FRIM SELANGOR FOREST PARK

Country : Malaysia
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Criteria: (v)
Category: Cultural
State, Province or Region: State of Selangor
Coordinates: N3 14 E101 38

Description

The FRIM Selangor Forest Park (FRIM-SFP) is a 544 ha park consisting of man-made tropical rain forest, a meandering stream (the River Kroh), waterfalls, arboreta, and botanic gardens. Today, this verdant man-made forest stands as a result of FRIM-SFP's succesful reforestation efforts that were initiated back in the 1920s. Among the most famous attractions of FRIM-SFP are the unique crown shyness phenomenon of *Dryobalanops aromatica*, the forest canopy walkway, the hiking and cycling trails under the shade of the giant canopy trees. The property occupies 170 ha or one third of the total area of FRIM-SFP. The property is protected by approximately 262 ha of buffer zone, and 112 ha of tertiary zone.

Tropical rain forests which contain more than half of the biodiversity of the world are a major carbon sink for the maintenance of global climatic stability. It used to cover all of Malaysia, most of the South East Asia, equatorial Africa, Central America and equatorial South America. The rapid degradation and elimination of tropical rain forests in the past 100 years has been a cause of great universal concern.

The FRIM-SFP provides the world with a rare and unique example of an area of tropical rain forest destroyed by farming and mining, and re-created through brilliant scientific effort. In the beginning, it was not known whether tropical rain forest could be re-created on such devastated land but the FRIM-SFP shows that it can be done within a human lifetime. All the attributes of tropical rain forest have been restored in FRIM-SFP including a four-layered structure of main canopy, understorey, shrub and

ground layers, and very high level of biodiversity. The FRIM-SFP serves as a model to show that re-creation of complex tropical rain forest can be done even on totally deforested and degraded land.

The success of the FRIM-SFP model can be traced back to the extra-ordinary effort and vision of the head of the Malayan Forest Department, G.E.S Cubitt, when he decided to establish a forest research entity. In 1917, Cubitt head-hunted the best known tropical forest scientist in the world, who was Dr F. W. Foxworthy, an American already well-known for his research on the tropical trees and timbers. Cubitt and Foxworthy then searched for a suitable site for the Forest Research Institute (FRI) and decided on Kepong. This area was nine miles from the centre of the growing capital city of Kuala Lumpur and adjacent to the natural virgin forest of Bukit Lagong. The location has turned out to be ideal for research, biodiversity conservation, environmental education and accesibility for public recreation.

It is evident that the vision of its founders was to create a world class forest research institute. This vision has been sustained without a break through several generations of forest scientists and four major changes of government: British (1918-1941), Japanese (1942-1945), British (1945-1957) and Malaysian (1957-present). The onset of independence was a critical period in all ex-colonial countries. Forestry research went through a steep period of decline in Indonesia, Sri Lanka, Myanmar and the Philippines. Their decline is evident in the drop in scientific output. In contrast, FRIM-SFP sustained and built upon its founding vision.

Justification of Outstanding Universal Value

FRIM-SFP is the world's oldest and largest re-created tropical rain forest, an outstanding centre of tropical biodiversity, and a superb example of scientific effort. It has contributed greatly to global knowledge of the growth and development of tropical rain forest.

FRIM-SFP is *the world's oldest and largest re-created tropical rain forest* and a model of successful re-creation of forest on what was totally deforested and degraded land. Much of the land had been devastated by tin-mining on the low ground, vegetable

farming on the high ground or covered with scrubby vegetation because it was too infertile for anything else. FRIM-SFP's mined area presented the greatest possible challenge for reforestation but this was not considered an impediment. Once the site was secured, 100 species of tropical timber trees, mainly of the timber family *Dipterocarpaceae* were planted in 1927. No other ex-mining site in the world has been successfully converted into high forest. The original planted trees are now big trees 70-90 years old.

To obtain seedlings of 100 species required a strong organisational effort involving the whole of the Forest Department of Peninsular Malaysia, as well as assistance from the Forest Department of Sabah. To support the effort, Cubitt transferred his most distinguished British officer, J. G. Watson, the top mangrove forest expert in the world, to FRIM-SFP. Watson had the whole area surveyed in detail, divided the area into Fields for plantation trials and established the arboreta for dipterocarps, non-dipterocarps and conifers. Watson succeeded in getting the timber seedlings to grow on what was a very inhospitable site. As the timber trees grew taller, understorey conditions were created for colonisation by species, that were carried by wind or animals such as bird, bats and other forms of wildlife. After 1970, six hundred more species were planted in the buffer zone. The total number of planted trees species is estimated to be just over 1000, all with records of age and origin, and making it probably the largest scientific collection of tropical trees of known age in the world. FRIM-SFP's arboreta were increased and two special botanical gardens were created to offer a rich and varied educational experience. Research was intensified, and many more scientists were appointed and all the scientific serial publications were continued without a break.

