LESSER-KNOWN TIMBERS AND THEIR POTENTIAL USAGE

HIGHLIGHTS OF THIS ISSUE

- The Beauty and Properties of Lesser-Known Timbers
- Product Development from Sesenduk Clone
- Sentang—Why Aren’t We Using it?
- Places/Streets that Share Names with Lesser-Known Timbers
About 4.2 million cubic meters of timber are harvested annually from the forest in Peninsular Malaysia. The timbers consist of about 900 different species. Fifty percent however, are traded under some 60 trade names including keruing, dark red meranti, balau, kapur, merbau, and monotypic timber such as kempas and cengal. Timber traded under these trade names are well-known and command high market prices. However, the remaining timber species grouped under mixed hardwood are usually for general applications and do not command good prices.

Back in the early 1980s’, an effort was made to identify a list of lesser-known or commercially less-accepted timber species and find ways to promote their utilisation and value. A total of 58 species was identified and 41 timbers were listed among the 102 commercially available species in the latest version of Malaysian Grading Rules 2009. However, about 25% of timber traded in terms of volume is still categorised as mixed light, medium or heavy hardwood for a broad range of uses and normally these timber groups command lower prices.

Lesser-known timbers are not traded individually or under proper trade names. To attract potential commercial uses and increase

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**THE BEAUTY AND PROPERTIES OF LESSER-KNOWN TIMBERS**

Kecantikan dan Ciri-Ciri Kayu Kurang Dikenali

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**Decorative features of selected lesser-known timbers (from left) kekabu, kayu malam, pelong, senumpul, tulang daing, kembang semangkuk and ara**
timber value, technical features are essential to identify suitable applications. The technical features also assist species identification and quantification in promoting the appropriate uses of timber by agencies such as the Forest Department of Peninsular Malaysia and the Malaysian Timber Industry Board. Information on volume or availability of lesser-known timbers is also important for long-term planning of timber uses and product manufacturing.

The potential uses of lesser-known timbers are greatly influenced by their properties. Several important properties such as density, colour, strength, decorative features and working/finishing properties are discussed as follows.

### Density

Wood density is by far, the most important property because of its effect on yield, strength, and general quality of most wood products. Some strength properties, like stiffness, is almost directly related with density, while for others the relation is less direct; toughness, for example, varies almost as a square of the density.

Lesser-known timbers are grouped according to three density classes. The high density timbers (800–1120 kg m\(^{-3}\)) include delek, mertas, ngilas, nipis kulit, pauh kijang, pelawan, penaga and petaling; the medium density (720–880 kg m\(^{-3}\)) include bangkal, bekak, dungun, derum, kandis, kayu malam, tulang daing, mempening, meransi, merbatu, minyak beruk, pasak, perah, senumpul, surian batu, tampoi and telur buaya; while the low density (< 720 kg m\(^{-3}\)) include ara, balik angin, batai, bayur, berangan, bungor, cempaka hutan, dedali, kasah, kekabu, kelempayan, kelumpang, ketapang, mahang, nyatuh kuning, pelong, petai, podo, putat, sentang, sepul, sempilor, sentul and surian.

### Wood colour

The presence of extraneous materials often gives wood a characteristic appearance, in particular, substances which impart special colours to the wood. Most wood, however, appear in various shades of brown, ranging from the rich reddish-brown of the dark red meranti, the light or pale brown of the rubberwood and kembang semangkuk

