Efforts are underway to revive the low number of fruit cultivars.

Stories by LIM CHIA YING

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ISIT any night market, fruit shop or supermarket and chances are you will find very few varieties of bananas being sold. For a crop that has been cultivated since ancient times in Malaysia (reputedly its place of origin), the lack of choice is surprising. A myriad of local species used to be available, but not anymore. A random check at two hypermarkets revealed only two choices: the imported Cavendish and the local pisang

The future scenario appears bleak for our local banana cultivars, which are not only up against foreign competition – in the form of the hardy and unblemished Cavendish – but also against other more profitable and productive crops. The problem is not just confined to bananas. Other fruits like pineapples and mangoes, too, suffer from dwindling

As farmers focus on growing only the best breeds for maximum yield, the challenge lies in the hands of the Malaysian Agricultural Research And Development Institute (Mardi) to stimulate research and conservation work to sustain diversity of these crops, and to ensure that a wealth of genetic resources exist for breeding quality and high-perform-

Mardi director-general Datuk Dr Sharif Haron acknowledged Malaysia as a centre of

diversity for wild and cultivated bananas. "We've been collecting cultivated bananas since the 1980s, with over 200 accessions (each unique specimen group) currently conserved in our field gene banks in Serdang, Selangor, and Jerangau, Terengganu.

"There are about 27,500ha planted with

bananas throughout Malaysia, with average productivity being 10 tonnes per hectare. That said, banana isn't a staple fruit for us, and is often plagued by diseases like the Panama fungus and Moko bacteria that stunt productivity. It may not necessarily be a good thing to have too many varieties in the mar-ket too, as supply would be a problem. What matters more is high yield."

Sharif says there are just two successful commercialised varieties so far. "Given the fact that there are a lot of banana germplasm in the country, there's definitely potential for more varieties to be commercialised. Mardi is currently developing them for the local market, though not so much for international

In Malaysia, banana varieties like berangan, mas, rastali and Cavendish are used in cookery while nipah, nangka, tanduk and pisang awak are used in desserts. These edible cultivars are derived from two wild species, Musa acuminata Colla and Musa balbisiana Colla. (The Musa acuminata is reportedly the most variable species and progenitor of cultivated bananas.)

Sharif says the commercial success of Cavendish, which dominates supermarket shelves, has a lot to do with promotion. For a fruit to do well, he says it has to meet consumers' expectations and acceptance - the fruit must not just look good but taste good.

Preserving diversity



Maintaining variety: Pisang lilin is one of the many native banana species in Mardi's germplasm collection in Jerangau, Terengganu. Photos: Mardi

foundation seeds and planting materials for

our research programmes."

The production sites are located at Mardi stations in Serdang, Sintok (Kedah), Kuala Kangsar (Perak), Jerangau (Terengganu), Jelebu (Negri Sembilan), Kelang (Selangor) and Bintulu (Sarawak).

In the case of mangoes, the Department of Agriculture has registered 77 varieties and 209 clones to date, though only a few clones are popular for commercial planting - chokanan, harum manis, golek, maha and mas muda. The common mango, *Mangifera* indica, is the only widely cultivated species, though there are several other lesser-known species like the Mangifera odorata (kuini), Mangifera foetida (bacang) and Mangifera cae-

An extensive 170 accessions of indigenous and exotic mango clones are kept as germplasm (seeds, tissue or plants, maintained

for the purpose of breeding or preservation) in field gene banks in Mardi stations in Sintok, Jelebu and Serdang. Additionally, some 100 accessions of the kuini species and 40 of the bacang species are stored in Serdang. The best accessions have since been planted nationwide. Malaysia produces about 25,000 tonnes of mangoes from approximately 9,500ha of land; states like Perak, Perlis, Kedah, Malacca and Sarawak are noted as top

growing mango regions.
With the pineapple, Sharif says Mardi has a few hybrid species ready for market release next year. Two cultivars are now in the market, the Josapine and Maspine.

"Most of our pineapple varieties are imported from the Philippines, with another two or three varieties from Sarawak. We have two main germplasm banks in Pontian and Kluang, Johor, for pineapple cultivation. The new varieties can only be released next year because it takes 15 months to ensure that there is sufficient planting materials (seedlings) for farmers to buy from us.'

Pineapples, too, are not spared from diseases, most notably the black rot that inflict the stems. This, Sharif says, underscores the importance



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of developing new varieties (through conventional breeding or semi-cloning) to increase

Fruit security

crop resistance and survival.

A visit to Mardi's expansive grounds in Serdang takes us through large tracts of field gene banks planted with various fruits and agricultural crops. The arboretum has hosted rare tropical fruits collected nationwide since the early 1980s. Meanwhile, its MyGenebank building houses laboratories and frozen rooms for long-term storage of seeds.

