

Annual Report
Laporan Tahunan

2007
Annual Report



Institut Penyelidikan Perhutanan Malaysia
Forest Research Institute Malaysia

Lembaga Penyelidikan dan Pembangunan Perhutanan Malaysia
Malaysian Forestry Research and Development Board

Kementerian Sumber Asli dan Alam Sekitar
Ministry of Natural Resources and Environment



Rasional Kulit Depan *Cover Page Rational*

Warna hijau, coklat dan putih mendominasi ruang kulit depan; hijau merupakan simbol kepelbagaian dan pemuliharaan hutan. Coklat melambangkan kayu; manakala putih pula ialah simbol penyelidikan yang boleh dipelbagaikan melalui aktiviti untuk memperkaya ilmu pengetahuan. Bulatan di dalamnya menggambarkan tanggungjawab kita kepada dunia keseluruhannya.

The major colours of the cover page are green, brown and white. Green represents forest diversity and its conservation. Brown signifies wood and its products. White symbolizes a research canvas on which every conceivable activity to enrich knowledge can be painted. The spherical inset reflects our global responsibility to the world at large

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Perutusan Pengerusi Chairman's Report

**LEMBAGA PENYELIDIKAN DAN PEMBANGUNAN
PERHUTANAN MALAYSIA
MALAYSIAN FORESTRY RESEARCH AND DEVELOPMENT BOARD**

Tahun 2007 ialah tahun kedua saya selaku Pengerusi Lembaga Pembangunan dan Penyelidikan Perhutanan Malaysia (MFRDB). Saya sentiasa mengikuti dengan penuh minat segala perkembangan dan pencapaian FRIM sehingga kini. Saya juga ingin menyampaikan penghargaan saya kepada Y.B. Dato' Seri Azmi Khalid, Menteri Sumber Asli dan Alam Sekitar (NRE) yang telah memberikan peluang ini kepada saya bersama-sama ahli-ahli lembaga yang lain untuk menerajui institut penyelidikan perhutanan yang dinamik ini.

Sesungguhnya saya cukup berbangga dengan pencapaian FRIM yang sentiasa mendahului institusi lain dalam bidang penyelidikan dan pembangunan (R&D). FRIM telah muncul sebagai sebuah institut penyelidikan perhutanan yang terkenal; di samping sebagai sebuah pusat rujukan bidang-bidang yang berkaitan dengan perhutanan. FRIM diiktiraf di peringkat antarabangsa dalam bidang R&D serta khidmat sokongan dalam pembangunan sektor perhutanan. Pencapaian terbaik pada tahun ini ialah penganugerahan pensijilan korporat oleh Lloyd's Register Quality Assurance Ltd. yang bertarikh 26 Disember 2007. FRIM turut memperoleh beberapa pensijilan antarabangsa seperti ISO 9001:2000; EN ISO 9001:2000; BS EN ISO 9001:2000; dan MS ISO 9001:2000. Saya turut berbangga dan gembira dengan pencapaian ini yang tentunya dapat menyumbang ke arah meningkatkan prestasi keseluruhan NRE. Dalam penilaiannya ke atas kesemua kementerian, NRE telah diiktiraf sebagai sebuah kementerian yang cemerlang oleh MAMPU. Bagaimanapun untuk mencapai prestasi yang lebih cemerlang tentunya memerlukan pencapaian-pencapaian lain yang luar biasa oleh kesemua jabatan dan institusi termasuklah FRIM.

Saya mengiktiraf pencapaian FRIM yang cemerlang dalam R&D bagi sektor perhutanan dan keluaran hutan. Contohnya, penerbitan FRIM tentang pemuliharaan telah menyokong

This is my second year as Chairman of the Malaysia Forestry Research and Development Board (MFRDB). I have been following with keen interest the progress and achievements made by FRIM to date. I also wish to express my appreciation to Y.B. Dato' Seri Azmi Khalid, the Honourable Minister of Natural Resources and Environment (NRE) for giving me this opportunity, together with the board members, to lead this dynamic forest research institute.

It is indeed heartening to note that FRIM has always been ahead of other institutions in research and development (R&D). It has emerged as a renowned tropical research institute as well as a centre of reference for other areas related to forestry. FRIM has gained international standards and recognition in R&D and support services for the development of the forestry sector. The best achievement for the year was the corporate certificate awarded to FRIM by Lloyd's Register Quality Assurance, Ltd., dated December 26, 2007. FRIM has also obtained international certifications such as ISO 9001:2000; EN ISO 9001:2000; BS EN ISO 9001:2000; and MS ISO 9001:2000. I wish to acknowledge and share the joy of these outstanding achievements, which undoubtedly contribute towards enhancing the overall performance of NRE. I am proud to announce that NRE has been given a four-star rating by MAMPU in its evaluation of all Ministries. To further attain higher performance obviously would require more outstanding achievements by all departments and institutions including FRIM.

I wish to acknowledge FRIM's remarkable achievements in R&D for both the forestry and forest products sector. For example, its publications on conservation support the Ministry's commitment to environmental protection and sustainable management of the natural resources. Amongst the notable

komitmen kementerian ke atas perlindungan alam sekitar dan pengurusan sumber-sumber asli secara mampan. Antara penerbitan yang penting termasuklah *Flora of Peninsular Malaysia*, Jilid 1, Bahagian 1 (28 families–Seed plants) dan Jilid 1, Bahagian 1 (8 families–Ferns and Fern-Allies); *Conservation Assessment of 100 Indigenous Plant Species, Proceedings of the Status of Biological Diversity for Malaysia*. Usaha-usaha penyebaran maklumat dalam bentuk *hard copy* serta senarai semak secara dalam talian bagi mamalia, burung, amfibia dan reptilia serta penerbitan internet *Tree Flora of Sabah and Sarawak Jilid 2 dan 3* akan dapat meningkatkan kekayaan sumber-sumber biodiversiti Malaysia.

Dua lagi sumbangan yang begitu ketara ialah aktiviti penyelidikan yang berkaitan dengan pemulihan kawasan-kawasan berlumpur melalui program penanaman paya laut serta tanaman pesisir pantai yang lain; di samping pembangunan preskripsi hutan pusingan kedua. Peruntukan dana di bawah RMK-9 bagi penanaman paya laut dan spesies-spesies pantai yang lain dari 2006-2010 menunjukkan keyakinan dan kepercayaan Kementerian di atas keupayaan FRIM. Di samping itu, hasil-hasil penyelidikan daripada projek hutan pusingan kedua akan digunakan untuk mengkaji semula kaedah pengurusan hutan asli secara mampan.

Selain kecemerlangan yang berterusan dalam R&D, saya turut berbangga dengan pencapaian FRIM dalam bidang saintifik yang diiktiraf di peringkat kebangsaan dan antarabangsa termasuklah dalam pemindahan teknologi serta pembangunan sumber manusia, penerbitan dan infrastruktur. Di peringkat kebangsaan, enam orang penyelidik FRIM termasuklah Ketua Pengarah telah dianugerahkan pingat-pingat kebesaran oleh DYMM Seri Paduka Baginda Yang Di-Pertuan Agong XIII, di atas sumbangan dan pencapaian yang cemerlang dalam bidang perhutanan. Setinggi-tinggi tahniah saya ucapkan kepada Datuk Dr. Abdul Razak Mohd. Ali, Ketua Pengarah FRIM, yang dianugerahkan Darjah Panglima Jasa Negara (PJN) yang membawa gelaran Datuk. Saya juga ingin menyampaikan ucapan tahniah saya kepada Dr. Abdul Rahim Nik, yang dianugerahkan Darjah Kesatria Mangku Negara (KMN) di samping Dr. Shamsudin Ibrahim, Dr. Lee Su See, Dr. Norini Haron, dan Dr. Ahmad Fauzi Puasa yang dianugerahkan Darjah Ahli Mangku Negara (AMN). Begitu juga dengan Dr. Rasadah Mat Ali yang menerima pingat Darjah Ahli Mahkota Perlis (AMP) daripada D.Y.M.M. Raja Perlis. Di peringkat antarabangsa pula, saya tujukan ucapan tahniah kepada Dr. Saw Leng Guan, yang dilantik sebagai ahli lembaga *Kew Bulletin* dan ahli lembaga editor *Journal of Tropical Ecology*.

FRIM turut menonjolkan kecemerlangan dalam bidang pengkomersialan hasil-hasil penyelidikan. FRIM telah membangunkan beberapa minuman herba dan seterusnya menilai bioaktiviti yang berpotensi bagi agen-agen *anti-multidrug resistant S. aureus* (MRSA), di samping kejayaan dalam bidang teknologi lain yang berpotensi untuk dikomersialkan. Yang membanggakan saya ialah pihak swasta bersetuju

publications include the Flora of Peninsular Malaysia, Vol. 1, Part 1 (28 families–Seed plants) and Vol. 1, Part 1 (8 families–Ferns and fern-allies); Conservation Assessment of 100 Indigenous Plant Species, Proceedings of the Status of Biological Diversity for Malaysia. The effort to disseminate this information in hard copy and through an online checklist for mammals, birds, amphibians, and reptiles of Malaysia well as the internet publication of Tree Flora of Sabah and Sarawak, Vols. 2 and 3, will further enhance Malaysia's rich biodiversity resources. Two other notable contributions are research activities related to rehabilitation of mudflat areas with mangroves and other coastal vegetation; and the development of management prescriptions for second-growth forests. In this respect, the allocation of funds under the Ninth Malaysia Plan for the planting of mangrove and other costal species from 2006 to 2010 marked the Ministry's growing confidence and trust in FRIM's capabilities. Besides this, research results from the second-growth-forests project may be used to revise our way of managing the natural forests on a sustainable basis.

Apart from its continuous excellence in R&D, I am also proud that FRIM has also gained national and international recognition for its scientific achievements including technology transfer as well as for its human resource development, publications and infrastructure development. At the national level, six FRIM officers, including the Director General, were conferred honorary awards by D.Y.M.M. Seri Paduka Baginda Yang Di-Pertuan Agong XIII, for their outstanding contributions and achievements in the field of forestry. I would like to congratulate Datuk Dr. Abdul Razak Mohd. Ali, FRIM's Director General, who was conferred the Darjah Panglima Jasa Negara (PJN), which carries the title Datuk. I also would like to congratulate Dr. Abdul Rahim Nik, who was conferred the Darjah Kesatria Mangku Negara (KMN) as well as Dr. Shamsudin Ibrahim, Dr. Lee Su See, Dr. Norini Haron, and Dr. Ahmad Fauzi Puasa, who were conferred the Darjah Ahli Mangku Negara (AMN). My congratulations also goes to Dr. Rasadah Mat Ali for receiving the Darjah Ahli Mahkota Perlis (AMP) from D.Y.M.M. Raja Perlis. On the international front, my congratulation goes to Dr. Saw Leng Guan, who was appointed as a board member of the Kew Bulletin and an editorial member of the Journal of Tropical Ecology.

FRIM has also made outstanding achievements in the area of commercialisation of research findings. It has developed several herbal-beverage and evaluated potential bioactivities for anti-multidrug resistant S. aureus (MRSA) agents, as well as other biotechnological achievements, which have great potential for commercialisation. I am glad to know that some of these products have already been taken up by the private sector for commercialisation. I wish to reiterate here the need for early partnerships to further hasten the uptake of potential R&D findings for commercialisation by industrial partners.

untuk mengkomersialkan beberapa produk FRIM. Saya ingin menegaskan bahawa kita perlu mengadakan perkongsian lebih awal ke arah mempercepat usaha-usaha komersialisasi produk oleh rakan kongsi industri. Sebagai contoh, program peningkatan kualiti produk herba FRIM-MECD bukan sekadar membuka peluang kepada FRIM untuk mengesahkan peranannya dalam membantu industri herba tempatan tetapi juga dapat membantu FRIM mengenal pasti rakan-rakan kongsi pada masa hadapan. Dengan adanya sumber manusia yang berkemahiran tinggi serta kemudahan-kemudahan moden di FRIM, dijangkakan bahawa bioteknologi perhutanan dapat dijadikan salah satu teras dalam penyelidikan pada masa akan datang. Kita juga patut memberi tumpuan yang sama dalam membangunkan produk kayu-kayan yang baharu bagi industri kayu-kayan Malaysia ke arah menjadikan industri tersebut lebih berdaya saing serta lebih maju daripada negara pengeluar lain di dunia. Untuk membangunkan produk-produk yang baharu, penggunaan kayu-kayan terutamanya dari hutan asli tidak boleh lagi berdasarkan spesies, tetapi lebih kepada pengguna akhir. Sehubungan dengan itu, penyelidik FRIM perlulah terus berusaha menggunakan residu daripada balak dan bukan-balak untuk menghasilkan produk-produk yang baharu seperti yang dikehendaki oleh pelanggan.

Selain itu, FRIM juga telah mengambil langkah-langkah yang sewajarnya dalam menggalakkan destinasi hutan untuk tujuan ekopelancongan dan aktiviti-aktiviti menghargai alam semula jadi. Dalam hal ini, kursus-kursus dan bengkel-bengkel yang dijalankan setakat ini sangat berfaedah kepada mereka yang berminat untuk terlibat secara aktif dalam bidang ini. Contohnya, bengkel pemudah cara bagi pendidikan alam sekitar dan Kursus Pensijilan Arboris dan Landskap merupakan langkah permulaan ke arah menanam minat dan memberi peluang yang berkaitan dengan aktiviti ekosistem hutan. Penerbitan kit pendidikan serta kursus tentang interpretasi alam semula jadi bagi jurupandu pelancong perlu dibuat dengan lebih kerap dan dipanjangkan kepada pelanggan-pelanggan yang berminat. Bagi memenuhi permintaan yang kian meningkat dalam ekopelancongan dan keperluan di kawasan bandar, para penyelidik FRIM juga boleh memainkan peranan aktif dengan memberikan khidmat kepakaran dalam kerja-kerja landskap dan pembangunan taman.

FRIM juga perlulah memainkan peranan yang lebih berkesan dalam usaha untuk menangani isu perubahan cuaca yang boleh menjejaskan kehidupan di muka bumi ini. Bagaimanapun, tidak banyak diketahui tentang kaedah penyesuaian dan pengurangan perubahan cuaca. Dengan adanya penyelidik yang terlatih serta kemudahan yang lengkap, FRIM berpotensi dan berupaya untuk menjalankan penyelidikan yang menjurus ke arah menangani isu perubahan cuaca. Memandangkan FRIM diberi tanggungjawab untuk mengetuai jawatankuasa tentang penyesuaian dan pengurangan perubahan cuaca dan terdapatnya sekretariat tentang *Clean Development Mechanism* (CDM) bagi projek perhutanan, ini bolehlah dianggap sebagai testimoni ke atas keupayaan penyelidikan FRIM.

With skilled manpower and modern facilities available at FRIM, it is envisaged that forestry biotechnology could be made one of the main thrusts of future research. Similar attention must also be focused on developing new timber products for the Malaysia timber industry in order for the industry to be competitive and stay ahead of other producers worldwide. To develop new products, utilization of timber especially from the natural forests will no longer be based on species but rather on end users. In view of this, FRIM's researchers should continuously work on making use of residues from both timber and non-timber to produce new products needed by clients.

Another pertinent development is that FRIM has taken the necessary steps in promoting forest destinations for ecotourism and nature-interpretation activities. In this regard, the courses and workshops conducted so far are indeed beneficial to those who wish to participate actively in such fields. For example, the facilitator workshop on environmental education and the Arborist Certification and Landscape Course can be considered starting points to inculcate interest and opportunity related to forest-ecosystem activities. Publication of special kits for education purposes and courses on nature interpretation for nature guides should be undertaken more frequently and extended to interested clients. FRIM's researchers can also play an active role by rendering their expertise as advisers on landscape work and development of parks to meet the growing demand for ecotourism and urban needs.

FRIM should also position itself to play a more effective role in the efforts to address the issue of climate change which is affecting the livelihood of everyone on this earth. However, not much is actually known about adaptation and mitigation of climate change. With well-trained researchers, facilities, and infrastructure, FRIM has the potential and capabilities to undertake research that will contribute towards addressing this issue. Above all, leading a committee on mitigation and adaptation and holding a Secretariat on the Clean Development Mechanism (CDM) forestry project, is a testimony to FRIM's research capabilities.

Besides pursuing the issue of climate change, researchers at FRIM should continuously look for new priority areas for research. Such priority areas will not only keep FRIM on the path for better research but also help FRIM stay relevant to the needs of its clients. Amongst the priority areas of importance include bio-fuel from wood and non-wood waste, bio-informatics, and nanotechnology.

Finally, while continuously striving for excellence in R&D by making inroads into new priority areas, FRIM should also give equal attention to improving technical support services,

Di samping mengetengahkan isu perubahan cuaca, para penyelidik di FRIM perlulah sentiasa berusaha meneroka bidang-bidang keutamaan yang baharu dalam penyelidikan mereka. Bidang-bidang keutamaan tersebut bukan sahaja akan membantu FRIM menjalankan penyelidikan yang lebih bermutu, malah penyelidikan di FRIM juga akan sentiasa relevan dengan keperluan pelanggan. Antara bidang keutamaan penyelidikan yang penting termasuklah *bio-fuel* daripada sisa-sisa kayu dan bukan kayu, *bio-informatics* dan teknologi nano.

Akhir kata, di samping terus melangkah menuju kecemerlangan dalam bidang penyelidikan sejajar dengan bidang-bidang keutamaan baharu, FRIM juga sepatutnya menumpukan perhatian ke arah membuat penambahbaikan dalam perkhidmatan sokongan teknikal, termasuklah menyediakan sistem pembayaran dan perkhidmatan yang berkesan dan cekap kepada pelanggannya. Dengan pencapaian Pensijilan Korporat yang merangkumi penyelidikan dalam sektor perhutanan dan khidmat sokongan, FRIM perlulah mengambil segala langkah ke arah menuju kecemerlangan dalam bidang ini.



DATUK SUBOH MOHD. YASSIN

PJN, DPSJ, KMN

Pengerusi MFRDB

MFRDB Chairman

which include providing an effective and efficient system of payment and services to clients. Having achieved Corporate Certification, which covers both R&D in the forestry sector and support services, every effort must be made to strive for excellence in this area.



Lembaga Penyelidikan dan Pembangunan Perhutanan Malaysia *Malaysian Forestry Research and Development Board*



Ahli Lembaga MFRDB *MFRDB Board Members*

SEHINGGA 30 SEPTEMBER 2009 *UNTIL 30 SEPTEMBER 2009*

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SEHINGGA 30 SEPTEMBER 2009 UNTIL 30 SEPTEMBER 2009

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Kementerian Sumber Asli dan Alam Sekitar Malaysia
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PN. ONG JOO LIN
(Sehingga/*Until* 30 September 2007)
PN. RAHANA MD. NOH (Silih Ganti/*Alternate Member*)
Kementerian Kewangan Malaysia
Ministry of Finance Malaysia

PN. RAHANA MD. NOH
(Dari/*From* 1 Oktober/October 2007)
EN. AZLAN ABD. RASHID (Silih Ganti/*Alternate Member*)
Kementerian Kewangan Malaysia
Ministry of Finance Malaysia

Y.BHG. DATO' SERI AZAHAR MUDA
SPMP, DPMP, PMP, BSK, AMN, AMP
Y.BHG. DATO' DAHLAN TAHA
DPSK, BSK (Silih Ganti/*Alternate Member*)
Jabatan Perhutanan Semenanjung Malaysia
Forestry Department of Peninsular Malaysia

DR. CHAN HEUN YIN JSM
Lembaga Getah Malaysia
Malaysian Rubber Board

TUAN HJ. RABUAN SULAIMAN
(Sehingga/*Until* 30 September 2007)
EN. ZAINI ITHNIN HJ. A. RAZAK (Silih Ganti/*Alternate Member*)
Persatuan Pengusaha Kayu-Kayan dan Perabot Bumiputra Malaysia (PEKA)
Association of Malaysian Bumiputra Timber and Furniture Entrepreneurs

EN. NG KAY YIP
(Dari/*From* 1 Oktober/October 2007)
EN. PON CHIA HWEE (Silih Ganti/*Alternate Member*)
Persatuan Industri Kayu-Kayan Malaysia
Malaysian Wood Industries Association (MWIA)

Y.BHG. DATUK DR. ABDUL RAZAK MOHD ALI
PJN, DIMP, JMN, FMIC
Institut Penyelidikan Perhutanan Malaysia
Forest Research Institute Malaysia

Jawatankuasa Audit *Audit Committee*

SEHINGGA 30 SEPTEMBER 2009 UNTIL 30 SEPTEMBER 2009

Pengerusi *Chairman*

PN. AZIYAH MOHAMED
(Sehingga/*Until* 30 September 2007)
EN. LETCHUMANAN RAMATHA
(Dari/*From* 1 October 2007)
EN. CHIN SHIH LOON (Silih Ganti/*Alternate Member*)
Kementerian Sumber Asli dan Alam Sekitar Malaysia
Ministry of Natural Resources and Environment Malaysia

Ahli dan Ahli Silih Ganti *Members and Alternate Members*

PN. ONG JOO LIN
(Sehingga/*Until* 30 September 2007)
PN. RAHANA MD. NOH (Silih Ganti/*Alternate Member*)
Kementerian Kewangan Malaysia
Ministry of Finance Malaysia

PN. RAHANA MD. NOH
(Dari/*From* 1 October 2007)
EN. AZLAN ABD. RASHID (Silih Ganti/*Alternate Member*)
Kementerian Kewangan Malaysia
Ministry of Finance Malaysia

Y.BHG. DATO' MOHD. NAZURI HASHIM SHAH
DSNS, JSM, DSM, AMN, BSK, PMC
CIK KHONG LYE FONG (Silih Ganti/*Alternate Member*)
EN. OSMAN KASSIM (Silih Ganti/*Alternate Member*)
(Dari/*From* 1 October 2007)
Lembaga Perindustrian Kayu Malaysia
Malaysian Timber Industry Board (MTIB)

Y.BHG. DATO' SHEIKH OTHMAN
SHEIKH ABDUL RAHMAN DIMP, JP
EN. CHONG KIAN KEE (Silih Ganti/*Alternate Member*)
Persatuan Pekilang Panel Malaysia
Malaysian Panel-Products Manufacturers' Association (MPMA)

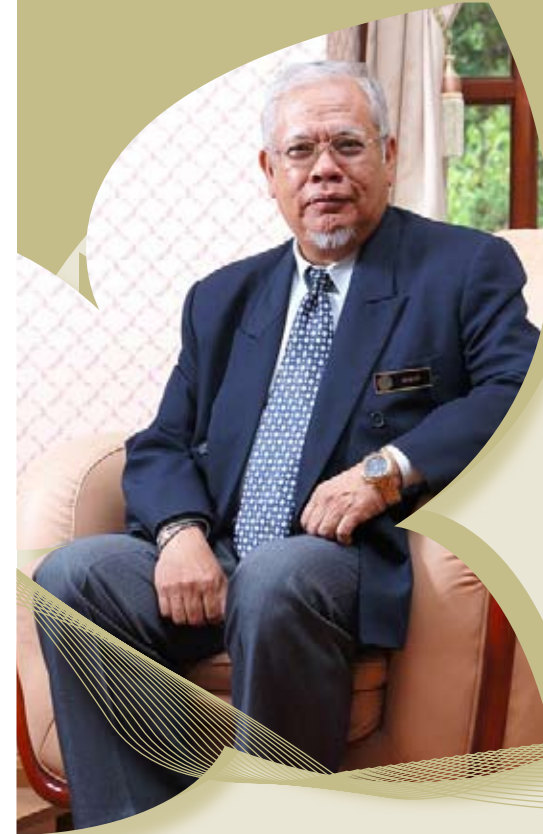
Y.BHG. DATO' SERI AZAHAR MUDA
SPMP, DPMP, PMP, BSK, AMN, AMP
Y.BHG. DATO' DAHLAN TAHA
DPSK, BSK (Silih Ganti/*Alternate Member*)
Jabatan Perhutanan Semenanjung Malaysia
Forestry Department of Peninsular Malaysia

EN. ABDUL GHANI SALLEH SMS, AMS, PPT
(Dari/*From* 1 October 2007)
Pejabat Pembangunan Negeri Selangor
Selangor State Development Office



Institut Penyelidikan Perhutanan Malaysia

Forest Research Institute Malaysia



Perutusan Ketua Pengarah

Director General's Report

Tahun 2007 menandakan satu lagi pencapaian cemerlang FRIM sebagai sebuah institusi penyelidikan. Sijil kelulusan bernombor KLR 6002590 yang dianugerahi Lloyd's Register Quality Assurance Ltd. yang bertarikh 26 Disember merupakan kemuncak keseluruhan pencapaian FRIM pada tahun ini. Sijil ini merangkumi Standard Sistem Pengurusan Kualiti: ISO 9001:2000; EN ISO 9001:2000; BS EN ISO 9001:2000; and MS ISO 9001:2000 yang diguna pakai untuk penyelidikan dan pembangunan (R&D) serta khidmat sokongan dalam pembangunan sektor perhutanan. Pensijilan ini semestinya akan meletakkan FRIM setaraf dengan institusi penyelidikan lain di dunia. FRIM sebenarnya merupakan satu-satunya institusi penyelidikan di Malaysia yang dianugerahkan pensijilan korporat. Selain itu, dua lagi pencapaian yang bersejarah ialah penambahan dua bidang tanah di luar pintu masuk utama FRIM yang telah diserahkan secara rasmi pada 17 Januari 2007 serta hak milik tanah secara rasmi dengan keluasan kira-kira 486.1 hektar, bertarikh 2 Ogos 2007. Kawasan di luar pintu masuk utama FRIM kini dikenali sebagai Taman Warisan. Saya ingin merakamkan ucapan setinggi-tinggi terima kasih kepada Y. Bhg. Dato' Dr. Abd. Latif Mohmod di atas daya usaha beliau tanpa mengenal jemu dan akhirnya menjadikan impian FRIM ini suatu kenyataan. Penyambungan kontrak selama setahun selaku Ketua Pengarah FRIM selepas persaraan rasmi saya pada 26 April; berserta kejayaan FRIM dalam menerima pensijilan korporat yang merupakan kemuncak bagi segala pencapaian bagi tahun ini telah menjadi suatu kenangan manis yang tidak dapat saya lupakan.

Dari segi pengiktirafan saintifik, kumpulan yang terdiri daripada Vimala Subramaniam, Dr. Mohd. Ilham Adenan, Abdul Rashih Ahmad, Rohana Sahdan, Juliza Mohamed, dan Dr. Rasadah Mohd. Ali, telah memenangi pingat perak bagi inovasi yang bertajuk "Natural Antioxidant Standardized Extracts (Nexes, Osteen & Guavyn) and Their Products (Avonys, Cartilac, Styn & Beaute)" dalam pertandingan inovasi di Geneva, yang diadakan dari 17 hingga 21 April. Vimala Subramaniam telah dinamakan sebagai "The Best Woman Inventor" oleh *International*

The year 2007 marked another excellent landmark in FRIM's achievements as a research institution. The certificate of approval number KLR 6002590, awarded by Lloyd's Register Quality Assurance Ltd. dated December 26, was the peak of all achievements for the year. The certificate covers the following Quality Management System (QMS) Standards: ISO 9001:2000; EN ISO 9001:2000; BS EN ISO 9001:2000; and MS ISO 9001:2000, which are applicable to research and development (R&D) and support services for the development of the forestry sector. Such certification definitely placed FRIM on a par with other research institutions worldwide. In fact, to date, FRIM is the only research institution in Malaysia that has been awarded such a corporate certification. Two other historical achievements are the addition of two pieces of land just outside FRIM's main gate, which were officially handed over on January 17, 2007, and an official land title for FRIM's grounds of approximately 486.1 hectares, dated August 2, 2007. The area outside FRIM's main gate is now known as Taman Warisan. For all of the above, I would like to express my sincere thanks to Y.Bhg. Dato' Dr. Abd. Latif Mohmod for his tireless effort in making our dream come true. A year's extension as the Director General of FRIM after my official retirement on April 26, coupled with receiving the corporate certification as the peak of all achievements for the year, has indeed made my stay a memorable one.

In terms of scientific recognition, Vimala Subramaniam, Dr. Mohd. Ilham Adenan, Abdul Rashih Ahmad, Rohana Sahdan, Juliza Mohamed, and Dr. Rasadah Mohd. Ali, as a group, won a silver medal for their innovation entitled "Natural Antioxidant Standardized Extracts (Nexes, Osteen & Guavyn) and Their Products (Avonys, Cartilac, Styn & Beaute)" at the innovation competition in Geneva, held from April 17 to 21. In fact, Vimala Subramaniam was named "The Best Woman Inventor" by the International Federation of Inventors' Association (IFIA), a recognition that will definitely place FRIM's scientists high on

Federation of Inventors' Association (IFIA), suatu pengiktirafan yang semestinya akan meletakkan FRIM setaraf dengan saintis lain di peringkat antarabangsa. Pada tahun ini juga, saintis FRIM iaitu Mohd. Tamizi Mustafa, Dr. Hamdan Husain, Dr. Wan Tarmeze Wan Ariffin, Khairul Awang, Emlee Mohd. Taib, dan Abd. Rahim Ahmad, telah memenangi pingat emas MTE-ITEX bagi reka cipta mereka yang bertajuk *Wood-v-Bam*. Dalam pertandingan yang sama, Mohd Tamizi Mustafa, Dr. Wan Tarmeze Wan Ariffin, Mohd Khairun Anwar Uyop, Mohamad Jani Saad, Emlee Mohd Taib, dan Abd. Rahim Ahmad memenangi pingat perak MTE-ITEX bagi reka cipta yang bertajuk *C-Bam Formwork*. Pengiktirafan saintifik yang diterima akan dapat merangsang minat para penyelidik di samping bertindak sebagai pemangkin ke arah mencapai kecemerlangan dalam bidang kepakaran masing-masing.

Dalam usaha untuk menyebarkan hasil-hasil penyelidikan kepada *stakeholders*, penyelidik FRIM terus menerbitkannya di dalam buku, jurnal, kertas kerja, laporan institusi dan tesis. Usaha penyebaran hasil-hasil penyelidikan juga termasuklah pembentangan melalui poster. Laporan institusi yang mengandungi maklumat terkini tentang R&D serta prestasi FRIM termasuk petunjuk prestasi utama (KPI) diterbitkan di dalam *FRIM Research Report* dan Laporan Tahunan. Laporan Tahunan FRIM telah terpilih sebagai Johan Anugerah Laporan Kencana iaitu satu pengiktirafan kepada penerbitan laporan tahunan terbaik bagi sektor awam. Anugerah ini diberikan kepada agensi badan berkanun yang menggunakan bahasa kebangsaan yang bermutu tinggi di dalam laporan tahunan mereka. Pada masa yang sama, FRIM turut dianugerahkan hadiah khas dalam penulisan teknikal. FRIM juga turut memenangi tempat kedua Anugerah Kualiti Pengurusan Kewangan (AKPK) anjuran Perbendaharaan dan MAMPU.

Pada tahun 2007 sahaja, FRIM telah menghasilkan sebanyak 655 penerbitan; 18 merupakan tesis. Dalam usaha pemindahan maklumat dan teknologi kepada *stakeholders* juga, pada tahun 2007, FRIM telah menganjurkan 44 acara termasuklah seminar, kursus dan bengkel. Antara yang paling signifikan ialah persidangan yang diadakan dua tahun sekali, iaitu *Conference on Forestry and Forest Products Research (CFFPR)* dari 27 hingga 29 November di Kuala Lumpur. Persidangan ini dianjurkan bersama-sama *Wageningen University, Research Centre of the Netherlands*, dan Persatuan Pengawet Kayu Malaysia. Persidangan yang bertajuk *Balancing Economics and Ecological Needs* berjaya menarik lebih daripada 400 peserta yang terdiri daripada ahli perniagaan, penyelidik, pegawai-pegawai kerajaan, pertubuhan bukan-kerajaan (NGO) serta ahli-ahli akademik. Di samping itu, FRIM turut menganjurkan bengkel yang tidak kurang pentingnya iaitu bengkel Hutan Paya Bakau, Muzium Sejarah Alam Semula Jadi, dan Pengetahuan Tradisional (Traditional Knowledge).

Pada tahun 2007, FRIM telah memilih media cetak untuk membolehkan penyelidik untuk memberi publisiti tentang hasil-hasil penyelidikan mereka kepada orang awam dengan lebih berkesan. Tiga artikel yang dihasilkan menggunakan bahasa yang lebih mudah difahami oleh orang awam telah diterbitkan di dalam pelbagai akhbar seperti Berita Harian, *Sabah Daily Express*, Utusan Sarawak, Sinar Harian, *Sunday Post*, Kosmo, dan *Eastern Times*. FRIM akan mengambil langkah-langkah untuk terus menyebarkan hasil penyelidikannya kepada orang

the scoreboard with other scientists internationally. During the year, FRIM's scientists, namely, Mohd. Tarmizi Mustafa, Hamdan Husain, Wan Tarmeze Wan Ariffin, Khairul Awang, Emlee Mohd Taib, and Abd. Rahim Ahmad, also won the gold MTE-ITEX award for their invention called Wood-v-Bam. In the same competition, Mohd Tarmizi Mustafa, Wan Tarmeze Wan Ariffin, Mohd. Khairun Anwar Uyop, Mohamad Jani Saad, Emlee Mohd. Taib, and Abd. Rahim Ahmad won a silver MTE-ITEX award for their invention called C-Bam Formwork. The scientific recognition received so far will stimulate other researchers' interest and act as a catalyst for them to excel in their respective fields of expertise.

To disseminate R&D findings to our stakeholders, FRIM's researchers continued to publish their results in books, journals, working papers, institutional reports, and theses. Dissemination efforts also included presenting R&D findings through posters. Two institutional reports that give first-hand information on FRIM's R&D highlights and performance for the year, including key performance indicators (KPIs), are the Research Report and the Annual Report. Apart from that, FRIM's Annual Report won first prize in the Kencana Report Award, an honour bestowed on the best annual report meant for the statutory sector. The award is given to a statutory body that uses high-quality national language in its annual report. FRIM also won another special prize in the technical category. On another occasion, FRIM won second place in the Anugerah Kualiti Pengurusan Kewangan (AKPK) organized by the Treasury and MAMPU.

In 2007 alone, there were 655 publications, 18 of which were documented as theses. Also in 2007, FRIM organized 44 events, consisting of seminars, courses, and workshops, as means of transferring information and technology to our stakeholders. Of the 44 events, the most significant was the biennial Conference on Forestry and Forest Products Research (CFFPR) held from November 27 to 29. The conference was jointly organized by the Wageningen University and Research Centre of the Netherlands, and the Wood Preservation Association, Malaysia. With the conference title of "Balancing Economics and Ecological Needs," the seminar attracted more than 400 participants, consisting of the business community, researchers, government officials, non-governmental organizations (NGO), and academicians alike. With regard to workshops, the ones on Mangrove, Natural History Museum, and Traditional Knowledge are among those worth mentioning.

In 2007, the print media were chosen as the immediate avenue for researchers to publicize R&D findings effectively to the general public. Three articles written in laymen's terms appeared in various newspapers, such as Berita Harian, Sabah Daily Express, Utusan Sarawak, Sinar Harian, Sunday Post, Kosmo, and Eastern Times. Efforts will be stepped up to publicize R&D findings to the general public in 2008. Research Sea, a web-based publication meant to capture the attention of journalists worldwide, is another medium used to disseminate FRIM's R&D findings. Another 15 new projects with a total funding of RM2.4 million were approved under the e-Science Fund in 2007. These new projects are expected to generate more R&D findings in the future.

awam pada tahun 2008. Satu lagi cara penyebaran maklumat FRIM kepada orang ramai ialah melalui *ResearchSea*, iaitu satu penerbitan yang berasaskan laman web yang bertujuan menarik perhatian wartawan di seluruh dunia untuk menyebarkannya melalui media cetak dan elektronik masing-masing. Sebanyak 15 projek baharu yang berjumlah RM2.4 juta telah diluluskan di bawah dana *ScienceFund* pada tahun 2007. Projek-projek ini dijangka akan dapat menghasilkan lebih banyak lagi penemuan R&D pada masa hadapan.

Dalam usaha untuk meningkatkan keupayaan yang berterusan, para penyelidik serta kakitangan pentadbiran digalakkan untuk melanjutkan pelajaran baik di universiti tempatan mahupun di luar negara. Pada tahun 2007, lima orang penyelidik telah menamatkan pengajian di peringkat ijazah kedoktoran, dan tiga orang menamatkan ijazah sarjana. Mereka yang menamatkan ijazah kedoktoran ialah Dr. Mohd. Noor Mahat, Dr. Norlia Basherudin, Dr. Grace Tabitha Lim Wui Oi, Dr. Ismail Harun, dan Dr. Safiah @Yusmah Muhd. Yusoff. Tiga orang penyelidik yang menamatkan ijazah sarjana ialah Rosdi Koter, Farah Fazwa Mohd. Arif, dan Ahmad Azaruddin Mohd. Noor. Pegawai Tadbir, En. Abdul Jabbar Sabli, turut menamatkan ijazah sarjana pada tahun 2007. Di samping itu, FRIM juga menyokong dalam pembinaan keupayaan (capacity building) kepada individu yang berminat untuk melanjutkan pelajaran melalui skim bantuan penyelidikan. Pada tahun 2007, enam orang siswazah bantuan penyelidikan telah menamatkan pengajian di peringkat sarjana. Dari tahun 1985 hingga 2007, 80 orang pegawai penyelidik telah berjaya menamatkan ijazah kedoktoran manakala 66 orang berjaya menamatkan ijazah sarjana mereka.