<table>
<thead>
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<th>Timber</th>
<th>Decorative features</th>
<th>Recommended uses</th>
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<tr>
<td>1</td>
<td>Ara (<em>Ficus</em> spp.)</td>
<td>Growth rings figure on flat-sawn material</td>
<td>Sliced veneer, furniture, panelling</td>
</tr>
<tr>
<td>2</td>
<td>Bungor (<em>Lagerstroemia</em> spp.)</td>
<td>Growth rings figure on flat-sawn due to semi-ring porous wood</td>
<td>Sliced veneer, furniture, solid door, domestic flooring, staircase components and ornamental items</td>
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<tr>
<td>3</td>
<td>Cempaka (species of Magnoliaceae)</td>
<td>Growth rings figure on flat-sawn</td>
<td>Sliced veneer, ornamental items, furniture, wall panelling</td>
</tr>
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<td>4</td>
<td>Delek (<em>Anisophylea</em> spp.)</td>
<td>Silver grain figure quarter-sawn</td>
<td>Solid door, furniture, flooring, and staircase components</td>
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<td>5</td>
<td>Kayu malam (<em>Diospyros</em> spp.)</td>
<td>Yellowish-white, dark streaky core</td>
<td>High-end furniture, sliced veneer, ornamental items</td>
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<td>6</td>
<td>Kembang semangkuk (<em>Scaphium</em> spp.)</td>
<td>Growth rings figure</td>
<td>Solid door sliced veneer, furniture, flooring, staircase components and panelling</td>
</tr>
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<td>7</td>
<td>Kelumpang (<em>Sterculia</em> spp.)</td>
<td>Growth rings figure</td>
<td>-</td>
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<td>8</td>
<td>Mempening (<em>Lithocarpus/Quercus</em> spp.)</td>
<td>Quarter-sawn gives ‘silver grain’ figure</td>
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<td>Meransi (<em>Carallia</em> spp.)</td>
<td>‘Silver grain’ figure on quarter-sawn</td>
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<tr>
<td>10</td>
<td>Nyatuh kuning (<em>Pouteria</em> spp.)</td>
<td>Uniform colour</td>
<td>Solid door, furniture, flooring, staircase components and panelling</td>
</tr>
<tr>
<td>11</td>
<td>Podo (<em>Podocarpus</em> spp.)</td>
<td>Growth rings figure</td>
<td>Solid door, sliced veneer, furniture, interior works, flooring, staircase components and panelling</td>
</tr>
<tr>
<td>12</td>
<td>Sena or angsana (<em>Pterocarpus indicus</em>)</td>
<td>Growth rings figure due to ring porous wood</td>
<td>Sliced veneer, furniture, staircase components, cigar box, ornamental items and panelling</td>
</tr>
<tr>
<td>13</td>
<td>Sentang (<em>Azadirachta excelsa</em>)</td>
<td>Growth rings figure</td>
<td>-</td>
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<tr>
<td>14</td>
<td>Surian (<em>Toona</em> spp.)</td>
<td>Growth rings figure due to ring porous wood</td>
<td>Sliced veneer, furniture, staircase components, cigar box, ornamental items and panelling</td>
</tr>
<tr>
<td>15</td>
<td>Surian batu (<em>Chukrasia tabularis</em>)</td>
<td>Attractive figure due to dark coloured streaks</td>
<td>Solid door, sliced veneer, furniture, flooring, staircase components and panelling</td>
</tr>
</tbody>
</table>
to the grey brown of sepetir. Wood consumers may prefer certain colours of wood for specific products, thus grouping wood by colour may be useful. Nevertheless, the exact colour of wood might not be as stated as majority of wood are a complex blend of shades and colours that are difficult to describe.

Lesser-known timbers are grouped into four colours which are (shade of) brown, (shade of) red, (shade of) yellow and white to grey.

(Shade of) brown wood include bayur, berangan, bungor, cempaka (with green tinge), delek, derum, dungun, kandis, sepul, mata keli, merbatu, mertas, ngilas (purple-brown), pasak, pelawan, penaga (red-brown), perah, petaling, putat (yellow-brown), rambutan, saga, samak, sawa luka, sempilor, sena (golden brown), sentang and surian batu (reddish-brown), tampoi and tulang daing (orange brown). (Shade of) red wood include bakau, bayur, bekak, kandis, surian and mempening, (shade of) yellow wood include ara, balik angin, bangkal (with orange hue), dedali, kayu malam (with dark and streaky core), kelumpang (yellow-brown), kembang semangkuk (yellow-brown), ketapang, mahang (light yellow-brown), mempening, minyak beruk, nyatuh kuning and podo (with green tinge). White to grey wood include batai, karas, kekabu (pale straw) and kelempayan (with yellow tinge).

Strength properties

Strength of wood refers to the ability of wood to resist external forces or loads tending to change its size and shape. Timbers with medium to high strength are suitable for heavy to medium construction work, whereas for household furniture, the strength of timber is not too critical.