For Sharif, the importance of retaining diversity boils down to the objective of having a bigger gene pool. He says native species might not have the desired characteristics of high yield or pleasant taste, but they might have other valuable properties that can be leveraged upon when cross-bred for production of new varieties.

"The 200 accessions from 70 varieties of bananas in our collection (gene bank) is a fine example of some efforts we are taking to ensure those species don't go extinct.

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While bananas are consumed fresh mostly by the global audience, Malaysians prefer fried bananas which require specific quality in the fruit. This is why certain genetic traits from indigenous species may be helpful in our research and development towards producing varieties that meet our needs," he says.

Mardi is also collaborating with Biodiversity International, working with local communities on on-farm conservation of local fruits. Six conservation sites have been established, which also help to boost the income of local farmers. The sites are Yan and Bukit Gantang in Peninsular Malaysia, Sibuti and Serian in Sarawak, and Kota Belud and Papar in Sabah.

In Serian, rambutans and mangoes are cultivated in orchards as part of in-situ (natural habitat) conservation while ex-situ (out of natural habitat) conservation is done in the form of seed gene banks and germplasm collections.

Germplasm banks, though, are costly to maintain and require large spaces. Hence, technologies like in-vitro propagation and cryopreservation (in liquid nitrogen) may be key to conserving seeds that can survive when they are regenerated in future. However, some seed cannot survive freezing or drying, so they still have to be conserved as living collections in the field.

Mardi has allotted land in its various stations to conserve some 3,705 accessions, 168 species and 11,694 specimens of local fruits, with a special focus on under-utilised or rare fruits.

'It's our role to expand on agrobiodiversity, which are key enablers for future crops. New varieties and crops are needed from time to time to complement the existing," says Sharif.

'Ultimately, conservation requires a solid, consolidated effort so that we don't waste resources, since labs are expensive to build. We have spent a lot on collecting, characterising, evaluating, conserving and documenting these fruits, as well as breeding and selecting them for market release."

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Hoping for a banana breakthrough

THE banana cultivation industry is plagued by various issues, ranging from the highly-destructive Fusarium wilt disease to lack of quality planting materials and the threat from floods and droughts. The practice of monocropping has also exposed the crop's vulnerability to diseases, which emerge when plantation lands are not rotated

Dr Sharif says

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Professor Dr Maziah Mahmood from Universiti Putra Malaysia's biotechnology and biomolecular sciences faculty says developing disease-resistant and flood-tolerant banana varieties is critical to protect the industry.

'It's not easy to improve bananas genetically because they have no seeds and there's no way of doing cross-breeding. So the only method is through tissue-culture, and planting them thereafter in the field to observe how well they perform. I have a tissue culture lab where I cultivate mini banana plants from different species which I have collected from all over Peninsular Malaysia," says Maziah.

She also does lab simulation studies for flood-tolerant bananas. Plants are left submerged in water to determine their survival rate, in order to identify stable species for use in field experiments.

"I'm now in the final stages of selecting the better ones and hopefully get them planted before year-end.'

While native banana species can be found in rural villages, Maziah says these varieties are not suitable for large-scale planting as they grow very tall and big, and there is a lack of planting materials. She says farmers often lack knowledge on the optimal growth and yield of bananas.

"One important area is in the use of fertiliser. There isn't any formula currently on the ratio of nitrogen or phosphorus needed to better-grow the crop. Different kinds of banana cultivars may require different kinds of fertiliser. Right now, a common fertiliser feeds all. This can be disadvantageous as some cultivars may experience nutrient deficiency and hence, are unable to survive.

Maziah continues to collect new germplasms. Hopefully, the good varieties, once



Professor Dr Maziah is invested in research to counter the various problems facing the banana

tested, can be passed on to farmers for future cultivation.

'One cultivar that I found to have high potential is pisang raja but it's hard obtaining the planting material. As it is, bananas are cultivated from plantlets that grow around the mother plants but it's difficult to determine the time when the flowers can be retrieved,"

Is there a threat of native varieties or species becoming extinct in view of farmers growing only a few commercial varieties? Maziah does not think so.

"I'm all for promoting native species, especially the cooking cultivars as they are very nutritious. Even our own locals don't know enough about these species. While some native species may not be commercially viable, due to the problem of insufficient planting materials, their diversity needs to be upheld as much as possible because we pride ourselves as the birthplace and centre of banana biodiversity.

Bananas have potential to be a fruit security crop, which can be diversified into products like baby food. I've done a lot of cloning for diversity conservation. What we need are more researchers to keep the study on bananwwystantwo contests, svile as

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