Pihak pengurusan FRIM juga terus menunjukkan komitmen dengan menyediakan kelengkapan dalam teknologi maklumat kepada pegawai penyelidik. Pada Jun 2007, talian rangkaian baharu telah dinaikkan taraf daripada dua Mbps kepada empat Mbps dengan kos menaik taraf ditanggung oleh Kementerian Sumber Asli dan Alam Sekitar (NRE); manakala *Government Integrated Telecommunication Network (GITN)* memberikan perkhidmatan bagi rangkaian ini. Cawangan Teknologi Maklumat (ICT) juga telah membangunkan satu cara pengurusan maklumat dalaman yang dipanggil *Research Information Management System (RIMS)* yang bertindak sebagai pusat sumber maklumat tentang projek-projek pembangunan di bawah RMK-9 dan R&D. Selain itu, turut dibangunkan oleh Cawangan ICT juga ialah pangkalan data maklumat tunggal yang berasaskan web iaitu *Timber Technology and Engineering Information Resource (TTEIR)* bagi membantu pihak industri dan pengusaha bidang kayu-kayan. Dengan dibantu oleh Universiti Teknologi Malaysia (UTM), Universiti Sains Malaysia (USM), Universiti Malaya (UM), Universiti Teknologi MARA (UiTM), Lembaga Industri Kayu-Kayan Malaysia (MTIB), Lembaga Pembangunan Industri Pembinaan (CIDB), Institut Penyelidikan Industri dan Standard Malaysia (SIRIM), Jabatan Perhutanan Semenanjung Malaysia, Jabatan Perhutanan Negeri Sarawak, Jabatan Kerja Raya (JKR), Institut Jurutera Malaysia (IEM), dan Persatuan Pembalak Sarawak, projek ini membangunkan satu portal yang mengandungi enjin carian parametrik serta bertindak sebagai pusat sehati yang berasaskan pengetahuan. Salah satu ciri yang unik bagi TTEIR ialah ia merupakan portal kejuruteraan kayu-kayan yang berautomasi dan berstruktur secara dalam talian dan dilengkapi contoh-contoh reka bentuk dan panduan pengiraan kejuruteraan

In ensuring continuous capacity development, researchers and administrative staff are encouraged to pursue their higher academic degrees either locally or overseas. In 2007, five researchers completed their Ph.D. degrees, and three completed their master's degrees. Those who completed their Ph.D. programme were Dr. Mohd. Noor Mahat, Dr. Norlia Basherudin, Dr. Grace Tabitha Lim Wui Oi, Dr. Ismail Harun, and Dr. Safiah alias Yusmah Muhd. Yusoff. The three master's degree recipients were Rosdi Koter, Farah Fazwa Mohd. Arif, and Ahmad Azaruddin Mohd. Noor. An administrative officer, En. Abdul Jabbar Sabli, also completed his master's degree in 2007. Besides researchers and administrators, FRIM also supports capacity building for interested individuals to pursue higher degrees through research assistantships (RAs). In 2007, six RAs completed their master's degree. From 1985 through 2007, 80 ROs successfully completed their Ph.D. programmes and another 66 concluded their master's degree programmes.

Top management at FRIM are also committed to continue to equip ROs with better facilities in information technology (IT). In June 2007, the incoming network line at FRIM was upgraded from two Mbps to four Mbps. The cost for upgrading the incoming network was borne by the Ministry of Natural Resources and Environment (NRE); the Government Integrated Telecommunication Network (GITN) was the service provider for the network. In relation to IT development, the IT Branch also developed an in-house knowledge-management tool called Research Information Management System (RIMS) to act as a one-stop source of information related to all 9th Malaysia Plan development and R&D projects. Another IT achievement for the year was the development of a single web-based Timber Technology and Engineering Information Resource (TTEIR) meant to assist the community of timber industry and contractors. Assisted by members from Universiti Teknologi Malaysia (UTM), Universiti Sains Malaysia (USM), University Malaya (UM), University Technology MARA (UiTM), the Malaysia Timber Industry Board (MTIB), Construction Industry Development Board (CIDB), Standard and Industrial Research Institute of Malaysia (SIRIM), Forestry Department Peninsular Malaysia, Sarawak Forestry Department, Jabatan Kerja Raya (JKR), Institute of Engineers Malaysia (IEM), and the Sarawak Timber Association, the project developed a portal that has a parametric search engine and acts as one-stop knowledge-based centre. One unique feature of the TTEIR is the on-line structural and automated timber engineering portal with design examples and guides to engineering calculations in accordance with Malaysian Standard MS544. Service-related fields, such as asset management, purchasing, over-time claims, and mileage claims, were all computerized in 2007. FRIM also has popularized the checking of assets through a system called self-auditing.

FRIM continued to collaborate with relevant organizations and agencies in R&D-related forestry fields, as well as the private sector, to help commercialize our potential research products. Ten memoranda of understanding (MoU) and three memoranda of agreement (MoA) were signed in 2007. One MoU worth mentioning is with the Research and Development Centre

yang selaras dengan Standard Malaysia MS544. Bidang-bidang yang berkaitan dengan perkhidmatan seperti pengurusan aset, perolehan, tuntutan kerja lebih masa dan tuntutan perjalanan juga boleh dilakukan secara dalam talian. FRIM juga turut menjalankan penyemakan aset melalui sistem pengauditan sendiri.

FRIM terus bekerjasama dengan pertubuhan, agensi serta sektor swasta dalam bidang R&D yang berkaitan dengan perhutanan untuk membantu dalam usaha komersialisasi hasil-hasil penyelidikannya yang berpotensi. Sepuluh memorandum persefahaman (MoU) dan tiga memorandum perjanjian (MoA) telah ditandatangani pada tahun 2007. Salah satu MoU yang ditandatangani ialah dengan *Research and Development Centre of Forestry and Nature Conservation* (FORDA), Republik Indonesia, pada 4 April. Dari sudut perniagaan, FRIM telah berjaya memperoleh tujuh pendedahan reka cipta, satu cap dagangan, 35 projek perundingan, dan empat paten. Dari segi nilai, royalti dan yuran perundingan yang diterima masing-masing berjumlah kira-kira RM54,000 dan RM822,000. Jumlah pendapatan yang diterima daripada perundingan dalam tahun 2007 adalah jauh lebih baik berbanding tahun 2006 yang hanya berjaya memungut sebanyak RM424 ribu. Mereka yang berminat untuk mengetahui dengan lebih lanjut tentang sumber-sumber pendapatan FRIM digalakkan merujuk Laporan Tahunan.

Tidak seperti institusi penyelidikan yang lain, fungsi-fungsi FRIM turut merangkumi promosi program-program kesedaran awam, terutamanya yang berkaitan dengan kepentingan sektor perhutanan sebagai warisan negara dan juga sebagai sumber keselamatan biologi, kepelbagaian biologi, dan kestabilan ekonomi, budaya dan sosial. Antara kempen kesedaran awam, termasuk untuk kanak-kanak sekolah yang telah dijalankan ialah *Forest is Fun*, yang diadakan sempena Hari Perhutanan Sedunia dan Hari Tanah Lembap Sedunia pada 1 April, Hari Alam Sekitar Sedunia pada 17 Jun; dan Kem Penyelidikan pada 22 hingga 27 Julai.

Akhir sekali, saya ingin mencatatkan bahawa 2007 merupakan tahun kejayaan bagi seluruh warga FRIM. Di samping itu, dengan penerimaan pensijilan korporat, FRIM kini berada setaraf dengan institusi penyelidikan lain di seluruh dunia dalam segala aspek R&D perhutanan, termasuklah juga aspek sokongan dan perkhidmatan. Bagaimanapun, saya ingin mengingatkan semua kakitangan FRIM agar tidak berasa selesa dengan pencapaian yang telah dikecapi sekarang. Bagi saya, setiap pencapaian yang diraih, sentiasa ada ruang untuk ditambah baik. Hanya dengan membuat penambahbaikan secara berterusan kita akan sentiasa berada di hadapan, termasuklah meneroka bidang-bidang keutamaan baru dalam penyelidikan serta memastikan keperluan-keperluan pelanggan sentiasa dipenuhi. Kita juga tidak perlu takut untuk melakukan perubahan seandainya perubahan tersebut adalah demi memastikan FRIM terus cemerlang dalam setiap apa yang di lakukan. Kakitangan FRIM tidak boleh bersikap sambil lewa sahaja, yakni hanya untuk menyempurnakan tugas yang telah ditetapkan. Sebaliknya, kita perlulah sentiasa membuat penambahbaikan jika kita mahu berada di hadapan. Akhir sekali, prospek komersialisasi perlulah digandingkan bersama-sama setiap inovasi yang dihasilkan. Hanya melalui usaha-usaha inilah FRIM dapat menyempurnakan matlamat ke arah mencapai pembiayaan-sendiri (self-sustenance).

of Forestry and Nature Conservation, Republic of Indonesia (in short, FORDA), signed on April 4. On the business front, FRIM attained seven invention disclosures, One trademark, 35 consultancy projects, and four patents. In terms of values, the royalty and consultancy fees received totaled almost RM54,000 and RM822,000, respectively. The total revenue collected from consultancies in 2007 was well above the value of RM424 thousand collected in 2006. Readers who are interested in finding out more about our sources of revenue are encouraged to examine the Annual Report.

Unlike other research institutions, FRIM's functions also cover promotion of programmes related to public awareness, especially related to the importance of the forestry sector per se as a national heritage and of forests as sources of ecological security, biological diversity, and economic, cultural, and social stability. Among the awareness events meant for the public, including school children, are Forest Is Fun, conducted in conjunction with World Forestry Day and World Wetlands Day, on April 1; World Environment Day on June 17; and Research Camp between July 22 and 27.

In conclusion, I want to put on record that 2007 was another great year for all of FRIM's staff. In addition, with the corporate certification received, riding high with other research institutions worldwide in all aspects of forestry R&D, including support and services, is indeed plausible. Nonetheless, I caution all FRIM staff not to be complacent about the achievements to date. To me, for every achievement made there is always room for improvement. It is only through continuous improvements that we can stay ahead of others, not to mention new priority areas in which to conduct research, so as to keep FRIM relevant with regard to requests from clients. Also, do not be afraid to make changes, if such changes will ensure that we continue to excel in what we do. FRIM staff cannot afford just to go through the motions, i.e., get things done. In short, business cannot be carried out as usual. Improvement after improvement in what we do is crucial for FRIM to stay ahead. Last but not least, commercialization prospects must be attached to every innovation made. It is only through such efforts that FRIM can accomplish the goal to strive for self-sustenance.



DATUK DR. ABDUL RAZAK MOHD. ALI
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Ketua Pengarah FRIM
Director General FRIM

Ahli Direktorat *Directorate Members*

Pengerusi *Chairman*

Y.BHG. DATUK DR. ABDUL RAZAK MOHD. ALI
PJN, DIMP, JMN, FMIC
Ketua Pengarah
Director General

Ahli *Members*

Y.BHG. DATO' DR. WAN RAZALI WAN MOHD.
DPMT, JSM, KMN, FIFM
Timbalan Ketua Pengarah (Penyelidikan dan Pembangunan)
Deputy Director General (Research and Development)
(Sehingga/*Until* 7 December 2007)

Y.BHG. DATO' DR. ABD. LATIF MOHMOD
DIMP, KMN, AMN
Timbalan Ketua Pengarah (Operasi)
Deputy Director General (Operations)

DR. ABDUL RASHID HJ. AB. MALIK
Timbalan Ketua Pengarah (Penyelidikan dan Pembangunan)
Deputy Director General (Research and Development)
(Dari/*From* 10 December 2007)

Pengarah Kanan Bahagian Pengurusan dan Multimedia
Senior Director Management and Multimedia Division
(Sehingga/*Until* 9 December 2007)

DR. CHE ABDUL RAHIM NIK KMN, AMN
Pengarah Kanan Bahagian Biodiversiti dan Alam Sekitar
Senior Director Biodiversity and Environment Division

DR. SHAMSUDIN IBRAHIM AMN
Pengarah Kanan Bahagian Perhutanan
Senior Director Forestry Division
Pengarah Program Hutan Asli
Director Natural Forest Programme

DR. MOHD. NOR MOHD. YUSOFF KMN
Pengarah Kanan Bahagian Keluaran Hutan
Senior Director Forest Products Division

DR. HOI WHY KONG AMN
Pengarah Kanan Bahagian Keluaran Hutan
Senior Director Forest Products Division
(Sehingga/*Until* 30 June 2007)

DR. CHAN HUNG TUCK KMN
Pengarah Kanan Bahagian Pengurusan Penyelidikan
Senior Director Research Management Division
(Sehingga/*Until* 1 November 2007)

EN. MOHD. ZAMSHARI ABD. RAHMAN
Pengarah Bahagian Kewangan
Director Finance Division

DR. SAW LENG GUAN
Pengarah Kanan Program TFBC
Senior Director TFBC Programme

PN. WAN RAHMAH WAN A. RAOF
Pengarah Kanan Bahagian Pengurusan Sumber Manusia
Senior Director Human Resource Management Division

DR. RAHIM SUDIN AMN, DSM
Pengarah Kanan Program Kimia dan Perlindungan Kayu
Senior Director Wood Chemistry and Protection Programme

DR. NORINI HARON AMN
Pengarah Kanan Bahagian Korporat dan Hal Ehwal Undang-Undang
Senior Director Corporate and Legal Affairs Division
Pengarah Kanan Program Tekno Ekonomi
Senior Director Techno-Economics Programme
(Dari/*From* 1 April 2007)

DR. RASADAH MAT ALI AMP
Pengarah Kanan Program Tumbuhan Ubatan
Senior Director Medicinal Plants Programme

DR. MARZALINA MANSOR
Pengarah Kanan Program Bioteknologi dan Farmaseutikal
Senior Director Biotechnology and Pharmaceutical Programme

DR. NOOR AZLIN YAHYA
Pengarah Program Ekopelancongan dan Hutan Bandar
Director of Ecotourism and Urban Forestry programme

DR. TAN YU ENG
Pengarah Program Pemprosesan dan Teknologi Kayu
Director Wood Processing and Technology Programme

DR. AHMAD ZUHAIDI YAHYA
Pengarah Program Hutan Ladang
Director Forest Plantations Programme

DR. WOON WENG CHUEN LIMIS
Pengarah Program Tekno-Ekonomi
Director Techno-Economics Programme
(Sehingga/*Until* 31 March 2007)

Ahli Direktorat
Directorate Members

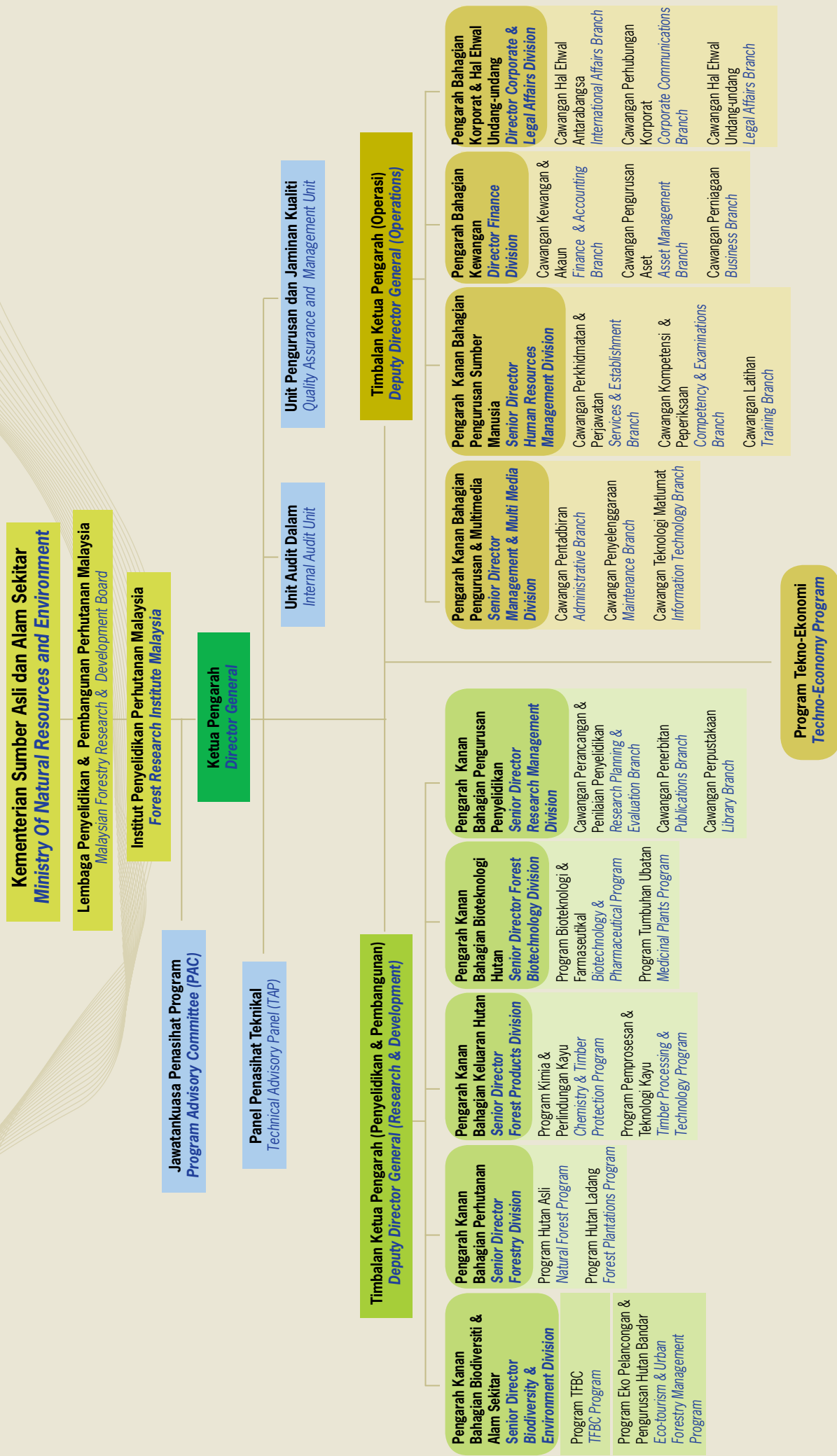


Dari kiri (*From left*)

Dr. Ahmad Zuhaidi Yahya, En. Mohd. Zamshari Abd. Rahman, Dr. Norini Haron, Dr. Rasadah Mat Ali, Dr. Abdul Rahim Nik, Dr. Rahim Sudin, Pn. Wan Rahmah Wan A. Raof, Dr. Tan Yu Eng, Y.Bhg. Dato' Dr. Abd. Latif Mohmod, Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, Dr. Abdul Rashid Ab. Malik, Encik Mohd. Dzaki Jusoh, Dr. Ismail Harun, Dr. Baskaran Krishnapillay, Dr. Mohd. Nor Mohd. Yusoff, Dr. Shamsudin Ibrahim, Dr. Marzalina Mansor, Dr. Noor Azlin Yahya

Carta Organisasi FRIM

FRIM Organisational Chart



Visi Vision

Menjadikan FRIM sebuah institusi penyelidikan hutan tropika yang bertaraf dunia
To make FRIM a world-class tropical forest research institute

Misi Mission

Mencapai kecemerlangan dalam penyelidikan saintifik, pembangunan dan perkhidmatan sektor perhutanan
To achieve excellence in scientific research, development and forestry services

Objektif Objectives

Objektif Umum FRIM:

- Menjana pengetahuan saintifik bagi pemahaman, pengurusan dan penggunaan sumber hutan
- Mencapai kecemerlangan dalam penyelidikan dan pembangunan dengan penggunaan alat saintifik terkini
- Mengkaji kepelbagaian biologi bagi menghasilkan produk berguna melalui penyelidikan dan pembangunan yang intensif
- Memajukan teknologi berkaitan bagi memenuhi keperluan industri perhutanan
- Mempakejkan hasil penyelidikan dan pembangunan untuk disebar kepada pelanggan
- Mengkomersialkan hasil penyelidikan dan pembangunan melalui pemindahan teknologi kepada pihak yang berminat
- Menyediakan perkhidmatan cemerlang untuk memenuhi kepuasan pelanggan
- Mewujudkan kerjasama strategik dengan agensi tempatan dan antarabangsa
- Meningkatkan kesedaran awam terhadap kepentingan alam sekitar dan pemuliharaan kepelbagaian biologi hutan

General Objectives:

- Generating scientific knowledge for the understanding, management, conservation and use of forest resources
- Achieving excellence in research and development through the use of the latest scientific equipment
- Studying biodiversity to produce useful products through intensive research and development
- Developing related technology to fulfill the needs of the forestry industry
- Packaging research and development findings for dissemination to clients
- Commercializing research and development findings through technology transfer to all interested parties
- Providing excellent service to fulfill client needs
- Creating strategic cooperation with local and international agencies
- Raising public awareness regarding the importance of the environment and the conservation of forest biodiversity

Objektif Operasi FRIM:

- Menyediakan program pembangunan sumber manusia bagi melahirkan golongan saintis yang berwibawa dan kompeten
- Menyediakan suasana kerja yang kondusif bagi menggalakkan cetusan idea di kalangan saintis dan perhubungan lebih rapat dengan pelanggan
- Menyebarkan hasil teknologi, penyelidikan serta memberi perkhidmatan nasihat dan teknikal yang tepat dan professional
- Menyediakan penyelesaian praktikal kepada masalah berkaitan pengurusan dan penggunaan sumber dan hasil hutan
- Menyediakan kemudahan dan memberi perkhidmatan profesional dalam meningkatkan kesedaran awam terhadap alam sekitar

Operational Objectives:

- *Providing human resource development programmes to produce a class of authoritative and competent scientists*
- *Providing a work environment that is conducive to encourage creative thinking among scientists and a close relationship with clients*
- *Disseminating the technological and research products as well as giving accurate and professional advice and technical services*
- *Providing practical solutions to problems involving management and usage of forest resources and products*
- *Providing facilities and professional services in order to raise environmental awareness.*

- Menawarkan khidmat nasihat, teknikal, perundingan dan latihan serta membekalkan produk yang mematuhi spesifikasi dan memenuhi sistem kualiti yang ditetapkan
- Menyediakan kemudahan dan perkhidmatan professional dalam meningkatkan kesedaran awam terhadap kepentingan alam sekitar melalui program eko-pelancongan dan pendidikan alam
- Menyediakan program latihan yang bersistematik serta berterusan bagi mewujudkan personel yang kompeten, beretika dan berintegriti serta berwibawa

- *Advisory, technical, consultation and training services are offered and products that meet the specifications and quality system required are provided*
- *Facilities and professional services are provided to enhance public awareness of the importance of the environment through ecotourism programmes and nature education*
- *Continual and systematic training programmes are provided to establish competent and ethical, personnel of integrity and credibility*

Fungsi Functions

Fungsi utama FRIM ialah:

- Merancang dan melaksanakan penyelidikan bagi pembangunan sektor perhutanan dan pemuliharaan sumber hutan
- Memperolehi dan menyebarkan maklumat hasil penyelidikan bagi meningkatkan pengurusan hutan dan penggunaan hasil hutan
- Mengadakan hubungan kerjasama penyelidikan dan pembangunan perhutanan dengan badan-badan dalam dan luar malaysia

The main functions of FRIM are:

- *Planning and implementing research for the development of the forestry sector and conservation of forest resources*
- *Obtaining and disseminating research information to enhance forest management and the use of forest products*
- *Establishing joint research and joint forest development with other bodies within and outside Malaysia*

Piagam Pelanggan Clients' Charter

Kami berjanji untuk berusaha membangun dan menggalakkan penggunaan sumber dan hasil hutan secara berkekalan melalui penyelidikan, pembangunan dan penggunaannya. Bagi tujuan ini, kami memberi jaminan seperti berikut:-

- Memastikan penyelidikan yang dilaksanakan adalah relevan dan memberi impak kepada industri perhutanan dan yang berkaitan serta menjurus kepada penjaan pengetahuan, pembangunan proses, teknologi dan produk baru berpandukan kehendak pasaran
- Memastikan semua hasil penyelidikan mengandungi maklumat yang tepat dan disebar secara berkesan melalui penerbitan, seminar, dialog dan media elektronik
- Mengkomersil penemuan baru melalui pemindahan teknologi dan kerjasama dengan industri

We pledge to develop and enhance the utilization of forest resources and produce on a sustainable basis through research, development and application. For this purpose, we ensure the following:

- *The implementation of research is relevant to give impact to the forest and any related industries, in the direction of knowledge generation, process development, technology and new products based on market needs*
- *All research results comprise precise information that is disseminated effectively through publications, conferences, dialogues and the electronic media*
- *New finding are commercialized through technology transfer and collaboration with the industries*

Dasar Kualiti Quality Policy

FRIM komited dalam menyediakan perkhidmatan penyelidikan dan perkhidmatan sokongan dengan cekap dan berkesan bagi memenuhi keperluan pelanggannya. Ini dilaksanakan berasaskan Piawaian MS ISO 9001:2000. FRIM akan melaksanakan penambahbaikan berterusan bagi meningkatkan keberkesanan sistem berkaitan

FRIM is committed to providing effective research and related supporting services to fulfill its clients' needs. This is carried out in accordance with MS ISO 9001:2000 Standards. FRIM will carry out continuous improvements to enhance the effectiveness of related systems

Slogan Kualiti Quality Slogan

“Kualiti teras kecemerlangan
Inovasi kunci keunggulan”
*“Quality is the pillar for excellence
Innovation is the key to preeminence”*



Penyelidikan dan Pembangunan *Research and Development*

Projek Hutan Paya Gambut

Projek Hutan Paya Gambut yang dibiayai oleh Kerajaan Malaysia dan UNDP/GEF dan DANIDA telah berjaya mengutarakan satu kaedah bagi perancangan pengurusan konsultatif melalui penubuhan pasukan teras. Pasukan teras dianggotai oleh wakil-wakil dari pelbagai agensi kerajaan utama di Sarawak, Sabah dan Pahang untuk merangka draf khusus pelan pengurusan untuk pemuliharaan hutan paya gambut masing-masing di Taman Negara Loagan Bunut (LBNP), Hutan Simpan Klias dan Hutan Paya Gambut Pahang Tenggara (SEPPSF).

Kumpulan pengurusan teras ini (MPCT) telah merumus dan menyiapkan pelan-pelan pengurusan dengan bantuan pakar perunding Projek Hutan Paya Gambut dalam jangka masa dua tahun bermula pada tahun 2005, dengan mengambil kira kepentingan penemuan pelbagai kajian saintifik yang dijalankan oleh pakar. Pendekatan yang digunakan dalam merumus rancangan yang diperkenalkan oleh Projek Hutan Paya Gambut adalah unik kerana ia bukan sahaja melibatkan agensi-agensi utama kerajaan secara langsung di sepanjang proses, malah ia juga menggalakkan penglibatan perundingan pihak-pihak berkepentingan dengan komuniti tempatan yang terlibat, sektor swasta serta organisasi bukan kerajaan (NGO).

Tempoh perancangan dua tahun membolehkan pencapaian yang berikut:

- interaksi antara agensi kerajaan negeri yang mencukupi untuk menangani masalah-masalah *multi jurisdictional* atau yang berkenaan dengan percanggahan bidang kuasa masing-masing;
- Sintesis maklumat yang diperoleh daripada penemuan-penemuan terbaharu dan data saintifik;
- perbincangan rapi tentang ancaman-ancaman utama serta isu-isu lain yang dibangkitkan;
- pertimbangan wajar diberikan ke atas pendapat-pendapat dan kecenderungan yang berbeza; serta
- pencapaian kata sepakat atau konsensus tentang strategi-strategi pengurusan dan tindakan-tindakan yang perlu diambil bagi menangani ancaman-ancaman yang dihadapi dalam pemuliharaan tapak projek.

Di sepanjang proses perancangan, sesetengah tindakan yang disyorkan di bawah pelan pengurusan telah dijalankan oleh agensi-agensi kerajaan negeri terlibat dengan menghasilkan

Peat Swamp Forest Project

The Peat Swamp Forest Project funded by the government of Malaysia and UNDP/GEF and DANIDA has successfully initiated and facilitated a consultative management planning method through the setting up of a core team comprising representatives of various key state agencies in Sarawak, Sabah and Pahang to draft the site-specific management plans for the conservation of the Loagan Bunut National Park (LBNP), Klias Forest Reserve and South-East Pahang Peat Swamp Forest (SEPPSF) respectively.

The respective management plan core team (MPCT) had conducted a series of meetings, with facilitation from the PSF Project consultant, to draft a two year plan starting from 2005, taking into account, findings from various scientific studies conducted by experts. The approach used in the plan formulation introduced by the PSF Project, was unique as it not only involved directly the key state agencies throughout the process, it also encouraged multi-stakeholders consultations which included local communities, the private sector and non-governmental organisations.

The two-year planning period allowed for:

- *sufficient inter-agency interaction for multi-jurisdictional concerns to be addressed;*
- *proper digestion of available information including latest scientific findings and data;*
- *adequate discussions of the major threats and other issues raised;*
- *due consideration to be given to different views and interests; and*
- *consensus to be achieved on the management strategies and actions required to address threats to conservation in the project site.*

During the planning process, some recommended actions under the management plans were undertaken by some state agencies involved, resulting in encouraging developments. These were:

- *The incorporation of proposed management zones for conservation under the Integrated Management Plan of South-East Pahang Peat Swamp Forest into the Pekan District Local Plan by the Pahang Town and Country Planning Department;*
- *The designation of SEPPSF and its surroundings as*

perkembangan yang sangat menggalakkan. Ini merupakan:

- Kemasukan zon-zon pengurusan yang dicadangkan di bawah Pelan Pengurusan Bersepadu Hutan Paya Gambut Pahang Tenggara ke dalam Pelan Tempatan Daerah Pekan oleh Jabatan Perancangan Bandar dan Desa Negeri Pahang;
- Pengisytiharan kawasan hutan paya gambut di Pahang Tenggara dan persekitarannya sebagai “Kawasan Sensitif Alam Sekitar” di bawah Akta Perancangan Pekan dan Desa 1976;
- Pembentukan satu Jawatankuasa Khas Perikanan di Taman Negara Loagan Bunut untuk menguatkuasakan Peraturan-peraturan Perikanan Tradisional untuk kelestarian sumber asli; dan
- Pewartaan tambahan 2148 ha tanah negeri kawasan paya gambut berdekatan Hutan Simpan Klias untuk perlindungan.

Kesan-kesan awal dan pengajaran yang didapati daripada pengalaman perancangan perunding ini telah dikongsi oleh pihak Projek dan jabatan-jabatan perhutanan negeri yang terlibat dengan agensi-agensi kerajaan negeri lain di Semenanjung Malaysia serta negara-negara jiran melalui kempen *roadshow* di Terengganu, Perak dan Johor, serta persidangan dan seminar di dalam dan di luar negara.

Pelan pengurusan yang dihasilkan, iaitu “Pelan Pengurusan Taman Negara Loagan Bunut”, “Pelan Pemuliharaan Hutan Simpan Klias” dan “Pelan Pengurusan Bersepadu Hutan Paya Gambut Pahang Tenggara” telah diluluskan oleh Jawatankuasa Pemandu Projek Negeri masing-masing pada pertengahan 2007 dan suntingan akhir telah pun dijalankan oleh pihak Projek.

“Pelan Pengurusan Taman Negara Loagan Bunut” telah diserahkan kepada pihak berkuasa negeri dan seterusnya dilancarkan secara rasmi oleh Ketua Menteri Sarawak, Pehin Sri Taib Mahmud di Dewan Undangan Negeri di Kuching pada 22 November 2007. Pelan yang mempunyai 122 muka surat tersebut dirumuskan oleh Kementerian Perancangan dan Pengurusan Sumber, Kementerian Kemajuan Tanah, Kementerian Pembangunan Bandar dan Pelancongan, Unit Perancangan Negeri, Jabatan Hutan Sarawak, Jabatan Tanah dan Survei, Jabatan Pengairan dan Saliran, Majlis Adat Istiadat, Lembaga Sumber Asli dan Alam Sekitar Sarawak, dan Sarawak Forestry Corporation. Ia mengandungi 14 strategi dan lebih 60 tindakan pengurusan bagi pelaksanaan kerajaan untuk memberi perhatian terhadap ancaman-ancaman terhadap pemuliharaan ekosistem taman. Pelan ini dijangka akan menjadi rujukan utama dalam membuat keputusan tentang penggunaan tanah dan aktiviti-aktiviti pembangunan lain di sekeliling taman.

“Pelan Pemuliharaan Hutan Simpan Klias” dan “Pelan Pengurusan Bersepadu Hutan Paya Gambut Pahang Tenggara” dijangka akan diserahkan kepada pihak berkuasa negeri pada bulan April 2008.

- “Environmentally Sensitive Areas” (Kawasan Sensitif Alam Sekitar) under the Town and Country Planning Act 1976;*
- *The setting up of a Special Fishery Committee in the LBNP to enforce the Traditional Fishing Regulations for the sustainability of natural resources; and*
 - *The gazettement of an additional 2,148 ha of stateland peat area near the Klias Forest Reserve for protection.*

The initial impacts and lessons learned from this consultative planning experience were widely shared by the Project and state Forestry Departments with other states in Malaysia as well as neighbouring countries through a series of roadshows and presentations at conferences and seminars.

All the management plans—“Loagan Bunut National Park Management Plan”, “Klias Forest Reserve Conservation Plan” and “Integrated Management Plan of South-East Pahang Peat Swamp Forest”—had been endorsed by the respective State Project Steering Committees by mid 2007, after which the final editing was being undertaken by the Project.

The first to be printed and handed over to the state authorities was the “Loagan Bunut National Park Management Plan”, officially launched by Sarawak Chief Minister Pehin Sri Taib Mahmud at the Dewan Undangan Negeri in Kuching on 22 November. The 122-page Plan was formulated by the Sarawak Ministry of Planning and Resource Management, Ministry of Land Development, Ministry of Urban Development and Tourism, State Planning Unit, Department of Forests, Department of Land and Survey, Department of Irrigation and Drainage, Majlis Adat Istiadat, Natural Resources and Environment Board and Sarawak Forestry Corporation. Containing 14 strategies and over 60 management actions for state implementation to address threats to the conservation the park ecosystems, the Plan is expected to be the main reference for decision-making on land use and other development activities surrounding the park.

The “Klias Forest Reserve Conservation Plan” and “Integrated Management Plan of South-East Pahang Peat Swamp Forest” are expected to be delivered to the state authorities by April 2008.

Sistem Pengawasan Ekologi (EMS)

Projek Hutan Paya Gambut telah membentuk satu sistem pengawasan ekologi (EMS), dengan pilihan penanda aras yang sesuai, prosedur-prosedur pengawasan realistik untuk pelaksanaan dan satu sistem pangkalan data untuk penyimpanan dan pencarian mudah maklumat yang mesra pengguna, untuk pemuliharaan Hutan Paya Bakau di Tenggara Pahang (SEPPSF) di Pahang, Taman Negara Loagan Bunut di Sarawak dan Hutan Simpan Klias, Sabah.

Sistem pengawasan ekologi, yang direka sebagai satu alat bantuan untuk menilai pola parameter biodiversiti terpilih adalah penting bagi memberi tanda-tanda amaran awal atau tanda-tanda perubahan keadaan yang berlaku di lapangan. Ini akan membolehkan pembuat-pembuat keputusan mengambil langkah untuk mengatasi ancaman-ancaman terhadap pemuliharaan dan ketahanan sumber biologi. Pengawasan ekologi adalah penting kerana ia menilai keberkesanan strategi-strategi pengurusan pemuliharaan dan menaksir kesan-kesan jangka panjang gangguan-gangguan atau aktiviti-aktiviti manusia terhadap alam sekitar. Ia juga dapat menaksir secara jangka panjang pencapaian hasil-hasil yang diinginkan, seperti tahap kesedaran awam dan pihak berkepentingan, perolehan serta kerugian pemuliharaan kepelbagaian biologi, pemuliharaan persekitaran (air dan tanah) dan impak ke atas kesejahteraan sosioekonomi komuniti tempatan.

Bersama-sama dengan pelan pengurusan bersepadu, sistem pengawasan adalah salah satu syarat penting dalam sembilan prinsip yang terkandung di bawah Sistem Kriteria, Petunjuk, Aktiviti dan Piawai Prestasi untuk Persijilan Pengurusan Perhutanan Malaysia (MC&I) 2002. EMS dibentuk dengan cara yang memudahkan orang yang terlibat dari peringkat lapangan sehingga tahap pembuatan keputusan untuk memahami proses dan hasil-hasil pengeluaran EMS. Tatacara Pengendalian Standard untuk sistem pengawasan ini termasuk parameter-parameter ekologi/landskap, hidrologi, biodiversiti serta petunjuk sosioekonomi.

Latihan pengumpulan data untuk lapangan dan penggunaan sistem pangkalan data telah dikendalikan di sepanjang 2007. Hasil aktiviti pengawasan ekologi akan digunakan sebagai asas untuk memperbaiki tindakan-tindakan atau preskripsi di bawah pelan pemuliharaan/pengurusan, program-program, projek-projek dan aktiviti-aktiviti.

Petunjuk Prestasi Bagi Taman Bandaran

Taman-taman bandaran dan kawasan hijau harus menjadi entiti utama dalam pembangunan sesebuah bandar. Taman bandaran adalah aset bagi sesebuah bandar dan penghuninya. Taman bandaran menyumbang pelbagai fungsi dari aspek sosial, alam sekitar dan ekonomi. Dalam semangat membentuk Malaysia ke arah Negara Dalam Taman melalui aktiviti penanaman pokok

Ecological Monitoring System (EMS)

The Peat Swamp Forest Project was designed as an ecological monitoring system, with a good selection of indicators, realistic monitoring procedures for implementation and a user-friendly database system for easy information storage and retrieval, for the conservation the South-East Pahang Peat Swamp Forest (SEPPSF) in Pahang, Loagan Bunut National Park in Sarawak and the Klias Forest Reserve, Sabah.

The ecological monitoring system, designed as a tool to regularly assess the trend of selected biodiversity parameters, is crucial for giving early warning signals/indications to changes on the ground. This will enable the decision makers to take steps or management actions to address threats on the conservation and sustainability of biological resources. Ecological monitoring is important as it evaluates the effectiveness of conservation management strategies and assesses long-term impacts of disturbances or human activities on the environment. It gauges over time the achievements of desired results, such as the level of awareness of the public and stakeholders, biodiversity conservation gains and losses, environmental conservation (water, soil), and the impact on the socio-economic well being of local communities.

Together with the integrated management plan, the monitoring system is a compulsory requirement under the nine principles of the 2002 Malaysian Criteria and Indicators (MC&I) of Performance for Forest Management Certification. The EMS process and outputs was designed in such a manner as to be easily understood by all persons involved; from the field to the state decision-making levels. The Standard Operating Procedures for this institutionalised monitoring system also included ecological/landscape, hydrological, biodiversity monitoring parameters and socio-economic indicators.

Training for field data collection and the use of the database system were conducted throughout 2007. The results of the ecological monitoring activities will be used as a basis for refining actions and prescriptions under the conservation/management plans, programmes, projects and activities.

Urban Parks Performance Indicators

Parks and green spaces should be at the centre of the revitalization of our towns and cities. Urban parks are a great asset for cities and its inhabitants. Urban parks have many valuable social, environmental and economic functions. In seeking to transform Malaysia into a Garden Nation through tree planting and the establishment of public parks, special attention should be given to the assessment of green areas or open spaces. This cannot be done without setting appropriate targets and measurable standards of quality. For example, the Kuala Lumpur City Hall (DBKL) should have an assessment of the availability and quality of green areas or open spaces



Roda berputar “Eye on Malaysia” di Taman Bandaran Tasik Titiwangsa, Kuala Lumpur
The Eye on Malaysia ferris wheel in Titiwangsa Lake Urban Park, Kuala Lumpur

dan pembangunan taman bandaran sekitar Wilayah Persekutuan Kuala Lumpur, perhatian harus juga diberikan kepada aspek penilaian kawasan hijau atau kawasan lapang oleh pihak Dewan Bandaraya Kuala Lumpur (DBKL). Walau bagaimanapun, ini tidak dapat dicapai tanpa pembangunan sebarang pengukur kualiti yang standard.