In Malaysia, timbers are divided into seven strength groups (SG) denoted by SG1 to SG7 in order of decreasing strength. Some of the lesser-known timbers are grouped under various strength groups: ara (SG7); penaga (SG1); pauh kijang (SG2); delek (SG3); dedali, derum and minyak beruk (SG4). Some of the lesser-known timbers are fairly strong and may be used for purposes where high strength is required for example, penaga, mertas and pauh kijang.

Decorative features

Decorative features refer to the pattern on the longitudinal surface of wood as a result of the arrangement of the different tissues, and the nature of the grain. Timbers with figurative or decorative features are sought after by manufacturers of high-end furniture, flooring and panelling in which the aesthetic values are important.

Some Malaysian timbers have fairly good decorative feature and could add value to the products if utilised. Selected decorative lesser-known timbers and their recommended uses are given on page 3.

Working and finishing properties

Timbers which are easily worked or machined with good surface finish are generally preferred. By using modern equipment and technologies however, these properties may not be considered critical anymore. Rubberwood for example, is refractory in many ways such as the presence of tension wood and coarse structure, the timber however, has been machined successfully using modern equipment and technologies to produce smooth and quality finishes.

Efficient use among the myriad of Malaysian timbers can be gauged from the traded proportion of the mixed group timbers. A more efficient use of timber should take into account its strength properties or aesthetic features such as figure, grain or colour. Capitalising on timber strength and beauty will not only create a niche for specific timbers but also increase its value.

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Shortage of timber supply from the forest is a pressing issue especially for the furniture and wood-based industry. Planted timber is one of the alternatives to supplement the decreasing availability of timber from the forest. Choiced planting material as such is crucial to establish a viable timber plantation. To fulfill the demand for a quality planting stock, researchers at FRIM came up with genetically improved clone of sesenduk, or scientifically known as *Endospermum* spp.

A 12-year old clone reached a sizable height and diameter at breast height (dbh) of 24 m and 32 cm respectively. The physical and mechanical properties of several individual clones were assessed for product development purposes.

A number of furniture items were made using veneer and solid material obtained from the cloned timber. Solid sesenduk timber was used for dining set (chairs and table), occasional chair with coffee table, and side table with mirror. Sesenduk veneers were used to produce various designs of moulded chairs, book shelves and table tops.

At FRIM, sesenduk cells obtained from a mother tree is multiplied using tissue culture technique, and after a successful growth, planted in the field. The processed timber is then sent to the Furniture Industry Technology Center (FITEC) for furniture manufacturing according to FRIM designs. Sesenduk timber is thicker than normal solid furniture; the cloned timber thus requires careful handling to avoid dents and defects. Throughout the manufacturing processes, modifications were made accordingly to suit the timber’s characteristics. Stability and durability of the furniture were carefully controlled during the production process.

Veneer products require additional processes such as peeling (to produce veneer), drying and cutting of veneers (to required size), gluing with urea formaldehyde (UF), pressing using high frequency or hot press machines, and...
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Focus article

shaping, finishing and assembly. Two types of plywood can be produced from veneer: flat board for table top and shelves, and moulded chairs of different shapes and sizes. For moulded chairs, different parameters such as time, pressure, and additions of fibreglass sheet and different layer of veneers were tested to determine the best treatment. The moulded chairs passed the minimum requirements for physical performance test and complied with the regulatory and standards of BS EN 12520: 2010 (furniture: strength, durability and safety).

The sesenduk clone is expected to provide advantages such as cheaper products and a shorter growing cycle. In addition, as growing material, the timber can be supplied in bulk, continuously and faster. Forest areas could then be conserved as planters no longer need to harvest planting materials from the forests. Sesenduk clone can be a supplement or an alternative timber for rubberwood, in view of the latter’s shortage of supply.

1. Normal
2. Institution
3. Butterfly
4. Occasional chair
5. Coffee table
6. Dining chair
7. Side table with mirror
8. Dining set

Various designs of moulded chair
Sentang is one of the 58 lesser-known timbers listed in 1980s’ in an effort to increase its utilisation and value of the timbers compared to 50 commonly traded timber groups such as meranti, balau, kapur and cengal. However, trade and utilisation of the timber on its own are insignificant; if harvested and used the timber is grouped under the mixed light hardwood group.