Another measure of successful re-creation of tropical rain forest is provided by data on the microclimate in FRIM-SFP, where the temperature increase has been below the annual mean increase for Peninsular Malaysia. FRIM-SFP's mean annual rainfall has also been higher than the mean annual rainfall for Peninsular Malaysia for the period 1951–2014.

The soil carbon stock in FRIM-SFP originally almost zero is now above the average value of carbon stock in natural virgin forest in Malaysia. These forests in FRIM-SFP

have in 90 years produced a large amount of organic matter stored in the top soil layer as humus.

FRIM-SFP is *an outstanding centre of biodiversity.* The level of genetic diversity of FRIM-SFP is comparable to those of natural forests. The tree diversity in FRIM-SFP exceeds the total 814 tree species of Pasoh Forest Reserve, a natural virgin forest in Peninsular Malaysia. FRIM-SFP has in total 2,724 of plant species, of which 1,349 are tree species consisting of 131 dipterocarps, 180 non-dipterocarps, 23 gymnosperms, 89 wild fruit trees, 100 monocots and 50 bamboos. FRIM-SFP has 13 critically endangered (CR), 25 endangered (EN), and 35 vulnerable (VU) species of plants. Critically endangered (CR) species are *Dipterocarpus sarawakensis, Hopea auriculata, H. bilitonensis*, *H. subalata, Shorea acuminatissima, S. hemsleyana, S. isoptera, S. lumutensis, S. peltata, S. pubistyla, S. seminis, S. smithiana, S. xanthophylla, Vatica flavida* and *V. yeechongii.* Endangered (EN) species are *Dipterocarpus obtusifolius* var. *subnudus, D. rigidus, D. rotundifolius, D. tempehes, Dryobalanops beccarii, Hopea apiculata, H. polyalthioides, Shorea agamii, S. argentiolia, S. atrinervosa, S. bentongensis, S. dealbata, S. domatiosa, S. henryana, S. inappendiculata, S. macrantha, S. obscura, S. platycarpa, S. quadrinervis, S. splendida, S. stenoptera, S. uliginosa, Vatica badiifolia, V. havilandii* and *V. scortechinii.* About 160 species of mushrooms have been recorded.

FRIM-SFP has 184 species of birds which is quarter of the total birds recorded in Malaysia. A total of 58 species of mammals have been recorded. Several mammals found in FRIM-SFP are fully protected under the Wildlife Conservation Act 2010; these are the Slow Loris (*Nycticebus coucang*), Black Giant Squirrel (*Ratufa bicolor*), Flying Lemur (*Cynocephalus variegatus*), Malayan Pangolin (*Manis javanica*), Common Palm Civet (*Paradoxurus hermaphroditus*), Malayan Porcupine (*Hystrix brachura*), Mouse-deer (*Tragulus javanicus*) and Pig-tailed Macaque (*Macaca nemestrima*). The number of reptiles recorded in FRIM-SFP is 75 species including Green Crested Lizard (*Bronchocela cristatella*), Common Flying Lizard (*Draco sumatranus*), Marbled Slender-toad Gecko (*Cyrtodactylus quadivirgatus*), Spotted Forest Skink (*Sphenomorphus maculatus*), Spotted Coral Snake (*Calliophis gracilis*), Wagler's Pit-viper (*Tropiodolaemus wagleri*), Puff Faced Water Snake (*Homalopsis buccata*), and Reticulated Python (*Python reticulatus*). 35 species of frogs and toads have been

recorded. The species diversity of frogs and toads in FRIM-SFP is higher compared to the virgin forest areas due to the high diversity of flora and greater variety of different habitats. A total of 21 species of fresh water fish have been recorded, in the streams, lakes and swamps of FRIM-SFP, including the Forest Snakehead (*Channa lucius*), Silver Sharkminnow (*Osteochilus hasseltii*), Trenchant Belly (*Oxygaster anomalura*), Three Spot Gourami (*Trichogaster trichopterus*), Giant Mottled Eel (*Anguilla marmorata*), Asian Bonytongue (*Scleropages formosus*). FRIM-SFP also has high diversity of insects including Golden Birdwing (*Troides aeacus thomsonii*), Lime Butterfly (*Papilio demoleus malayanus*) Giant ant (*Camponatus gigas*), and Cicada (*Cryptotympana aquilla*). 204 species of butterflies share habitats with beetles, while dragonflies are commonly found in the wet areas.

The National Herbarium located in FRIM-SFP holds 350,000 reference plant specimens and serves as the national centre for documentation and exploration of the forest flora of Malaysia. The exploration of the flora is a continuing project. The diversity of the flora is so great that new species of plants are still being discovered every year. At the same time the National Herbarium monitors the conservation status of species that are endangered. FRIM-SFP is also the national centre for the documentation and identification of Malaysian woods. Its xylarium, holds more than 10,000 reference wood specimens. FRIM-SFP holds the highly valuable National Germplasm Bank for forest species, which has a DNA bank of almost 11,000 DNA ID for commercial timbers. This is important for timber tracking, origin verification, identification and authentication.