Melalui petunjuk prestasi, pihak majlis tempatan dapat memastikan prestasi yang berterusan dalam menjalankan fungsi-fungsi harian. Petunjuk prestasi dapat memastikan prestasi yang berterusan dalam menyediakan perkhidmatan berkualiti kepada orang awam. Dengan ini adalah penting bagi pihak majlis tempatan untuk mempunyai petunjuk prestasi supaya penilaian ke atas aktiviti harian dapat dilakukan. Justeru itu, pencapaian prestasi juga dapat dipantau oleh pihak majlis tempatan secara berterusan.

Sehingga kini belum ada lagi sebarang petunjuk prestasi untuk mengukur kualiti taman bandaran di Malaysia seperti *Best Value Performance Indicators*, yang berkenaan dengan taman-taman dan kawasan hijau seperti yang diguna pakai di England. Dengan ini, satu kajian telah dijalankan untuk membangunkan satu set petunjuk prestasi bagi taman bandaran di Kuala Lumpur dari aspek keselamatan dan sekuriti. Ini adalah selaras dengan konsep “Program Bandar Selamat” di Malaysia. Sebanyak 14 petunjuk prestasi telah dibangunkan daripada kajian ini yang seterusnya dibahagikan kepada tiga sektor; strategi memperkasakan kawasan sasaran, strategi mereka bentuk persekitaran fizikal dan strategi pendidikan kesedaran awam.

around the Federal Territory of Kuala Lumpur when it sets out to establish urban parks and to green developed urban areas.

The introduction of Performance Indicators, which requires local authorities to secure continuous improvement in the way as they carry out their functions, offers an excellent opportunity to develop meaningful measures on the standard of care of urban parks. The essence of performance indicators is for the continuous improvement in the quality of services provided to the public. It is therefore vital that local councils have a comprehensive performance baseline against which they and the people they serve, can judge the progress made. It is also important to be able to intelligently assess whether improvements have been achieved quickly enough through the timely identification of performance trends.

At present, there is virtually no standard method to measure the improvement of quality in urban parks in Malaysia. In contrast, local authorities in England have a standard measure which gauges the improvement in the quality of their urban parks. This is known as the Best Value Performance Indicator, which is used for parks and green spaces in England. With this in view, a study was conducted to develop a set of performance indicators for parks in Kuala Lumpur particularly from the safety and security perspective. This is to be in line with the Safe City concept in Malaysia. A set of 14 indicators were developed from this study which was further divided into three sectors; namely target hardening strategies, physical planning and design strategies and public awareness strategies. It is hoped that with this step, a standard measure for quality improvement in the management of urban parks in Malaysia would be achieved.



Bangku-bangku yang dibina dengan begitu baik sekali di salah sebuah taman bandaran
Well constructed benches in an urban park

Paku-pakis Baharu dari Semenanjung Malaysia

Semakan famili paku-pakis Grammitidaceae bagi *Flora of Peninsular Malaysia*, Siri Paku-Pakis Baharu telah menghasilkan penerbitan beberapa spesies dan genus baru. Grammitidaceae dicirikan sebagai paku-pakis yang berjambak dan bersaiz kecil hingga terlalu kecil, hidup sebagai epifit atau di atas batu dan lazimnya ditemui di kawasan pergunungan. Disebabkan saiznya yang kecil (paling kecil hanyalah beberapa sentimeter panjang), ahli botani sering kali terlepas pandang spesies-spesies famili ini. Oleh yang demikian, ketelitian dan ketajaman penglihatan seorang pakar famili ini diperlukan bagi mengenal pasti spesies-spesies langka dan endemik.

Dr. Barbara S. Parris dari Fern Research Foundation, New Zealand telah melawat FRIM pada tahun 2006 di bawah Felo Lawatan Penyelidikan FRIM (FRIM Visiting Research Fellowship) untuk melengkapkan kajian semakan famili Grammitidaceae untuk Bahagian 1 Flora tersebut. Peluang ini telah digunakan oleh beliau untuk mengkaji spesimen-spesimen herbarium dari herbarium-herbarium tempatan serta menjalankan kerja lapangan. Hasilnya, tiga spesies baharu telah ditemui. Dua daripadanya telah dikutip untuk sekian lama tetapi kewujudannya di herbarium sebagai spesies baru tidak disedari selama 80 tahun atau lebih, *Oreogrammitis kunstleri* Parris telah dikutip sekali pada tahun 1880 dan *Xiphopterella gracilis* Parris dari Gunung Tahan dikutip pada tahun 1928. Spesies ketiga, *Oreogrammitis malayensis* Parris, telah dikenal pasti oleh Dr. Parris berdasarkan spesimen tip dari Genting Highlands yang dikutip oleh Nor Ezzawanis Abdullah Thani. Ketiga-tiga spesies ini adalah amat langka dan endemik kepada Semenanjung Malaysia. Sebagai tambahan, beliau turut menemui *Oreogrammitis caespitosa*, satu rekod baru bagi Semenanjung Malaysia. Sebelum ini, spesies tersebut diketahui berasal dari Jawa.

Semakan famili tersebut telah menyelesaikan masalah dalam pembatasan genus, terutama sekali merujuk kajian molekular terkini, seterusnya membawa kepada penghuraian lima genus baru iaitu *Ctenopterella*, *Dasygrammitis*, *Radiogrammitis*, *Tomophyllum* dan *Xiphopterella*.

Spesies-spesies dan genus-genus baru ini telah diterbitkan dalam *The Gardens' Bulletin Singapore* 58 (2006) : 233-274.

New Ferns from Peninsular Malaysia

The revision of the fern family Grammitidaceae for the new Flora of Peninsular Malaysia Fern Series resulted in the publication of new species and genera. The Grammitidaceae are small to tiny tufted ferns that grow as epiphytes or on rocks and most are found in the mountains. Because of their small size, the smallest are only a few centimetres long, they are often overlooked and it requires the keen eye of a specialist to spot this rare and endemic species.

Dr. Barbara S. Parris from the Fern Research Foundation of New Zealand came to FRIM in 2006 on a FRIM Visiting Research Fellowship to complete the family for Part 1 of the Flora. This gave her the opportunity to study herbarium specimens from local herbaria and to carry out field work. As a result three new species were discovered. Two were species collected long ago but have lain unnoticed in the herbaria for 80 or more years, Oreogrammitis kunstleri Parris collected once in 1880 and Xiphopterella gracilis Parris from Gunung Tahan collected in 1928. The third, Oreogrammitis malayensis Parris, Dr. Parris discovered at Genting Highlands with the type specimen collected by Nor Ezzawanis Abdullah Thani. All are extremely rare and endemic to Peninsular Malaysia. In addition she discovered Oreogrammitis caespitosa, which is a new record for Peninsular Malaysia. Previously it was known only to be located in Java.

Her revision of the family solved the problem of generic limits, especially in view of recent results of molecular studies, and this necessitated the description of five new genera, Ctenopterella, Dasygrammitis, Radiogrammitis, Tomophyllum, and Xiphopterella.

The new species and genera are published in The Gardens' Bulletin Singapore 58 (2006) : 233-274.



Oreogrammitis malayensis



Dr. Saw di samping buluh *Schizostachyum lengguanii*
Dr. Saw and Schizostachyum lengguanii bamboo

Tumbuhan yang Dinamakan Bersempena Kakitangan FRIM

Ahli botani kadangkala menamakan tumbuhan bersempena dengan penghormatan kepada individu tertentu. Satu spesies buluh dan satu spesies begonia (asam batu) dinamakan sempena Dr. Saw Leng Guan, Pengarah Kanan Program TFBC dan Ahli Botani Hutan Kanan, FRIM. Kedua-dua buluh dan begonia itu dikutip oleh Dr. Saw, masing-masing pada tahun 1993 dan 1988.

Schizostachyum lengguanii K.M.Wong

Spesies buluh yang langka ini ditemui di Sumatra, Semenanjung Malaysia dan Kalimantan. Di Semenanjung Malaysia, spesies ini hanya diketahui dari Tasik Chini di Pahang. Spesies ini cenderung ditemui di kawasan yang berpaya serta tebing-tebing sungai. Buluh elegan ini mempunyai daun paling sempit berbanding spesies *Schizostachyum* lain yang terdapat di Semenanjung Malaysia. Ditemui pada tahun 1993 oleh Dr. Saw, spesies baharu ini telah dihuraikan dalam buku *Bamboos of Peninsular Malaysia* oleh Profesor Dr. Wong Khoon Meng pada tahun 1995.

Begonia lengguanii Kiew

Satu spesies herba endemik di Semenanjung Malaysia, diketahui hanya dari Bukit Rengit dan Hutan Simpan Lanjang di selatan Pahang. Spesies ini lazimnya ditemui di atas batu yang basah dan teduh yang terdapat di kawasan air terjun di hutan tanah pamah. Spesies ini mempunyai batang berizom sehingga 10 cm panjang dengan daun berwarna hijau kekelabuan, bertompok-tompok merah dan tangkai berwarna perang kemerahan. Spesies baru ini telah diterbitkan di dalam buku *Begonias of Peninsular Malaysia* oleh Dr. Ruth Kiew pada 2005 selepas dikutip buat pertama kalinya oleh Dr. Saw pada tahun 1998.

Plants Named after FRIM Staff

Botanists sometimes name plant species in honour of a person. One species of bamboo and one species of begonia were named after Dr. Saw Leng Guan, the Senior Director of TFBC Programme and Senior Forest Botanist, FRIM. Both bamboo and begonia were discovered by him in 1993 and 1988 respectively.

Schizostachyum lengguanii K.M.Wong

This rare bamboo species is found in Sumatra, Peninsular Malaysia and Kalimantan. In Peninsular Malaysia, it is only known to come from Tasik Chini in Pahang. This species preferred slightly swamp sites and streambanks. This elegant bamboo has the narrowest leaves among the Peninsular Malaysian *Schizostachyum* species. Discovered in 1993 by Dr. Saw, this new species was described in the book entitled "Bamboos of Peninsular Malaysia" by Professor Dr. Wong Khoon Meng in 1995.

Begonia lengguanii Kiew

This endemic herbaceous species in Peninsular Malaysia is known only from Bukit Rengit and the Lanjang Forest Reserve in south Pahang. It is often found on wet rocks in the shade by waterfalls in lowland forest. It has a rhizomatous stem of up to 10 cm long, greenish-grey with a red patch at the base of the leaves and a reddish brown stalk. This new species was published in the book entitled "Begonias of Peninsular Malaysia" by Dr. Ruth Kiew in 2005 after it was first collected by Dr. Saw in 1988.



Begonia lengguanii

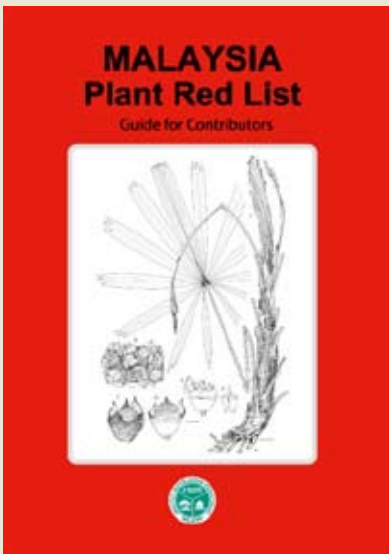
Penilaian ke atas Tumbuhan Langka dan Terancam di Semenanjung Malaysia

Malaysia merupakan salah sebuah daripada 12 negara yang mempunyai kepelbagaian biologi yang tertinggi, dan kini sedang menghadapi situasi yang mencabar dengan perubahan ekonomi yang makin pesat dan membangun. Penggerak ekonomi seperti pertanian perladangan memerlukan kawasan tanah yang luas, manakala sektor berasaskan sumber asli pula bergantung sepenuhnya kepada sumber hutan yang masih ada. Percanggahan penggunaan tanah ini telah memberi kesan yang besar terhadap kepelbagaian biologi yang ada. Walaupun Malaysia, khususnya Semenanjung Malaysia dikatakan mempunyai pengetahuan yang mendalam tentang flora dan fauna yang wujud di situ, hasil penelitian mendedahkan bahawa terdapat jurang maklumat yang besar antara kumpulan organisma yang lain. Selain itu, tidak terdapat data yang mencukupi untuk menunjukkan bahawa perubahan corak penggunaan tanah akan memberi kesan terhadap spesies dan populasi.

Pada 24 Jun 1994, Malaysia telah meratifikasi Konvensyen Kepelbagaian Biologi. Sebagai menunaikan tanggungjawab serta kehendak untuk mengurus dan menggunakan sumber-sumber yang ada dengan sebaik-baiknya, Malaysia perlulah mengetahui sepenuhnya kepelbagaian dan magnitud sumber yang ada ini. Langkah pertama yang perlu diambil ialah menilai status kepelbagaian biologi yang diketahui. Setelah mengenal pasti spesies yang terancam, diikuti dengan langkah-langkah bagi memulihara dan melindungi spesies tersebut.

FRIM, di bawah Kementerian Sumber Asli dan Alam Sekitar, telah diberi tugas sebagai peneraju utama untuk menjalankan penilaian ancaman ini. Projek ini mensasarkan penilaian terhadap status pemuliharaan dan ancaman terhadap spesies tumbuhan asli yang terdapat di Malaysia. Penilaian akan memberi tumpuan kepada spesies langka, terancam dan hampir pupus serta dapat menghasilkan cadangan dan strategi bagi meningkatkan tahap pemuliharaan dan memperbaiki rangkaian kawasan perlindungan *in situ* dan *ex situ*. Matlamat utama *Red List* ini ialah untuk menyampaikan maklumat serta menyatakan tahap pemuliharaan yang ada kepada orang ramai dan pembuat polisi. Selain itu, diharapkan ia dapat memberi kesedaran kepada pihak yang berkenaan supaya membantu usaha untuk mengurangkan kepupusan spesies ini. Maklumat mengenai spesies dan ekosistem ini amat bernilai ke arah penggunaan sumber asli yang lestari.

Status pemuliharaann lebih daripada 200 spesies famili Dipterokarpa dan Begonia telah dinilai. Pengetahuan tentang status pemuliharaan bagi famili Dipterokarpa semakin penting apabila permintaan



Conservation Monitoring of Rare and Threatened Plants of Peninsular Malaysia

As one of the twelve mega-diverse countries in addition to being a nation with an economy in transition, Malaysia is in a challenging situation. Economic drivers such as plantation agriculture are land-hungry while natural resource-based sectors depend largely on what remains available for extraction from the forests. Such demands extort enormous toll on biological diversity. Although Malaysia, particularly Peninsular Malaysia, may boast of having a fairly detailed knowledge of her flora and fauna, closer inspection reveals massive gaps of information in many groups of organisms. And we have very scant data to indicate how the extensive changes in land use patterns have affected species and populations.

On 24 June 1994, Malaysia ratified the Convention on Biological Diversity. Together with our obligations towards this convention and our desire to use and manage our biological resources wisely, Malaysia needs to know fully the diversity and magnitude of these resources. An important first step is to assess the status of the known biological diversity. Identification of threatened species would initiate follow-up measures on how to conserve and protect such species.

FRIM, under the Ministry of Natural Resources and Environment (NRE), has been tasked to spearhead this attempt on threat assessment. The project is aimed at producing an assessment of the conservation status and threats for indigenous plant species in Malaysia. This assessment is expected to highlight species that are rare, threatened and endangered and to develop recommendations and strategies towards improving their conservation through enhancing the current network of in situ protected areas as well as a national network for ex situ conservation. The ultimate aim of the Red List is to convey the urgency and scale of conservation problems to the public and policy makers, and to motivate the relevant authorities to try to reduce species extinctions. Information about species and ecosystems is essential in moving towards a more sustainable use of our natural resources.

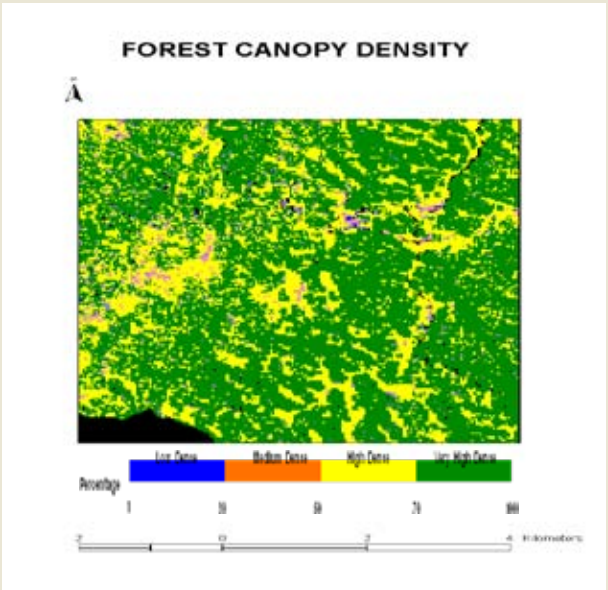
To date some 200 over species of Dipterocarpaceae and Begoniaceae have been assessed. Knowing the conservation status of the members of the family Dipterocarpaceae is becoming increasingly important as the international market is progressively demanding sustainable use of timber. Begoniaceae is the family of the understorey and has more than 88% of endemic species, many of which are highly threatened either by ornamental trade of land-use conversion.

terhadap kayu balak semakin berkait rapat dengan isu-isu persekitaran. Lebih daripada 88% famili Begonia merupakan spesies yang endemik. Kebanyakannya terancam disebabkan oleh perniagaan tumbuhan hiasan atau pertukaran kegunaan tanah yang asal.

Pilihan Silvikultur Optimum untuk Hutan Pusingan Tebangan Kedua

Pengurusan hutan di Malaysia dijangka akan menghadapi cabaran-cabaran baharu dengan perubahan eksploitasi penghasilan hutan yang kian beralih dari hutan produktif tidak terganggu ke kawasan hutan yang telah dibalak atau hutan sekunder. Hutan pusingan tebangan kedua ini dikhuatiri bukan sahaja tidak mempunyai stok yang konsisten malah tidak sekaya yang dijangkakan jika menggunakan sistem pengurusan semasa; maka ini akan menyukarkan usaha mendapatkan sumber mentah yang berkualiti pada masa hadapan. Bagi menangani isu ini, satu kajian telah dijalankan di dua kawasan hutan penghasilan pusingan kedua iaitu di Hutan Simpan Tekam, Pahang dan Hutan Simpan Cherul, Terengganu yang merangkumi kawasan masing-masing seluas 11,000 ha dan 3600 ha. Projek kajian ini merupakan inisiatif FRIM sejak 2002 dengan kerjasama Jabatan Perhutanan Semenanjung Malaysia (JPSM) untuk meninjau stok pokok di dalam kawasan hutan ini dan membentuk regim silvikultur yang dapat meningkatkan produktivitinya.

Pendekatan projek ini untuk menilai status stok hutan dilakukan dalam dua peringkat; (i) mengklasifikasikan kawasan kajian mengikut kepadatan pokok berdasarkan kepadatan kanopi hutan atau *forest canopy density* (FCD) menggunakan perisian *FCD Mapper 1.0* dan menjalankan inventori berdasarkan setiap kelas atau strata yang berbeza, dan (ii) membentuk pilihan silvikultur untuk kelas/strata hutan yang berbeza. Empat kelas stok telah digunakan iaitu FCD 1-4 dengan kepadatan kanopi



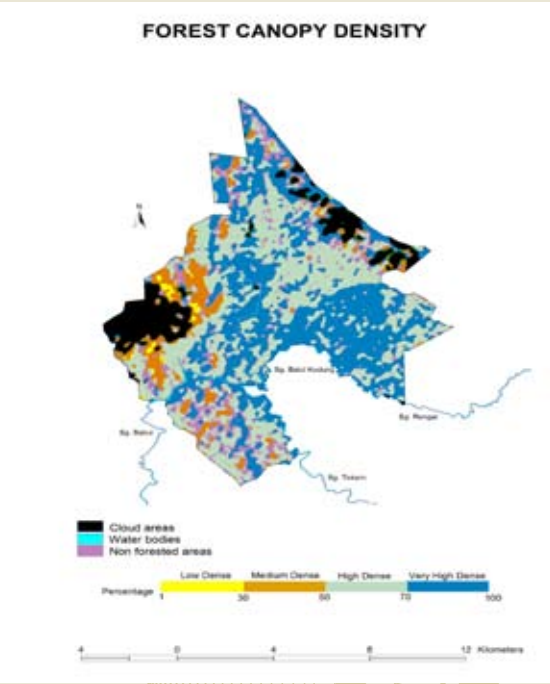
Mengklasifikasikan kawasan kajian mengikut kepadatan pokok berdasarkan kepadatan kanopi hutan di Cherul FR
Forest Canopy Density classification in Cherul FR

Optimum Silvicultural Options for Second Growth Forests

The management of forests in Malaysia is expected to face new challenges as exploitation of production forests are shifting from the generally rich and productive undisturbed forests stands to the logged-over or second-growth forests. There are concerns that second rotation forests which are highly variable in stocking are also not as rich as expected under the current management system and thus the supply of quality raw materials may be hampered in the future. To address the issue, a study was carried out in two second rotation production forests located in Tekam Forests Reserve, Pahang and Cherul Forest Reserve, Terengganu covering an area about 11,000 ha and 3,600 ha respectively. This research project was initiated by FRIM in 2002 in collaboration with the Forestry Department Peninsular Malaysia to assess the stocking and develop silvicultural regimes to enhance the productivity of these forests.

The research adopted a two stage sampling design to assess the stocking status; (i) classification/stratification of the study areas according to tree densities based on forest canopy density (FCD) using FCD Mapper 1.0 software and undertaking ground inventory based on the different forest classes/strata, and (ii) developing silvicultural options for these different forest classes. Four broad stocking classes was used namely FCD 1-4 with canopy densities less than 30%, 30-50%, 50-70% and more than 70% respectively. Subsequently for the ground inventory, a total of 727 sampling plots were established in Tekam and 323 plots in Cherul.

The results from the first phase of the project conclude that smaller trees are dominant in second rotation forests, which



Mengklasifikasikan kawasan kajian mengikut kepadatan pokok berdasarkan kepadatan kanopi hutan di Tekam FR
Forest Canopy Density classification in Tekam FR

masing-masing ialah <30%, 30-50%, 50-70% dan >70%. Kawasan hutan yang telah diklasifikasikan adalah seperti di Gambarajah 1.

Hasil fasa pertama projek merumuskan bahawa pokok-pokok kecil yang kebanyakannya jenis bukan dipterokarpa adalah dominan di hutan pusingan kedua yang kurang menyumbang kepada jumlah isi padu keseluruhan. Kadar pertumbuhan juga adalah lebih rendah daripada yang dijangkakan dan mungkin tidak dapat pulih dalam tempoh 25 – 30 tahun iaitu tempoh pusingan yang diramalkan dalam Sistem Pengurusan Memilih atau *Selective Management System* (SMS). Secara ringkasnya, komposisi spesies hutan pusingan kedua bukan sahaja terdiri daripada spesies yang kurang nilai komersialnya tetapi hasil kajian memberi petunjuk bahawa stok pokok yang mempunyai saiz tebangkan akan berkurangan dalam pusingan tebangkan seterusnya.

Fasa kedua projek ini telah membentuk rawatan silvikultur yang khusus bagi meningkatkan produktiviti dan memastikan pertumbuhan yang lebih baik dalam pusingan tebangkan yang akan datang. Hasil kajian ini akan dapat membantu pengurus-pengurus hutan membuat keputusan yang lebih baik dalam pengurusan hutan pusingan kedua yang akan menjadi sumber terulung untuk memenuhi permintaan bahan mentah industri perakyuan. Sumber ini akan terdiri daripada kayu balak yang bersaiz lebih kecil dan komposisi spesies komersial yang lebih rendah; maka suatu perubahan adalah perlu dalam pengurusan hutan untuk memastikan peningkatan produktiviti sumber perakyuan pada masa yang akan datang. Pilihan silvikultur yang dicadangkan adalah langkah ke hadapan tetapi ia perlu diuji di peringkat operasi untuk menilai kos dan faedahnya.

Klon Hibrid Acacia yang Berpenghasilan Tinggi

Satu kerjasama penyelidikan telah diadakan antara Institut Penyelidikan Perhutanan Malaysia (FRIM), *Fletcher Challenge of New Zealand*, *Golden Hope* dan *Sime Darby Malaysia* untuk mengenal pasti hibrid *Acacia* yang berpenghasilan tinggi. Empat klon telah berjaya dihasilkan daripada fenotip terbaik yang dipilih dari hibrid *Acacia* asal yang terdapat di ladang-ladang di Semenanjung Malaysia, iaitu M2, M4, M5 dan C14. Klon-klon terpilih ini dihasilkan secara besar-besaran menggunakan teknik kultur tisu dan diuji di lapangan pada Julai 1998.



Dirian hibrid *Acacia* yang terdiri daripada klon M5, M4, M2 dan C14, enam tahun selepas penanaman *Acacia* hybrids stand comprising clones M5, M4, M2 & C14, and at six years after planting

does not contribute much in the overall timber volume and will consist mainly of non-dipterocarps. Growth rates are also slower than expected and may not be able to recover within 25-30 year cutting cycle as predicted in the Selective Management System (SMS). In summary, the species composition of second rotation forests will not only consist of lesser commercial species, but results also indicate that there will be a shortage of harvestable size trees in the next cutting cycle.

In the second phase, the project formulated specific silvicultural treatments to enhance their productivity and ascertain a better crop in future cutting cycles. The findings of the project will assist forest managers to better plan and manage second rotation forests which in the near future will be the only source for the supply of raw materials to meet the requirements of the industry. The resource will consist of smaller sized logs and lower proportions of the main commercial species. Forest management will have to be modified to ensure that productivity of future stands is enhanced. The proposed silvicultural options provide a way forward. The options will however have to be tested at the operational level to assess its costs and benefits.

High Yield Clones of Acacia Hybrids

A collaborative research work was started between the Forest Research Institute Malaysia (FRIM), Fletcher Challenge of New Zealand, Golden Hope and Sime Darby Malaysia, to identify high yield Acacia hybrids. From the selection of the best phenotypes of natural Acacia hybrids in existing Acacia plantations in Peninsular Malaysia, four clones of M2, M4, M5 and C14 were successfully produced. These selected clones were mass-produced using tissue-culture techniques and field-tested in July 1998.

The trial was established in the Sime Darby Kirby Estates, Labu-Sendayan, Negeri Sembilan, Peninsular Malaysia. The site received precipitation at the middle range of rainfall typical of the humid tropics. The plots were located at about 80 m above sea-level on flat terrain. The parent material is granite and the soil texture ranged from lateritic, sandy loam to sandy soils. Plantings were usually on reddish loam soil with a silty clay texture and a composition of 60 % clay and 30 % silt. The underlying rock and granite belonged to the Palaeodulit series, also locally known as the Rengam series. Generally the area had good drainage

Ujian ini telah ditubuhkan di *Sime Darby Kirby Estates*, Labu-Sendayan, Negeri Sembilan, Semenanjung Malaysia (2° 35' U, 102° 30' T). Suhu purata harian adalah dalam julat 27-31 °C. Curahan hujan tahunan adalah antara 1800 dan 2030 mm yang menunjukkan kawasan tersebut menerima curahan hujan pada julat pertengahan bagi kawasan tropika lembap. Petak kajian terletak kira-kira 80 m pada aras laut di kawasan rata yang terdiri daripada tanah granit dan tekstur tanah antara laterit, lom berpasir dan pasir. Penanaman biasanya dilakukan di atas tanah jenis lom kemerah-merahan dengan tekstur liat dan kandungan 60% liat dan 30% kelodak. Secara umumnya, perparitan di kawasan tersebut adalah baik.

Objektif kajian penanaman ini adalah untuk menentukan pencapaian kadar pertumbuhan dan hasil klon-klon hibrid yang dipilih. Selepas enam tahun, klon C14, M2 dan M5 menunjukkan kadar pertumbuhan (diameter) yang tertinggi. Tiada perbezaan signifikan peningkatan diameter antara klon-klon ini. Purata peningkatan diameter untuk semua klon hibrid yang diuji adalah dalam julat 19.9 ± 0.6 cm. Pertumbuhan tertinggi ialah klon C14 dengan 22.0 ± 0.7 cm. Secara keseluruhannya, klon-klon tersebut mempunyai isi padu 187.07 m³ha⁻¹ tahun⁻¹ atau kadar penghasilan balak tahunan sebanyak 29.38 ha³ tahun⁻¹.

Hasil ujian penanaman hibrid *Acacia* selama enam tahun menunjukkan potensi spesies ini sebagai bahan mentah untuk industri penghasilan kayu. Dalam penghasilan gentian kayu untuk kegunaan industri, aspek kualiti boleh diabaikan maka penjarangan tidak diperlukan dan perhatian terhadap masalah seperti *multiple leadering* dan reput teras kurang diperlukan. Pusingan tebangkan juga boleh dikurangkan kepada 5 hingga 7 tahun.

Usaha kerjasama ini telah dapat menentukan klon hibrid *Acacia* yang berpenghasilan tinggi. Penyelidikan lanjutan untuk menguji klon-klon tersebut di tempat yang berlainan dengan keadaan yang berbeza adalah perlu untuk perbandingan di sekitar negara. Panduan teknikal juga perlu dibentuk untuk membolehkan pertukaran bahan genetik.

Teknik Penanaman Inovatif Bakau di Pesisiran Pantai

Tragedi tsunami pada 26 Disember 2004 telah menyedarkan kita peranan hutan paya laut (bakau) sebagai pemecah ombak dan penstabil pesisiran pantai. Ini adalah kerana kawasan pesisiran pantai yang dilitupi pokok bakau menunjukkan kesan kemusnahan oleh ombak tsunami yang minimum. Lahir daripada kesedaran ini, FRIM berusaha untuk memastikan pemeliharaan dan pemuliharaan hutan paya laut ditingkatkan melalui program penanaman bakau dan spesies yang sesuai di kawasan pesisiran pantai negara. Hutan bakau di pesisiran pantai ini akan bertindak sebagai lapisan pelindung semula jadi kepada ancaman hakisan dan bencana alam.

with some soil disturbance. The site was semi-mechanically prepared and burning was confined to stacked debris.

The objective of the planting trial was to determine the growth performance, and yield of the selected hybrid clones. At six years growth, clones C14, M2 and M5 showed the highest diameter growths. No significant differences in diameters were observed between these clones. The average diameter growth for all the Acacia hybrid clones tested was 19.9 ± 0.6 cm. The highest diameter growth measuring 22.0 ± 0.7 cm was recorded for clone C14 and the lowest diameter growth measuring 16.6 ± 0.7cm was recorded for M4. Overall, the clones had an average volume of 187.07 m³ ha⁻¹ year⁻¹, which is equivalent to an annual log production rate of 29.38 m³ ha⁻¹ year⁻¹.

The results from the trial planting of six-year old Acacia hybrids showed the potential of the species as a raw material for industrial wood production. In the production of wood fibres for industrial usage, quality aspects can be neglected, thus no thinning is required and less attention paid to the problems of multiple leadering or even heart rot. The rotation could also be shortened to about five to seven years.

The collaborative effort had identified high yield clones of Acacia hybrids. To allow comparison of results across the country it is particularly important that further research for the testing of the clones in a variety of sites and under diverse conditions be carried out. Technical guidelines should also be developed for the exchange of genetic materials.

Innovative Planting Techniques for Mangroves in Coastal Areas



Penanaman *Rhizophora apiculata* (Bakau minyak) menggunakan teknik Comp-pillow
Planting Rhizophora apiculata (Bakau minyak) using Comp-pillow technique

The tsunami tragedy on 26 December 2004 made us aware of the importance of mangrove forests as wave breakers and coastal stabilizers. This was because coastal areas covered by mangrove trees showed minimal destructive impacts by the tsunami. Born from this awareness, the FRIM strive to ensure that the conservation and restoration efforts are enhanced through planting programs of mangrove and other suitable species on Malaysia's coasts. Mangrove forest and vegetation

Antara masalah utama yang dihadapi dalam penanaman pokok bakau ialah faktor pukulan ombak dan arus laut yang kuat. Ini menghalang substrat paya laut menjadi stabil untuk membolehkan percambahan biji benih dan pertumbuhan pokok bakau. Maka usaha FRIM merangkumi kajian bagi menentukan teknik inovatif yang sesuai untuk penanaman bakau dan spesies di kawasan pesisiran pantai yang berkesan dan menjimatkan untuk jangka panjang.



Penanaman *Avecinnia alba* (api-api) menggunakan teknik Com-pillow
*Planting *Avecinnia alba* (api-api) using Com-pillow technique*

on the coastlines will act as a layer of natural protection from threats of erosion and natural disasters.

Among the main challenges faced in mangrove planting is the strong waves and currents. This restricts the stabilization of the mangrove substrate to allow the germination of seeds and growth of mangrove trees. Thus, FRIM's effort covers a study to determine innovative

techniques suitable for the planting of mangrove and other suitable species in coastal areas that are cost effective in the long term.

*Two planting techniques are still in the trial period. Planting trials of the *Rhizophora apiculata* (bakau minyak) species using the Bamboo Encasement Method (BEM) is being carried out on the coastal areas of Kampung Pulau Sayak, Kuala Muda, Kedah and Sungai Haji Dorani, Sungai Besar, Selangor. BEM is a planting technique using *Gigantochloa scortechinii* (buluh semantan) as a planting encasement to simplify and stabilize planted seedlings in the muddy mangrove substrate. This is a modified technique from the Riley Encasement Method (REM) introduced by Riley in 2005 using PVC encasements. The study areas are further protected with the installation of Geotubes, a wave-breaking structure by the Drainage and Irrigation Department (DID) of Malaysia. Early observations (13 weeks after planting) at Kampung Pulau Sayak showed that 60% of the planted mangrove species survived while all of those planted the conventional way (without BEM) died or was swept away by waves.*

*The second planting technique is the Comp-pillow. Trials were conducted with three mangrove species; *Avecinnia alba*, *Rhizophora mucronata* and *Rhizophora apiculata* in the coastal areas of Sungai Haji Dorani, Sungai Besar, Selangor. This planting technique involves the planting of seedlings in coir-logs as a planting media. The coir-logs used measure at 30 cm in diameter and 100 cm in length with five planting holes, but coir-logs can be custom-made for desired specifications directly from the factories. To enhance the planting success rate, it is best to leave the seedlings in the coir-logs for two months prior to planting in the mangrove substrate to allow the development of roots. Three months after planting using Comp-pillow showed 100% survival of the seedlings regardless of strong tidal waves.*

Teknik penanaman kedua ialah *comp-pillow*. Percubaan penanaman ini dijalankan dengan tiga spesies bakau iaitu api-api (*Avicennia alba*), bakau kurap (*Rhizophora mucronata*) dan bakau minyak (*Rhizophora apiculata*) di pantai Sungai Haji Dorani, Sungai Besar, Selangor. Teknik penanaman ini melibatkan penanaman anak pokok dalam *coir-log* sebagai media tanaman. *Coir-log* yang digunakan berukuran 30 cm diameter dan 100 cm panjang dengan lima lubang tanaman yang boleh ditempah terus dari kilang mengikut spesifikasi yang diperlukan. Sebaik-baiknya anak bakau dibiarkan selama dua bulan sebelum dipindah tanam di kawasan pantai untuk membolehkan akar pokok bakau tumbuh berkembang di dalam *coir-log* lalu meningkatkan kadar kejayaan (peratus yang hidup) dan kemandirian anak bakau apabila ditanam di pantai. Selepas tiga bulan penanaman, 100% tanaman bakau yang menggunakan teknik *comp-pillow* masih hidup walaupun menghadapi ombak pasang dan surut.

Pembalakan Mampan di Hutan Paya Gambut

Hutan paya gambut (HPG) merupakan ekosistem hutan yang agak 'rapuh'. Berbanding hutan tropika darat, HPG mengandungi kepelbagaian spesies pokok yang lebih rendah dan bersaiz lebih kecil, fizikal tanah adalah kurang stabil, lebih sukar untuk dijelajahi dan amat sensitif terhadap gangguan (contohnya kebakaran hutan). Oleh itu, aktiviti-aktiviti pembalakan di HPG memerlukan perancangan yang rapi untuk mengurangkan impak pembalakan tersebut bagi meminimumkan ketidakseimbangan ekologi yang boleh mendatangkan kesan negatif.

FRIM sedang menerajui projek penyelidikan tentang regim pembalakan optimum untuk HPG di Semenanjung Malaysia dengan mengkaji kesan pembalakan berimpak rendah (RIH) ke atas pokok dirian tinggal. Secara umum, RIH ialah kaedah pembalakan mesra alam yang telah dibangunkan ke arah pengurusan perhutanan secara mampan di kawasan tropika. Projek penyelidikan ini dijalankan di Kompartmen 77, Hutan Simpan Pekan, Pahang. Protokol RIH yang digunakan melibatkan penandaan pokok dan penebangan pokok secara berarah serta penggunaan mesin *Rimbaka Timber Harvester* atau 'Rimbaka' yang dihasilkan oleh Syarikat Upayapadu Sdn. Bhd. untuk pembalakan di kawasan hutan. Rimbaka mampu mengeluarkan balak dengan menarik balak berkenaan dari kawasan tebangan sejauh sehingga 100 m dari arah kanan dan kiri jalan penarik yang dikenali sebagai Jalan Tarik Rimbaka (JTR). Seterusnya kayu-kayu balak ini akan ditarik menggunakan mesin *traxcavator* dari JTR ke matau sementara.

Projek ini meneliti kesan kerosakan terhadap pokok dirian tinggal akibat operasi pembalakan di dalam kawasan seluas 100 ha. Semua pokok ≥ 10 cm dbh dalam petak kajian yang berukuran 50 x 20 m yang merangkumi 10% daripada keseluruhan kawasan pembalakan telah diperiksa. Pokok-pokok dirian tinggal dikelaskan kepada tiga kategori kerosakan: ringan, sederhana dan berat. Pokok-pokok dalam kategori kerosakan ringan dan sederhana dijangka akan dapat terus hidup manakala yang mengalami kerosakan teruk dijangka akan mati sebelum pusingan tebangan yang seterusnya.