Sentang (*Azadirachta excelsa*) is native to Peninsular Malaysia. It is commonly found as a village tree and for the Malays the timber is an important raw material for building houses. Young sentang shoots are consumed as vegetable and matured leaves, which are intensely bitter, are sought for medicinal purposes. The trees can easily be found in the northern and eastern states of the Peninsular Malaysia. Sentang tree is fast-growing and the timber is suitable for various products particularly furniture. Sentang was promoted as a plantation species in mid-1990s’ and trees which were planted during its promotion have now reached harvestable sizes.

To date, the acceptance of sentang timber is not encouraging and its potential is not fully realised. To overcome the low market demand for sentang timber, impeding factors towards its full utilisation and related issues were given a thorough check.

Availability is an important criterion for successful utilisation. The timber must be available in substantial quantity to justify promotional efforts by the manufacturers. At present there may be lack of data to support wider applications of lesser-known timbers.

Ease of accessibility to the plantation site is required for the timber to be economically harvested and transported to the mills. Trees planted in villages are usually scattered and harvesting requires coordination so that operating costs are competitive compared to harvesting logs from the natural forest.

Several premium items developed by FRIM using sentang

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**SENTANG—WHY AREN’T WE USING IT?**

*Sentang—Mengapa Ia Tidak Digunakan?*

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*Sentang tree at FRIM*

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*Several premium items developed by FRIM using sentang*
Lesser-known or unknown timber should be aggressively promoted to both manufacturers and users through the dissemination of technical information. Wood identification features for instance, are useful to broaden the choices for traders. For sentang, dissemination of information on the timber’s characteristics and aesthetic beauty will prompt users to select and specify the timber in their purchases.

In terms of wood characteristics and timber properties, sentang shares the same category as light red meranti, durian and melantai. The densities of the timbers fall in the range of 400–750 kg m$^{-3}$ denote easy processing and drying. Drying, which is an important process in timber product manufacturing can be conducted easily without serious timber degrades. Processing or machining is also not an issue for the timber. Sentang, light red meranti, durian and melantai are classified under strength grouping 6 and suitable for applications where mechanical strength properties are non-demanding such as for interior finishing, furniture, mouldings, panelling, fancy boxes, doors, veneers and plywood. Peeling is also hassle-free and sentang timber has no technical deficiency in applications compared to many other light hardwoods.

Essentially, issues on the availability, harvesting and accessibility of sentang trees should be solved before it can be accepted and promoted for specialised applications by the timber processing industry. Only then the marketability and value of the timber can be realised instead of using it as a mixed timber.

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Dr Gan Kee Seng heads the Wood Processing Technology Programme, Forest Products Division, FRIM. His past articles in *FRIM in Focus* include “Heavy Hardwood Products” (September 2011) and “Moisture in Wood. A Bane in Utilisation?” (March 2009).

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### Comparison of sentang with light red meranti, durian and melantai

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<thead>
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<th>Sentang</th>
<th>Light red meranti</th>
<th>Durian</th>
<th>Melantai</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Colour</strong></td>
<td>Heartwood reddish brown, sapwood is yellowish white, grayish white or sometimes gray-pink</td>
<td>Heartwood light red or pink, distinct from sapwood which is lighter in colour</td>
<td>Heartwood pink-brown or red-brown, sapwood white or pale yellow</td>
<td>Heartwood yellow-pink, sapwood lighter in colour and not differentiated from the heartwood</td>
</tr>
<tr>
<td><strong>Wood characteristics</strong></td>
<td>Almost straight grain, slightly coarse and uneven texture</td>
<td>Grain interlock or wavy, texture coarse but even</td>
<td>Grain straight to interlock. Texture coarse and uneven</td>
<td>Grain straight to interlock. Texture moderately coarse and even</td>
</tr>
<tr>
<td><strong>Density (kg m$^{-3}$)</strong></td>
<td>550–780</td>
<td>385–755</td>
<td>420–800</td>
<td>415–625</td>
</tr>
<tr>
<td><strong>Strength grouping</strong></td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

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*Chairs from sentang*
Focus article

PLACES/STREETS THAT SHARE NAMES WITH LESSER-KNOWN TIMBERS

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Lesser-known timbers are a group of timbers identified in an effort to promote and increase their utilisation and market value. The lesser-known names are not exactly foreign as many are known and used by the local communities long ago. There are places and streets named after these timbers; some names were used for decades while others although quite recently, are fairly well-known. From the 58 lesser-known timbers identified, seven species sharing same names with places and streets are highlighted here; surian batu, kulim, macang, perah, petaling, sena and sentul. Some botanical information and usages of the timber are provided, together with a short description of the place and street named after it.

