the lower levels of pests: the plastic and screens are a solid physical barrier for insects entering the greenhouse. Details of crop protection were presented by Ineke Stijger (see appendix), and can be summarized with the following keywords:

- Sanitation
 - o all access doors should be locked at all times
 - o always close doors of sluice
 - o visitors only by appointment (wear overalls, company footwear and gloves, don't use cell phones)
 - o clean clothing (wash at 95°C), footwear
 - o casual staff should not work on more than one nursery on a single day

- no trash around the greenhouse
- no weeds in vicinity of greenhouse
- dispose of all plant material in a well-covered or closed container (prevent leakage of infected water or plant sap)
- burn plant waste and old cocopeat (do not dump just a few km away – this only serves as a source of infestation)
- base spraying on observations of pests and diseases
- therefore, scout for pests and diseases
- train permanent and temporary staff (show photographs of symptoms of the diseases) and instruct them properly
- use record sheets for scouting
- spot spraying where possible
- remove infected plants immediately out of the crop in a plastic closed bag
- always work in the same direction



Figure 4. Trash around the greenhouse should be removed (left); the sluice in the greenhouse that must prevent insects from entering (right)

Analysis of irrigation water

Irrigation water is taken from a pond in which rainwater is collected. A sample of the irrigation water was taken to the Netherlands and tested at a Dutch laboratory on 47 different fungi. Only *Pythium* sp. was found. It is therefore concluded that at the moment, the water is safe for irrigation purposes. However, it is recommended that the quality of the irrigation water is tested periodically.



Figure 5. Rock melon growing in traditional greenhouse with on the leaves symptoms of a virus disease (left), and with thrips in the flower (right).

3.4 Observations to be taken

Crop Protection

- One person should observe all plants.
- Use tags to indicate affected plants
- Indicate on a map the precise locations of plants with pests, diseases and viruses
- Use the monitoring form sent by Ineke Stijger
- Record the levels of pest, diseases and viruses
- Remove plants that are infected (especially if the disease spreads easily), and register the location of the removed plant.
- Spray on the basis of the monitored data

Crop development

Observations on crop development are taken on 1 plant per row. This provides sufficient information.

There are two exceptions to this: observations on the number of fruits and the number of shoots are taken on all plants.

- Take observations on 1 plant per row, so 13 plants in total
 - o Select these plants randomly
 - o Mark them well
 - o Develop a registration form on the computer
 - o Send the information every week to Anne
- Plant length
 - o Daily
 - o From the bottom of the stem
- Number of leaves
 - o weekly
- leaf area
 - o montly
 - o every 2nd leaf
 - o Anne will send a protocol
- Number of female flowers
 - o 25-30 days after transplanting
- Number of fruits
 - o Final number (after pruning at egg size)
 - o Location (counted by the leaf number)
 - o On all plants
- Number of shoots
 - o On all plants

Crop harvest

Data on crop harvest are naturally taken at the end of the season (for other crops this might be different!).

- Total number of fruits harvested.
 - o From all plants in the greenhouse
 - o From the 13 plants selected for development observations
- Fresh weight of fruits harvested
 - o From all plants in the greenhouse
 - o From the 13 plants selected for development observations
- Quality characteristics of the fruits harvested
 - o Brix
 - o Netting
 - o skin colour
 - o flesh colour
 - o grading
 - o malformation
 - o flesh thickness

Annex I.

Itinerary

Thu 21 Oct	afternoon	Departure from The Netherlands
Fri 22 Oct	afternoon	Arrival to Kuala Lumpur; Check-in at Lanson Place, Kuala Lumpur Rest
	evening	Dinner with Mr. KC Chong, assistant agricultural council, based in Singapore
Sat 23 Oct	Morning	Visit to greenhouses at Serdang, with Mr. Luuk Runia
	afternoon	rest
Sun 24 Oct	morning	leisure
	Afternoon + evening	Preparation of training programme
Mon 25 oct	morning	Meeting with DoA staff, visit to greenhouses
	Afternoon	Training on crop protection
Tue 26 Oct	morning	Training on crop protection and crop management
	afternoon	Planning of observations
	evening	Departure to The Netherlands
Wed 27 Oct	morning	Arrival to The Netherlands

Annex IV.

Persons met with

Name	Position	Address	Email / web	Telephone/fax
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