Rimbaka Timber Harvester atau 'Rimbaka'
The Rimbaka Timber Harvester or 'Rimbaka'

Sustainable Harvesting in Peat Swamp



Operasi penebangan terarah
Directional felling operation

Peat swamp forests (PSFs) are fragile ecosystems. When compared to terrestrial tropical forests; PSFs have less tree species diversity with smaller average sized-trees, grow on unstable soils, are highly sensitive to disturbances (i.e. prone to forest fires) and poorly accessible. Harvesting in PSFs should therefore be well planned to ensure low harvesting impacts that minimises ecological imbalances.

FRIM is leading a research project on the optimum harvesting regime of PSFs in Peninsular Malaysia by assessing the impact of reduced impact harvesting (RIH) to residual stands. RIH is a well developed harvesting method that supports sustainable forestry practices in the tropics. A study was conducted in Compartment 77, Pekan Forest Reserve in Pahang using the RIH method. The RIH protocol consists of tree marking and directional tree felling practices as well as the use of the Rimbaka Timber Harvester, 'Rimbaka', a machine specially designed and developed by Syarikat Upayapadu Sdn. Bhd. for use in forest harvesting. The Rimbaka extracts logs from felling areas up to 100 m to the right and left of a skid trail called 'Jalan Tarik Rimbaka' (JTR). A 'traxcavator' is then used to pull logs along the JTR to a temporary logyard.

The study assessed the degree of damage to residual trees caused by harvesting operations in an area of 100 ha. within Compartment 77. A 10 % systematic line-plot of 50 x 20 m was established measuring all trees ≥ 10 cm dbh in the sampling plots. Trees were classified into three damage classes viz. light, moderate and heavy. Trees with light and moderate damage were expected to survive, while heavily damaged trees were expected to die within the cutting cycle period.

*Results of the project showed very clearly that the use of RIH, minimised damage to residual stands of trees of ≥ 30 cm dbh. Important commercial timber species i.e. *Calophyllum* spp. (bintangor) and *Gonystylus bancanus* (ramin malawis) were the main composition of the surviving residual stand, a crucial resource for the next cutting cycle. Felling and timber extraction were responsible for 11 % and 3 % respectively of the heavily damaged trees.*



Keadaan salah satu petak kajian selepas pembalakan
Condition of one of the study plots after harvesting

Hasil penelitian tersebut jelas menunjukkan bahawa kerosakan pokok dirian tinggal yang berukuran ≥ 30 cm dbh dapat diminimumkan dengan penggunaan RIH. Sebanyak 72% (546 pokok) daripada jumlah pokok dirian tinggal yang hidup (iaitu 756 dari 848 pokok) tidak mengalami sebarang kerosakan manakala yang lainnya masing-masing mempunyai kerosakan ringan, sederhana dan berat sebanyak 12% (91 pokok), 7% (49 pokok) dan 9% (70 pokok). Spesies balak komersial utama seperti *Callophyllum* spp. (bintangor) dan *Gonystylus bancanus* (ramin melawis) adalah antara spesies dirian tinggal tersebut yang merupakan sumber kayu yang penting untuk pusingan tebanan yang seterusnya. Didapati juga secara keseluruhan pokok yang telah diperiksa, sebanyak 11% dan 3% pokok yang mati adalah akibat aktiviti penebangan dan penarikan balak.

Penemuan awal projek ini menunjukkan bahawa kadar pokok dirian tinggal yang terselamat apabila menggunakan RIH adalah tinggi. Dengan ini ia menunjukkan bahawa pembalakan yang mampan di HPG dengan regim pembalakan berimpak rendah yang meminimumkan kerosakan terhadap pokok dirian tinggal dapat dicapai melalui RIH.

Menjadikan Kenaf Kertas Percetakan yang Bermutu Tinggi

Sejenis tumbuhan semusim berherba yang berasal dari Afrika, kenaf (*Hibiscus cannabinus* L.) mengandungi hampir 35–40%



Dirian pokok kenaf secara dekat
Close-up of a kenaf plantation stand



Pokok-pokok dirian tinggal selepas pembalakan
Residual trees after harvesting

The preliminary results of this study demonstrated that the survival rate of residual trees using RIH is high and indicated that sustainable timber harvesting in PSF can be achieved through using the RIH method.

Kenaf as High Quality Printing Paper

An annual herbaceous plant originated from Africa, kenaf (Hibiscus cannabinus L.), consists of approximately 35–40% bast fibres and 60–65% core fibres by weight. It is a fast growing crop that can be harvested after four to five months. Kenaf can produce three to six mt of dry fibres per ha. generating three to five times as much biomass compared with most forest species. It has been regarded as one of the promising raw materials for manufacturing of pulp and paper, and wood composites due to its adaptability in tropical and subtropical regions as well as its desirable fibre and pulp properties. Currently in Malaysia, efforts have been undertaken by various agencies to examine the potential of kenaf as a one of the selected crops suitable to replace tobacco.



Batang kenaf V36 selepas 5 bulan
Stems of 5-month old kenaf-V36

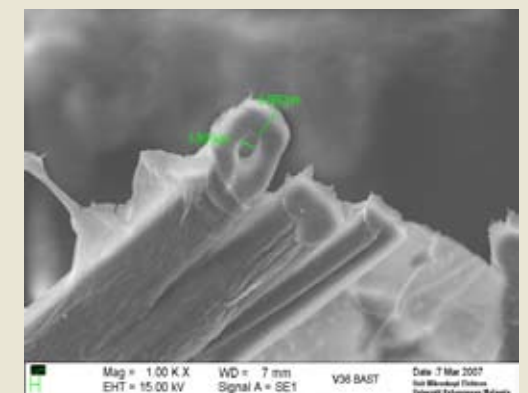
gentian kulit dan 60–65% gentian batang berdasarkan berat. Ia merupakan sejenis tanaman yang cepat membesar iaitu sudah boleh dituai selepas empat hingga lima bulan. Kenaf boleh menghasilkan tiga hingga enam tan metrik gentian kering sehektar, memberikan tiga hingga lima kali ganda biojisim berbanding kebanyakan spesies hutan. Ia dianggap sebagai salah satu bahan mentah yang berpotensi dalam penghasilan pulpa dan kertas serta komposit kayu kerana kebolehsuaiannya di kawasan tropika dan subtropika di samping sifat pulpa dan gentiannya yang baik. Kini di Malaysia, usaha-usaha telah dijalankan oleh pelbagai agensi untuk melihat potensi kenaf sebagai salah satu tanaman yang boleh menggantikan tembakau.

Projek yang berasaskan satu memorandum persefahaman bertarikh 7 Julai 2007 ini telah memperlihatkan satu usaha bersepadu yang dijalankan oleh FRIM, MTIB, UPM dan Eko Pulp and Paper Sdn. Bhd. ke arah mengkomersialkan kenaf untuk industri pulpa dan kertas. Skop projek ini meliputi penyelidikan dan pembangunan (R&D) yang komprehensif bagi menghasilkan kertas gred percetakan pada skala makmal dan skala rintis. Kenaf jenis V36 dipilih untuk digunakan dalam projek ini. Pada peringkat awal kajian, gentian kenaf-V36 ini diperoleh daripada petak percubaan MARDI manakala untuk percubaan skala rintis berterusan yang selanjutnya, kenaf-V36 akan diperoleh daripada ladang Lembaga Tembakau Negara. FRIM selaku agensi peneraju dalam fasa R&D akan menumpukan kepada teknologi pemprosesan kenaf kepada serpih, proses pempulpaan soda-AQ, proses pelunturan bebas klorin, rumusan pembuatan kertas percetakan dan percubaan pembuatan kertas secara berterusan pada skala rintis di pusat penyelidikan luar negara.

Penemuan awal menunjukkan bahawa sistem penyerpihan yang sesuai untuk industri pulpa dan kertas perlu beroperasi menggunakan gabungan prinsip proses penuaian dan penyerpihan menggunakan traktor. Pempulpaan soda-AQ yang optimum telah dicapai. Pelunturan bebas klorin tiga-peringkat telah berjaya menghasilkan pulpa terluntur pada kecerahan >85% ISO. Kertas makmal yang dihasilkan telah menunjukkan sifat-sifat mekanik dan optik yang setara dengan tiga kertas percetakan komersial yang ada di pasaran. Keputusan percubaan pembuatan kertas secara berterusan pada skala rintis, iaitu sasaran utama projek ini, dijangka akan menghasilkan maklumat penting sebelum percubaan komersial yang seterusnya dijalankan. Secara keseluruhannya, projek ini bakal menjadi panduan yang ditunggu-tunggu oleh industri pulpa dan kertas dalam penghasilan pulpa dan kertas yang berasaskan sumber baru.

This project, governed by an MOU signed on 7 July 2007, demonstrates a concerted effort undertaken by FRIM, MTIB, UPM and Eko Pulp and Paper Sdn. Bhd. towards commercializing kenaf for the pulp and paper industry. The scope of this project covers a comprehensive research and development (R&D) programme related to the development of printing grade paper both at laboratory and pilot scales. Kenaf of V36 cultivar will be used throughout the project duration. Initially sourced from the MARDI's trial plots, the required V36 fibres for continuous pilot-scale trials would be obtained from the National Tobacco Board's plantations. FRIM, appointed as the lead agency for the R&D phase, would focus on chipping technology for kenaf, soda-AQ pulping process, chlorine-free bleaching process, printing paper formulation and continuous pilot papermaking trial.

Initial findings indicate that a favourable tractor mounted kenaf chipping system for our pulp and paper industry should use a combined principle of harvesting and chipping processes. Best pulping parameters for an optimised soda-AQ pulping has also been developed. A three-stage elemental chlorine free bleaching sequence had successfully produced a bleached kenaf pulp of >85% ISO brightness. The kenaf laboratory handsheets produced showed its comparable mechanical and optical properties against three commercial printing papers available in our market. Results from the eventual continuous pilot papermaking trial, i.e. the highlight of this project would provide useful crucial data prior to commercial trials. All in all, this project paves the way for a very interesting endeavour.



Mikrograf SEM menunjukkan gentian kenaf V36
SEM micrograph of Kenaf-V36 fibre



Kertas percetakan berkecerahan tinggi yang dihasilkan di makmal
High brightness printing handsheets from kenaf

Protokol Ujian untuk Penentuan Permetrin

Permetrin ialah bahan kimia sintetik dan salah satu sebatian dalam kumpulan piretroid. Ia digunakan dengan meluas sebagai bahan racun serangga dalam bidang pertanian dan awetan kayu. Dalam industri perkayuan, piretroid digunakan sebagai bahan awet dalam larutan organik ringan. Kegunaan akhir kayu berawet ini adalah lebih kepada kegunaan dalaman seperti kerangka kayu, lantai, dinding, bahan panel, dan bahagian penyambungan. Perkembangan terkini menunjukkan bahawa bahan awet permetrin telah digunakan dalam rawatan komponen kayu-kayu kekuda bumbung. Walau bagaimanapun, negara kita masih belum mempunyai kaedah piawai untuk memantau kualiti permetrin yang terdapat di dalam kayu yang dihasilkan oleh pembekal kayu. Memandangkan kepentingan aspek kualiti di samping perkembangan industri kayu-kayuan negara yang menjurus kepada penggunaan bahan ini, serta keperluan pembangunan kaedah standard di negara ini, FRIM telah mengambil inisiatif untuk membangunkan satu protokol kaedah ujian berkaitan permetrin.

Protokol ujian ini telah dibangunkan berdasarkan draf pembangunan *British Standard, Methods of Analysis of Wood Preservative and Treated Timber, Part 3: Quantitative Analysis of Permethrin in Solutions of Wood Preservatives in Organic Solvents* (DD257-3:2003). Dua jenis pelarut organik iaitu n-heksana dan iso-oktana pada fasa bergerak yang berbeza iaitu 99.5% n-heksana: 0.5% THF dan 99.5% iso-oktana: 0.5% etil asetat, telah digunakan dalam penentuan kandungan isomer cis dan trans permetrin di dalam kayu berawet. Ujian validasi telah dijalankan ke atas kaedah ini berdasarkan keperluan standard MS ISO/IEC 17025:2005.

Keputusan ujian validasi menunjukkan bahawa kaedah yang dibangunkan adalah sesuai untuk digunakan dalam penentuan kandungan permetrin di dalam kayu berawet. Sampel yang disediakan dengan kedua-dua pelarut boleh dianalisis menggunakan HPLC PDA atau HPLC-UV. Justeru, hasil kajian ini dijangka merintis kepada aplikasi industri lain pada masa depan khususnya yang berkaitan dengan industri awetan kayu.



Proses mengekstrak
Extraction process

Permethrin Determination Test Protocol

Permethrin is a synthetic chemical and one of the compounds under the pyrethroid group. It is widely used as an insecticide for agriculture and wood preservation. In timber industries, permethrin is used as a preservative in light organic solvent known as light organic solvent preservative (LOSP), to protect timber from termite and wood-boring insects. The end-use of this treated wood is for indoor application such as timber framing, flooring, wall, panelling and joinery lattice. The latest development in this country shows that this chemical has been used to treat roof trusses made from timber. However, there is no standard method available in this country to monitor the quality of the permethrin treated products produced by the timber supplier. As such FRIM has taken the initiative to develop a test protocol for permethrin.

The test protocol that was developed is based on the draft British Standard namely Methods of Analysis of Wood Preservative and Treated Timber. Part 3: Quantitative Analysis of Permethrin in Solutions of Wood Preservatives in Organic Solvents (DD257-3:2003). Two types of organic solvent, i.e. n-hexane and iso-octane at different mobile phases; 99.5% n-hexane: 0.5% THF and 99.5% iso-octane: 0.5% ethyl acetate, were used to determine Cis and Trans isomers of permethrin in the treated wood. This approach was validated according to the standard requirements of MS ISO/IEC 17025:2005.

The validation test results showed that, this method is suitable to be used for permethrin determination in treated wood. The sample prepared by using both solvents was analysed by an HPLC-PDA or an HPLC-UV. Thus, this test protocol would pave the way for future industrial uptake especially in wood preservation industry.



Kayu untuk rawatan LOSP
Stack of wood ready for LOSP treatment



Panel daripada kayu yang dirawat
Treated wood used as panel

Mengetengahkan Penggunaan Batang Kelapa Sawit untuk Produk Panel

Penyelidikan dan pembangunan produk daripada batang kelapa sawit (OPT) telah mendapat perhatian yang meluas daripada penyelidik dan industri yang berasaskan kayu. Ini memandangkan bahawa bahan ini berpotensi tinggi sebagai bahan mentah alternatif untuk pelbagai produk. Justeru, pengenalan OPT untuk digunakan dalam pembuatan produk papan adalah amat bertepatan bagi membolehkan industri yang berasaskan kayu mengorak langkah ke hadapan. Batang sawit yang digunakan dalam kajian ini diperolehi daripada program penanaman semula sawit. Kajian-kajian terdahulu menunjukkan bahawa OPT boleh diproses untuk menghasilkan kayu bergergaji, papan lapis, papan laminasi venir (bukan struktur), dan pelbagai produk papan seperti papan serpai, papan serpai ikatan simen, papan serpai ikatan gipsium serta papan gentian berketumpatan sederhana.

Namun, produk-produk yang berasaskan OPT masih dianggap baharu dan kini di peringkat awal pembangunannya. Buat masa ini, kebanyakan produk ini hanya dikeluarkan pada skala kecil dengan hasil pemprosesan dan produktiviti keseluruhannya yang terhad. Ini disebabkan mesin, peralatan dan kaedah pengeluaran yang sedia ada direka bentuk khusus untuk memproses kayu keras tropika. Selain itu, OPT bukan bahan kayu yang sebenar. Ini merupakan satu cabaran utama kepada institusi penyelidikan dan pengilang-pengilang yang berkaitan jika kita berhasrat untuk menghasilkan produk daripada OPT seperti pencapaian penggunaan kayu getah. Memandangkan sebahagian besar pengeluaran mesin kerja kayu adalah dari luar negara, pengetahuan mereka mengenai sifat-sifat OPT mungkin sangat sedikit. Malaysia selaku pengeluar minyak sawit utama dunia dan mempunyai banyak OPT matang, seharusnya mensasar dan mengusahakan pembangunan suatu teknologi khusus yang direka bentuk hanya untuk memproses OPT ke arah menghasilkan produk-produk yang bernilai tambah.

Berdasar senario ini, FRIM telah menggembelng usaha untuk memproses dan menggunakan papan lapis (termasuk papan laminasi venir untuk aplikasi bukan struktur) daripada OPT. Inisiatif ini bertujuan merealisasikan penggunaan OPT sebagai



Pra-penekanan ke atas papan lapis OPT
Pre-press of OPT plywood

Unfolding the use of Oil Palm Trunk for Panel Products



Batang sawit yang panjangnya sembilan kaki
Nine-footer oil palm log

Research and development of products from oil palm (Elaeis guineensis) trunks (OPT) has gained a lot of attention from researchers and the wood-based industry. This is because this material has shown great potential as an alternative raw material for various products. The introduction and utilisation of OPT for panel products is therefore timely for the wood-based industry. The trunks used in the study were obtained from oil palm replanting programme. Early studies indicated that OPT can be converted into sawntimber, plywood, laminated veneer lumber (non-structural), blockboard and various panel products such as particleboard, cement-bonded particleboard, gypsum-bonded particleboard and medium density fiberboard.

However, OPT-based products are still considered new and at the infancy stage of development. Most of the products are currently manufactured on a small scale with overall restrained recovery and productivity, due to the fact that the existing machinery, equipment and production set-up are designed to process tropical hardwood. Furthermore, anatomically, OPT is not truly a woody material. This is a big challenge to our R&D institutions and the relevant manufacturers if they aimed to turn OPT into products following the footsteps of rubberwood. As manufacturers for woodworking machinery are mainly from abroad, they may know very little about the characteristics of OPT. Being a major world's palm oil producer, Malaysia has abundant matured OPT and therefore, should aim for and initiate the development of indigenous technology, designed solely for processing of OPT into valued-added products.

With this scenario in mind, FRIM has begun concerted efforts to process and utilize plywood (even the laminated veneer lumber for non-structural purpose) from OPT. This endeavour is to rationalize the use of OPT as a potential material for future panel-based production in Malaysia. The success in manufacturing OPT-based panel products is largely dependant on knowledge of OPT characteristics and the know-how of designated processing machinery, correct processing layout and strict quality control. In other words, the technological development depends crucially on all the individual components integrated

bahan yang berpotensi dalam pengeluaran produk berasaskan panel di Malaysia pada masa depan. Kejayaan dalam pengilangan produk panel yang berasaskan OPT ini banyak bergantung kepada pengetahuan tentang sifat-sifat OPT dan prinsip mesin pemrosesan yang khusus, kaedah pemrosesan yang betul dan kawalan mutu yang ketat. Dengan perkataan lain, pembangunan teknologi ini sangat bergantung kepada integrasi semua komponen menjadi satu sistem yang koheren. Namun, bahagian yang tidak tersurat serta faktor yang penting dalam kejayaan pemrosesan dan penggunaan OPT banyak bergantung pada kemahuan dan usaha yang berterusan daripada pengilang-pengilang papan lapis sendiri.

Melalui R&D yang berterusan serta ujian-ujian yang dijalankan di kilang, papan lapis OPT boleh dikeluarkan pada kapasiti yang maksimum di setiap kilang. Papan lapis OPT yang dikeluarkan adalah menepati piawaian konsisten dan diterima pasaran. Kini, dengan bantuan teknikal daripada FRIM, beberapa pengilang papan lapis telah berjaya mengeluarkan papan lapis-OPT. Kejayaan ini merupakan sebahagian daripada pencapaian Projek Papan Lapis Kelapa Sawit yang dinaungi oleh Persatuan Pengilang Panel Malaysia (MPMA).



Penghasilan venir dengan pelarik tanpa spindel
Veneer peeling using spindleless lathe

Borogard ZB untuk Melindungi Papan Serpai dan Papan Gentian Berketumpatan Sederhana

Terdapat 11 kilang papan serpai dan 11 kilang papan gentian berketumpatan sederhana (MDF) di seluruh Malaysia. Kebanyakan kilang ini terutamanya di Semenanjung Malaysia, menggunakan kayu getah sebagai bahan mentah utama mereka. Beberapa tahun kebelakangan ini, bekalan kayu getah didapati semakin berkurangan disebabkan penggunaannya yang kian meningkat dalam pembuatan perabot, papan panel dan aplikasi hiliran yang lain. Ini ditambah pula dengan pengecilan saiz ladang getah akibat harga komoditi getah di pasaran dunia yang rendah. Namun, apabila harga getah melonjak pada tahun 2006, kebanyakan pemilik ladang getah enggan menebang pokok-pokok mereka yang telah matang mengakibatkan bekalan kayu getah kepada pengeluar produk komposit kayu terjejas teruk.

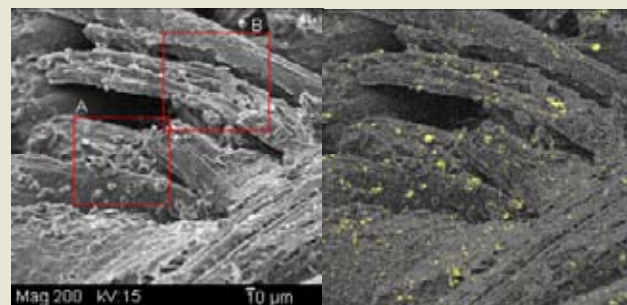
into a coherent system. Yet, the unwritten and decisive part of OPT processing and appreciation of operations will largely come from the willingness and consistent effort of the plywood manufacturers themselves.

Through continuous R&D and mill trials, OPT-based plywood could be produced at maximum capacity from each plywood mill. The OPT plywood produced has met the governing quality standard consistently, and it has gained the market acceptance. To date, with technical assistance from FRIM, several plywood manufacturers have succeeded in producing plywood from OPT. This achievement is part of the success story of Palm Plywood Project under the auspices of the Malaysian Panel-Products Manufacturers' Association (MPMA).



Proses membulat menggunakan pelarik kitaran
Round-up process using rotary lathe

Protecting Particleboard and MDF with Borogard ZB



Mikrograf SEM membuktikan kehadiran Borogard ZB (kuning) di dalam komposit kayu
SEM micrograph proves the presence of Borogard ZB (yellow) in wood composite

Malaysia currently has 11 particleboard and 11 medium density fibreboard (MDF) plants. Most of the plants especially in Peninsular Malaysia use rubberwood as their main raw material. The availability of rubberwood has become crucial during the last few years due to increased utilization of rubberwood for furniture, wood composite manufacture and other downstream application. In addition, the hectareage of rubberwood has shrunk due to the fact that the commodity price of rubber in the world market is low. However, when the price of rubber increased in 2006, most of the rubberwood plantation owners

Gentian kelapa sawit dicadangkan sebagai bahan mentah gantikan kepada industri komposit kayu kerana jumlahnya yang banyak dan belum dikomersialkan. Kajian terdahulu oleh para penyelidik tempatan menunjukkan bahan mentah batang, tandan kosong (EFB) dan pelepah kelapa sawit sesuai digunakan dalam pembuatan pelbagai produk komposit kayu. Malaysia mempunyai keluasan ladang kelapa sawit di seluruh negara sebanyak 4.1 juta hektar dan menghasilkan 10.1 juta tan metrik EFB setahun daripada kilang minyak sawit sebagai hasil sampingan industri kelapa sawit.

Kajian awal menunjukkan bahawa papan panel daripada EFB mudah diserang oleh kulat selepas beberapa minggu disimpan. Penggunaan bahan awetan yang berasaskan boraks seperti Borogard ZB dijangka mampu menghasilkan papan serpai dan MDF yang mempunyai kerintangan terhadap serangan kulat dan juga anai-anai. Kajian ini adalah berdasarkan satu kerjasama antara FRIM dan Borax (Asia) untuk mengenal pasti kesesuaian Borogard ZB sebagai bahan awetan bagi mengawal serangan kulat dan anai-anai terhadap papan serpai dan MDF. Sejumlah 27 siri papan serpai dan MDF telah dihasilkan berdasarkan kombinasi kayu getah dan gentian kelapa sawit sebagai bahan mentah, pelbagai peratusan resin pada beberapa tahap kemasukan Borogard ZB.

Keputusan kajian menunjukkan bahawa penambahan Borogard ZB tidak memberi kesan ke atas sifat-sifat mekanikal (modulus kepecahan, modulus kekenyalan, ikatan dalaman, pembengkakan ketebalan dan serapan air) papan panel. Borogard ZB dengan kepekatan pada 1.5% berupaya melindungi papan serpai dan MDF daripada serangan kulat-kulat perosak kayu dan pewarna. Borogard ZB pada kepekatan yang sama juga berjaya menghalang serangan anai-anai bawah tanah ke atas blok-blok ujian papan serpai dan MDF yang didedahkan selama empat minggu di makmal dan 16 minggu di lapangan.



Blok-blok ujian yang mengandungi Borogard ZB selepas didedahkan kepada kulat
Test blocks with Borogard ZB after fungus exposure test



Blok-blok ujian tanpa Borogard ZB selepas didedahkan kepada kulat
Test blocks without Borogard ZB after fungus exposure test

were reluctant to cut down the old trees and thus worsened the supply of rubberwood for wood composites manufacturers.

Oil palm fibre is recommended as the logical substitute material for wood composite industries since the availability of the materials is abundant and has yet to be commercialised. Previous studies have revealed that the oil palm fibres generated from oil palm trunk, empty fruit bunches (EFB) and fronds were technically feasible to be used for the production of various wood composite products. Malaysia has 4.1 million hectares of oil palm plantation in the country and they generate more than 10.1 million tonnes annually of EFB as by-products from the palm oil industries.

Preliminary study indicated that the EFB boards were very susceptible to fungus growth upon storing for few weeks after production. The application of borax-based preservative like Borogard ZB is expected to produce particleboards and MDFs which have resistance against fungus and probably termite attack. This work is based on a collaborative study between FRIM and Borax (Asia) Sdn. Bhd. on the feasibility of using Borogard ZB as a preservative to counter fungus infestation and termite attack on manufactured particleboard and MDF. A total of 27 series of particleboards and MDF was produced based on the combination of rubberwood and oil palm fibre as raw material, various percentages of resin and Borogard ZB loadings.

The study revealed that the incorporation of Borogard ZB has had no effect on the mechanical properties (modulus of rupture, modulus of elasticity, internal bond) as well as the physical properties (thickness swelling, water absorption) of the boards. An optimum concentration of Borogard ZB successfully protected MDF and particleboards from both mould and decay fungi. The same concentration of Borogard ZB also protected test blocks of both particleboard and MDF exposed for four weeks (laboratory test) and 16 weeks (field test) to subterranean termites.



Sampel tanpa Borogard ZB selepas 16 minggu didedahkan kepada anai-anai
Sample without Borogard ZB after 16 weeks of termite exposure test in the field



Sampel yang mengandungi Borogard ZB selepas 16 minggu didedahkan kepada anai-anai
Sample with Borogard ZB after 16 weeks of termite exposure test in the field

Memperkuat Produk Venir Beracuan untuk Aplikasi Struktur

Sumber kayu yang semakin berkurangan turut mempengaruhi bekalan bahan veneir kepada pengusaha papan panel dan perabot. Kajian ini bertujuan untuk mencari alternatif dalam pembuatan panel kayu dengan meminimumkan penggunaan bahan mentah. Ini boleh dicapai dengan menggabungkan gentian kaca sebagai tetulang untuk memperoleh sifat yang setanding ataupun yang lebih baik. Gentian kaca ini boleh digubah mengikut keperluan dengan membina lapisan yang disusun agar lapisan yang mengalami tegasan diimbangi. Manakala untuk lapisan yang kurang bertegasan, penggunaan bahan mentah akan dikurangkan. Permukaan berikatan yang menjadi sempadan di antara dua bahagian veneir kayu dan gentian kaca amat mempengaruhi sifat mekanik komposit veneir kayu dan gentian kaca tersebut.

Selaku bersifat kuasi-isotropik, kaca gentian ini dijangka akan memberi kekuatan yang sama pada kedua-dua arah x dan y. Panel-panel papan gentian kaca yang dibina dalam enam dan tujuh lapisan setiap satu, telah dibangunkan berasaskan kepada dua konfigurasi reka bentuk yang berikut:

- Gentian kaca di tengah
- Gentian kaca di lapisan kedua dan keempat

Hasil kajian ini seharusnya menunjukkan bahawa kekuatan dan ketahanan produk panel komposit veneir kayu gentian kaca ini membolehkan sesuatu bangunan direka bentuk kepada pelbagai komponen arkitek. Selain itu, penggunaan panel komposit ini juga dapat mengurangkan penjana sisa buangan di tapak pembinaan kerana ia boleh dihasilkan mengikut saiz dan spesifikasi tertentu. Dalam aplikasi perabot, panel nipis dan ringan ini dijangka boleh menghasilkan reka bentuk yang lebih canggih.

Justeru, hasil kajian ini dijangka dapat dimanfaatkan oleh industri pembinaan dan perabot. Panel yang diperkuat oleh gentian kaca ini akan memberi banyak pilihan penggunaan di samping menawarkan peningkatan ciri-ciri kekuatan dan kepelbagaian. Struktur panel kayu ringan yang diperkuatkan dengan gentian kaca ini akan memberi alternatif kepada pengeluar dan pembuat untuk menerokai penggunaan bahan mentah tanpa kekangan.

Reinforcing Moulded Veneer Products for Structural Application

Depleting resources of timber in Malaysia also affect the supply of veneer that caters to the panel and furniture industry. This study aims to provide an alternative in making wood panel products by minimizing the usage of raw material and incorporating fiberglass as reinforcement to obtain similar to better properties. Fiberglass can be tailored to requirements by building up layers oriented with the stress part being encountered while removing unnecessary material from areas with little stress. The bonding quality interfacing between fiberglass and wood veneer would influence the mechanical properties of the fiberglass-wood veneer composite.

Being quasi-isotropic, fiberglass is equally strong in both x-y directions. Flat fiberglass-reinforced veneer panels of proprietary numbered layers each, were developed based on two design configurations:

- Fiberglass placed at the center*
- Fiberglass reinforced at predetermined layers respectively*

Results indicated that the superior strength of this engineered composite panel product meant that buildings could be designed into various architectural components. In addition, this composite panel product produced less construction-site waste because they could be ordered to size and specification. For furniture, the anticipated thin and lightweight material would enhance the direction towards design sophistication.

Output from this study will definitely benefit both the construction and furniture industries. The engineered timber panel will provide wider variations in utilization as well as an increase in strength and flexibility. The fiberglass-reinforced light structure wood panel should provide a viable alternative for manufacturers and fabricators in the construction and furniture industry.



1
Penyediaan bahan
Preparation of materials



2
Pengeras
Hardener



3
Melapis
Layering



4
Resin poliester
Polyester Resin



5
Tekanan-panas
Hot-pressing



6
Mengemas panel
Finishing touch to panel



7
Panel yang dihasilkan
Panel produced

Proses penghasilan panel kayu yang diperkuat dengan gentian kaca
Production flow for making fiberglass-reinforced wood veneer panel

Joystyn: Jus Buah Manggis dan Ais Krim



Garcinia mangostana L., ratu buah-buahan
Garcinia mangostana L., the queen of fruits



Joystyn, jus daripada buah manggis
Joystyn mangosteen fruit juice

Manggis (*Garcinia mangostana* L.) dari famili *Clusiaceae* merupakan sejenis buah yang kaya dengan nutrien penting yang diperlukan termasuk sejenis antioksidan yang dikenali sebagai xantona. Lebih daripada 40 jenis xantona termasuk α - and γ -mangostin, normangostin, gartanin, antosianin, polifenol, kuinin, tannin, catechin, polisakarida dan stilbena diketahui terkandung di dalam kulit manggis. Selain mempunyai rasa yang unik, ia juga mempunyai kelebihan dari segi perubatan.

Di FRIM, akues ekstrak kulit manggis telah melalui ujian antioksidan dan menunjukkan kandungan anti-radikal bebas yang memberangsangkan.

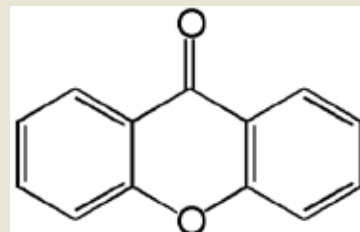
Bersama-sama Fuley Marketing Sdn. Bhd., ekstrak kulit manggis dicampur dengan jus buah untuk menghasilkan jus dan ais krim manggis yang antioksidan; dinamakan JoyStyn. JoyStyn telah dilancarkan secara rasmi semasa Pameran WHAT Medicine 2007 di PWTC, Kuala Lumpur.



Sultanah Hajah Kalsom merasa jus buah Joystyn di gerai pameran FRIM
Sultanah Hajah Kalsom sampling Joystyn fruit juice at FRIM's booth

Joystyn: Whole Fruit Mangosteen Juice and Ice-cream

Mangosteen (*Garcinia mangostana* L.) family *Clusiaceae* is a fruit rich in essential and complimentary nutrients including an antioxidant known as xanthenes. About 40 types of xanthenes are present inclusive of α - and γ - mangostin, normangostin, gartanin, anthocyanin, polyphenols, quinines, tannin, catechins, polysaccharides and stilbenes. Apart from its rich and unique favour, mangosteens have medicinal properties as well.



Xantona: Struktur tulang belakangnya yang unik serta kumpulan kimia menerangkan tentang fungsi khusus xantona
Xanthone: Its unique backbone structure and attached chemical groups define the specific functionalities of xanthone

In FRIM, the antioxidant research team evaluated the mangosteen fruit rind aqueous extract and whole fruit mangosteen juice for antioxidant activity using the Superoxide Scavenging (SS) Assay & DPPH Radical Scavenging Assay. Both the rind extract and whole fruit juice showed high antioxidant properties. The HPLC profile showed the presence of significant amounts of alpha-mangostin.

Together with Furley Marketing Sdn. Bhd., an optimum amount of rind extract was mixed with the fruit juice to produce antioxidant mangosteen juice and ice cream, called Joystyn. Joystyn was launched at the WHAT Medicine Conference in 2007.



Ais krim Joystyn
Joystyn ice cream



Produk Joystyn yang dipamerkan di gerai pameran FRIM semasa Persidangan WHAT Medicine
A display of Joystyn products at the FRIM booth in the WHAT Medicine Conference

Pembangunan Ekstrak Piawai Flavonoid (ChromolinEx) daripada Pokok Kapal Terbang

Daun segar dan ekstrak daripada *Chromolaena odorata* (L.) R.M. King and H. Rob. (Asteraceae) (pokok kapal terbang) merupakan rawatan herba tradisional untuk lecur, luka dan jangkitan pada kulit. Kajian kami telah membuktikan bahawa ekstrak daun mempunyai ciri antioksidan, antiradang dan antistafilokokol tetapi tidak menunjukkan sifat sitotoksik pada sel hati dan ginjal. Ekstrak daun mengandungi campuran sebatian kimia semula jadi yang kebanyakannya terdiri daripada flavonoid. Sekurang-kurangnya sepuluh jenis flavonoid telah dituliskan daripada ekstrak daun dan dikenal pasti strukturnya. Kumpulan flavonoid telah dikenal pasti mempunyai kelebihan ciri dari segi aktiviti biokimia dan farmakologi. Oleh itu, berbagai-bagai jenis flavonoid berasaskan tumbuhan telah dicampur di dalam makanan sebagai bahan fungsian dan juga dalam rumusan kosmetik serta aplikasi luaran.

Pendekatan sistematik telah dijalankan untuk memperoleh ekstrak flavonoid daripada serbuk kering daun pokok kapal terbang. Kesan daripada faktor-faktor pengekstrakan iaitu suhu, masa, nisbah bahan-pelarut dan kepekatan etanol pada kandungan flavonoid telah diambil kira dan dikaji. Hasilnya ialah satu ekstrak yang mengandungi kandungan flavonoid sebanyak 39 $\pm$ 6% persamaan kuersetin (*quercetin equivalent*). Ekstrak ini dinamakan ChromolinEx dan ia menunjukkan aktiviti antistafilokokol yang lebih tinggi tetapi tidak menunjukkan peningkatan aktiviti sitotoksik pada sel hati dan ginjal. Kajian rumusan asas telah dilakukan dengan ChromolinEx dan minyak pati daripada pokok kapal terbang untuk menghasilkan produk penjagaan kulit (ciri antiseptik dan rawatan luka yang berasaskan kegunaan tradisional) dalam bentuk krim dan gel. Kajian lanjut akan menumpu kepada pembangunan ChromolinEx sebagai produk herba yang selamat dan berkualiti.



Ekstrak flavonoid dipiawaiakan
Standardised flavonoid extract

Development of CromolinEx From Pokok Kapal Terbang

The fresh leaves and extracts of Chromolaena odorata (L.) R.M. King and H. Rob. (Asteraceae) (pokok kapal terbang) are traditional herbal remedies in many countries for burns, soft tissue wounds and skin infections. Our study has demonstrated that the leaf extract had anti-oxidant, anti-inflammatory and anti-staphylococcol properties, but no cytotoxic effect on normal liver and kidney cells. The leaf extract is a mixture of compounds comprising mainly of flavonoids and at least ten flavonoids have been isolated and identified. Due to their many biological and pharmacological activities, flavonoids have been added in food as functional ingredients, and in many cosmetic and dermatological formulations, mainly in the form of plant-derived extracts for their beneficial biochemical activity.

Systematic attempts were carried out to obtain a standardized flavonoid extract from the dried and powdered leaves of C. odorata. Effects of extraction parameters such as temperature, extraction time, material-solvent ratio and concentration of ethanol on the contents of flavonoids were investigated. On this basis, an extract with flavonoid content of 39 $\pm$ 6% quercetin equivalent was obtained. This extract, named ChromolinEx showed enhanced anti-MRSA activity but there was no increase in cytotoxic effect on normal liver and kidney cells. Basic cream and gel formulation study was conducted using ChromolinEx and essential oils of C. odorata. As a result, prototype cream and gel products for skin care (antiseptic and wound healing properties based on traditional claims) were developed. Further study will be carried out in order to provide comprehensive scientific evidence for developing the ChromolinEx into potential and affordable healthcare product.



Pucuk dan daun pokok *Chromolaena odorata*
A Chromolaena odorata plant showing shoots and leaves

Pembangunan Agen Antiparasit

Penyakit terabai merupakan kumpulan 13 penyakit berjangkit Tropika iaitu kala-azar, tripanosomiasis Afrika (African sleeping sickness), penyakit Chagas, sistosomiasis, filariasis limfatik, onkosieriasis, drankunkuliasis, askariasis, trikuriasis, jangkitan cacing kerawit, leprosi, ulser Buruli dan trakoma. Penyakit-penyakit ini melibatkan golongan miskin yang tidak berupaya di kawasan membangun sub-Sahara Afrika, Asia dan Amerika. Secara keseluruhan, penyakit ini mengakibatkan antara 500 ribu hingga satu juta kematian setahun, dan menyumbang kepada beban kesihatan yang setara akibat HIV-AIDS. Sebahagian daripada penyakit ini memberi kesan sepanjang hayat kepada individu yang terjangkit, mengakibatkan morbiditi serta kecacatan fizikal dan, dalam sesetengah kes, melibatkan kecacatan paras rupa yang teruk.