Surian batu or Chukrasia tabularis is a big tree that reaches up to 40 m. It is an Asian species distributed from Nepal, India and Sri Lanka, and eastwards through tropical Asia to South China, North Sumatra, Peninsular Malaysia and Borneo. In Peninsular Malaysia, the species are found in Kedah, Seberang Prai, Selangor, Negeri Sembilan, Melaka, Terengganu and Pahang. The timber is commonly used for interior finishing, panelling, moulding, flooring, decorative furniture, handicrafts and sliced veneer. It is also suitable for medium to heavy and indoor construction work.

Persiaran Surian is a driveway (6.7 km) in Petaling Jaya, Selangor which connects the densely populated townships of Kota Damansara and Mutia Damansara. Visitors to Mutia Damansara use the driveway to reach popular shopping and entertainment complexes such as The Curve, Ikano Power Centre, IKEA and Cathay Cineleisure. Persiaran Surian also houses the elevated Sungai Buloh-Kajang Mass Rapid Transit (MRT) line from PJU 5 to The Curve which is still under construction.

Kulim or Scorodocarpus borneensis is a tree from the Olacaceae family. Kulim tree emits strong garlic smell from all parts thus it is called garlic nut tree, woodland onion, wood garlic or jungle garlic. The timber is known to produce first class timber which is heavy and hard. Kulim timber smells of garlic when fresh and peppery when dry. The timber is not durable when in contact with soil. Kulim timber is used for construction, boat keels, posts, agricultural implements and sleepers on temporary railway lines.

Kulim is a town located at the southeast of Kedah and bordered by Penang on the west. Kulim is situated 13.8 km from Bukit Mertajam in Seberang Perai, Penang. The close proximity helped Kulim evolve from a small settlement in the 1950s to a successful town. Kulim is a district consisting of 15 smaller sub-districts also known as mukim.
**Focus article**

**Macang** is a vernacular name for *Mangifera foetida* or horse mango. The tree has straight boles and reaches up to 35 m tall. The crown is dense with dark green foliage and massive branches. *Mangifera* spp. comprise 15 species and are found scattered in the lowlands and hill forests throughout Peninsular Malaysia. The light hardwood timber is suitable for light construction, boxes, crates, pallets and plywood manufacture. The corewood is used for decorative veneer production.

**Machang** is also the name of a major town and territory in Kelantan which is at the centre or heart of Kelantan. It is bordered by the districts of Kota Bharu to the north, Pasir Puteh to the east, Tanah Merah to the west and Kuala Krai to the south. A historical attraction of Machang is the leaning tower of Pulai mosque.

**Perah** or *Elateriospermum tapos* is found within Peninsular Malaysia, Sumatra and Borneo. Perah belongs to the family Euphorbiaceae (rubber tree family) with the characteristic white sticky latex present in bark, leaves and fruit stalks. The seeds of perah can be eaten when carefully cooked. In the east coast, Perah seeds are pickled and eaten as delicacies. At FRIM, visitors are able to view the breathtaking flushing of perah tree. New perah shoots form patches of red leaves against the dark green surrounding. The timber is a medium hardwood which is non-durable and susceptible to termite and powder post beetle attack. The timber can easily be treated (except for the core wood) and suitable for medium to heavy indoor construction.

**Sena** or *angsana* tree (*Pterocarpus indicus*) is a native species from the family Fabaceae. It is one of the earliest species grown for ornamental and urban landscape purposes in the 17th century. Angsana is a common shade tree planted along roadsides, office compounds, parks and open spaces. The tree can grow up to 30 m; the crown is dense and cylindrical or dome-shaped. The flowers are tiny golden yellow and when the fallen blooms carpet the surrounding area they create a spectacular scene.

**Pokok Sena** is the 12th district in Kedah located towards the north of the state. The fairly new and developing district is further divided into six sub-districts namely Gajah Mati, Jabi, Tualang, Lesong, Bukit Lada and Derang.