FRIM-SFP has been for almost 100 years, *a superb example of scientific effort* to re-create a natural forest from degraded land. This began in 1920's with organisational vision starting with the decision to select and appoint brilliant tropical forest scientists in the world who had the drive and experience to establish a forest on totally degraded land.

This founding vision continued without interruption despite major political changes. The research in FRIM-SFP was based on the over-riding concept that tropical rain forest is an asset to be managed in perpetuity. This was in stark contrast to what was happening in for example tropical America, where forests were regarded as waste land of no value.

The first forest management concept to be developed was *Regeneration Improvement Felling,* to improve the commercial value of forests. This concept was superseded by the *Malayan Uniform System* (MUS), to produce a uniform crop of timber after logging, for the next rotation. Enrichment planting was the next big concept. This was followed by the *Selection Management System* (SMS), in which emphasis was placed on controlled felling to leave behind 'advanced growth' for the next crop.

Criterion (v): The property and its buffer were totally degraded by tin mining, vegetable farming and cattle grazing and was occupied by tin-miners, vegetable farming squatters, roaming cattle and the arboriginal Orang Asli. This site was selected, despite serious challanges, for ecological reasons such as the presence of a river, a variety of terrain ranging from lowland to hill, and proximity to natural forest. Its proximaty to the capital city facilitated logistic and administrative support from relevant government agencies.

FRIM-SFP began with the vision to create a world class research entity and to produce the best example of reforestation in the tropics, taking in account the physical and cultural nature of the environment. The best forest scientists in the world were assigned to the project, which required outstanding research in the growth and establishment of tropical trees of which there was little prior knowledge.

FRIM-SFP has inspired and nurtured the greening of Malaysia's urban areas by providing expertise. FRIM-SFP has been a source of information on the germination and growth of 600 species of tropical trees and it has inspired the development of the urban landscaping industry in this region. As a result of FRIM-SFP, the urban tree flora of Malaysia is much richer in diversity of species than anywhere else in the world.

Statements of authenticity and/or integrity

The re-created forest in FRIM-SFP has all the essential properties of natural rain forest including its physical stratification into four layers of main canopy, understorey, shrub and ground vegetation, its exceptionally high level of biodiversity, its high level

of its soil carbon content, and its moderating influence on the local climate including temperature and rainfall.

FRIM-SFP's tree planting and reforestation are not only visible on the ground but also well documented in written records and substantiated by data on its forest structure, content of biodiversity, and influence on the local climate. These records are continously updated in order to monitor the health of the system.

Because the site is still rich in tin and its close to Kuala Lumpur, FRIM-SFP has been under pressure from the beginning. In the years of high demand for tin, there was pressure to mine the area again. In the last two decades, pressure came from developers to acquire parts of the site for commercial development. However, FRIM-SFP has successfully resisted and managed to protect the authenticity and integrity of the site. FRIM-SFP also had strong support from the public and NGO's.

Legal instruments have been established to further protect the integrity of the site. FRIM-SFP was established on 1st October 1926 (*Selangor Gazette Notification No. 5449*) as a reserve for public purposes. FRIM-SFP's integrity was further enhanced in 2009 by the National Heritage Act 2005 (Act 645) when FRIM-SFP was inscribed as a national heritage site. The inscription of FRIM-SFP was given in recognition of its conservation efforts, and legacy as the largest and oldest re-created tropical rain forest in the world.

Management plans:

Planning and management efforts are aimed at ensuring that any development in FRIM-SFP and adjacent areas does not negatively impact FRIM-SFP's outstanding universal values, authenticity, and integrity. Eco-tourism management aims to minimise the direct and indirect impacts of heavy visitation and maximize the opportunities to raise awareness for nature conservation.

Currently, a park management team is responsible for daily monitoring and enforcement. Park-rangers patrol the site and report its condition in the daily log book, and the reports are channelled to a committee. As a research institute, FRIM-SFP has a full complement of scientists including botanists, zoologists, ecologists, siviculturists,

arborists, soil-scientists and hydrologists who are available to support the park management team.

An *Integrated Conservation and Management Master Plan* (ICMMP) is in draft form and will be completed by December 2017.

Comparison with other similar properties

There are large man-made forests in Indonesia, including old teak forests in Java, acacia forests in Sumatra, and pine forests in Java and Sumatra. There is also the Bohol man-made forest in the Philippines. All of these forests are monoculture industrial wood plantations with no intention to serve natural forest functions. In contrast, FRIM-SFP is a re-created tropical rain forest with the properties and functions of natural forest.

FRIM-SFP is comparable to *Singapore Botanic Gardens,* in that both are legacies from the British colonial era. However, Singapore Botanic Gardens is a garden with only a small patch of natural forest while FRIM-SFP is dominated by re-created tropical rain forest.

FRIM-SFP's large collection of living trees is comparable with the collections in the Royal Botanic Gardens Kew, the Arnold Arboretum in Harvard and Kebun Raya in Bogor, Indonesia. However, the trees in Kew, Harvard and Bogor are grown as individual display specimens, not as forest stands as in FRIM-SFP.