DNDi merupakan satu inisiatif pembangunan ubatan bebas tanpa melibatkan keuntungan yang bertujuan untuk membangunkan ubatan baharu, diperbaharu serta bidang yang relevan untuk penyakit terabai. Rakan-rakan DNDi termasuklah institut penyelidikan sektor awam dari Brazil, Kenya, Malaysia dan India, Institut Pasteur dan program Penyelidikan Penyakit-penyakit Tropika WHO. Di samping portfolio terkini yang melibatkan 20 projek penyelidikan dan pembangunan ubatan di pelbagai peringkat, DNDi juga sedang berusaha untuk meningkatkan kesedaran tentang perlunya peningkatan dalam R&D bagi penyakit terabai dan untuk memperkasakan kapasiti penyelidikan yang sedia ada di negara-negara penyakit endemik. Oleh itu, PASN telah ditubuhkan sebagai subset kepada DNDi, kini melibatkan kerjasama pusat enam negara iaitu Institut Kitasato, Jepun; Institut Penyelidikan Dadah Pusat, India; Shanghai Institute of Material Media, China; FRIM dan Institut Farmaseutikal dan Nutraseutikal Malaysia (MIPN),

Anti-parasitic agents Development

The neglected diseases are a group of 13 tropical infectious diseases namely kala-azar, African sleeping sickness, Chagas disease, schistosomiasis, lymphatic filariasis, onchocerciasis, drancunculiasis, ascariasis, trichuriasis, hookworm, leprocy, Buruli ulcer and trachoma. These diseases afflict the poor and powerless in the developing regions of sub-Saharan Africa, Asia and the Americas. Together, they cause an estimated 500,000 to one million deaths annually and cause a global disease burden equivalent to that of HIV-AIDS. Some diseases affect individuals throughout their lives, causing a high degree of morbidity and physical disability and, in certain cases, gross disfigurement.

The Drugs for Neglected Diseases Initiative (DNDi) is an independent, not-for-profit drug development initiative that aims to develop new, improved, and field-relevant drugs for neglected diseases. DNDi's partners include public sector research institutions from Brazil, Kenya, Malaysia and India, Institut Pasteur, and the WHO's Tropical Diseases Research program. With a current portfolio of 20 projects in various stages of drug research and development, DNDi also works to raise awareness about the need for greater R&D for neglected diseases and to strengthen existing research capacity in disease-endemic countries. As such, the Pan-Asian Screening Network for Drugs for Neglected Diseases from Natural Substances (PASN) was established as a subset of DNDi which currently involves collaborating centers in six countries; Kitasato Institute, Japan; Central Drug Research Institute, India; Shanghai Institute of Materia Medica, China; FRIM and Malaysian Institute for Pharmaceuticals and Nutraceuticals, Malaysia; Institut Pasteur, Korea; Novartis Institute of Tropical Diseases, Singapore. The objective of PASN is to create a

Malaysia; Institut Pasteur, Korea; serta Institut Penyakit Tropika Norvatis, Singapura. Objektif PASN adalah untuk mewujudkan iklim yang sesuai bagi kerjasama penyelidikan dalam mengenal pasti molekul baru sebagai agen terapeutik terhadap penyakit terabai serta memberikan maklumat kepada rakan-rakan institut tentang penyelidikan penyakit terabai, produk semula jadi, serta penyaringan biologi.

Cawangan Farmaseutikal, Bahagian Bioteknologi Hutan dari FRIM telah terlibat dalam proses penyaringan tumbuhan dan aktinomiset daripada tanah di Malaysia dalam pembangunan dan potensi penawar melawan penyakit terabai yang disebabkan oleh *Trypanosoma* dan *Leishmania* sp. Makmal Bio-Keselamatan Tahap III telah disediakan bagi menjalankan pengasaian *Trypanosoma brucei brucei* strain S427 (bukan patogen manusia) yang telah berjaya dikultur dan dipelihara di dalam makmal tersebut.

Penyaringan awal ke atas 222 ekstrak yang diuji ke atas *Trypanosoma* mendapati beberapa ekstrak tumbuhan dan ekstrak aktinomiset memberi keputusan positif pada $IC_{50} < 12.5 \mu g/ml$ (IC_{50} ialah kepekatan perencat yang menyebabkan 50% kematian sel). Asai *in vivo* ke atas ekstrak yang positif masih dijalankan. Hasil keputusan tersebut akan digunakan sebagai asas pemilihan "ekstrak sasaran" untuk penyelidikan seterusnya. Menerusi penggabungan asas dalam aplikasi penyelidikan dan jalinan pengetahuan kimia dan biologi dengan usaha sama pelbagai agensi antarabangsa, para penyelidik di FRIM akan bersama-sama memainkan peranan dalam mengenal pasti molekul-molekul baharu dari sumber biodiversiti di Malaysia yang boleh digunakan sebagai terapi untuk penyakit terabai.

Pertalian Genetik 16 Individu *Ficus deltoidea* Jack (mas cotek)

Ficus deltoidea Jack merupakan salah satu spesies *Ficus* atau tumbuhan herba yang lebih dikenali sebagai mas cotek di Malaysia. Daunnya mengandungi sebatian aktif seperti flavanoid dan triterpenoid yang mempunyai ciri-ciri antioksidan dan antiradang. Selain itu, daun mas cotek sangat berkesan sebagai pembakar lemak, mengurangkan tahap kolestrol dan boleh menghindarkan sakit kepala, migrain dan angin ahmar. Secara tradisional, daun, batang, akar dan buah yang direbus boleh digunakan untuk menyembuhkan arthritis, kepenatan dan mempunyai ciri-ciri afrodisiak.

Secara taksonomi, enam varieti *F. deltoidea* yang dikenal pasti di Semenanjung Malaysia, iaitu var. *angustifolia*, var. *bilobata*, var. *trengganuensis*, var. *kunstleri*, var. *intermedia* dan var. *motleyana*. Identifikasi untuk setiap varieti agak rumit dan sukar disebabkan morfologi daun yang pelbagai bentuk dan saiz. Dengan itu, FRIM telah menjalankan kajian pertalian genetik ke atas 16 individu *F. deltoidea* menggunakan penanda genetik iaitu DNA Polimorf Diperganda secara Rawak "Random Amplified

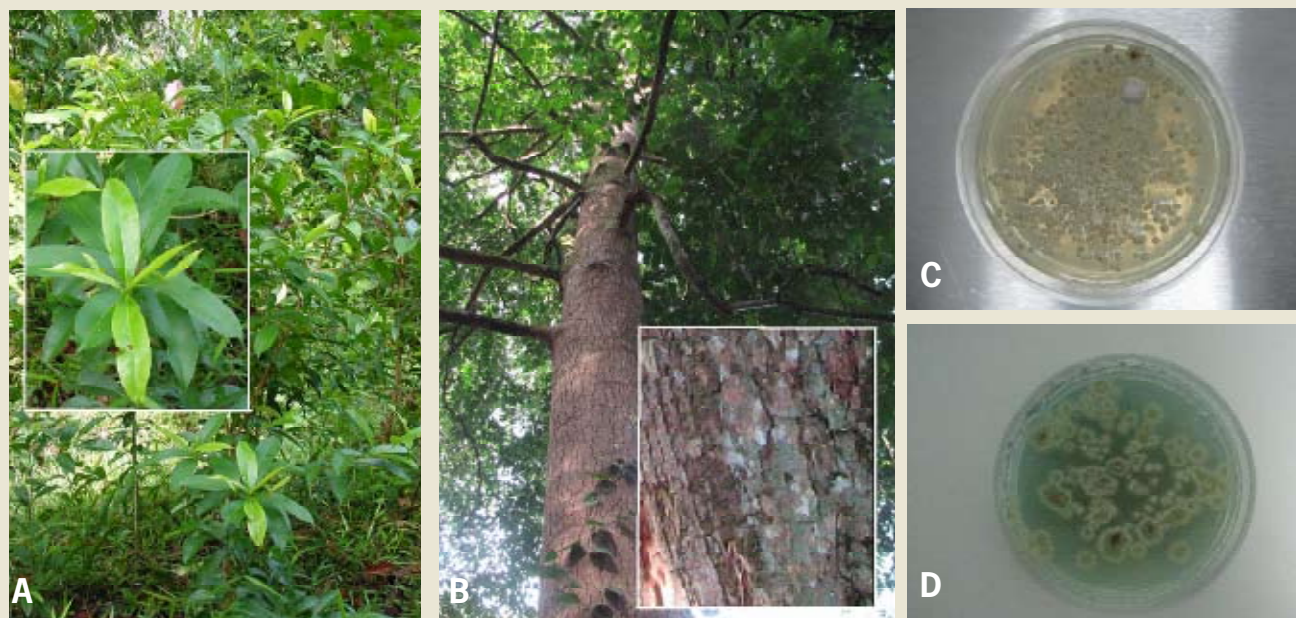
climate suitable for collaborative research on identification of novel molecules that could be used as therapeutic agents for neglected diseases and to provide the partner institutions with information regarding neglected diseases' research, natural products, and biological screening.

*The Pharmaceutical Branch of the Forest Biotechnology Division of FRIM has been involved in the screening of Malaysian plants and soil actinomycetes as candidates for the development of potential drug against neglected diseases caused by Trypanosoma and Leishmania spp. A Biosafety Level III laboratory (BBSL-III) was established to carry out the assay and the Trypanosoma brucei brucei strain S427 (not human pathogenic) was successfully cultured and maintained in the laboratory. The preliminary screening have shown that out of the 222 extracts tested against trypanosome, few plant and actinomycete extracts were positive giving the $IC_{50} < 12.5 \mu g/ml$ (IC_{50} is the inhibition concentration that caused 50% cell death). The *in vivo* assay on the positive extracts is ongoing and the result obtained will be used as basis for selection of "hit extract" for further research work. By combining basic and applied research and through cross-fostering between chemistry and biology, together with the international collaboration efforts with various agencies, scientists at FRIM will play an indispensable role in the identification of novel molecules from Malaysian biodiversity resources that could be used for the therapy of neglected diseases.*

Genetic Relatedness of 16 Individuals of *Ficus deltoidea* Jack (mas cotek)

Ficus deltoidea Jack a well known herb in Malaysia, is one of many species of *Ficus*. Locally known as mas cotek, the leaves contain active compounds such as flavonoids and triterpenoids and these have anti-oxidant and anti-inflammatory properties. In addition, locals believe that the *F. deltoidea* leaves are effective as a fat burner, a reducer of cholesterol levels and prevent headaches, migraines and strokes. Traditionally, the boiled leaves, stems, roots and fruits are used to treat arthritis and general exhaustion. It is also believed to have aphrodisiacal properties.

FRIM has taxonomically recognized six varieties of *F. deltoidea* in Peninsular Malaysia. They are var. *angustifolia*, var. *bilobata*, var. *trengganuensis*, var. *kunstleri*, var. *intermedia* and var. *motleyana*. Identification of each variety can be tricky and tedious due to the variability of leaf morphological characteristics, such as shape and size. Hence, FRIM has undertaken a genetic relatedness study on 16 individuals of *F. deltoidea* using Random Amplified Polymorphic DNA (RAPD) markers. The 16 samples (designated as: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O and FRIM) were further divided into five types, solely based on the leaf morphological characteristics (Figure 1), i.e., **Type 1**: A, E, I, J, M, N and O (roundshaped with base minutely tapered); **Type 2**: B, L and FRIM (obovate-shaped with



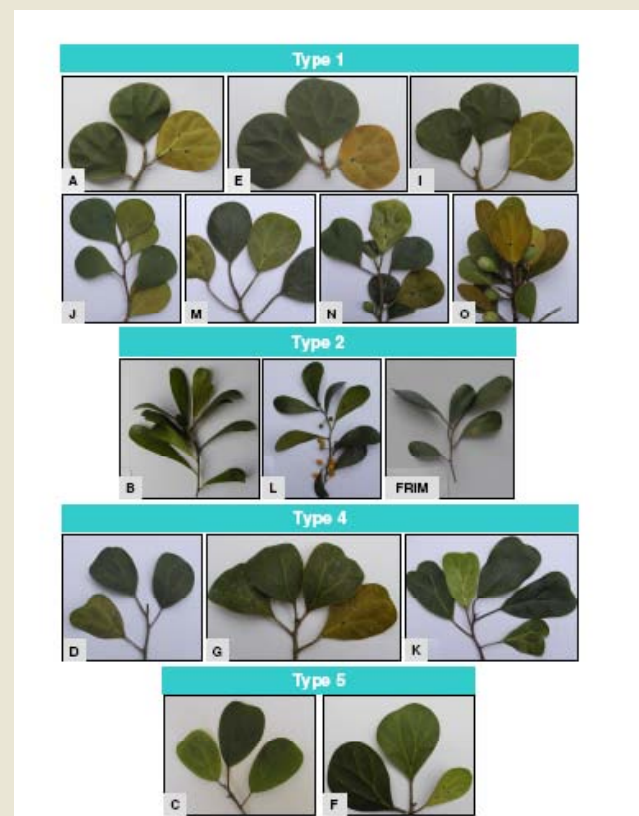
Sumber biodiversiti Malaysia yang berpotensi untuk aktiviti antiparasit, A: Geronggang (*Cratoxylum arborescens*), B: Dedali (*Strombosia javanica*), dan strain Aktinomiset C: A049, and D: A028

Potential Malaysian biodiversity resources with anti-trypanosomal activities, A: Geronggang (Cratoxylum arborescens), B: Dedali (Strombosia javanica), and Actinomycete strains C: A049, and D: A028

Polymorphic DNA (RAPD)". Berdasarkan ciri-ciri morfologi daun, 16 sampel itu (dilabel sebagai: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O dan FRIM) dibahagikan kepada lima jenis; **Jenis 1:** A, E, I, J, M, N dan O (bentuk bulat dengan pangkal tirus kecil); **Jenis 2:** B, L dan FRIM (bentuk obovat dengan pangkal tirus); **Jenis 3:** H (kombinasi bentuk obovat dengan pangkal tirus dan bentuk elips dengan pangkal berkuneat); **Jenis 4:** D, G dan K (bentuk delta dengan apeks emarginated tirus dan bersimetri); dan **Jenis 5:** C dan F (bentuk delta dengan apeks emarginated tirus dan tak bersimetri).

Genom DNA yang telah diekstrak akan digunakan untuk amplifikasi tindak balas berantai. Fragmen yang telah diamplifikasi akan dipisahkan pada gel agaros yang mengandungi etidium bromida dan ia boleh dilihat melalui cahaya ultraungu pada alat penganalisis imej. Untuk menentukan pertalian genetik antara sampel, analisis data dilakukan dengan menggunakan beberapa kaedah statistik dan perisian komputer.

Kesimpulannya, analisis genetik telah membahagikan 16 sampel kepada enam kluster. Bagaimanapun pada asalnya 16 sampel itu dibahagikan kepada lima jenis berdasarkan ciri-ciri morfologi daun. Hanya **Jenis 4** dan **Jenis 5** yang mempunyai persamaan dengan kluster genetik. Manakala sampel **Jenis 1** dibahagikan kepada tiga kluster genetik yang berbeza. Postulasi kajian ini menunjukkan 16 sampel *F. deltoidea* itu boleh dibahagikan kepada enam varieti. Di samping itu, kajian ini juga mendapati bahawa penggunaan ciri-ciri morfologi daun adalah tidak mencukupi untuk identifikasi varieti.

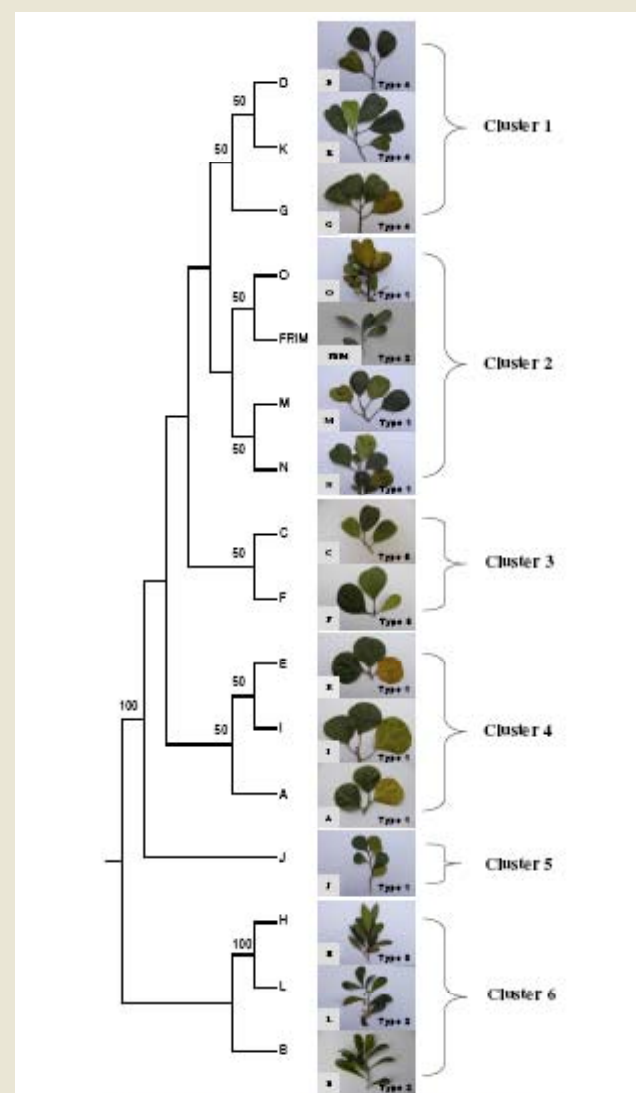


Ciri-ciri morfologi daun bagi individu *Ficus deltoidea*
Leaf morphological categorise of the individual of *Ficus deltoidea*

base tapered); **Type 3:** H (combination of obovate-shaped with base tapered and elliptic-shaped with base cuneated); **Type 4:** D, G and K (delta-shaped with apex minutely and symmetrically emarginated); and **Type 5:** C and F (delta-shaped with apex minutely and asymmetrically emarginated).

Genomic DNA was extracted and polymerase chain reaction (PCR) amplifications were performed. Amplified fragments were separated on agarose gels stained with ethidium bromide, visualized by illumination with ultraviolet light and recorded using an image analyser. To determine the genetic relatedness among samples, data analyses were carried out using several statistical methods and programs.

In summary, based on the leaf morphological characteristics, although the 16 samples were grouped into five types, the genetic analyses further divided the 16 samples into six clusters (Figure 2). Only **Types 4 and 5** corresponded to the genetic clusters but the samples in **Type 1** were further divided into three genetic clusters. Studies are currently on going to further clarify the varieties and their genetic relationships.



Analisa pertalian genetik ke atas 16 sample membentuk enam kluster
The genetic relatedness analysis among 16 sample formed six clusters

Koleksi Kultur Aktinomiset FRIM untuk Penggunaan Sumber Asli Secara Mampan dan Inovasi Berterusan Melalui Mikrob



Pengumpulan sampel tanah dari hutan
Collection of soil samples from the forests

Semenjak itu, aktinomiset telah memberikan hasil yang berfaedah terutamanya kepada industri farmaseutikal kerana mempunyai kebolehan yang tidak terbatas untuk menghasilkan metabolit sekunder yang mempunyai pelbagai struktur kimia dan aktiviti biologi. Penemuan-penemuan ini telah memberikan impak yang penting ke atas pemencilan genus dan spesies yang spesifik, identifikasi, paten, pemeliharaan kultur, dan penyimpanan kultur aktinomiset.

Hutan hujan tropika, secara umumnya, telah dikenali sebagai khazanah negara bagi kepelbagaian bio. Kajian ini menunjukkan bahawa hutan dipterokarpa yang tersebar luas di negara-negara Asia Tenggara mempunyai kepelbagaian aktinomiset yang tinggi. Bagaimanapun, hanya sebilangan kecil laporan membincangkan kepelbagaian aktinomiset yang dijumpai di hutan-hutan tropika di Malaysia. Oleh yang demikian, kemungkinan penggunaan strain aktinomiset yang berasal dari negara kita sebagai sumber bagi sebatian-sebatian bioaktif yang baru dan untuk aplikasi industri yang lain, tidak dikaji dengan sepenuhnya. Dalam usaha untuk menggunakan potensi daripada kepelbagaian mikrob secara mampan di negara kita, FRIM bekerjasama dengan Nimura Genetic Solutions Sdn Bhd (NGS) untuk memulakan penubuhan satu koleksi simpanan aktinomiset yang dikendalikan dengan tersusun dan selamat untuk mempercepat inovasi melalui kajian mikrob.

Pada masa kini, satu koleksi besar yang terdiri daripada pelbagai kumpulan aktinomiset telah dipencilkan dari sampel tanah yang diambil dari lokasi yang berbeza di sekitar kampus FRIM dan beberapa stesen luar FRIM. Pencilan-pencilan aktinomiset ini dipencilkan menggunakan prosedur pemencilan dalaman yang standard dan yang telah dibangunkan oleh penyelidik FRIM dan NGS. Pencilan-pencilan ini seterusnya akan dituliskan menggunakan media aktinomiset piawai yang dipantau dan disimpan di dalam tiub krio pada suhu -80°C. FRIM Actinomycetes Culture Collection (FACC) kini mengendalikan pengkulturan dan pemantauan pada semua pencilan aktinomiset untuk aktiviti bioprospek dalaman termasuk penyaringan untuk aktiviti anti-kanser payudara, antiprotozoa, antikulat dan antibakteria. Di samping menyediakan kultur stok aktinomiset, pangkalan

FRIM Actinomycetes Culture Collection (FACC) For Sustainable Utilization of Natural Resources and Continued Innovation Through Microbes



Aplikasi rawatan sampel tanah sebelum menyebarkan suspensi tanah di atas media selektif untuk pemencilan – Piring agar membantu pertumbuhan aktinomiset yang dipencil dari tanah
Soil pretreatment before plating soil suspension on selective isolation media – Agar plate supporting the growth of soil derived actinomycetes

Actinomycetes, the Gram positive filamentous bacteria, are an important source of natural products to treat diseases of humans, animals, and plants. The isolation and cultivation of these industrial actinomycetes may be traced back to the discovery in the 1940s of the antibiotics actinomycin and streptomycin. Since then, actinomycetes have been especially useful to the pharmaceutical industry for their seemingly unlimited capacity to produce secondary metabolites with diverse chemical structures and biological activities. These discoveries have an important impact on isolation of specific genera and species, identification, patents, culture preservation, and culture collections of actinomycetes.

Tropical rainforests are generally regarded as treasuries of biodiversity. Studies have shown that dipterocarp forests, which are dominant in South East Asian countries, have high actinomycetes diversity. However, few reports have addressed the diversity of actinomycetes found in tropical forests of Malaysia. Thus, the vast possibilities of using indigenous strains of actinomycetes as sources for new bioactive compounds and other industrial applications have not been adequately tapped. In an attempt to sustainably exploit the potentials in our microbial diversity, FRIM is collaborating with Nimura Genetic Solutions Co. Ltd. (NGS) to initiate the development of a safe and properly preserved collection of actinomycete cultures to accelerate the innovation through microbial research.

Currently, a large collection of diverse groups of actinomycetes have been isolated from soil samples collected from different locations within FRIM and its various sub-stations. Isolates were isolated using standardized in-house isolation procedures developed by FRIM and NGS researchers. These isolates were purified on standard actinomycete media and stock cultures were maintained and stored in cryovials at -80°C. The FRIM Actinomycetes Culture Collection (FACC) is currently handling cultivation and maintenance of all the actinomycete isolates

data yang mengandungi perkara-perkara mengenai lokasi koleksi tanah, nama pengendali koleksi, ciri-ciri morfologi dan taksonomi, serta profil-profil penjenisan biokimia dan gen bagi setiap pencilan juga turut didokumentasikan. Hala tuju kerjasama ini bagi jangka masa panjang adalah untuk menyediakan sebuah pusat koleksi yang menyediakan fasiliti untuk koleksi kultur aktinomiset yang akan menjadi asas kepada penyelidikan di masa hadapan dalam penemuan sebatian bioaktif yang baharu dengan nilai terapeutik.



Analisis Bekalan dan Ramalan Sumber Hutan di Malaysia

Pada Februari 2007, FRIM telah diberi tanggungjawab oleh Centre for International Forestry Research (CIFOR) untuk menjalankan kajian kes tentang pengeluaran dan unjuran pengeluaran sumber hutan di Malaysia dari sumber pemberi maklumat data. Dalam laporan ini, analisis data menekankan lima jenis produk kayu-kayan iaitu kayu gergaji, papan lapis, veneir dan kayu kumai. Perkara-perkara penting dalam kajian ini adalah seperti yang berikut:

1. Wujud kekurangan atau persaingan untuk bahan mentah produk kayu-kayan untuk kegunaan tempatan (pembangunan pengeluaran produk separuh siap dan produk siap) mahupun permintaan antarabangsa (khususnya dari China, India, Amerika Syarikat, Kesatuan Eropah dan Jepun) untuk bekalan bahan mentah yang sama.
2. Corak perdagangan dipengaruhi oleh urbanisasi di peringkat tempatan mahupun antarabangsa. Apabila masyarakat menjadi lebih moden, terpelajar dan berkemampuan, mereka lebih menyukai produk akhir kayu-kayan yang berkualiti dan produk yang telah disijilkan.
3. Wujud persaingan minimum untuk bahan mentah lignoselulosa antara industri berasaskan kayu dan lain-lain industri berasaskan serat (seperti industri pulpa dan kertas). Industri berasaskan kayu banyak menggunakan sumber bahan dari hutan asli. Industri pulpa dan kertas pula menggunakan banyak serat daripada kayu sama ada daripada tumbuhan renek (tumbuhan bukan kayu) yang ditanam bukan untuk sektor perhutanan mahupun daripada kayu lembut (*conifer wood*) dari ladang hutan di samping kertas terpakai sebagai bahan mentah. Kesan daripada arus kemodenan dalam masyarakat Malaysia, tiada persaingan untuk bahan api daripada kayu

for in-house bioprospecting activities which include screening for anti-breast cancer, antiprotazoan, anti-fungal and anti-bacterial activities. Besides preparing stock cultures, database containing information on the soil collection location, name of collector, morphological and taxonomical characteristics, and biochemical and gene typing profiles of the isolates were also documented. The long-term aim of this collaboration would be to have a one-stop collection centre/facility for actinomycete cultures at FRIM that will form the basis for future R&D in the discovery of novel bioactive compounds with therapeutic value.

Enam kultur bakteria pelbagai strain aktinomiset yang disimpan dan diselenggarakan di FACC
Six bacterial cultures of various actinomycete strains stored and maintained in FACC

The Malaysian Forest Resource Supply and Forecast Analysis

In 2007, FRIM was entrusted with the responsibility by the Centre for International Forestry Research (CIFOR) to conduct a Malaysian case study on Malaysian forest resource supply and forecast. Data analysis focussed on five timber products, namely logs, sawntimber, plywood, veneer and moulding. Highlights of the study included the followings.

1. *There is tension or competition for raw materials in timber products for local consumption (development of semi-processed or processed end-use products industries) as well as international demand (particularly from China, India, US, European Union and Japan).*
2. *The trade patterns are influenced by the process of urbanization, both domestically and internationally. As societies becoming more urbanized, educated and affluent, their preference will gravitate towards high quality timber products from certified forests.*
3. *There is minimum competition between the wood-based industries and other fiber-based industries (such as pulp and paper) for lignocellulosic raw materials. While the*

kerana penggunaan kayu sebagai bahan bakar semakin berkurangan.

4. Dalam jangka masa 10 tahun (2006-2015), pengeluaran balak, papan lapis dan kayu kumai dijangkakan mengalami pengurangan masing-masing sebanyak 14, 11 dan 18%. Di sebaliknya, dalam jangka waktu yang sama, pengeluaran veneir di Malaysia dijangka meningkat sebanyak 162% dan kayu gergaji sebanyak 2%. Pada masa yang sama, penggunaan semua jenis produk kayu-kayan Malaysia dijangka bertambah, iaitu balak 7%, kayu gergaji 18%, papan lapis 7% dan veneir 47%.

Kajian ini juga telah mengemukakan tiga cadangan yang berikut:

1. Akibat kekurangan sumber kayu-kayan daripada hutan asli, dicadangkan agar lebih banyak insentif disediakan bagi menggalakkan pembangunan ladang hutan dibuka di semua negeri oleh sektor awam dan sektor swasta.
2. Untuk perkembangan lanjut industri perabot, dicadangkan R&D reka bentuk dan kualiti produk akhir dipertingkatkan lagi.
3. Lebih banyak peruncit Malaysia membuka *outlet* mereka di luar negara supaya produk tempatan dpt dijual terus kepada pengguna.

Sumbangan FRIM kepada Laporan UNODC

Pada tahun 2007, FRIM bekerjasama dengan United Nations Office on Drugs and Crime (UNODC) untuk menghasilkan satu laporan serantau berdasarkan laporan yang disediakan oleh penyelidik dari enam negara (Cambodia, China, Indonesia, Lao PDR, Thailand dan Vietnam). Laporan yang diterbitkan bertajuk "Essential Oils Rich in Safole: Survey on Production, Trade and Use in East and Southeast Asia" ini telah diedarkan secara terhad kepada agensi kerajaan dan institusi penyelidikan dan institusi akademik. Kajian ini adalah penting kerana spesies tumbuhan tertentu mengandungi minyak asas yang kaya dengan safrol, sejenis bahan kimia yang digunakan dalam pembuatan pil-pil haram MDMA (Ekstasi). Sebanyak 36 jenis tumbuhan dikenal pasti mengandungi minyak yang kaya di dalam safrol berdasarkan survei yang dijalankan di enam buah negara. Kebanyakan tumbuhan ini tergolong dalam spesies *Cinnamomum*. Isi kandungan laporan ini merangkumi profil negara, kaedah kajian, hasil kajian, dasar dan undang-undang nasional tentang pengeluaran dan perdagangan minyak yang kaya dengan safrol, masalah yang dihadapi oleh para pengkaji dan cadangan-cadangan. Salah satu kesan hasil kajian survei nasional ialah peningkatan kesedaran oleh pihak berkuasa kerajaan mengenai pengeluaran dan perdagangan minyak tersebut. Survei tersebut telah membawa kepada peningkatan usaha dalam pemantauan dan pengawalan kegiatan pengeluaran dan perdagangan minyak yang kaya dengan safrol itu.

former category uses timber from natural forests, the pulp and paper industry uses a lot of wood fibers either from small plants derived from farms outside the forestry sector, soft woods from planted forests or recycled papers as raw materials. There is also no competition for energy wood as the demand for fuel wood decreases with increasing usage of gas in a rapidly urbanizing Malaysia.

4. *Within ten years (2006-2015), the production of logs, plywood and moulding is expected to decrease by 14%, 11% and 18% respectively. On the other hand, during the same period, it is expected that the production of veneer to increase by 162% and sawntimber to increase by 2%. Amidst these changes in production of timber products, it is expected that there will be a rise in consumption of all Malaysian timber products i.e. log (7%), sawntimber (18%), plywood (7%) and veneer (47%) in the same 10-year period.*

The study also provided the following three recommendations.

1. *Due to the shortage of timber resources from the natural forests, it is recommended that more incentives be provided to enable the setting up of more forest plantations in the country by both the public and private sectors.*
2. *For the future development of the furniture industry, it is suggested that R&D on design and quality of end products be enhanced.*
3. *More Malaysian retail outlets should be set up overseas where the products are sold directly to the consumers.*

FRIM's Contribution to the UNODC Regional Report

*In 2007, FRIM in collaboration with the United Nations Office on Drugs and Crime (UNODC) compiled a regional report based on the country reports submitted by national surveyors from six countries (i.e. Cambodia, China, Indonesia, Lao PDR, Thailand and Vietnam). The published report entitled "Essential Oils Rich in Safole: Survey on Production, Trade and Use in East and Southeast Asia" was restricted to reference by government agencies, research and academic institutions. The study was significant as certain plant species contain essential oils that are rich in safole, a precursor chemical used in the manufacture of the illicit drug MDMA (Ecstasy). In the six countries that were surveyed, a total of 36 plants were found to contain essential oils rich in safole. Most of the plants were of the *Cinnamomum* species. The contents of the report included country profiles, methodology used, research findings, national policies and laws pertaining to the productions of and trade in safole-rich oils, problems encountered by researchers and recommendations and suggestions. A major outcome of the national survey was the sharp increase in awareness of government authorities with respect to the production and trade activities involving safole-rich oils. The survey had generated a high level of interest in monitoring and controlling the production and trade activities of safole.*

Memperkasa Industri Herba ke arah Globalisasi

Produk-produk herba berasaskan aktiviti Penyelidikan dan Pembangunan dengan jaminan kualiti, keselamatan dan efikasi, melambangkan ketinggian integritinya selaras dengan kehendak pasaran di seluruh dunia. Justeru, Program Peningkatan Kualiti Produk Herba FRIM-MECD, iaitu usahasama sinergi antara FRIM dan Kementerian Pembangunan Usahawan dan Koperasi (MECD) telah diwujudkan bagi membantu dan menyediakan industri herba tempatan ke pasaran global. Bagi merealisasikan aspirasi ini, Program Tumbuhan Ubatan FRIM telah mengambil inisiatif untuk berkongsi pengalaman dan teknologi yang telah dijana sejak lebih sedekad penubuhannya.

Bermula Disember 2006, program selama 12 bulan ini telah dilaksanakan melalui pendekatan interaktif. Para usahawan dari 10 syarikat telah ditingkatkan kesedaran dan kefahaman mereka terhadap peri kepentingan aspek-aspek kualiti, keselamatan dan efikasi menerusi siri seminar, bengkel dan dialog yang direncana. Kualiti, tahap keselamatan dan efikasi produk-produk usahawan peserta dinilai dan dianalisis sebelum diusulkan syor-syor penambahbaikan. Menerusi program ini juga, Sudut Herba di Perpustakaan FRIM yang kini menempatkan koleksi lebih daripada 90 judul rujukan tentang herba dan perubatan alternatif dijangka menjadi pusat sehati bagi rujukan tentang herba. Suatu laman web (<http://info.frim.gov.my/cfdocs/infocenter/herba/index.cfm>) yang memaparkan maklumat tentang projek kerjasama ini, usahawan peserta, status analisis sampel dan senarai rujukan dalam koleksi Sudut Herba di Perpustakaan FRIM telah dibangunkan sebagai wahana interaksi alternatif di kalangan pihak yang berkepentingan.



Sudut herba dengan bahan rujukan yang berkaitan di perpustakaan FRIM
Herbal corner with relevant literature located at FRIM's library

Empowerment of Herbal Industries Towards Globalisation

Research and Development (R&D) based herbal products with assurance to their quality, safety and efficacy signifies high integrity and augurs well with world wide market demand. In this regard, the Herbal Product Quality Enhancement Programme is a synergistic collaboration in between FRIM and Ministry of Entrepreneur and Cooperative Development (MECD) initiated to facilitate and prepare our local herbal industry to position themselves in the global market. Medicinal Plants Programme has therefore taken the initiative to share her vast experience and technology generated since more than a decade of its establishment to realize this aspiration.

Commencing December 2006, the twelve-months-programme has been implemented via interactive approach where entrepreneurs representing 10 companies have had their awareness and understanding on all relevant aspects of quality, safety and efficacy enhanced through a series of seminars, workshops and dialogues. The quality, safety and efficacy of herbal products submitted by the participating entrepreneurs were evaluated and analysed prior recommendations for improvement. Additionally a Herbal Corner located at FRIM's library (Herbal Corner@FRIM's library) with a collection of more than 90 titles on herbs and alternative medicine has been initiated and aspired to be a one-stop centre for reference materials on herbals. A web-site (<http://info.frim.gov.my/cfdocs/infocenter/herba/index.cfm>) featuring information on the collaboration programme, participating entrepreneurs, sample analysis status and listing of references titles deposited at Herbal Corner@FRIM's library was created as an additional interaction avenue amongst the stakeholders.



Peserta dari industri herba pada Program Peningkatan Kualiti Produk Herba
Participants from the herbal industry at a Herbal Product Quality Enhancement Programme



Penetapan Hak Milik Tanah FRIM *Establishment of FRIM Land Area*

Survei Pra-perhitungan dan Penanaman Batu Sempadan FRIM

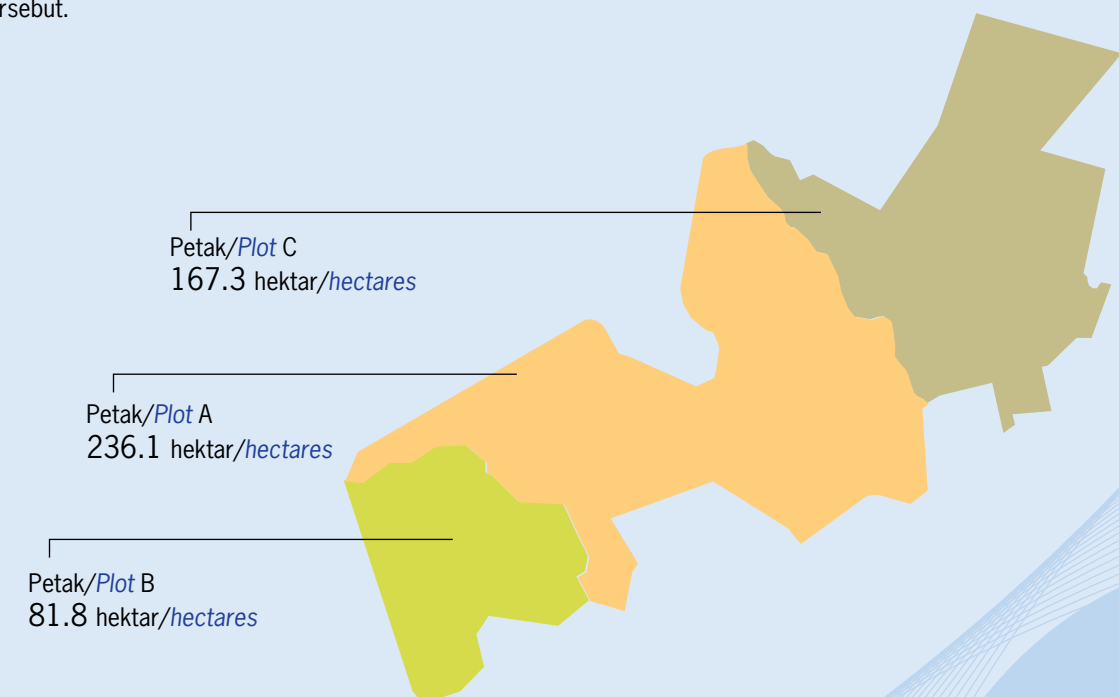
Pada tahun 2007, FRIM telah menjalankan satu tugas penting untuk menentu dan memastikan sempadannya di kawasan sekitar Sungai Buloh, Selayang, Rawang dan Kepong. FRIM telah berada di dalam kawasan tersebut sejak 1929 lagi. Pelbagai perubahan telah berlaku di dalam kawasan ini dari segi penggunaan tanah, persempadanan kawasan tanah bersebelahan serta pembangunan infrastruktur secara besar-besaran di dalam serta di luar kawasan FRIM. Oleh yang demikian, perlulah diambil tindakan untuk menentu dan mewujudkan semula sempadan di bahagian luar FRIM. Pada 2 Ogos 2007, FRIM berjaya mendapat hak milik tanah daripada Kerajaan Negeri Selangor.