**Perah** is the name of a camp site at FRIM Kepong. The camp site is a popular venue for nature-related environmental activities. The site can accommodate 60–80 people at a time in an area of 300 m². Facilities provided include kitchen, hall, A-Huts and chalets as well as an obstacle run. Perah Camp, surrounded by trees and alive with sounds of the forest, provides visitors with real jungle experience. The camp site, which started operations in May 2001, attracts visitors from all walks of life throughout the year.
Petaling or *Ochanostachys amentacea* belongs to the family Olacaceae. The tree has silvery conical-shaped and dense crown with drooping leaves. Petaling tree can be found in Sumatra, Peninsular Malaysia (except Perlis), Singapore and Borneo. It thrives well in drained lowland dipterocarp forest, and is sometimes found up to 900 m altitude in hill dipterocarp forest, in primary as well as disturbed forest. The timber is hard, heavy with fine texture and suitable for durable construction purposes such as house, building, furniture and indoor applications.

Petaling is a name given to a district in the state of Selangor. Petaling Jaya on the other hand is a town in the Petaling district. The Petaling district was established on 1 January 1974, on the day Kuala Lumpur was declared a Federal Territory. The district is located at the heart of Klang Valley and has since experienced tremendous urbanisation. Shah Alam, Petaling Jaya and Subang Jaya are among the notable towns located at the Petaling district. Also included is the Damansara area which houses popular shopping malls and entertainment outlets such as One Utama, KidZania and the largest Ikea outlet in Southeast Asia. Sultan Abdul Aziz Shah Airport is also situated at Subang within the Petaling district.

Sentul or *Sandoricum koetjape* from the Meliaceae family is now rarely seen in Malaysia. The natural distribution includes Vietnam, Laos, Cambodia, Thailand, Malaysia, Phillipines and Indonesia. Sentul is a weather resistant tree that can stand prolonged hot climate. Sentul fruit is tasty, the inner flesh are arranged in segments and resembles the mangosteen. Sentul root, bark and leaves were discovered to have medicinal properties. Sentul timber is used in capentry, light construction and made into household items.

Sentul is a main town area in Kuala Lumpur. It is divided into two sections namely Sentul Barat (West Sentul) and Sentul Timur (East Sentul). The RapidKL bus depot is located here. Jalan Sentul and Jalan Ipoh are the two major roads servicing the area. Accessing public transportation is fairly easy in Sentul. The KTM Batu Caves–Port Klang Route, Sentul commuter station and Ampang Line, Sentul Timur LRT station are situated in the area.
A vine-clad arbour (middle) welcomes visitors entering the garden from the Administration building.

GARDEN WITH AN ENGLISH TOUCH
Taman dengan Sentuhan Inggeris

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The beauty of FRIM campus is further enhanced with the addition of another unique landscape in the form of an English garden. The garden, located at the centre yard, surrounded by three buildings: Administration (D1), Finance (D3) and Natural Forest (D4) was completed on December 2014. The garden complements the colonial look of the Administration building which was designed by the British and completed in 1929.

What makes the garden look English? English gardens are often adorned by a wide variety of perennial and annual plants including flowering shrubs, herbs, vegetables, bulbs and ground covers. Strong mix of plant colours are arranged on the lush green lawn either edging a walkway or surrounding focal point structures such as pergolas, gazebos or vine-clad arbours.

Visitors entering the English garden from the direction of the Administration building immediately notice a white octagonal gazebo with its diamond-patterned lattices and rails. An arbour on the light-coloured pebble-wash walkway creates a welcoming scene while the wooden white-washed benches in the gazebo provide seating convenience. Bird house, bench and flower vases stacked in a fountain-like arrangement are among structures that create a relaxing scene. Plants of various species with multi-coloured flowers such as Jatropha integerrima (shanghai beauty), Ipomoea tricolor (morning glory), cultivars of Rosa (rose), Russelia equisetiformis (firecracker plant), Rondeletia leucophylla (panama rose), Turnera subulata (sulphur alder), Spathiphyllum wallisi (peace lily) and Galphimia glauca (rain of gold) brighten up the landscape.
The English garden is a dynamic concept where flowering plants are replaced according to the changing seasons of spring, summer, autumn and winter. The concept is also possible at FRIM in which flowering plants are changed to create the scenes of a different season.

