Tropical rain forest in a shopping mall

A tropical rain forest has a four-layered structure consisting of a canopy of spreading tree crowns, under which fits an understorey of narrow-crowned juvenile trees. Below that is a shrub layer and then a ground layer Such a forest was created in the 1 Utama shopping mall in Kuala Lumpur in the span of a few weeks. Here's how it was done.

By F.S.P. Ng

Shopping malls in Malaysia are among the largest in the world. 1 Utama is the name of the largest mall in Malaysia and reputedly the fourth largest globally. From one end to the other, it covers a distance of one kilometre. There are four shopping levels, so one can shop for four kilometres in air-conditioned comfort.

In one part of the building, there is an atrium with an open roof and here, a tropical rain forest has been created, oval in shape and measuring about 40 x 20 metres. On the day that the first tenants were preparing to move in, we planted the first trees of our Rainforest in the Mall. The date was 13 October 2003.

Tabebuia rosea being lifted up to a lorry

For the forest canopy, we needed big trees with spreading crowns. We selected three trees of *Tabebuia rosea* that were growing a short distance away. This species is native to Tropical America and we knew from experience that it is possible to transplant big trees of this species provided all the leaves are removed to stop water loss while the root system is recovering from damage. Scaffolds were built around the selected trees several days before the move so that workers could reach and defoliate the crowns. At the same time, trenches were cut at about one meter radius around the base of each tree to isolate its root ball. The trunks of the

The tree being delivered to the Mall

Lifting the tree above the roof

The tree being lowered into the Atrium

trees were covered with wetted cloth to protect the bark and also to prevent it from drying. On the day of the move, each tree was lifted up with a construction crane and positioned on a lorry, with its crown sticking out at the back. The remaining leaves were removed, and the lorry was then slowly driven to the mall. A construction crane on the roof lifted up the tree, positioned it above the atrium and carefully lowered it to the ground, where men were waiting to move it to a prepared hole. The three big trees were all planted in one night. A few weeks after planting, new leaves appeared and the green canopy of the forest became a reality.

The understory was established next. In tropical rain forests, the canopy develops at about 30 m above the ground. The understorey is made up mainly of juvenile trees that take about 20 years to grow up to canopy level. These juvenile trees concentrate their efforts in vertical growth, building up a slender pole-like trunk that bears leaves on relatively short thin branches. These branches are eventually shed, leaving the tree with a clean trunk that eventually becomes a timber log. To create an understorey of pole-sized juvenile trees we moved in 20 specimens of 6-11 m tall juvenile trees of Merawan Siput Jantan (*Hopea odorata*) and Kempas (*Koompassia malaccensis*), both well-known Malaysian timber species, that we bought from the Forest Research Institute Malaysia. The trees were excavated, transported and planted on 25 October 2003.

Simultaneously we created the shrub layer. The shrub layer in the forest is made up of shade-tolerant plants growing to about 2 m tall and among them are saplings of timber

Alfred Cheong (back to camera) and his men positioning the tree

trees. We planted saplings of over 50 species of native trees including well-known Malaysian timbers such as Belian (*Eusideroxylon*), Binuang (*Octomeles*), Dedali (*Strombosia*), Jelutong (*Dyera*), Kayu Arang (*Diospyros*), Keruing (*Dipterocarpus*), Meranti (*Shorea*), Merawan (*Hopea*), Perah (*Elateriospermum*) and Sepetir (*Sindora*). About 200 saplings were planted. *Alocasia*, wild bananas and palms (especially *Johanesteijsmannia*) helped to make the shrub layer more realistic.

The ground layer was then planted with low herbaceous shade-tolerant

The forest canopy completed and starting to flush new leaves

The canopy walkway above the forest

Restaurant balcony with a forest view

plants like *Aglaonema* and *Phyllagathis*. By November 2003, the rain forest was effectively established.

Since then we have had to periodically replace dead trees. Two of the original *Tabebuia* trees were lost to wind damage. In the Atrium there have been occasions when wind blew in to form a 'twister' and a big leafy crown that catches the wind is twisted around with great force and uprooted. One of these trees came down together with a big rattan palm that it was supporting.

In time, some plants have turned out to be star performers. One notable example is Binuang (*Octomeles sumatrana*) which was 2 m tall when planted but within a few years it had outgrown the *Tabebuia*. It has now reached the top of the Atrium and is developing a spreading crown above the surviving *Tabebuia*. Another surprise is the giant palm *Arenga undulatifolia*, native to streamsides in Borneo, which has found an unexpected niche in the mall and is spreading out its giant fronds. Another Bornean native, the belian (*Eusideroxylon zwageri*) is inching up from Basement Level 2 to Basement Level 1 and will eventually link the two basement car park floors with the 4 shopping floors above it.

The Rainforest in the Mall is actually grown on the top of a two-level car park, on soil no more than 1 m deep, except for a small area that stands on Basement Level 2. The soil originally consisted of a mixture of ordinary earth (mostly subsoil clay), coconut fibre and charcoal chips in equal proportions. As the mixture settled down due to decay of the coconut fibre and breaking up of the charcoal it has been topped up with charcoal chips (biochar) only. The charcoal keeps the soil porous and free-draining. Water is drained out by large outlet pipes. The hardscape and drainage, including the planting beds, walkways, water cascades, a vegetation-covered rock face, fish

Koi fish and cascading water

The rock face

ponds, a flowing stream, and a large aquarium were all designed by Mr Alfred Cheong and implemented by his 1 Utama in-house team. I was the botanical consultant.

Four floors above the rain forest floor which is technically the Lower Ground Floor, a canopy walkway runs across the atrium. The walkway was constructed with the building before there was any forest but now the forest has caught up with the walkway.

Over the sound of splashing water from the cascades, one can occasionally hear the chirping of birds, and there are lots of koi fish in the water that children love to feed.

People ask if the soil is not too shallow to support a forest. They assume that a tall tree must have deep roots for anchorage. In reality the effective rooting depth of most trees is about 1 m and most roots are to be found close to the surface of the soil.

Binuang (*Octomeles sumatrana*) rising above *Tabebuia*

Fresh-water aquarium on one side of the Rainforest

Around the rain forest, restaurants are situated that allow for *al-fresco* dining with a view of the forest.

The Rainforest of 1 Utama is small, but its species diversity and physical structure is much closer to the real thing than any other man-made model that we have seen. For most urban children and many adults this is their first experience of tropical rain forest and we want it to be reasonably authentic.

The Rainforest in the Mall in March 2015

Arenga undulatifolia