FRIM yang meliputi kawasan seluas 485.2 hektar boleh dibahagikan kepada tiga petak utama. Petak-petak yang ditandakan sebagai Petak A, B dan C masing-masing adalah seluas 236.1, 81.8 dan 167.3 hektar. Gambar rajah di bawah menerangkan dengan lebih jelas tentang kedudukan petak-petak tersebut.

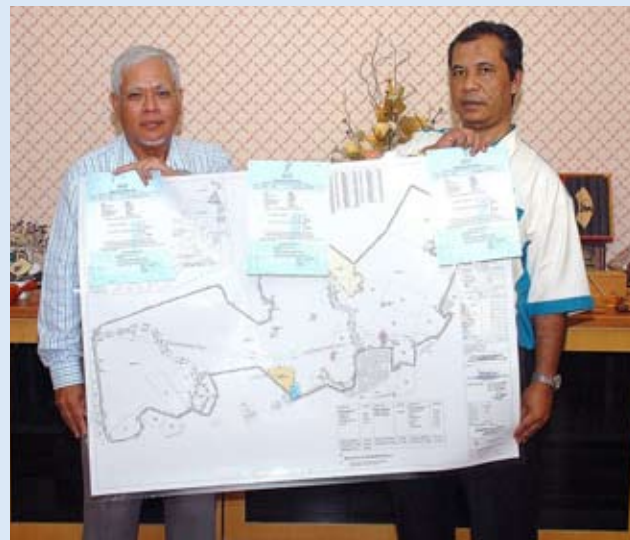
Precomp Evaluation survey and Establishment of FRIM Boundaries

In 2007, FRIM undertook the important task of ascertaining and determining its boundaries with respect to the surrounding areas of Sungai Buloh, Selayang, Rawang and Kepong. Having been established in the area since 1929, there have been innumerable changes to the surrounding areas in terms of land use, boundary demarcations of adjoining plots of land and major infrastructural developments within and outside of FRIM. Hence, it was found necessary to reconfirm and reestablish the outer boundaries of FRIM. On the 2 August 2007, FRIM obtained the land titles from the Selangor State Government.

FRIM covering a total of 485.2 hectares can be divided into three major plots. These plots labeled as Plots A, B and C were 236.1, 81.8 and 167.3 hectares respectively. The figure below illustrates the relative positions of the plots in FRIM.



Survei di sempadan luar FRIM dijalankan oleh Syarikat Jurukur Putra dengan pengawasan oleh Unit Kejuruteraan Hutan. Kerja-kerja bermula pada bulan Ogos 2007 berdasarkan peta rujukan Pelan Pra-perhitungan Untuk Pemberimilikan Tanah Kerajaan Kepada Institut Penyelidikan Malaysia (FRIM), bertarikh 23 Mac 2006. Selepas kerja survei selesai, batu sempadan diletakkan bagi menandakan dengan jelas kawasan FRIM. Terdapat beberapa percanggahan dalam sempadan FRIM yang ada sekarang. Beberapa batu sempadan didapati berada di bahagian luar kawasan; manakala sebahagian lagi terdapat di dalam kawasan pagar FRIM.



Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali dan Y.Bhg. Dato' Dr. Abd. Latif Mohmod memegang hak milik tanah serta peta sempadan tanah FRIM
Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali and Y.Bhg. Dato' Dr. Abd. Latif Mohmod holding the land titles and map of the land boundaries of FRIM

The survey of the outer boundaries of FRIM was undertaken by Syarikat Jurukur Putra with monitoring oversight by FRIM's Forest Engineering Unit. Work began in the month of August 2007 based on the "Pelan Pra – Hitungan Untuk Pemberimilikan Tanah Kerajaan Kepada Institut Penyelidikan Malaysia (FRIM)" reference map, dated 23 March 2006. After the survey was completed, boundary stones were then established to clearly mark the area of FRIM. A number of discrepancies were found in FRIM's current boundary. Some of the newly established boundary stones were found to be outside; while some were within the existing fence of FRIM.



Beberapa orang kakitangan FRIM menanam batu sempadan FRIM
Some FRIM staff establishing the boundaries of FRIM



Gambar menunjukkan tiang sempadan lama yang terpaksa digali keluar dan ditanam dengan batu sempadan yang baharu.
Picture showing an old boundary pole being dug up and replaced by a new boundary stone.

Taman Sains Rimba Baharu

Sebuah Taman Sains Rimba telah dibangunkan di dalam kawasan berhampiran dengan Sekolah Menengah Kebangsaan Kepong. Sebelum ini tanah seluas tiga hektar ini didiami oleh setinggan. Kerja-kerja infrastruktur bagi mewujudkan Taman Sains Rimba bermula dengan pembersihan setinggan yang berakhir pada September 2007. Pembersihan serpihan dan runtuhan serta kerja-kerja tanah terus dijalankan sehingga ke akhir tahun 2007. Kakitangan FRIM turut mengadakan siri gotong-royong dengan menanam serta memulihkan kawasan tersebut. Taman Sains Rimba yang baharu ini dikenali sebagai "Taman Warisan" dan akan menjadi sebahagian daripada taman-taman warisan yang terdapat di Kuala Lumpur dan Selangor.

New Forest Science Park



Rumah setinggan dirobohkan untuk Taman Warisan
Squatter houses cleared for the "Taman Warisan"

A new Forest Science Park was established in an area near the Sekolah Menengah Kebangsaan Kepong. Previously this land was occupied by squatters and covered an area of about three hectares. Infrastructural work for the establishment of the Forest Science Park began with the clearing of squatters and by September 2007 this was completed. Land clearing of debris and earthworks continued for much of the year of 2007. FRIM staff also held a number of gotong royong's where FRIM staff volunteered their help to plant and rehabilitate the area. This new Forest Science Park known as "Taman Warisan" will form part of the Selangor and Kuala Lumpur heritage parks.



Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, Y.Bhg. Dato' Dr. Abd. Latif Mohmod serta beberapa orang kakitangan FRIM menanam pokok pada majlis gotong-royong di Taman Sains Rimba
Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, Y.Bhg. Dato' Dr. Abd. Latif Mohmod and some FRIM staff planting a tree in a gotong-royong at the Forest Science Park



Kakitangan FRIM menanam pokok-pokok renek di tepi pagar Taman Sains Rimba
FRIM staff planting some shrubs near the fence of the New Science Park



Gotong royong di Taman Sains Rimba Baharu
Gotong royong at the New Forest Science Park

Stesen Penyelidikan Luar dan Skim Anak Angkat Ladang Hutan

FRIM Research Stations and Adopted Plantation Schemes

Pembangunan Stesen Penyelidikan Luar FRIM

Stesen Penyelidikan Luar (SPL) FRIM merupakan salah satu daripada strategi FRIM ke arah memantapkan penyelidikan yang merangkumi pelbagai bidang kajian. Sehingga kini, tujuh buah SPL berjaya ditubuhkan.

Stesen Penyelidikan <i>Research Station</i>	Lokasi <i>Location</i>	Kegiatan <i>Activity</i>
Mata Air	Perlis	Teak Research
Bidor	Perak	Tin tailing area rehabilitation
Pasoh	Negeri Sembilan	Centre for ecological studies
Segamat	Johor	Agroforestry research
Maran	Pahang	Herbal development centre
Jengka	Pahang	Centre for sustainable forest management
Setiu	Terengganu	Bris soil research

Stesen Penyelidikan Segamat

Kawasan seluas 722 ekar ini merangkumi kawasan yang mempunyai pelbagai tanah dan topografi. Ia bersempadan dengan negeri Pahang di sebelah utara, rizab hutan simpan di selatan, rizab hidupan liar di timur dan tanah bermilik di barat.

Antara wawasan FRIM bagi SPL Segamat ini ialah;

- ladang contoh sebagai rujukan informasi pengurusan perladangan hutan yang komprehensif dan berkekalan serta sistem perhutanan tani menggunakan pengetahuan dan teknologi terkini hasil usaha-usaha penyelidikan FRIM,
- menguji perkembangan/pertumbuhan industri ladang hutan,
- menjadi salah satu sumber bahan mentah dan ekonomi negara,
- kawasan ekopelancongan berasaskan perhutanan, dan
- mewujudkan pusat pemuliharaan dan pengeluaran spesies hutan

Bagi mencapai wawasan ladang contoh, lebih kurang 300 ekar sedang diuruskan secara intensif menggunakan teknologi dan pengetahuan terkini yang terhasil daripada penyelidikan di FRIM. Sehingga April 2007, lebih daripada 70,000 pokok daripada pelbagai spesies tempatan dan eksotik telah ditanam iaitu jelutong, sentang, *Khaya ivorensis*, *Khaya senegalensis*, merawan siput jantan, meranti temak nipis, karas dan meranti temak. Beberapa penyelidikan juga sedang giat dijalankan

Development of FRIM's Research Station

One of FRIM's important strategy to concentrate its research efforts in specialised fields is in the development of Research stations. Currently there are seven Research Stations at different locations carrying out a variety of research activities.

Segamat Research Station

A total of 722 acres in the Segamat Research Station, encompassing differing soil types and topographies has been set aside for Agroforestry research. To the north of the research station is the Pahang state boundary, the south adjoins a forest reserve, the east is a wildlife sanctuary and to the west are inhabited land areas.

FRIM's objective for the Segamat research station are

- *As a model plantation which serves as a reference for the comprehensive application for good forest plantation management and an agroforestry system which uses the latest technology and research findings from FRIM*
- *As a stimulus to the development of Agroforestry industry in Malaysia*
- *As a source of raw materials for the economy of the country*
- *As a forest ecotourism destination*
- *To create a rehabilitation and conservation centre for forest species*

*A land area of about 300 acres has been set aside for intensive development as a model plantation. About 70,000 plants encompassing a variety of local plant and exotic species has been planted up till April 2007. These included jelutong, sentang, *Khaya ivorensis*, *Khaya senegalensis*, merawan siput jantan, meranti temak nipis, karas and meranti temak. Research*

termasuklah petak kajian pokok untuk mengkaji tumbesaran pokok, penyakit dan serangga perosak, mikrob tanah serta keupayaan spesies melalui rintangan tanaman secara perladangan.

Antara daya tarikan SPL Segamat yang sedang diusahakan ialah pembinaan tiga empangan yang dihiasi dengan landskap spesies-spesies hutan sebagai kawasan riadah kepada para pengunjung untuk menikmati pemandangan di sekitarnya. Ia juga akan berfungsi sebagai kawasan tadahan air untuk kegunaan stesen. Tiga wakaf dengan kemudahan tandas juga akan disediakan untuk keselesaan para pengunjung. Reka bentuk wakaf juga membolehkan ia berfungsi sebagai tempat perbincangan/ taklimat kepada para pelawatnya.

Dari segi keselamatan, memandangkan kawasan SPL ini bersempadan dengan rizab hidupan liar, parit (*elephant trench*) telah digali di kawasan yang bersempadan dengan rizab ini bagi mencegah kemasukan binatang liar.

Skim Anak Angkat Ladang Hutan FRIM

FRIM telah lama berkecimpung dalam penyelidikan tanaman pokok-pokok hutan. Dengan pengalaman dan maklumat yang terkumpul, FRIM berhasrat untuk mengembangkan lagi penanaman pokok-pokok hutan di Malaysia khususnya kepada pihak swasta dan pekebun kecil. Projek Skim Anak Angkat Hutan Ladang yang pertama telah dijalankan di Kuala Perlis oleh seorang pemilik tanah persendirian seluas lima ekar. Berikutnya projek ini telah diperkenalkan di seluruh Negeri Perlis dan mendapat sambutan yang menggalakkan tidak hanya di Perlis tapi juga di Negeri-negeri di Semenanjung Malaysia.



Jati ialah spesies utama yang ditanam di bawah Skim Anak Angkat Ladang Hutan
Teak is the main species planted in the Adopted Plantation Scheme

was also carried out on plant growth, diseases, insect pest infestation, soil microbes in the plantation.

Infrastructural development of the site included the building of three dams to serve as a catchment for water. The dams were also appropriately landscaped with forest species. Toilet and meeting facilities were also built for tourists. Since the research station was close to a wildlife sanctuary, for safety reasons an elephant trench was dug for the passage of wildlife.

Adopted Plantation Scheme for FRIM



Skim Anak Angkat Ladang Hutan konsep dalam perhutanan tani
Agro - forestry concept in an Adopted Plantation Scheme

FRIM has gained considerable experience in the planting of forest species since its inception. With this experience and knowledge, FRIM is well placed to stimulate interest in developing forest plantations for the private and small holding sector. The first Adoption Plantation Scheme was conducted with a private individual who possessed a five acre lot in Perlis. Its success, made the scheme well known in Perlis as well as throughout Peninsular Malaysia. In 1992 when the Forest Plantation Division in FRIM was set up, the scheme was extended to other areas in Peninsular Malaysia.



Skim Anak Angkat di Negeri Perlis
Adopted Plantation Scheme in Perlis

Projek ini menjadi bertambah terkenal lagi apabila Bahagian Hutan Ladang ditubuhkan pada tahun 1992.

Tujuan utama Skim Anak Angkat Ladang Hutan ini adalah untuk menggalakkan pekebun kecil menanam spesies pokok-pokok hutan yang cepat membesar dan bermutu tinggi di tanah kepunyaan mereka sebagai suatu pelaburan jangka panjang. FRIM akan memainkan peranan sebagai penasihat dalam aspek-aspek teknikal yang berkaitan termasuk teknik penanaman, kadar pembajaan, sistem pemangkasan dan kawalan penyakit dan serangga yang berhubung kait dengan keadaan tempat dan masa.

Dengan usaha ini, perladangan hutan akan dapat dikembangkan kepada rakyat dan FRIM dapat menyalurkan hasil-hasil penyelidikan terus kepada pengguna.

- Mengembangkan konsep perhutanan secara perhutanan tani.
- Meningkatkan produktiviti tanah terbiar dengan tanaman pokok-pokok hutan.
- Menjadikan satu program pengembangan bagi penyaluran teknologi FRIM kepada pengguna
- Membolehkan FRIM menggunakan tapak kawasan bagi menjalankan penyelidikan tanaman jati
- Menaikkan nama FRIM di kalangan rakyat
- Menggalakkan FRIM berinteraksi dengan pekebun kecil, agensi pertanian dan pihak swasta

Sehingga kini, 37 petani telah menyertai Skim ini. Projek yang berlandaskan sistem perhutanan-tani ini berasaskan tanaman utamanya jati dan tanaman selingan seperti cili, pegaga dan herba (tongkat ali dan kaci fatimah). Peringkat umur projek ini adalah antara 10 hingga 18 tahun. Dari segi tumbesaran pokok jati di bawah skim ini amat menggalakkan; kesemua ladang mencapai purata pertumbuhan tahunan (MAI) dari segi diameternya lebih daripada 2 cm (purata MAI yang disasarkan).

Peserta yang mengamalkan sistem perhutanan tani telah mendapat faedah dari awal lagi. Salah satu contohnya, seorang peserta telah memperoleh pendapatan sebanyak RM12,000 setahun untuk dua tahun pertama dengan penjualan hasil cili. Tiga peserta telah berjaya menjual kesemua balak hasil daripada ladang Skim ini. Dua lagi peserta telah berjaya menjual hasil penjarangan di ladang jatinya. Oleh kerana kebanyakan ladang masih di peringkat umur 10 tahun, masih awal lagi untuk kita merumuskan kejayaan sebenarnya projek ini. Setelah semua ladang ini dapat ditebang tuai, data penjualan kayu ini akan digunakan untuk menilai pencapaian sebenarnya projek ini.

The objective of the Adoption Plantation Scheme is to encourage long term investment of small holding plantations in fast growing and desirable forest species. FRIM would help by providing critical technical assistance such as plantation techniques, rate of fertilization and pest control. With this, FRIM would be able to transfer its technical know how to those who need it.

With this scheme in place FRIM hopes to benefit its various stakeholders in the following areas

- *To develop the concept of plantation forestry*
- *To increase productivity of unused land by growing them with forest plant species*
- *The program would serve as a conduit for technological transfer of FRIM know how to its stakeholders*
- *Enabling FRIM to conduct research in Teak plantations as most schemes involved the growing of Teak*
- *To engender interaction between FRIM and small holding plantations, agricultural agencies and the private sector*

Currently 37 farmers are involved in the Scheme. Where agroforestry is practised, most have teak plants growing together with agricultural crops such as chillies, pegaga, and herbal plants like tongkat ali and kaci fatimah. Most of these projects are between 10 to 18 years duration. Teak growth rates in these schemes were encouraging.

The benefits to those involved were obvious. One participant was able to realise an income of RM12,000 per year for two years from the sale of chillies. Three participants were able to sell all the timber produced by their plantations. Since the scheme is only 10 years old, it is still too early to judge the success of the scheme. Until all the timber has been harvested, and the data from the sale of these timber collected would FRIM be able to judge whether the scheme was a success.



Sebahagian hasil balak jati daripada Skim Anak Angkat Teak log harvest from an Adopted Plantation Scheme



Petunjuk Prestasi Utama Key Performance Indicators

Objektif

- Menjana pengetahuan dan membangunkan teknologi yang bersesuaian untuk pemuliharaan, pengurusan, pembangunan dan penggunaan sumber-sumber hutan
- Menyediakan perkhidmatan berasaskan penyelidikan yang memenuhi keperluan pelanggan
- Mengkomersialkan hasil-hasil penyelidikan dan pembangunan
- Memperoleh serta menyebarkan maklumat
- Meningkatkan kesedaran terhadap peranan alam sekitar dan pemuliharaan hutan
- Mencapai kecemerlangan dan memperoleh kepimpinan dalam penyelidikan hutan tropika

Objectives

- *To acquire knowledge and to develop technology that is pertinent to the conservation, management, development and utilisation of forestry resources*
- *To meet the needs of clients through extension of services based on research*
- *To commercialise R&D findings*
- *To obtain and disseminate knowledge*
- *To promote awareness on the role of environment and forestry conservation*
- *To achieve excellence and to gain leadership in tropical forestry research*

Petunjuk Prestasi Utama

- Pemindahan teknologi kepada industri perhutanan melalui seminar, kursus dan bengkel
- Peningkatan perkhidmatan teknikal kepada industri perhutanan untuk menghasilkan produk yang berkualiti
- Pengkomersialan hasil penyelidikan melalui khidmat perundingan dan projek kerjasama
- Penggalakan kesedaran peranan hutan dan kepentingan pemuliharaan hutan
- Peningkatan prestasi dan kecekapan kakitangan melalui program pembangunan sumber manusia yang berterusan

Key Performance Indicators

- *Technology transfer to forestry based industries through seminars, courses and workshops*
- *Extension of technical services to enable the manufacture of quality products by the forestry based industries*
- *Commercialisation of research findings through consultancy*
- *Services and collaborative projects*
- *Promotion of awareness on the role of forests and the importance of forestry conservation*
- *Improvement of staff performance and efficiency through continuous human resource development*

Petunjuk Prestasi Utama

Key Performance Indicators

Pencapaian <i>Achievement</i>	2006	2007
Jumlah projek penyelidikan Science Fund / <i>Total number of Science Fund projects</i>	38	52
Jumlah penerbitan yang dihasilkan / <i>Total number of publications</i>	662	656
Jumlah Penerbitan di dalam jurnal / <i>Total number of journal publications</i>	-	68
Tesis / <i>Theses</i>	16	18
Dialog dengan industri / <i>Dialogues with the industries</i>	15	18
Seminar dan bengkel / <i>Seminars and workshops</i>	49	29
Bilangan kilang perusahaan kecil yang menerima faedah daripada R&D / <i>Number of factories SMI's that benefited from R&D</i>	34	30
Bilangan kilang yang menggunakan mesin atau teknologi FRIM / <i>Number of factories that used FRIM's equipment or technology</i>	286	300
Kuantiti biji benih spesies hutan yang dikutip (kg) / <i>Quantity of forest tree seeds collected (kg)</i>	489	390
Latihan teknikal yang dianjurkan / <i>Number of technical trainings organised</i>	74	38
Bilangan paten / <i>Number of patents</i>	15	4
Bilangan produk yang sedia dikomersialkan / <i>Number of Products ready to be commercialised</i>	-	7
Bilangan ujian yang dijalankan / <i>Number of tests conducted</i>		
Pintu rintangan api / <i>Fire doors</i>	19	16
Perabot / <i>Furniture</i>	224	232
Awetan kayu / <i>Wood preservation</i>	1718	1088
Kejuruteraan Kayu / <i>Timber Engineering</i>	5	300
Pengecaman kayu / <i>Wood Identification</i>	824	1447
Ujian komposit kayu / <i>Wood composite test</i>	176	270
Ujian fungi / <i>Fungi test</i>	7	17
Ujian pulpa dan kertas / <i>Pulp and paper test</i>	766	224
Ujian ubatan herba / <i>Medicinal herbs test</i>	276	384
Khidmat perundingan / <i>Consultancy services</i>	25	35
Bilangan projek penyelidikan dengan agensi luar / <i>Number of research projects with external agencies</i>	25	39
Pameran / <i>Exhibitions</i>	29	26
Jumlah pelawat ke FRIM / <i>Total number of FRIM visitors</i>	58562	59557



Anugerah dan Pelantikan

Awards and Appointments

Anugerah Bintang Kebesaran

Pada tahun ini, Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, Ketua Pengarah FRIM telah dikurniakan bintang kebesaran Panglima Jasa Negara (PJN), Darjah Yang Mulia Jasa Negara Pangkat Pertama oleh Duli Yang Maha Mulia Seri Paduka Baginda Yang di-Pertuan Agong sempena Hari Keputeraan baginda.

Seramai enam orang pegawai telah dikurniakan pingat kebesaran pada tahun ini. Lima orang kakitangan menerima anugerah Negara sebagai menghargai sumbangan mereka kepada negara di samping sumbangan dalam bidang penyelidikan oleh Duli Yang Maha Mulia Seri Paduka Baginda Yang di-Pertuan Agong sempena Hari Keputeraan baginda. Mereka terdiri daripada:

Nama <i>Name</i>	Anugerah <i>Award</i>
Dr. Abdul Rahim Nik	Kesatria Mangku Negara (KMN)
Dr. Shamsudin Ibrahim	Ahli Mangku Negara (AMN)
Dr. Lee Su See	Ahli Mangku Negara (AMN)
Dr. Norini Haron	Ahli Mangku Negara (AMN)
Dr. Ahmad Fauzi Puasa	Ahli Mangku Negara (AMN)

Seorang lagi kakitangan FRIM iaitu Dr. Rasadah Mat Ali turut dikurniakan Pingat Darjah Ahli Mahkota Perlis (AMP) oleh Duli Yang Maha Mulia Raja Perlis pada 15 November 2007.

Honorary Awards

During the year, Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, the Director General of FRIM was conferred the Honorary Award of Panglima Jasa Negara (PJN), Darjah Yang Mulia Jasa Negara Pangkat Pertama by His Majesty Seri Paduka Baginda Yang di-Pertuan Agong in conjunction with His Majesty's birthday.

A total of six staff members were conferred honorary awards during the year. Five staff members of FRIM were conferred national awards for their service to research and the nation by His Majesty Seri Paduka Baginda Yang di-Pertuan Agong in conjunction with his Majesty's birthday. They were:



Dr. Shamsudin Ibrahim sedang menerima pingat AMN
Dr. Shamsudin Ibrahim receiving the AMN medal



Dr. Rasadah Mat Ali sedang menerima pingat AMP
Dr. Rasadah Mat Ali receiving the AMP medal

Anugerah Penerbitan



Y.Bhg. Dato' Dr. Abd. Latif Mohmod menerima piala Johan Anugerah Laporan Kencana daripada Datuk Seri Utama Dr. Rais Yatim.
Y.Bhg. Dato' Dr. Abd. Latif Mohmod receiving the Kencana Report Award from Datuk Seri Utama Dr. Rais Yatim.

FRIM Menang Anugerah Laporan Kencana 2006

FRIM telah berjaya memenangi tempat pertama Anugerah Laporan Kencana, iaitu anugerah laporan tahunan terbaik bagi sektor badan berkanun. FRIM juga turut memenangi Hadiah Khas Kategori Teknikal. Anugerah disampaikan oleh Menteri Kebudayaan, Kesenian dan Warisan Malaysia, Datuk Seri Utama Dr. Rais Yatim dalam Majlis Anugerah Citra Wangsa Malaysia 2006 di Auditorium Perdana, Angkasapuri, Kuala Lumpur pada 24 Ogos 2007. Timbalan Ketua Pengarah (Operasi), Y.Bhg. Dato' Dr. Abd. Latif Mohmod dan Pengarah Kanan Bahagian Pengurusan Penyelidikan, Dr. Chan Hung Tuck telah menerima anugerah tersebut bagi pihak FRIM. Majlis tersebut dianjurkan oleh Dewan Bahasa dan Pustaka dengan kerjasama Radio Televisyen Malaysia. Ini merupakan kali keempat FRIM memenangi anugerah ini.

Anugerah Laporan Kencana ialah anugerah yang diberikan kepada badan berkanun yang telah menggunakan bahasa kebangsaan yang berkualiti tinggi dalam penulisan laporan tahunan. Anugerah ini diadakan sejak 1999 dengan kerjasama Persatuan Badan Berkanun Malaysia. Kriteria utama penghakiman ialah bahasa, laras bahasa, penggunaan istilah, estetika dan gaya penulisan.

Pensijilan Korporat ISO

Program kesedaran pelaksanaan proses kerja Pensijilan Korporat FRIM MS ISO 9001:2000 secara menyeluruh di FRIM telah dilancarkan dengan rasminya oleh Y.B. Dato' S. Sothinathan, Timbalan Menteri NRE pada 14 Ogos 2007. Selepas pihak pengurusan dan kakitangan FRIM bertungkus-lumus selama empat bulan, Lloyd's Register of Quality Assurance (LRQA) telah menganugerahi FRIM Sijil Kelulusan

Publication Award



Sijil, piala Johan Anugerah Laporan Kencana dan Hadiah Khas Kategori Teknikal
Certificate, Kencana Report Award and Special Technical Category Prize

FRIM Wins Kencana Report 2006 Award

FRIM won the first prize in the Kencana Report Award which honoured the best annual report in the statutory body sector. FRIM also won another prize which was the Special Prize in the Technical Category. The awards were presented by the Minister of Culture, Arts and Heritage, Datuk Seri Utama Dr. Rais Yatim in the Citra Wangsa Malaysia Award 2006 ceremony held at the Perdana Auditorium, Angkasapuri, Kuala Lumpur on 24 August 2007. Deputy Director General (Operations), Y.Bhg. Dato' Dr. Abd. Latif Mohmod and Senior Director Research Management Division, Dr. Chan Hung Tuck received the awards on behalf of FRIM. The presentation ceremony was organized by Dewan Bahasa dan Pustaka, with cooperation from Radio Televisyen Malaysia. This was a fourth time win for FRIM.

The Kencana Report Award is given to a statutory body that has the best Bahasa Malaysia text in their annual report. This award was initiated in 1999 with cooperation from the Malaysian Statutory Bodies Association. The main criteria for the award were language, grammar, usage of terms, esthetics and style of writing.

ISO Corporate Certification

On the 14 August 2007, Y.B. Dato' S. Sothinathan Deputy Minister of the NRE launched the awareness programme for the implementation of the MS ISO 9001:2000 Corporate Certification work processes for the whole institute of FRIM. After four months of intense hard work on the part of FRIM Management and staff, Lloyd's Register of Quality Assurance awarded the Certificate of Approval to FRIM as an ISO compliant Institution on the 24 December 2007. The Certificate of Approval covered four Quality System Management Standards. They were ISO 9001:2000, EN ISO 9001:2000, BS EN ISO

yang mengesahkan FRIM selaku institusi yang telah mematuhi ISO pada 24 Disember 2007. Sijil kelulusan ini merangkumi empat Piawaian Pengurusan Sistem Kualiti iaitu ISO 9001:2000, BS EN ISO 9001:2000 dan MS ISO 9001:2000. Sijil Kelulusan disampaikan oleh En. Lee Ng Chai yang mewakili LRQA kepada Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, Ketua Pengarah FRIM; disaksikan oleh Y.B. Dato' Seri Azmi Khalid, Menteri NRE dan Y.Bhg. Datuk Suboh Mohd. Yassin, Pengerusi MFRDB di Kementerian Sumber Asli dan Alam Sekitar, Putrajaya. Satu lagi majlis telah diadakan di FRIM semasa Perhimpunan Bulanan. En. Azhar Sulaiman dari LRQA menyampaikan sijil kepada Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali.



En. Azhar Sulaiman wakil Lloyd menyampaikan Sijil Kelulusan kepada Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali
Lloyd's representative En. Azhar Sulaiman presenting the Certificate of Approval to Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali



Sijil Kelulusan MS ISO 9001:2000 dari Lloyd's Register Quality Assurance untuk FRIM
MS ISO 9001:2000 Certificate of Approval from Lloyd's Register Quality Assurance for FRIM

Anugerah Inovasi

Pada tahun ini, saintis-saintis FRIM telah berjaya memenangi beberapa anugerah inovasi.

Pada Pameran Reka Cipta Antarabangsa yang ke- 35 yang bertema *New Techniques and Products of Geneva* yang diadakan pada 17 hingga 21 April 2007, di Palexpo, Geneva,

9001:2000 and the MS ISO 9001:2000. The Certificate of Approval was presented by Mr Lee Ng Chai representative for Lloyd's Register Quality Assurance (LRQA) to Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, General Director of FRIM in the presence of Y.Bhg. Dato' Seri Azmi Khalid Minister of the NRE and Y.Bhg. Datuk Suboh Yassin, Chairman of the MFRDB at the Ministry of Natural Resources and Environment at Putrajaya. Another ceremony was also conducted at FRIM where Encik Azhar Sulaiman from Lloyd's Register Quality Assurance (LRQA) presented the certificate to Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali during FRIM's monthly Assembly.



Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali menerima sijil kelulusan daripada En. Lee Ng Chai disaksikan oleh Y.B. Dato' Seri Azmi Khalid dan Y.Bhg. Datuk Suboh Mohd. Yassin
Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali receiving the Certificate of Approval from Mr. Lee Ng Chai in the presence of Y.B. Dato' Seri Azmi Khalid and Y.Bhg. Datuk Suboh Mohd. Yassin

Innovation Awards

During the year, a number of innovation awards were won by FRIM's Scientists.

At the 35th International Exhibition of Inventions themed "New Techniques and Products of Geneva" held on the 17 to 21 April 2007, at Palexpo, Geneva, Switzerland, Vimala Subramaniam was awarded "Best Woman Inventor" by the International Federation of Inventor's Association (IFIA).



Vimala Subramaniam menerima trofi Best Woman Inventor- Lady Prize 2007
Vimala Subramaniam receiving the trophy for the "Best Woman Inventor- Lady Prize 2007" award



Trofi IFIA Lady Prize 2007
The IFIA Trophy for the Lady Prize 2007

Switzerland, Vimala Subramaniam telah dianugerahkan Best Woman Inventor oleh International Federation of Inventor's Association (IFIA).

Pada pameran tersebut juga, kumpulan penyelidik FRIM yang terdiri daripada Vimala Subramaniam, Mohd. Ilham Adenan, Abdul Rashih Ahmad, Rohana Sahdan, Juliza Mohamed, dan Rasadah Mat Ali telah memenangi pingat perak bagi inovasi projek mereka yang bertajuk “Natural Antioxidant Standardized Extracts (NEXES, OSTEEN & GUAVYN) and Their Products (AVONYS, CARTILAC, STYN & BEAUTE)”.



Sijil Pingat Perak MTE 2007 bagi inovasi yang bertajuk “C-Bam For Formwork”
Certificate of the MTE 2007 Silver award for their innovation entitled “C-Bam For Formwork”

Pada pameran Malaysia Technology Exposition 2007 (MTE 2007) bersempena dengan Pertandingan Inovasi dan Reka Cipta 2007 yang diadakan pada 29 hingga 31 Mac 2007 di PWTC, Kuala Lumpur, dua kumpulan saintis FRIM berjaya memenangi satu pingat emas dan satu pingat perak.



Sijil dan pingat perak yang dimenangi bagi projek yang bertajuk “Natural Antioxidant Standardized Extracts (NEXES, OSTEEN & GUAVYN) and Their Products (AVONYS, CARTILAC, STYN & BEAUTE)”.
Certificate and medal of the Geneva Silver award for their project entitled “Natural Antioxidant Standardized Extracts (NEXES, OSTEEN & GUAVYN) and Their Products (AVONYS, CARTILAC, STYN & BEAUTE)”.

At the same exhibition, a team comprising Vimala Subramaniam, Mohd. Ilham Adenan, Abdul Rashih Ahmad, Rohana Sahdan, Juliza Mohamed, and Rasadah Mat Ali, won the silver medal for Innovation for their project entitled “Natural Antioxidant Standardized Extracts (NEXES, OSTEEN & GUAVYN) and Their Products (AVONYS, CARTILAC, STYN & BEAUTE)”.



Sijil pingat emas MTE 2007 bagi inovasi yang bertajuk “Wood-V-Bam”.
Certificate of the MTE 2007 Gold award for their innovation entitled “Wood-V-Bam”.

At the Malaysia Technology Exposition 2007 (MTE 2007) in conjunction with the Sixth Invention & Innovation Competition 2007 held on the 29 to 31 March 2007 at PWTC, Kuala Lumpur, two FRIM scientist teams won one gold and silver awards each.

The gold award was won by the team comprising Mohd. Tarmizi Mustafa, Hamdan Husain, Wan Tarmeze Wan Ariffin,

Pingat emas dimenangi oleh kumpulan saintis yang terdiri daripada Mohd. Tarmizi Mustafa, Hamdan Husain, Wan Tarmeze Wan Ariffin, Khairul Awang, Emlee Mohd Taib, dan Abd. Rahim Ahmad bagi inovasi mereka yang bertajuk “Wood-V-Bam”.

Kumpulan yang terdiri daripada Mohd. Tarmizi Mustafa, Wan Tarmeze Wan Ariffin, Mohd. Khairun Anwar Uyop, Mohamad Jani Saad, Emlee Mohd. Taib, dan Abd. Rahim Ahmad pula memenangi pingat perak bagi inovasi yang bertajuk “C-Bam Formwork.”

Sempena Invention, Innovation, Industrial Design & Technology Exhibition 2007 (ITEX) yang diadakan pada 18 hingga 20 Mei 2007 di Kuala Lumpur, dua kumpulan saintis FRIM berjaya memenangi pingat perak.

Mereka terdiri daripada Ong Boo Kean, Rasadah Mat Ali, Mohd. Shahidan Mohd. Arshad, Mohd. Zamree Md Shah, Pin Kar Yong, Hada Masayu Ismail, Noor Rasyila Mohd. Noor, Abdull Rashih Ahmad dan Mohd. Radzi Ahmad bagi inovasi mereka yang bertajuk “Body Weight Maintenance Herbal Tea”.

Satu lagi kumpulan yang memenangi pingat perak ialah Mailina Jamil, Nor Azah Mohd. Ali, Ong Boo Kean, Saidatul Husni Saidin, Siti Asha Abu Bakar, Ahmad Hafiz's Hamsan, Mazura Pisar, Mohd. Faridz Zoll Patah, Abu Said Ahmad, Nik Yasmin Nik Yahya dan Ibrahim Jantan bagi inovasi yang bertajuk “Natural inflammation Active Ingredient from Alpinia galangal:

Pengiktirafan

Selain dilantik sebagai Ahli Audit Sains bagi Royal Botanic Gardens (RBG), Kew, UK pada tahun lepas, Dr. Saw Leng Guan turut dipilih sebagai ahli Lembaga Editor Kew Bulletin dan editor Journal of Tropical Ecology pada 2007.

Komersialisasi

Tujuh produk telah dikenal pasti berpotensi untuk dikomersialkan, iaitu:

1. DEESREPT Merupakan produk pencegah nyamuk yang mengandungi minyak pati bioaktif. Kumpulan penyelidik

Khairul Awang, Emlee Mohd Taib, and Abd. Rahim Ahmad for their innovation entitled “Wood-V-Bam”.

The silver award was won by the team comprising Mohd. Tarmizi Mustafa, Wan Tarmeze Wan Ariffin, Mohd. Khairun Anwar Uyop, Mohamad Jani Saad, Emlee Mohd. Taib, and Abd. Rahim Ahmad for their innovation entitled “C-Bam Formwork.”

At the 18th International Invention, Innovation, Industrial Design & Technology Exhibition 2007 (ITEX) held on the 18 to 20 May 2007 at Kuala Lumpur, two FRIM Scientist's teams won silver awards.



A silver award was won by the team comprising Ong Boo Kean, Rasadah Mat Ali, Mohd. Shahidan Mohd. Arshad, Mohd. Zamree Md Shah, Pin Kar Yong, Hada Masayu Ismail, Noor Rasyila Mohd. Noor, Abdull Rashih Ahmad and Mohd. Radzi Ahmad for their innovation entitled “Body Weight Maintenance Herbal tea”.

Another silver award was won by the team comprising Mailina Jamil, Nor Azah Mohd. Ali, Ong Boo Kean, Saidatul Husni Saidin, Siti Asha Abu Bakar, Ahmad Hafiz's Hamsan, Mazura Pisar, Mohd. Faridz Zoll Patah, Abu Said Ahmad, Nik Yasmin Nik Yahya and Ibrahim Jantan for their innovation entitled, “Natural inflammation Active Ingredient from Alpinia galangal:

Sijil untuk pingat perak ITEX 2007 bagi inovasi “Body Weight Maintenance Herbal Tea”.
Certificate of the ITEX 2007 Silver award for their innovation entitled “Body Weight Maintenance Herbal Tea”.