Some of the flowering plants in the English Garden of FRIM:

1. *Galphimia glauca*
2. *Rondeletia leucophylla*
3. *Ipomoea tricolor*
4. *Jatropha integerrima*
5. *Turnera hybrid*
6. *Turnera subulata*
7. *Russelia equisetiformis*
8. *Spathiphyllum wallisi*

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13 Januari 2015  Sempena program Teknousahawan, Teknologi Herba MARA–FRIM siri kedua, Bahagian Hasilan Semula Jadi telah menganjurkan bengkel teknik pengutipan sampel tumbuhan ubatan dan beraroma serta penyediaan sampel herbarium di kampus FRIM, Kepong. Lima syarikat pengusaha herba yang menyertai bengkel ini mempelajari kepentingan penyediaan sampel herbarium dan teknik kutipan sampel tumbuhan yang betul dan seragam. Pengecaman nama saintifik herba yang betul akan membantu penyelidikan dan penghasilan produk. Selain itu, usahawan industri herba juga didedahkan kepada teknologi pemprosesan dan penghasilan produk herba yang terkini. Program kerjasama di antara Bahagian Pembangunan Usahawan, Majlis Amanah Rakyat (MARA) dan FRIM bertujuan membantu usahawan mengeluarkan produk herba berkualiti dan bermutu tinggi menggunakan penyelidikan dan pembangunan yang dijalankan oleh FRIM. Produk yang dihasilkan dijangka dapat memenuhi piawaian bagi menembusi pasaran tempatan dan antarabangsa.
Salah satu tarikan utama di FRIM ialah titian silara yang berada pada ketinggian 300 m dari aras laut. Titian ini dibuka setiap hari kecuali Isnin dan Jumaat dari 9.30 pagi hingga 2.30 petang. Strukturnya terdiri daripada lima titian dan tiga pelantar pemerhati; pelantar pertama dan ketiga mampu menampung empat orang manakala pelantar kedua menampung lapan orang pada sesuatu masa. Pengunjung perlu merentasi laluan rover dan denai alam sepanjang 1.4 km untuk sampai ke titian silara. Melalui titian silara, pengunjung berpeluang menikmati pemandangan hutan dan sebahagian daripada bandaraya Kuala Lumpur serta kawasan sekitarnya dari paras silara pokok.

Titian silara FRIM mula dibina pada tahun 1991 dan mengambil masa setahun untuk diisapkan sebelum dibuka kepada orang awam pada penghujung tahun 1993. Panjang titian silara ialah 150 m dengan ketinggian 30 m dari aras tanah. Ketiga-tiga pelantarnya disokong oleh tiga batang pohon gergasi iaitu surian batu (Chukrasia tabularis) untuk pelantar 1, dan merbau (Intsia palembanica) bagi pelantar 2 dan 3.


Ketika fenomena daun luruh, dapat juga dilihat dengan jelas kehadiran berpuluh-puluh ekor burung kecil pemangsa serangga seperti burung jirijit dan sambar. Burung ini berterbangan atau bertenggek di pokok merbau sambil memakan ulat dan serangga. Kehadiran burung ini

NIKMATI KEINDAHAN SEMULA JADI DI TITIAN SILARA FRIM
Savour the Natural Beauty at FRIM Canopy Walkway

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& Ahmad Nazarudin Mohd Roseli

Salah satu tarikan utama di FRIM ialah titian silara yang berada pada ketinggian 300 m dari aras laut. Titian ini dibuka setiap hari kecuali Isnin dan Jumaat dari 9.30 pagi hingga 2.30 petang. Strukturnya terdiri daripada lima titian dan tiga pelantar pemerhati; pelantar pertama dan ketiga mampu menampung empat orang manakala pelantar kedua menampung lapan orang pada sesuatu masa. Pengunjung perlu merentasi laluan rover dan denai alam sepanjang 1.4 km untuk sampai ke titian silara. Melalui titian silara, pengunjung berpeluang menikmati pemandangan hutan dan sebahagian daripada bandaraya Kuala Lumpur serta kawasan sekitarnya dari paras silara pokok.

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penting bagi mengawal populasi ulat dan serangga yang merosakan tunas-tunas daun baharu.