Recognition

Dr. Saw Leng Guan in addition to his appointment of Member of Science Audit to the Royal Botanic Gardens (RBG), Kew, UK last year was also elected as Editorial Board member of the Kew Bulletin and an editor for the Journal of Tropical Ecology in 2007.

Commercialisation

A total of seven products were identified to have commercial potential they are:-

1. DEESREPT This product is a Mosquito repellent containing bioactive essential oils to repel mosquitoes. A team comprising of Nor Azah Mohd. Ali, Zaridah Mohd. Zaki,

- yang membangunkan produk ini terdiri daripada Nor Azah Mohd. Ali, Zaridah Mohd. Zaki, Malina Jamil, Abd. Majid Jalil, Saidatul Husni Saidin, Mohd. Faridz Zollpatah, dan Abu Said Ahmad.
- WOOD-V-BAM. Produk yang diperbuat daripada buluh pencong yang direkat dengan resin bagi membentuk komponen berstruktur yang sesuai untuk perabot. Kumpulan yang mereka cipta produk ini terdiri daripada Mohd. Tamizi Mustafa; Hamdan Hussain, Wan Tarmeze Wan Arifin, Khairul Awang, Emlee Mohamad Taib dan Abd Rahim Ahmad.
 - C-BAM FOR FORMWORK. Papan komposit yang dihasilkan dengan merekat dan menekan buluh secara berselang-seli. Kumpulan yang membangunkan produk ini ialah Mohd. Tamizi Mustafa; Wan Tarmeze Wan Arifin, Mohd. Khairun, Mohd. Jani, Saimin, Emlee Mohamad Taib dan Abd Rahim Ahmad.
 - POPS Lumber (Parallel Oil Palm Strand Lumber). Merupakan bahan alternatif dalam produk yang berasaskan kayu seperti bingkai untuk struktur binaan dan pagar. Produk ini dibangunkan oleh Wan Tarmeze Wan Arifin, Khairul Awang, Marzalina Mansor, Mohd. Tamizi Mustafa dan Abdul Hamid Salleh.
 - CO-E. Ekstrak pokok *Cerbera odollam* Gaertn (pong-pong) yang aktif menentang titisan siri sel kanser payu dara (MCF7 & T47D). CO-E merupakan fraksi etil asetat daripada *Cerbera odollam* yang dipisahkan menggunakan pendekatan pemisahan berpanduan biocerakanan dan ia di dapati mengandungi kesan sitotoksik ke atas pelbagai titisan sel kanser payu dara manusia. Kumpulan Mohd. Ilham Adenan, Siti Syarifah Mohd. Mutalip, Nurhanan Murni Yunos, Asiah Osman, Norhayati Ismail dan Mohd. Hafidz Hadi Abdullah bertanggungjawab membangunkan produk ini.
 - CaFR 04 sebagai bahan tanaman elit daripada *Centella asiatica* (L.) Urb. (pegaga). Daripada 14 aksesori spesies *C. asiatica* (L.) Urb. yang terpilih, CaFR04 telah dikenal pasti sebagai bahan tanaman elit. Aksesori ini mempunyai prestasi pertumbuhan yang baik serta mempunyai sebatian bioaktif dengan aktiviti antioksidan yang tinggi. Pertumbuhan aksesori optimum turut ditentukan. Kumpulan yang membangunkan produk ini terdiri daripada Mohd. Ilham Adenan, Rafedah Abas, Nurhanan Murni Yunos, Lili Shahira Husin, Mohd. Radzi Ahmad dan Mohd. Hafidz Hadi Abdullah.
 - Ekstrak ECfC 06 yang dipiawaikan daripada *Erythroxylum cuneatum* (Miq) Kurz. forma *cuneatum*. Produk mengandungi ekstrak cinta mula dan 10% β -siklodekstrin. Produk didapati berupaya melemahkan simptom penarikan di dalam badan tikus yang bergantung pada morfina. Mohd. Ilham Adenan, Anee Suryani Sued, Siti Syarifah Mohd. Mutalip, Norhayati Ismail, Mohd. Hafidz Hadi Abdullah, Mohd. Faizulzaki Mohd Yatim, Ruzana Rabuzin dan Sim Peck Kung telah membangunkan produk ini.

Malina Jamil, Abd. Majid Jalil, Saidatul Husni Saidin, Mohd. Faridz Zollpatah, and Abu Said Ahmad was responsible in developing the product.

- WOOD-V-BAM. A product which is made of parallel oriented bamboo skewers bonded together with resin to form a structural component suitable for furniture. A team comprising of Mohd. Tamizi Mustafa; Hamdan Hussain, Wan Tarmeze Wan Arifin, Khairul Awang, Emlee Mohamad Taib; and Abd Rahim Ahmad was responsible in developing the product.
- C-BAM FOR FORMWORK. A composite panel produced by gluing and pressing together crushed bamboo ply alternately. A team comprising of Mohd. Tamizi Mustafa; Wan Tarmeze Wan Arifin, Mohd. Kahirun, Mohd. Jani, Saimin, Emlee Mohamad Taib; and Abd Rahim Ahmad was responsible in developing the product.
- POPS Lumber (Parallel Oil Palm Strand Lumber). An alternative material for making timber-based products such as structural frames for building structures and fences. A team comprising of Wan Tarmeze Wan Arifin, Khairul Awang, Marzalina Mansor, Mohd. Tamizi Mustafa; and Abdul Hamid Salleh was responsible in developing the product.
- CO-E. Active fraction of *Cerbera odollam* Gaertn (pong-pong) against human breast cancer cell lines (MCF7 & T47D). CO-E is an active ethyl acetate fraction of *Cerbera odollam* which was fractionated using bioassay-guided fractionation techniques. The active ingredient was found to have cytotoxic effects on various human breast cancer cell lines. A team comprising of Mohd. Ilham Adenan, Siti Syarifah Mohd. Mutalip, Nurhanan Murni Yunos, Asiah Osman, Norhayati Ismail and Mohd. Hafidz Hadi Abdullah was responsible in developing the product.
- CaFR 04 as an elite planting material of *Centella asiatica* (L.) Urb. (pegaga). CaFR04 is an elite *C. asiatica* (L.) Urb. selected from 14 identified accessions. This accession had superior growth performance and bioactive compound with high antioxidant activity. Optimum growth condition of the accession was also determined. A team comprising of Mohd. Ilham Adenan, Rafedah Abas, Nurhanan Murni Yunos, Lili Shahira Husin, Mohd. Radzi Ahmad and Mohd. Hafidz Hadi Abdullah was responsible in developing the product.
- ECfC 06 standardised extract of *Erythroxylum cuneatum* (Miq) Kurz. forma *cuneatum*. The product contains extracts of cinta mula and 10% β -cyclodextrin. The product has been found to be able to attenuate withdrawal symptoms in morphine dependent rats. A team comprising of Mohd. Ilham Adenan, Anee Suryani Sued, Siti Syarifah Mohd. Mutalip, Norhayati Ismail, Mohd. Hafidz Hadi Abdullah, Mohd. Faizulzaki Mohd Yatim, Ruzana Rabuzin and Sim Peck Kung was responsible in developing the product.



Beberapa produk komersial FRIM
Some commercialised products of FRIM

Memorandum Persefahaman

Sejumlah 13 MOU dan MOA antara FRIM dan pelbagai entiti komersial telah diproses oleh Cawangan Undang-Undang pada 2007. Berikut ialah senarai MOU dan MOA tersebut:

Memorandum of Understanding

A total of 13 MOU's and Agreements of FRIM and various commercial entities were processed by the Legal Affairs Branch for 2007. The following are a listing of these MOU's and Agreements.

No	Pihak terlibat <i>Entities involved</i>	Tarikh <i>Date</i>	Catatan <i>Remarks</i> (Sehingga / <i>Until</i>)
1	Eko Paper Sdn. Bhd.	19 Januari / <i>January</i> 2007	18 Januari / <i>January</i> 2010
2	Staedtler Malaysia & Jabatan Hutan Negeri Pahang	13 Februari / <i>February</i> 2007	13 Februari / <i>February</i> 2012
3	PLUS Expressway Berhad	13 Februari / <i>February</i> 2007	13 Februari / <i>February</i> 2010
4	Infovalley Life Sciences Sdn. Bhd., Silicon Graphics (Malaysia) Sdn. Bhd. & Intel Electronics (Malaysia) Sdn. Bhd.	20 Februari / <i>February</i> 2007	20 Februari / <i>February</i> 2009
5	Safa College	13 Februari / <i>February</i> 2007	13 Februari / <i>February</i> 2009
6	Lim Ah Soon Sdn. Bhd.	13 Februari / <i>February</i> 2007	13 Februari / <i>February</i> 2008
7	M-Trex Active Carbon Sdn. Bhd.	13 Februari / <i>February</i> 2007	13 Februari / <i>February</i> 2009
8	Khazanah Nasional Berhad	14 Mac / <i>March</i> 2007	14 Mac / <i>March</i> 2012
9	The Forestry Research and Development Agency (FORDA), Indonesia	5 April 2007	5 April 2012
10	Maju Kastara Sdn. Bhd.	10 April 2007	10 April 2012
11	Grand Perfect Sdn. Bhd.	26 April 2007	26 April 2010
12	Perbadanan Harta Intelek Malaysia (MyIPO)	28 April 2007	28 April 2012
13	Universiti Kebangsaan Malaysia (UKM) & Borneo Trees Seeds & Seedlings Sdn. Bhd. (BTS)	6 Disember 2007	6 Disember / <i>December</i> 2012



Pemindahan Teknologi *Technology Transfer*

Pada tahun ini, FRIM terus menumpukan usaha dalam pemindahan teknologi. Selaras dengan objektif institut, maklumat tentang pengurusan dan pembangunan perhutanan, hasil hutan dan penggunaannya disebarkan melalui kursus, seminar, bengkel, persidangan, simposium, dan pameran.

Aktiviti pemindahan teknologi ini dianjurkan oleh FRIM ataupun anjuran secara kerjasama dengan agensi lain termasuklah organisasi kerajaan dan bukan-kerajaan. FRIM juga banyak terlibat dalam program yang dikendalikan oleh agensi lain.

During the year, FRIM continued to focus its efforts in technology transfer. In line with the objectives of the institute, information regarding the management and development of forestry, forest products and their utilisation was disseminated through Training Courses, Seminars, Workshops, Conferences, Symposia and Exhibitions.

Many of these activities for technology transfer were either organised solely by FRIM or jointly with other collaborative agencies comprising government and non-government organisations. In some cases, FRIM also participated in events organised by other agencies.

Pameran *Exhibitions*

- Pameran MIFF 2007, 8-9 Mac/*March*, PWTC Kuala Lumpur
- Pameran Terowong SMART, 11 Mac/*March*, Kuala Lumpur
- Pameran MIFF(PWTC) 6-10 Mac/*March*, Kuala Lumpur
- Pameran National Horticulture Conference, 13-15 Mac/*March*, Puteri Pacific, Johor Bahru, Johor
- Pameran Herbal R&D Commercialization, Fourth Asia-Pacific Natural Product Expo (NATPRO 2007), 29 - 31 Mac/*March*, PWTC, Kuala Lumpur
- Pameran Malaysian Technology Exhibition (MTE), 28 - 31 Mac/*March*, PWTC, Kuala Lumpur
- Pameran Harta Intelek, 26-29 April, KLCC, Kuala Lumpur
- Pameran Eighteenth International Invention, Innovation, Industrial Design and Technology Exhibition 2007 (ITEX), 18-20 Mei/*May*, KLCC, Kuala Lumpur
- Pameran SMIDEX 2007 and SME Convention, 5 - 8 Jun/*June*, KLCC, Kuala Lumpur
- Pameran Kempen Kesedaran Alam Sekitar (NRE), Karnival Jom Heboh, 8 Jun/*June*, Queensbay, Penang
- Pameran Keselamatan dan Kesihatan Pekerjaan FRIM, 12-13 Jun/*June*, FRIM, Kepong, Selangor, Malaysia
- Pameran Hari Alam Sekitar FRIM-The Star (di padang FRIM) 17 Jun/*June*
- Pameran Asia Pacific Conference on Plant Tissue Culture and Agrobiotechnology (APaCPA), 17 - 21 Jun/*June*, PWTC, Kuala Lumpur, Malaysia
- Pameran Malaysia International Commodity Conference and Showcase (MICCOS), 3- 8 Julai/*July*, PWTC, Kuala Lumpur
- Pameran Satu Daerah Satu Industri (SDSI) (MITC Melaka), 5-8 Julai/*July*, Air Keroh Convention Centre, Melaka
- Kursus Unit Latihan Perhutanan Kepong, 23 - 26 Julai/*July*, FRIM, Kepong, Selangor, Malaysia
- Pameran Kempen Kesedaran Alam Sekitar (NRE), Karnival Jom Heboh, 4 - 5 Ogos/*August*, Stadium Bukit Jalil, Selangor
- Pameran Rakan Muda, 18 -19 Ogos/*August*, Taman Tasik Titivangsa, Kuala Lumpur
- Pameran Klinik Konsultansi sempena aktiviti Gerak Usahawan Nasional 2007, 25 - Ogos/*August*
- Pameran Kemerdekaan (NRE), 25 - 26 Ogos/*August*, NRE, Putrajaya
- Perasmian Taman Teknologi Perlis, 2 - 5 September, Sg. Batu Pahat, Perlis
- Pameran 50 Tahun Kemerdekaan FRIM (ruang legar Auditorium FRIM), 7 September, FRIM, Kepong, Selangor, Malaysia
- Pameran 'Climate Change' anjuran NRE, 30 -31 Oktober/*October*, PWTC, Kuala Lumpur

Pameran *Exhibitions*

- Pameran Herbal Asia 2007 Seminar: Asia's premier herbal trade show, 1 - 4 November, Matrade exhibition & Convention Centre, Kuala Lumpur
- Pameran WHAT Medicine III Conference. Women's Health and Asian Traditional Medicine. Towards sustainable medicine and healthcare, 16 - 17 November, PWTC, Kuala Lumpur
- Pameran BioMalaysia, 27 - 30 November, PWTC, Kuala Lumpur
- Pameran Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 - 29 November, The Legend Hotel, Kuala Lumpur
- Pameran 'National Innovation Conference & Exhibition' (PRPI 07), 27 - 29 November, UPM, Selangor, Malaysia

Kursus Latihan *Training Course*

- Kursus dan Ceramah Keselamatan Kakitangan FRIM, 25 April, FRIM, Kepong, Selangor, Malaysia
- Commercial Nursery Course, 7 - 11 Mei/*May*, FRIM, Kepong, Selangor, Malaysia
- Kursus Tapak Semaian, Kementerian Kemajuan Luar Bandar dan Wilayah, 7 - 11 Mei/*May*, Hotel Putra, Kuala Lumpur
- Kursus pengeringan kayu – FRIM/UPM/MTIB 8 -25 Mei/*May*, FRIM, Kepong, Selangor, Malaysia
- Kursus Herba (UNDP and FRIM) – Planting of misai kucing conducted at Kg. Simpai, 16 Mei/*May*
- Kursus Interpretasi Alam Semula Jadi Fasa I, 21 - 24 Mei/*May*, FRIM, Kepong
- Kursus Pengendalian Biji Benih Hutan Paya Gambut, FRIM/UNDP/GEF dan Jabatan Perhutanan Pahang, 30 Mei/*May* - 1 Jun/*June*, Kuantan, Pahang, Malaysia
- Training Workshop On Forest Biodiversity – Conservation And Management Of Forest Genetic Resources, 11- 16 Jun/*June*, APAFRI/Bioversity/ FRIM, FRIM, Kepong, Selangor
- Kursus Rimbawan Asli, Kem. Pembangunan Luar Bandar dan Wilayah, FRIM, JHEOA, 18 Jun/*June* to 2 Julai/*July*, Hotel Putera, Kuala Lumpur
- Kursus Teknologi Herba dan Pembangunan Produk Herba [Asas], (KKLW dan FRIM), 18 - 22 Jun/*June*, Hotel Crystal Crown, Kepong, Kuala Lumpur
- Educational Research Institute Tour by INSEP (Biotechnology and Biopharmaceutical), CfPR-Universiti Sains Malaysia, Terengganu Skill Development Centre and FRIM, 27 Julai/*July*, Terengganu
- Kursus Unit Latihan Perhutanan Kepong, 23 to 26 July, FRIM, Kepong, Selangor, Malaysia
- Kursus Teknologi dan Pembangunan Produk Herba [lanjutan], (KKLW & FRIM), 7 - 9 Ogos/*August*, FRIM, Kepong, Selangor
- Forest Secret Herbal Shop Training Workshop, CfPR-Franchise Channel (M) Sdn. Bhd., CfPR & FRIM, 13 September, FRIM, Kepong, Selangor
- Nursery Practices and Planting Techniques, FRIM, 12 - 16 November, FRIM, Kepong, Selangor
- Kursus Tanaman Herba, FRIM, 12 - 16 November, FRIM, Kepong, Selangor
- Kursus Pemprosesan Herba, MIGHT-METEOR and FRIM, 19 - 23 November, FRIM, Kepong, Selangor

Seminar, Bengkel, Persidangan dan Simposium

Seminar, Workshop, Conferences and Symposia

- National Conference on The Management and Conservation of Forest Biodiversity in Malaysia, 20 - 21 Mac/*March*, Marriot Hotel, Putrajaya, Selangor
- Bengkel Analisis Kualiti, Keselamatan dan Efikasi Produk Herba: Fasa I, FRIM dan MECD, 4 April, FRIM, Kepong, Selangor
- *Soil Science Conference of Malaysia 2007: Peat and Other Soil Factors in Crop Production*, MSSS, DOA, UNDP/GEF and ISP, 17-19 April, Serdang, Selangor
- *Regional Workshop on the Implementation of Codes of Practices for Forest Harvesting*, FAO Regional Office for Asia Pacific (Bangkok), Sabah Forestry Department and FRIM, 14 -18 Mei/*May*, Sabah Hotel, Sandakan, Sabah
- *Ninth Symposium of the Malaysian Society for Microbiology*, 30 - 31 Mei/*May*, USM, Bayview Hotel, Penang
- Bengkel Pengenalpastian Hasil Penyelidikan yang Berpotensi Komersil (FRIM-MTDC), 7 Jun/*June*, FRIM, Kepong, Selangor, Malaysia
- Mesyuarat JK Teknikal Projek Penghasilan Pulpa dan Kertas dari Kenaf, 11 Jun/*June*, FRIM, Kepong, Selangor
- *Project Evaluation Meeting*, FRIM, 2 - 4 Julai/*July*, Seri Pacific Hotel, Kuala Lumpur

Seminar, Bengkel, Persidangan dan Simposium *Seminar, Workshop, Conferences and Symposia*

- Conference on Plantation Commodities, 3 to 4 Julai/*July*, Putra World Trade Centre, Kuala Lumpur
- Seminar on Advances in Pulp and Paper Technology, Harmonising Technology and the Environment: Opportunities and Challenges, 10 - 12 July, The Legend Hotel, Kuala Lumpur
- Seminar Arborikultur, Institut Tadbiran Awam Negara, 12 Julai/*July*, INTAN, Selangor
- Bengkel Penjenamaan Produk dan Strategi Pemasaran, FRIM-MECD, 25 Julai/*July*, FRIM, Kepong, Selangor
- Meeting-Discussion-Workshop on Seed Handling and Establishment of Seed Production Area, 6-8 Ogos/*August*, Semenggoh, Kuching, Sarawak
- Malaysian Society of Plant Physiology Conference MSPPC, 20 - 22 Ogos/*August*, Le Meridian, Kota Kinabalu, Sabah
- Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products and Medicinal Chemistry (NPMC) 2007, 23 - 25 Ogos/*August*, Putra World Trade Centre, Kuala Lumpur
- Workshop on A&R CDM Project Readiness in Malaysia, 12 September, FRIM, Kepong, Selangor
- Fourteenth Malaysian Forestry Conference: Forestry in Malaysia: Reinventing Human-Nature Relationships, 12 - 16 September, Kota Kinabalu, Sabah
- FRIM Furniture Seminar 2007, FIRA-MFIC-MFPC, 3 Oktober/*October*, FRIM, Kepong, Selangor
- Bengkel Hutan Pesisiran Pantai Negara: Kesedaran dan Tindakan Bersama, Residence @ Paka, Terengganu, Forestry Department Peninsular Malaysia, Wetlands International, Malaysian Nature Society, World Wide Fund (WWF) for Nature, Global Environment Centre, National Hydraulics Research Institute Malaysia (NAHRIM), 5 - 7 November, FRIM, Kepong, Selangor
- Seventh National Conference on Oil Palm Tree Utilisation OPTUC: Strategizing for Commercial Exploitation, 13 - 15 November, Sunway Resort Hotel, Petaling Jaya, Selangor
- National Biodiversity Seminar, 20 - 21 November, Allson Klana Resort, Seremban, Negri Sembilan
- Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, FRIM, 27 - 29 November, The Legend Hotel, Kuala Lumpur
- Asian Mycological Congress 2007 and Tenth International Marine and Freshwater Mycology Symposium (IFMFS), 2 - 6 Disember/*December*, USM, Penang
- Workshop on Biotechnology R&D Project Monitoring and Evaluation (MOSTI), 8 - 11 Disember/*December*, Palace of the Golden Horses, Mines Resort City, Seri Kembangan, Selangor
- Seminar on Second Growth Forest, Management of Second Rotation Forests: Challenges and Opportunities, Forestry Department Peninsular Malaysia and FRIM, 12-13 Disember/*December*, Swiss Garden Resort and Spa, Kuantan, Pahang
- Project Evaluation Meeting, 18 - 20 Disember/*December*, Awana Genting Highlands, Pahang, Malaysia

Dialog *Dialogues*

- Second Malaysian Forest Dialogue, with Members of Forestry Related Industries, 22 - 23 Disember/*December*, Kuala Lumpur, Malaysia
- Sesi Dialog Bersama BPFK dan JAKIM, FRIM-MECD, 13 Disember/*December*, FRIM, Kepong



Y.A.M. Sultanah Pahang, Sultanah Hajah Kalsom merasmikan Persidangan 'WHAT MEDICINE'
Y.A.M. Sultanah Pahang, Sultanah Hajah Kalsom officiating the 'WHAT MEDICINE' Conference



Lawatan lapangan peserta Bengkel Hutan Pesisiran Pantai Negara di Paka, Terengganu
Field visit by participants at the Bengkel Hutan Pesisiran Pantai Negara in Paka, Terengganu



Y.B. Dato' Seri Azmi Khalid, Menteri Sumber Asli dan Alam Sekitar merasmikan Conference on Forestry and Forest Products Research (CFFPR)
Y.B. Dato' Seri Azmi Khalid, Natural Resources and Environment Minister officiated in the opening ceremony of the Conference on Forestry and Forest Products Research (CFFPR)



Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali merasmikan Seminar Perabot FRIM 2007
Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali officiated in the opening ceremony of FRIM Furniture Seminar 2007



Y.Bhg. Tan Sri Abdul Rahim Thamby Chik, Pengerusi Gagasan Badan Ekonomi Melayu (GABEM) merasmikan pembukaan Pameran Herbal Asia 2007
Y.Bhg. Tan Sri Abdul Rahim Thamby Chik, Chairman of the Gagasan Badan Ekonomi Melayu (GABEM) officiated in the opening ceremony of Herbal Asia 2007 Exhibition

Khidmat Perundingan Consultancy Services

Pada tahun 2007, FRIM mengendalikan sebanyak 34 perundingan yang bernilai RM810,090. Daripada perundingan ini, FRIM menerima sebanyak RM279,198 sebagai bayaran pengurusan dan pentadbiran.

In 2007, FRIM conducted 34 consultancies worth RM810,090. From these consultancies, RM279,198 was due to FRIM as charges for management and administration.

Bidang <i>Field of Work</i>	Pengurus <i>Project Manager</i>	Pelanggan <i>Client</i>
Provision consultancy and technical services for regional survey on Safrole-Rich Essential Oils	Dr. Lim Hin Fui	United Nation (UN) Office.
Khidmat nasihat permasalahan berkaitan anai-anai dan menjalankan ujian ketahanan kayu	Roszaini Kadir	Sahabat Alam Sdn. Bhd.
Tree risk assessments on SKYTREX selected trees	Dr.Elizabeth Philip	Julien Repelin
Third surveillance visit of Johor FMU against the requirements of MC&I (2001)	Dr. Ismail Harun	Malaysian Timber Certification council (MTTC)
Membangunkan sistem inventori dan pemeliharaan pokok	Adnan Mohamad	Jabatan Perancang Bandar
Ujian ketahanan dalaman (makmal) dan luaran (lapangan) ke atas kayu yang diawet terhadap serangan kulat perosak	Baharuddin Kamaruddin	Ancom Crop Care Sdn. Bhd.
Bancian dan pemetaan vegetasi di kawasan seluas 4 ha di Tapak Pusat Penyelidikan Tasik Chini	Wan Mohd. Shukri Wan Ahmad	Faculty of Science UKM
Auditor to conduct pre-assessment to MC&I (2002) for Forest management certification of Kubuan Puak FMU Sarawak.	Dr. Lim Hin Fui	SIRIM QAS International Bhd.
Evaluation study on wood based data provided by FAO, ITTO, UN ComTrade, and the Malaysian Government.	Dr. Ahmad Fauzi Puasa	Center for International Research (CIFOR)
Khidmat nasihat permasalahan yang berkaitan dengan anai-anai dan menjalankan ujian ketahanan (Ujian Makmal) ke atas wood composite	Roszaini Kadir	Foster Asia (M) Sdn. Bhd.
Pemindahan dua pokok besar (Hujan-hujan dan Angsana) dan 3 pokok kecil di Perkarangan Plaza Gurney, Pulau Pinang	Adnan Mohamad	Altinum Pmc Sdn. Bhd.
Menentukan kesihatan pokok-pokok di sekitar kawasan Datai	Dr. Elizabeth Philip	Mr. Jamie Case
Consultation project proposal particleboard from wood residues - Sony EMCS	Sufian Misran	Sony EMCS Malaysia.
Technical assistance on development of sustainable forestry in Pakistan	Dato' Dr. Wan Razali Wan Mohd.	Usaid Prog. Economic Growth
Analisis data dari petak-petak tumbesaran (Hutan Asli)	Nur Hajar Zamah Shari	Eclipse Green Sdn. Bhd.
Desktop review and feasibility report of information Memorandum and Financial Projection	Dato' Dr. Wan Razali Wan Mohd.	Lanexang Forest Resources Development Co. Ltd.
Projek perintis fasa pertama penggunaan sistem inventori dan maklumat pengurusan pokok (Gis Tree Mapping and Arbor Tracking System) untuk Majlis Bandaraya Shah Alam	Ahmad Azaruddin Mohd. Noor	Majlis Bandaraya Shah Alam

Bidang <i>Field of Work</i>	Pengurus <i>Project Manager</i>	Pelanggan <i>Client</i>
Projek perundingan pembangunan pelan induk landskap Bangiwood	Adnan Mohamad	Negara Properties Smarthome Sdn. Bhd.
Khidmat nasihat permasalahan yang berkaitan dengan anai-anai dan menjalankan ujian keberkesanan sampel papan lapis dan kayu gergaji terhadap serangan anai-anai	Roszaini Kadir	Samling Plywood (Baramas) Sdn. Bhd.
Durability of TIM-BOR Treated Wood used under Hazard Class 2 (H2) conditions	Mohamad Nasir Mat Arip	Nufarm Technologies (M) Sdn. Bhd.
Desktop review and feasibility report of Mansfield Enterprise (PNG) Ltd for logging natural forest	Dato' Dr. Wan Razali Wan Mohd.	Mansfield Enterprise (PNG) Ltd.
Bancian Flora dan Fauna - Ulu Jelai	Dr. Shamsuddin Ibrahim	Uni-Technologies Sdn. Bhd.
Inventori dan pemetaan pokok - Sierra Selayang, Gombak	Adnan Mohamad	IJM Properties Sdn. Bhd.
Tree risk assessment on Skytrex selected tress	Dr. Elizabeth Philip	Julien Repelin
Advisory services on trial experiments & Quality Control Assay (QCA) on our Rhizagold® Product	Dr. Kodi Isparan Kandasamy	BioTrack Technology (M) Sdn. Bhd.
Peningkatan kualiti kayu gergaji (<i>Acacia mangium</i>) kering - Tanur menerusi pengoptimasian	Choo Kheng Ten	Valued Products (M) Sdn. Bhd.
Auditor to conduct verification visit for forest management certification of Perak FMU	Dr. Lim Hin Fui	SIRIM QAS International Bhd.
Tree Risk Assessment	Sreetheran Maruthaveeran	The Royal Selangor Golf Club
Penyelenggaraan sistem pengurusan gaji (ESPG). Lembaga Koko Malaysia	Wan Zahari Wan Yaacob	Lembaga Koko Malaysia
Penyelenggaraan sistem pengurusan gaji untuk MARDI	Wan Zahari Wan Yaacob	MARDI
Membangunkan sistem maklumat penyelidikan dan pembangunan Koko (eRNDMCB)	Wan Zahari Wan Yaacob	Lembaga Koko Malaysia
Expose test for mould resistance	Baharuddin Kamaruddin	Protim Solignum Sdn. Bhd.
Testing of wood plastic composite (WPC)	Baharuddin Kamaruddin	Kuala Genting Sdn. Bhd.
A survey on the tree species of Pulau Banding, Gerik Perak	Dr. Richard Chung Cheng Kong	M.K.N Group Sdn. Bhd.



Perjawatan Establishment

Pelantikan

Pada tahun 2007, FRIM telah melantik seramai enam orang Pegawai Penyelidik dan Penolong Pegawai Penyelidik baharu di bawah Kumpulan Pengurusan dan Profesional. Seorang Pegawai Tadbir dan 45 orang kakitangan Kumpulan Sokongan turut dilantik. Mereka terdiri daripada:

Pegawai Penyelidik Gred Q41	Tarikh Iantikan / Appointment date
Chong Mew Im	16 April
Salleh Mat	16 April
Rosilah Ab. Aziz	2 Julai/July
Saiful Azmi Johari	3 September
Pegawai Tadbir Gred N41	
Azuarni Abdul Adzis	1 Jun/June
Penolong Pegawai Penyelidik Gred Q27	
Emlee Mohamad Taib	1 Mei/May
Mohd. Shis Ibrahim	1 Jun/June
Penolong Pegawai Tadbir Gred N27	
Nazly Jamaludin	1 Mei/May
Pen.Peg.Teknologi Maklumat Gred F29	
Intan Farah Wahida Khabir	1 Jun/June
Penolong Akauntan Gred W27	
Emylia Ayoub	1 Januari/January
Zainorasri Yahya	1 November
Pembantu Penyelidik Gred Q17	
Firmansyah Julius Syafri	1 Jun/June
Mohammad Faizal Jaafar	1 Jun/June
Muhammad Shahrul Md Nasir	1 Jun/June
Nafaruding Che Nan	1 Jun/June
Rohani Abdullah	1 Jun/June
Saiful Azhari Zainal Abidin	1 Jun/June
Suryani Che Seman	1 Jun/June
Abdul Muaz Sagimin	1 Oktober/October
Mohd Hafidz Hadi Abdullah	1 Oktober/October
Mohd Izwan Jaimi	1 Oktober/October
Rohana Idris	1 Oktober/October
Juruteknik Gred J17	
Mohamad Iqbal Marazlen	1 November
Renjer Hutan Gred G17	
Zakaria Yusoff	1 Mei/May
Pembantu Akauntan Gred W17	
Nurul Zamzurina Osman	4 1 Jun/June

Appointments

In 2007, a total of six new Research Officers and Assistant Research Officers under the Management and Professional Category, were appointed. An Administrative Officer and forty-five staff members from the Supporting Group were also appointed. The details are as follows:

Pemb Tadbir (Perkeranian/Operasi) Gred N17	
Jasmawati Johan	2 Januari/January
Pembantu Tadbir (Kewangan) Gred W17	
Zuraidah Mat Ali	1 September
Pembantu Tadbir (Kesetiausahaan) Gred N17	
Rosnaidah Ibrahim	1 Mei/May
Nor Azlina Ahmad	1 Jun/June
Noor Syilawati Ahmad	1 Jun/June
Pengawas Hutan Gred G11	
Mohd. Yusoff Abd. Razak	1 Mei/May
Mohd. Hanafiah Ahmad	1 Mei/May
Mohammad Bohari Ehwan	1 Mei/May
Amran Harun	16 Mei/May
Mohd. Sulaimi Che Seman	16 Mei/May
Pembantu Tadbir Rendah Gred N11	
Nurulhuda Abas	1 Oktober/October
Noor Hafizan Mohd Sharif	1 Oktober/October
Tukang K3 Gred R9	
Mohammad Adzam Ahmad	
Pemandu Kenderaan Bermotor Gred R3	
Mat Salan Mat Rosli	3 Januari/January
Rosli Abdul Majid	3 Januari/January
Azmi Mat Isa	3 Januari/January
Pekerja Rendah Awam Khas Gred R3	
Abdul Rahim Razali	1 Mei/May
Khamis Mat Ain	1 Mei/May
Suhaimi Mohd. Eskak @ Khairi	1 Mei/May
Vasuthevan Narayana	1 Mei/May
Wan Adanan Wan Ishak	1 Oktober/October
Pembantu Am Pejabat	
Amirulezzuan Mohd Yatim	1 Oktober/October
Mohd Hafizuddin Ab Lah	1 Oktober/October
Pekerja Rendah Awam Gred R1	
Hairol Nizam Haron	1 Jun/June
Mohd. Khafadzi Zulkapli	1 Jun/June
Noor Ratul Maleka Sirajuddin	1 Jun/June

Promotions

Kenaikan Pangkat

Seramai 43 orang Kakitangan FRIM telah dinaikkan pangkat pada tahun 2007. Mereka ialah:

A total of a 43 FRIM Staff members were promoted in the year 2007. The details are as follows:

Nama / Name	Gred / Grade	Tarikh / Date
Abdul Rashid Ab. Malik (Dr.)	Peg. Penyelidik Gred Utama 'B' VU 6	10 Disember/ December
Saw Leng Guan (Dr.)	Peg. Penyelidik Gred Utama 'C' VU 7	1 September
Marzalina Mansor (Dr.)	Peg. Penyelidik Gred Khas 'C' VK 7	1 Disember/ December
Norini Haron (Dr.)	Peg. Penyelidik Gred Khas 'C' VK 7	1 Disember/ December
Rahim Sudin (Dr.)	Peg. Penyelidik Gred Khas 'C' VK 7	1 Disember/ December
Rasadah Mat Ali (Dr.)	Peg. Penyelidik Gred Khas 'C' VK 7	1 Disember/ December
Sim Heok Choh (Dr.)	Peg. Penyelidik Gred Utama 'C' VU 7	10 Disember/ December
Gan Kee Seng (Dr.)	Peg. Penyelidik Gred Q54	1 April
Noor Azlin Yahya (Dr.)	Peg. Penyelidik Gred Q54	1 April
Mohd. Noor Mahat (Dr.)	Peg. Penyelidik Gred Q52	1 Januari/January
Raja Barizan Raja Sulaiman (Dr.)	Peg. Penyelidik Gred Q52	1 Mac/ March
Wan Tarmeze Wan Ariffin (Dr.)	Peg. Penyelidik Gred Q52	1 April
Mohd. Rosli Haron	Peg. Penyelidik Gred Q48	1 April
Abdul Jabbar Sabli	Peg. Tadbir Gred N48	1 April
Mohd Shahidan Mohd Arshad	Peg. Penyelidik Gred Q44	1 April
Baharuddin Kamaruddin	Pen. Peg. Penyelidik Gred Q32	1 Januari/January
Khairuddin Kamaruddin	Pen. Peg. Penyelidik Gred Q32	1 Januari/January
Zawawi Kassim	Pen Peg Penyelidik Gred Q32	1 Januari/January
Md. Nasir Dayat	Pen. Peg. Tadbir Gred N32	1 Januari/January
Damahuri Sabari	Pembantu Penyelidik Gred Q22	1 Januari/January
Rozidah Khalid	Pembantu Penyelidik Gred Q22	1 Januari/January
Yusni Idris	Pembantu Penyelidik Gred Q22	1 Januari/January
Abdul Halim Talha	Pembantu Penyelidik Gred Q22	1 Jun/June
Mazli Abdul Wahab	Pembantu Penyelidik Gred Q22	1 Jun/June
Mohamad Shafie Jusoh	Pembantu Penyelidik Gred Q22	1 Jun/June
Chong Yoon Thai	Pembantu Penyelidik Gred Q26	1 Januari/January
Mahat Mijan	Pembantu Penyelidik Gred Q26	1 Januari/January
Mohd. Zaini Ujang	Pembantu Penyelidik Gred Q26	1 Januari/January
Mohd. Sahrie Mohd. Som	Renjer Hutan Gred G22	1 Januari/January
Mohamad Rosdi Abdul Kadir	Renjer Hutan Gred G22	1 Oktober/October
Zaiton Saleh	Pembantu Makmal Gred C22	1 Januari/January
Sarina Hussin	Pembantu Tadbir (S/U) Gred N22	1 Januari/January
Siti Roshidan Saidin	Pembantu Tadbir (S/U) Gred N22	1 Januari/January
Suzrina Shamsuddin	Pembantu Tadbir (S/U) Gred N22	1 Januari/January
Abu Bakar Md Razlii	Pengawas Hutan Gred G14	1 Januari/January
Mahat Judin	Pengawas Hutan Gred G14	1 Januari/January
Mohd. Kafi Jaapar	Pengawas Hutan Gred G14	1 Januari/January
Salehin Jantan	Pengawas Hutan Gred G14	1 Januari/January
Mohamad Alhad Salleh	Pembantu Am Pejabat Gred N4	1 Oktober/October
Zarah Bachik	Pembantu Tadbir Rendah Gred N14	1 Oktober/October
Abdul Razak Omar	Pekerja Rendah Awam Khas Gred R6	1 Oktober/October
Jefrey Zainudin	Pemandu Kenderaan Gred R6	1 Januari/January
Angan Atan	Pekerja Rendah Awam Gred R4	1 Januari/January
Irwan Mohamad Taib	Pekerja Rendah Awam Gred R4	1 Januari/January

Penerima Anjakan Gaji

Pay Increment Awardees

Seramai lapan orang Pegawai Penyelidik dan 54 orang kakitangan Kumpulan Sokongan telah menerima anjakan gaji.

During the year eight Research Officers and 54 staff members from the Supporting Group received pay increments.