Ketika luruhnya daun berlubang, pelawat lebih mudah memerhatikan haiwan kecil seperti tupai tompok (Callosciurus nigrovittatus), tupai belang tiga (Lariscus insignus), tupai ekor kuda (Sundasciurus hippurus), tupai cerleh (S. tenuis) dan kerawak hitam (Ratufa bicolor) berbanding waktu lain. Burung kecil seperti beberak mahkota-berangan (Merops leschenaultia), tengkek biru Asia (Irena puella) dan keliccap (Arachnothera spp.) mudah dilihat, di samping burung takau hitam kuning (Eurylaimus ochrolamus) yang dikenali kerana kecil-kecil warnanya. Burung helang ‘crested serpent’ (Spilornis cheela) atau lang kuik juga kerap dilihat berlebar-lebar di kawasan titian silara terutamanya pada waktu tengah hari.

Fenomena daun berlubang ini hanya dilihat pada awal pagi sehingga pukul 9 pagi. Haiwan ini sensitif dengan kehadiran manusia dan biasanya menjauhkan diri jika terdengar bunyi bising.

Fenomena daun luruh menunjukkan ciri keberkawalan pelbagai organisme dalam sebuah ekosistem. Apabila daun luruh, mudah untuk memerhati dan mengkaji haiwan yang kebiasaannya sukar dilihat.

Pucuk-pucuk merbau yang baharu juga menyediakan sumber makanan yang banyak kepada serangga dan haiwan kecil.

Ekosistem hutan yang stabil ialah harta yang berharga kepada manusia. Hutan merupakan kawasan tadahan air dan punca aliran sungai. Tumbuhan pula mengawal hakisah dengan mengurangkan kelajuan dan memecahkan titisan hujan. Lantai hutan pula berfungsi menapis bagi menghasilkan sumber air yang bersih dan jernih.

Fenomena alam semula jadi yang berkait dengan daun luruh di FRIM akan terjejas sekiranya pelawat terlalu ramai dan suasana menjadi terlampau bising. FRIM perlu memantau bilangan pelawat untuk mengekalkan suasana hutan semula jadi. Aspek pendidikan juga perlu ditekankan supaya FRIM kekal sebagai kawasan istimewa di mana pendidikan alam semula jadi dapat dinikmati dan diterapkan.

TENTANG PENULIS UTAMA
Nor Marzuni Fardid Khan Nasyir ialah seorang pembantu penyelidik di Program Eko Perlancongan dan Hutan Bandar (EU). Bahagian Perhutanan dan Alam Sekitar, FRIM.

1. Beberak mahkota-berangan
2. Sebahagian daun pokok merbau yang kekuningan dan akan luruh dilihat dari pelantar kedua
3. Tengkek biru Asia (Irena puella)
4. Lotong bercelak (Trachypithecus obscurus)
5. Tupai ekor kuda (Sundasciurus hippurus)
6. Lang kuik (Spilornis cheela)
7. Takau hitam kuning (Eurylaimus ochrolamus)
8. Pokok merbau yang telah luruh daunnya
INOVASI JERAMI PADI DAN GAHARU BAWA KEJAYAAN DI MTE 2015

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Inovasi daripada jerami padi

Kumpulan penyelidik yang diketuai oleh Dr Rushdan Ibrahim dan ahli kumpulan Mahmundin Saleh, Dr Sharmiza Adnan, Latifah Jasmani, Azizi Abd Jalil, Mohd Shukri Said, Muzalina Muhammad dan Hamsinah Hashim telah bekerjasama dengan Lembaga Kemajuan Pertanian Muda (MADA) untuk memanfaatkan hasil buangan pertanian iaitu jerami padi. MADA menguruskan hampir 100 ribu ha sawah padi dengan 400 ribu tan jerami padi terhasil setahun. Bahan ini sukar dilupuskan kerana kuantitinya yang banyak. Jika dibiarkan di atas tanah, jerami mereput dengan perlahan kerana kandungan mineralnya yang tinggi. Bahan yang mereput juga membiak kuman dan kutu penyebab penyakit padi. Kaedah pelupusan secara pembakaran terbuka juga tidak sesuai kerana menyebabkan pencemaran alam.


Inovasi berkaitan gaharu