Kumpulan Pengurusan dan Profesional Management and Professional Group	
Ab. Rasip Ab. Ghani (Dr.) Ang Lai Hoe (Dr.) Liza ismail Mahmudin Saleh Nik Zanariah Nik Mahmood Tan Yu Eng (Dr.) Wan Tarmeze Wan Ariffin (Dr.) Woon Weng Chuen (Dr.)	
Kumpulan Sokongan Supporting Group	
Abdul Razak Abdul Rahman Ahmad Sahar Mohd Yusof Aminudin Abd. Aziz Amir Saiffudin Kassim Asman Alias Asnah Hashim Fatimah Abd. Rahman Hamsinah Hashim Hamzah Mamat Ibharim Hasim Kamal Ariffin Ismail Mariam Din Mashilah Mior Ismail Maznan Mohamad Md. Azimi Abu Bakar Mohd. Nizal Salehin Mohd. Radzi Ahmad Mohd. Rizal Mohd Kassim Mohd. Sulaimi Che Seman Naemah Hashim Narayanan Alimuthu Norbaite Saharuddin Norihan Mohd. Salih Nuziah Hashim Othman Mohd. Desa Rashidah Abd. Razak Rodziah Hashim	Rosidi Sulaiman Rosmaidi Ibrahim Rozaida Latip Roziah Ayoub Rukiah Mirin Sabariah Ramuddin Salbiah Man Salen Ismail Samsuri Toh Harun Shaari Jantan Shahrul Sa Sharifah Talib Siti Sanisah Kamsah Sufian Hamsan Suhaimi Husain Suhaimi Mohd. Eskak @ Khairi Syahrullzaman Ismail Tanjong Abdullah Yahya Marhani Yusof Darus Zainol Abu Zainol Ahmad Zainol Khalid Zairi Sudin Zakaria Ariffin Zamri Zainuddin Zulifah Omar

Peletakan Jawatan

Pada tahun 2007, empat orang Pegawai Penyelidik dan tiga orang kakitangan Kumpulan Sokongan telah meletak jawatan. Mereka terdiri daripada:

Kakitangan <i>Staff</i>	Tarikh Peletakan Jawatan <i>Date of resignation</i>
Kho Lip Khoon	21 Januari/ <i>January</i>
Mohd. Rafik Idris	30 Julai/ <i>July</i>
Chang Li Yen	1 Ogos/ <i>August</i>
Noorul Ashekha Zulkifli	1 Ogos/ <i>August</i>
Maizatulakhmaliza Muhamad	20 Ogos/ <i>August</i>
Adzmi Yaakob (Dr.)	1 Oktober/ <i>October</i>
Jaya Vejayan Palliah (Dr.)	1 Disember/ <i>December</i>

Persaraan

Tujuh orang Pegawai Penyelidik dan tiga orang kakitangan Kumpulan Sokongan bersara pada tahun ini iaitu:

Persaraan <i>Retirement</i>	Tarikh <i>Date</i>
Persaraan Wajib <i>Mandatory Retirement</i>	
Abdul Razak Mohd. Ali (Datuk Dr.)	26 April
Ashaari Hj. Mohd. Amin	16 Mei/ <i>May</i>
Shaaruddin Mat	2 Julai/ <i>July</i>
Roslin Badu	4 Julai/ <i>July</i>
Abdul Hamid L.Hassan	16 Ogos/ <i>August</i>
Hashim Kamal Mahadi	1 November
Chan Hung Tuck (Dr.)	1 November
Lim Seng Choon	15 November
Wan Razali Wan Mohd. (Dato' Dr.)	8 Disember/ <i>December</i>
Persaraan Pilihan <i>Optional Retirement</i>	
Hoi Why Kong (Dr.)	1 Julai/ <i>July</i>

Resignation

In 2007, four Research Officers and three staff members of the Supporting Group resigned from the Institute. The details are as follows:-

Retirement

Seven Research Officers and three staff members of the Supporting Group retired in the year 2007. The details are as follows:



Latihan Training

Latihan Akademik

Pegawai Yang Berjaya Menamatkan Pelajaran

Pada tahun ini, seramai sembilan orang pegawai berjaya menamatkan pengajian dari universiti tempatan dan luar negara. Mereka termasuklah lima berkelulusan Ijazah Doktor Falsafah dan empat orang Ijazah Sarjana.

Nama <i>Name</i>	Ijazah <i>Degree</i>	Universiti <i>University</i>
Grace Tabitha Lim Wui Oi (Dr.)	Ph.D.	U. Virginia Tech. USA
Safiah @ Yusmah Muhammad Yusoff (Dr.)	Ph.D.	U. of Wales, UK
Ismail Harun (Dr.)	Ph.D.	UPM
Mohd. Nor Mahat (Dr.)	Ph.D.	UPM
Norlia Basherudin (Dr.)	Ph.D.	UPM
Abdul Jabbar Sabli	M.Sc.	UKM
Farah Fazwa Mohd. Ariff	M.Sc.	UKM
Ahmad Azaruddin Mohd. Nor	M.Sc.	UPM
Rosdi Koter	M.Sc.	UPM

Pegawai yang Mendaftar untuk Pengajian Lepasn Ijazah

Seramai 14 orang pegawai telah mendaftar untuk pengajian lepasn ijazah pada 2007. Sebelas orang pegawai mendaftar untuk Ijazah Doktor Falsafah dan tiga orang mendaftar untuk Ijazah Sarjana.

Latihan Akademik <i>Academic Training</i>	Luar Negeri <i>Overseas</i>		Dalam Negeri <i>Local</i>		Jumlah <i>Total</i>	
	2006	2007	2006	2007	2006	2007
Ph.D.	1	7	3	4	4	11
M.Sc.	-	-	1	3	1	3
B.Sc.	-	-	-	-	-	-
Jumlah <i>Total</i>	1	7	4	7	5	14

Academic Training

Officers Who Have Completed Their Studies

During the year, nine officers successfully completed their academic training from local and overseas universities. The degrees included five Ph.D. and four M.Sc.

Officers Registered for Post-Graduate Studies

A total of fourteen officers registered for post-graduate studies in 2007. Eleven officers registered for the Ph.D programme and three registered for the Master's programme.

Latihan Bukan Akademik

Pada tahun 2007, pegawai FRIM yang menyertai kursus latihan di dalam dan di luar negara menunjukkan peningkatan yang ketara bagi Kumpulan Pengurusan dan Profesional iaitu sebanyak 83.9% manakala bagi Kumpulan Sokongan terdapat sedikit pengurangan iaitu sebanyak 6.2%. Bagi pegawai yang menghadiri persidangan di dalam dan di luar negara, peratusan kedua-dua Kumpulan iaitu Pengurusan dan Profesional dan Sokongan telah menunjukkan penurunan masing-masing iaitu 68.5% dan 61.1%.

Latihan Bukan Akademik <i>Non-Academic Training</i>	Pengurusan & Profesional <i>Management & Professional</i>		Kumpulan Sokongan <i>Supporting Group</i>		Jumlah <i>Total</i>	
	2006	2007	2006	2007	2006	2007
Kursus / <i>Course</i>						
Luar Negeri / <i>Overseas</i>	17	82	2	4	19	86
Tempatan / <i>Local</i>	387	661	592	553	979	1214
Persidangan / <i>Conferences</i>						
Luar Negeri / <i>Overseas</i>	88	29	1	-	89	29
Tempatan / <i>Local</i>	150	46	17	7	167	53
Jumlah / <i>Total</i>	642	818	612	564	1254	1382

Non-academic Training

In 2007 FRIM officers attending training courses both locally and overseas registered a tremendous 83.9% increase in the Management and Professional category while there was a slight decrease of 6.2% in the supporting group. Among those attending conferences both locally and overseas, officers in the management and professional group and the supporting showed a sharp decrease of 68.5% and 61.1% respectively.



Hari Anugerah Sempena Ulang Tahun Yang Ke-22 FRIM *FRIM's Awards Day In Conjunction With 22nd Anniversary*

Hari Anugerah yang diadakan bersempena Ulang Tahun FRIM yang ke-22 telah diadakan di Dewan MATRADE, Jalan Duta, Kuala Lumpur pada 30 November 2007. Y.B. Dato' Sazmi Miah, Setiausaha Parlimen, Kementerian Sumber Asli dan Alam Sekitar telah merasmikan majlis tersebut. Acara kemuncak ialah penyampaian Anugerah MFRDB, Anugerah Ketua Pengarah FRIM, Anugerah Khidmat Cemerlang (individu dan kumpulan), Anugerah Khidmat Setia, Anugerah Penerbitan Terbaik, Anugerah Khidmat Masyarakat, Anugerah Penyelidikan Terbaik dan Anugerah Saintis Terbaik.

FRIM's Awards Day in conjunction with its 22nd Anniversary was held at the MATRADE Hall, Jalan Duta, Kuala Lumpur on 30 November 2007. Y.B. Dato' Sazmi Miah, the Parliamentary Secretary of the Ministry of Natural Resources and Environment officiated the occasion. Highlights of the event included the presentations of the MFRDB award, FRIM Director General's Award, Excellent Service (individual and group), Long Service and Outstanding Publications, Community Service Awards, Best Research Project Awards and Best Research Scientist Awards for the year.



Y.B. Dato' Sazmi Miah merasmikan majlis
Y.B. Dato' Sazmi Miah officiated the occasion

Anugerah MFRDB **MFRDB Award**

Penerima Anugerah *Awardee*:
Y.Bhg. Dato' Dr. Abd. Latif Mohmod



Y.Bhg. Dato' Dr. Abd. Latif Mohmod menerima Anugerah MFRDB
Y.Bhg. Dato' Dr. Abd. Latif Mohmod receiving the MFRDB Award

Anugerah Ketua Pengarah **Director General Award**

Penerima Anugerah *Awardee*:
Dr. Hoi Why Kong



Dr. Hoi Why Kong menerima Anugerah Ketua Pengarah FRIM
Dr. Hoi Why Kong receiving the Director General Award

Anugerah Pekerja Terbaik Tahunan
Best Employee Award

Pegawai Penyelidik Research Officers	Pegawai Sokongan Supporting staff
Zahari Othman	Mohd. Afendi Hussin Rosnaidah Ibrahim



Zahari Othman menerima Anugerah Pekerja Terbaik Tahunan
Zahari Othman receiving the Best Employee Award



Rosnaidah Ibrahim menerima Anugerah Pekerja Terbaik Tahunan
Rosnaidah Ibrahim receiving the Best Employee Award

Anugerah Khidmat Cemerlang
Excellent Service Award

Penerima Individu
Individual Awardees

Pegawai Penyelidik Research Officers
Chang Yu Shyun (Dr.) Ho Yuen Foon Mastura Mohtar Mohd. Khairun Anwar Uyup Mohd. Tamizi Mustafa Norul Maslissa Ahmad Roshamida Ruslan Wan Zahiri Wan Yaacob



Mastura Mohtar menerima Anugerah Khidmat Cemerlang
Mastura Mohtar receiving the Excellent Service Award



Mohd. Khairun Anwar Uyup menerima Anugerah Khidmat Cemerlang
Mohd. Khairun Anwar Uyup receiving the Excellent Service Award



Roshamida Ruslan menerima Anugerah Khidmat Cemerlang
Roshamida Ruslan receiving the Excellent Service Award

Pegawai Sokongan Supporting staff	
Abd. Rahim Razali Abdul Rahim Omar Ahmad Hasim Ahmad Sharafi Othman Anuradha Uthaya Kamaran Azlina Ahmad Azman Mohamad Azmi Mahyuddin Che Rohani Che Wil Ellamah Perumal Emlee Mohamad Taib Fakhrul Effendi Othman Ismail Mansor Jaafar Sulaiman Jamal Abdul Razak Jesmini Mat Ali Latifamir Ibrahim Markandan Moorthy Mazlyna Md.Nor Mazurah Mohamed Isa Mohamad Adnan Mohamed Idris	Mohamad Shapiei Jusoh Mohd. Ghaus Hussein Mohd. Md. Sahat Mohd. Rosle A. Rahman Nor Ashikin Mohd Zabri Norashikin Kamarudin Nordin Puteh Othman Hasin Rahmat Othman Roszalli Mohd Saiful Nizam Samrin Saimas Ariffin Salamah Alias Samsol Daud Shamsuri Mohd Som Suhaimi Wan Chik Suzanaakma Mansor Ya'acob Zahari Zaisatul Nur Fadzilah Salleh Zaleha Abdul Hamid Zuraida Abd. Majid



Ismail Mansor menerima Anugerah Khidmat Cemerlang
Ismail Mansor receiving the Excellent Service Award



Nor Ashikin Mohd. Zabri menerima Anugerah Khidmat Cemerlang
Nor Ashikin Mohd. Zabri receiving the Excellent Service Award



Anuradha Uthaya Kamaran menerima Anugerah Khidmat Cemerlang
Anuradha Uthaya Kamaran receiving the Excellent Service Award

Kumpulan
Group

Pasukan Survei Kawasan FRIM <i>FRIM Area Survey Team</i>	Pasukan Kerja Aset <i>Asset Task Force</i>
Muhammad Farid Abdul Rashid (Ketua) Abdul Azhan Shah Idris Abdul Hamid Lebai Hassan Abdul Razak Abdul Rahman Faridahanum Ali Maskom Peseri Mohammad Bohari Ehwan Mohd. Afendi Abdul Ghani Norsiha Ayob Rashidah Hasnim@hashim Rodziah Hashim Rosmaidi Ibrahim Shahrizal Samudin Wan Adanan Wan Ishak	Y. Bhg. Dato' Dr. Abd. Latif Mohmod (Ketua) Abd. Rashih Ahmad Abu Husin Harun Azahari Mohd Yusoff Baharudin Kamaruddin Emlee Mohamad Taib Ismail Mansor Lili Sahira Husin Mariam Din Mashilah Mior Ismail Mohammad Faridz Zollpatah Mohd. Akhir Abdul Rahman Mohd. Arshad Saru Mohd. Asmawee Ismail Mohd. Ehlas Hassan Mohd. Parid Mamat Mohd.Rizal Mohd Kassim Mohd. Tamizi Mustafa Mohd. Zamshari Hj. Abd. Rahman Mohd. Hassan Buang Nazarudin Ramli Noorsuhanis Abd. Latif Norbaite Saharuddin Norsham Suhaina Yaakob Ong Tai Hock Samsul Bahrin Abdullah Siti Hasanah Mat Said Yahya Marhani Zahari Othman Zaitun Said

Anugerah Khidmat Masyarakat
Community Service Awards

Musni Hj. Abdul Mois

Anugerah Khidmat Setia
Long Service Awards

Penerima <i>Awardees</i>
Aminah Hamzah (Dr.) Ani Sulaiman (Dr.) Hoi Why Kong (Dr.) Ismariah Hj. Ahmad (Dr.) Mohammad Bohari Ehwan Mohd. Hanafiah Ahmad Norini Haron (Dr.) Rozita Ibrahim Salamah Selamat Saw Leng Guan (Dr.) Zaitun Said Zakaria Yusoff



Musni Hj. Abdul Mois menerima Anugerah Khidmat Masyarakat
Musni Hj. Abdul Mois receiving the Community Service Award

Anugerah Persekitaran Kerja Terbaik
Best Work Environment Award

Penerima <i>Awardees</i>
Kategori Pejabat <i>Office Category</i>
Pertama <i>First</i> Cawangan Perancangan dan Penilaian Penyelidikan <i>Research Planning and Evaluation Branch</i>
Kedua <i>Second</i> Bahagian Pengurusan Sumber Manusia <i>Human Resource Management Division</i>
Kategori Makmal/Bengkel/Stesen Penyelidikan Luar <i>Laboratory/Workshop/Sub-Station Category</i>
Pertama <i>First</i> Makmal Genetik <i>Genetic Laboratory</i>
Kedua <i>Second</i> Makmal Kimia Tanah <i>Soil Chemistry Laboratory</i>

Anugerah Penerbitan

Publication Award

Anugerah ini diberikan kepada pegawai penyelidik yang telah menghasilkan penerbitan yang cemerlang pada tahun ini. Pemenang bagi pelbagai kategori adalah seperti yang berikut:

These awards are conferred to research officers for their outstanding publications for the year. Winners of the various categories of publications in 2007 were as follows:

Anugerah Khas Penerbitan *Special Publications Awards*

Penerima <i>Awardees</i>
Jurnal Terbanyak <i>Most Journal Papers</i> Pertama <i>First</i> Lee Su See (Dr.)
Kedua <i>Second</i> Ahmad Fauzi Puasa (Dr.)

Penerbitan Teknikal *Technical Papers*

Penerima <i>Awardees</i>
Pertama <i>First</i> Linking the Gaps between Conservation Research and Conservation Management of Rare Dipterocarps: A Case Study of <i>Shorea lumutensis</i> Lee Soon Leong, Kevin Ng Kit Siong, Saw Leng Guan, Lee Chai Ting, Norwati Mohammad, Naoki Tani, Yoshihiko Tsumura dan/ <i>and</i> Jarkko Koskela
Kedua <i>Second</i> Revision of <i>Grewia</i> (Malvaceae-Grewioideae) in Peninsular Malaysia and Borneo Richard Chung Cheng Kong
Managing Tropical Peat Swamp Forest: Integrating Forestry Practices and Hydrological Processes Abdul Rahim, N., Wollesen, L., Efranjah dan/ <i>and</i> Khali Aziz Hamzah
Spacial Structure and Genetic Diversity of Three Tropical Tree Species with Different Habitat Preferences within a Natural Forest Kevin Ng Kit Siong, Lee Soon Leong, Saw Leng Guan, Joshua B. Plotkin dan/ <i>and</i> Koh Chong Lek

Penerbitan Separa/Bukan Teknikal *Semi/Non-Technical Papers*

Penerima *Awardees*

Pertama *First*
Effective Implementation of EIA Forest Harvesting in
Peninsular Malaysia
Lim Hin Fui dan/and Shamsudin Ibrahim

Dr. Lim Hin Fui menerima Hadiah Pertama bagi Anugerah
Penerbitan Separa/Bukan Teknikal
*Dr. Lim Hin Fui receiving the First Prize for Semi/
Non Technical Paper Award*



Anugerah Buku dan Buku Panduan *Book and Guideline awards*

Penerima *Awardees*

Pertama *First*
Plants of Krau
Lillian Chua Swee Lian dan Saw Leng Guan

Penghasilan Bahan Tanaman Meranti Tembaga (*Shorea
Leprosula*)
Aminah Hamzah, Nashatul Zaimah Noor Azman, Kodi
Isparan a/I Kandasamy dan Marzalina Mansor

Kedua *Second*
Kajian Sosio-ekonomi Penanam Tembakau di Kawasan
Tanah Liat di Kedah, Perlis dan Kelantan
Ahmad Fauzi Puasa, Najib Lotfy Arshad, Mohd. Parid
Mamat, Rosdi Koter dan Ismariah Ahmad

Merit *Merit*
Panduan Mengecam dan Pencegahan Penyakit Pokok
Sentang
Mohd. Farid Ahmad, Lee Su See dan Patahayah Mansor



Dr. Saw Leng Guan menerima Hadiah Pertama Anugerah Buku dan
Buku Panduan
*Dr. Saw Leng Guan receiving the First Prize for the Books and
Guidelines Awards*



Dr. Marzalina Mansor menerima Hadiah Pertama Anugerah Buku dan
Buku Panduan
*Dr. Marzalina Mansor receiving the First Prize for the Books and
Guidelines Awards*



Dr. Ahmad Fauzi Puasa menerima Hadiah Kedua Anugerah Buku dan
Buku Panduan
*Dr. Ahmad Fauzi Puasa receiving the Second Prize for the Books and
Guidelines Awards*

Anugerah Tesis Terbaik
Best Thesis Awards

Penerima *Awardees*

Kategori Ph.D. *Ph.D. Category*

Pertama *First*
NADPH Oxidase Versus Mitochondria-Derived ROS in Glucose-
induced Apoptosis of Pericytes in Early Diabetic Retinopathy
(University of London)
Nik Musaadah Mustapha

Kedua *Second*
Roost Selection of Forest Interior Insectivorous Bat Species
in Krau Wildlife Reserve, Peninsular Malaysia (Universiti
Kebangsaan Malaysia)
Serafina Christine Fletcher

Penghargaan *Consolation*

- Identification of Genetic Regions Controlling the
Efficiency of *Agrobacterium*-Mediated Transformation of
Arabidopsis thaliana (University of Birmingham)
Fadhilah Zainudin
- Selection, Characterisation and Evaluation of an
Antagonistic *Streptomyces* sp. for the Control of
Fusarium Wild of Banana (Universiti Malaya)
Getha Krishnasamy
- Penambahan Poliakrilamida dalam Penyediaan Kertas
Magnet (Universiti Kebangsaan Malaysia)
Ainun Zuriyati Mohamed @ Asa'ari

Kategori M.Sc. *M.Sc. Category*

Pertama *First*
Kesan Faktor-Faktor Pempulpaan Soda-Antrakuinon ke atas
Sifat-Sifat Pulpa dan Kertas Tandan Buah Kosong Kelapa
Sawit (Universiti Sains Malaysia)
Nurul Husna Mohd. Hassan

Kedua *Second*
Pra-rawatan Proses Pempulpaan Kayu Kisar Berkimia (CMP)
ke atas *Endospermum malaccense* (Universiti Kebangsaan
Malaysia)
Sharmiza Adnan

Penghargaan *Consolation*

Effect of Light Level on Growth and Shoot Development for
Five Species of Tropical Saplings (Universiti Putra Malaysia)
Tong Pei Sin

Anugerah Penyelidikan Terbaik
Best Research Award

Penerima *Awardees*

Pertama *First*
Tree Flora of Sabah and Sarawak (Botanical Inventory,
Conservation and Sustainable Management of Tree
Resources of Sabah and Sarawak)
E. Soepadmo (Project Leader), Saw Leng Guan, Ruth Kiew,
Richard Chung Cheng Kong, Julia Sang, John Baptist Sugau,
Suzana Sabran, Nadiyah Idris, Siti Eryani Suterisno, Tan Hui
Sin, Rusea Go, Soh Wu Kuang, Yahud Wat, Arnold Gadana,
Normaya Nordin, Noorsiha Ayop, Abdul Latiff Mohamad,
Berhanam Ahmad, Jamili Nais dan/and Salma Idris



Dr. E. Soepadmo menerima Anugerah Penyelidikan Terbaik
Dr. E. Soepadmo receiving the Best Research Award

Anugerah Saintis Harapan
Most Promising Scientist Award

Penerima *Awardees*

Mastura Mohtar
Nor Hasnida Hassan

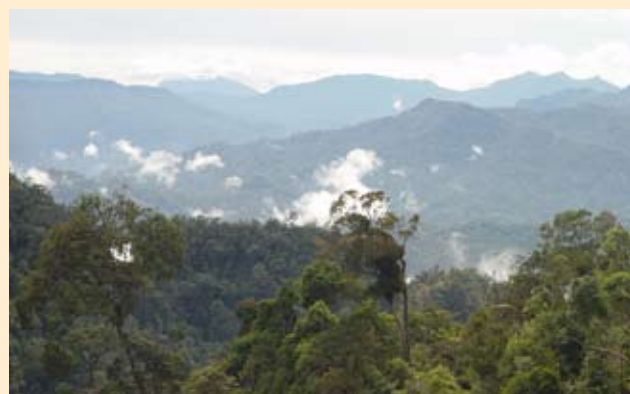


Nor Hasnida Hassan menerima Anugerah Saintis Harapan
*Nor Hasnida Hassan receiving the FRIM's Most Promising Scientist
Award*



Peristiwa Lain Other Events

Ekspedisi Botani Ke Taman Negara Pulong Tau, Sarawak



Pemandangan di PTNP
Scenery in PTNP

Ekspedisi botani ke Taman Negara Pulong Tau (PTNP), Sarawak (3°25'–3°58' N, 115°12'–115°35' E) telah dianjurkan bersama oleh Projek Tree Flora of Sabah and Sarawak (TFSS), Sarawak Forestry Corporation (AFSID/SFC) dan International Tropical Timber Organization (ITTO) pada 6–20 Mei 2007. Pengutipan spesimen herbarium dijalankan di kawasan-kawasan yang kurang diketahui dari segi botani, termasuklah Danau Anau' (berdekatan dengan Raan Ngela, 1370 m a.s.l) dan Ulu Sg. Talun (berdekatan dengan Bukit Tenidan, 1920 m a.s.l.) di kawasan tapak kem dibina. Kedua-dua tempat kutipan terletak pada bahagian barat-tengah PTNP. Ekspedisi selama 15 hari ini diketuai oleh Cik Julia Sang dan Encik Malcom Demies, dan disertai oleh 10 pakar botani dari Herbarium KEW, FRIM, ITTO, Jabatan Perhutanan dan Universiti Sabah dan Sarawak. Seramai 15 orang kakitangan sokongan dari Jabatan Perhutanan Sarawak dan lapan orang asli tempatan (Penan) juga terlibat dalam ekspedisi ini. Objektif utama ekspedisi botani ini adalah untuk membuat kutipan am spesimen spesies pokok yang berbunga dan berbuah, dan kutipan khusus bagi famili tumbuhan yang pada masa ini sedang dikaji oleh pakar-pakar botani terlibat dalam projek TFSS. Selain itu, tumbuhan etnobotani yang digunakan oleh masyarakat tempatan juga turut dikutip.

Taman Negara Pulong Tau yang bermakna 'hutan kita' dalam bahasa tempatan terletak di bahagian utara-timur Sarawak di antara Bahagian Limbang dan Miri. Ia merangkumi kawasan seluas 59,817 hektar dan digazetkan pada 24 Mac 2005. PTNP boleh dianggap sebagai tulang belakang kawasan

Botanical Expedition To Pulong Tau National Park, Sarawak

A botanical expedition to Pulong Tau National Park (PTNP), Sarawak was jointly organized by the Tree Flora of Sabah and Sarawak Project (TFSS), the Sarawak Forestry Corporation (AFSID/SFC) and the International Tropical Timber Organization (ITTO) on 6 - 20 May 2007. Botanical collections were carried out in a botanically little known areas of the PTNP: Danau Anau, (near Raan Ngela, 1370 m a.s.l) and Ulu Sg. Talun (near Bukit Tenidan, 1920 m a.s.l.) where base camps were established. Both collection sites are located at the central western parts of the PTNP. The 15-day expedition was led by Julia Sang and Malcom Demies. Ten botanists and researchers from the Kew Herbarium, FRIM, ITTO, Forest Departments and universities of Sabah and Sarawak, 15 supporting staff from the Sarawak Forestry Department and eight Penan communities took part in the expedition. The main objectives of this botanical expedition were to conduct general collection of flowering and fruiting species, specialized collection of tree families currently being revised by botanists involved in the TFSS Project, and ethnobotanical specimens used by local communities.

Pulong Tau National Park which means 'our forest' in local language is located at the northeastern part of Sarawak between Limbang and Miri. It occupied an area of 59,817 hectares and was gazetted on 24 March 2005. The PTNP may be aptly described as the backbone of the Northeastern Highlands, as it comprises the mountain ranges of Gunung Murud (Sarawak's highest peak) and Tama Abu Range. The main forest types observed in the area include alluvial, riparian, lowland and hill



Bunga Syzygium sp. (Myrtaceae)
Flower of Syzygium sp. (Myrtaceae)

Pergunungan Timur Laut Sarawak, yang merangkumi Barisan Gunung Murud (puncak tertinggi di Sarawak) dan Barisan Tama Abu. Jenis hutan utama yang terdapat di kawasan ini termasuk hutan aluvium, hutan riparian, hutan campuran dipterokarpa rendah dan bukit serta hutan pergunungan rendah dan tinggi.



Peserta ekspedisi
Participants of the expedition

Dalam ekspedisi ini, sebanyak 1109 spesimen herbarium telah dikutip. Kutipan ini merangkumi kira-kira 570 spesies dari 198 genus dalam 99 famili yang dikenali daripada pokok berbijai dan paku-pakis, dan 19 spesies yang belum dikenali. Selain itu, kira-kira 150 tumbuhan hidup, kebanyakannya dari famili Ochidaceae, dan sebanyak 100 spesimen etnobotani telah dikutip. Sebilangan besar daripada spesimen yang dikutip terdiri daripada ahli famili pokok Annonaceae, Euphorbiaceae, Fagaceae, Lauraceae, Meliaceae, Melastomataceae, Moraceae, Myrtaceae, Polygalaceae, Rubiaceae dan Theaceae, dan famili bukan pokok Araceae, Begoniaceae, Gesneriaceae, Orchidaceae dan Zingiberaceae.

Bagi famili yang pada masa ini sedang dikaji pakar botani projek TFSS (Bombacaceae, Lauraceae, Theaceae, Tiliaceae dan Verbenaceae), sejumlah 144 spesimen telah dikutip.



Bunga Hoya sp. (Asclepiadaceae)
Flower of Hoya sp. (Asclepiadaceae)



Buah Lithocarpus echinifer (Fagaceae)
Fruit of Lithocarpus echinifer (Fagaceae)

mixed dipterocarp, kerangas and lower and upper montane forests.

A total of 1,109 herbarium specimens were collected, comprising approximately 570 identified species in 198 genera and 99 families of seed plants, ferns and ferns allied, and 19 unidentified species. Besides this, about 150 live plants, mostly of the

Orchidaceae, were collected during the expedition whereas the ethnobotanical team collected about 100 ethnobotanical specimens. The most commonly collected specimens belong to the families Annonaceae, Euphorbiaceae, Fagaceae, Lauraceae, Meliaceae, Melastomataceae, Moraceae, Myrtaceae, Polygalaceae, Rubiaceae and Theaceae among the trees and shrubs, and the Araceae, Begoniaceae, Gesneriaceae, Orchidaceae and Zingiberaceae among the non-tree species.

For families of special interest (Bombacaceae, Lauraceae, Theaceae, Tiliaceae and Verbenaceae), a total of 144 specimens were collected.



Buah Shorea sp. (Dipterocarpaceae)
Fruit of Shorea sp. (Dipterocarpaceae)



Jambak bunga Helicia sp. (Proteaceae)
Inflorescence of Helicia sp. (Proteaceae)

Anugerah Masjid Terbaik Daerah Gombak

Masjid FRIM telah berjaya memenangi Anugerah Masjid Terbaik Daerah Gombak 2007 pada Majlis Penyampaian Tauliah Pelantikan Ahli Jawatankuasa Masjid Tahun 2006–2009 dan Anugerah Masjid Terbaik Daerah Gombak yang telah diadakan pada 25 Julai 2007 bertempat di Dewan Alwy, Jabatan Perhutanan Malaysia. Nazir Masjid Jamek FRIM, Y.Bhg. Dato' Dr Abd. Latif Mohmod telah menerima anugerah tersebut.

Majlis Pecah Tanah Pusat Teknologi FRIM-MTDC



Upacara penyerahan cenderahati kenang-kenangan kepada Y.Bhg. Datuk Suboh Mohd. Yassin
Presentation of a souvenir item to Y.Bhg. Datuk Suboh Mohd. Yassin

Majlis Pecah Tanah Pusat Teknologi FRIM-MTDC telah berlangsung pada 7 Disember 2007 di hadapan Bangunan Pusat Teknologi Kayu (TTC), Jalan Kapur, FRIM. Pusat Teknologi FRIM-MTDC yang dijangkakan beroperasi sepenuhnya pada tahun 2009, bakal menyediakan platform yang khusus untuk pembangunan dan perkembangan industri herba tempatan. Pusat ini akan bertindak sebagai sebuah pusat sehati dalam penyelidikan bioteknologi dengan pengkhususan dalam industri herba. Pusat ini juga akan bertindak sebagai sebuah pusat rujukan maklumat khusus untuk komersialisasi, penyelidikan dan pengembangan industri herba. Menurut Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, Ketua Pengarah FRIM, Pusat Teknologi FRIM-MTDC ini akan memberikan tumpuan khusus kepada bidang nutrasetikal, kosmesetikal dan minuman dan makanan berfungsi. Majlis telah dirasmikan oleh Y.Bhg. Datuk Suboh Mohd. Yassin, Ketua Setiausaha Kementerian Sumber Asli dan Alam Sekitar Malaysia merangkap Pengerusi Lembaga Penyelidikan dan Pembangunan Perhutanan Malaysia (MFRDB). Turut sama di majlis tersebut ialah Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, Ketua Pengarah FRIM dan Y.Bhg. Dato' Dr. Ariffin Aton, Ahli Lembaga Pengarah MTDC. Slaid tentang pembinaan bangunan Pusat Teknologi FRIM-MTDC turut ditayangkan.



Y.Bhg. Datuk Suboh Mohd. Yassin merasmikan Majlis Pecah Tanah
Y.Bhg. Datuk Suboh Mohd. Yassin officiating at the ground breaking ceremony

Gombak District's Best Mosque

Masjid FRIM won the Best Mosque Award for the District of Gombak 2007 at the Majlis Penyampaian Tauliah Pelantikan Ahli Jawatankuasa Masjid Tahun 2006–2009 and Anugerah Masjid Terbaik Daerah Gombak. The event was held on the 25 July 2007 at the Dewan Alwy, Malaysian Forestry Department. Y.Bhg. Dato' Dr. Abd. Latif Mohmod, the Nazir of Masjid Jamek FRIM, graciously received the award.



Y.Bhg. Dato' Dr. Abd. Latif Mohmod sedang menerima Anugerah Masjid Terbaik Daerah Gombak

Y.Bhg. Dato' Dr. Abd. Latif Mohmod received the award

Ground Breaking Ceremony for Pusat FRIM-MTDC Technological Centre

A ground breaking ceremony for the Pusat Teknologi FRIM-MTDC was held on 7 December 2007 in front of the Timber Technology Center in Jalan Kapur, FRIM. The FRIM-MTDC Technological Centre will be fully operational in 2009 and will serve as platform for the development of the local herbal industry. The centre will serve as a one stop centre for the Herbal Industry through its specialisation in research biotechnology. The centre will also serve as a reference centre for commercialization, research and the development of the Herbal Industry in Malaysia. According to Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, FRIM's Director General, the centre will focus on the nutraceutical, cosmeceutical and functional food aspects of herbal plants. The ceremony was officiated by Y.Bhg. Datuk Suboh Mohd. Yassin, who is the Secretary General of the Natural Resources and Environment (NRE) Ministry as well as the Chairman of the Malaysian Forestry Development Board (MFRDB). Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali, FRIM's Director General and Y.Bhg. Dato' Dr. Ariffin Aton, MTDC Board Chairman were also present at the opening ceremony. A slide show on the development of the FRIM-MTDC Technological Centre was also presented.

Hari Alam Sekitar Sedunia

FRIM dengan kerjasama akhbar The Star telah mengadakan sambutan Hari Alam Sekitar Sedunia pada 18 Jun. Festival Hijau yang bertemakan 'Hijau Setiap Hari' bertujuan memberikan penekanan kepada masyarakat tentang kepentingan penjagaan alam sekitar. Festival dirasmikan oleh Y.Bhg. Datuk Suboh Mohd. Yassin, Pengerusi Lembaga Penyelidikan dan Pembangunan Perhutanan Malaysia (MFRDB). Y.B. Dato' Zulhasnan Rafique Menteri Wilayah Persekutuan turut hadir bersama-sama keluarga. Kira-kira 5000 orang menghadiri festival ini.



Mengibarkan bendera Hari Alam Sekitar Sedunia
Flagging off for the World Environment Day

Penghayatan Kemerdekaan Malaysia

Bersempena sambutan Merdeka yang ke-50, FRIM telah menganjurkan beberapa aktiviti bagi menanam semangat patriotisme di kalangan kakitangan FRIM.

Antara aktiviti yang dijalankan ialah:

- Pertandingan Menghias Kenderaan Patriotik
- Majlis Doa Selamat dan Tahlil
- D'Pentas Merdeka
- Penyerahan bendera kepada kakitangan FRIM dan pengunjung FRIM

Sambutan secara keseluruhannya amatlah baik sekali. FRIM juga telah menerima tajaan bendera Malaysia daripada Kementerian Kesenian dan Warisan Malaysia sebanyak 1000 unit.

Kejuaraan Kali Kedua Sukan NRE 2007

Pasukan FRIM telah menganbil bahagian dalam Kejohanan Sukan NRE 2007 yang telah dilangsungkan di kampus Universiti Malaya, Kuala Lumpur pada 29 Jun - 1 Julai 2007. Dalam kejohanan kali ini yang disertai oleh 11 agensi di bawah NRE, kontingen FRIM telah berjaya menjadi Johan bagi 10 daripada 19 acara yang dipertandingkan iaitu bagi permainan bola sepak, futsal lelaki, futsal wanita, badminton, bola jaring, karom, bola tampar wanita, ping pong, boling lelaki dan boling wanita. Selain itu, pasukan FRIM juga telah menjadi Naib Johan bagi empat acara lain iaitu bola tampar lelaki, catur, sepak

World Environment Day

FRIM together with the STAR Newspaper commemorated World Environment Day on 18 June. The day was marked by a festival called "Green Fest" with the theme "Green Everyday" to stress the importance of the environment to society. The festival was officiated by Y.Bhg. Datuk Suboh Mohd. Yassin, the Chairman of the MFRDB. Y.B. Dato' Zulhasnan Rafique Minister of the Federal Territories together with his family was also in attendance. About 5000 participants came for the festival.

Commemorating Malaysia Independence

In conjunction with the "50 years of Merdeka" celebration, FRIM organized a number of activities to instill the spirit of patriotism among its staff members. Some of the activities implemented were:

- Patriotic vehicle decoration competition
- Majlis Doa Selamat dan Tahlil
- D'Pentas Merdeka
- Unfolding of the flag for FRIM staff and visitors

The celebrations were widely received by FRIM staff and the general public. About a 1000 units of the Malaysia Flag to FRIM was sponsored by The Ministry of Culture and Heritage Malaysia.



Salah sebuah kereta yang dihiasi bendera Malaysia
One of the cars which was decorated with Malaysian flags

Champions of the Second NRE Sports 2007

FRIM's sports' team participated in the NRE Sports 2007 held at the Universiti Malaya Campus on the 29 June - 1 July 2007. Out of the eleven government agencies which participated in the events, FRIM emerged as champions in 10 out of 19 competitions. These were football, futsal (men), futsal (women), badminton, basketball, caroms, volleyball (women), table tennis, bowling (men) and bowling (women). In addition, FRIM also became runners-up in four events namely Volley ball (men), Chess, Sepak takraw and the Road relay races. FRIM was third in Golf. In total, FRIM emerged as overall champions with 99 marks. The Department of Irrigation and Drainage (DID) was second and was champion in four events.

takraw dan lari berganti-ganti jalan raya. FRIM juga mendapat tempat ketiga bagi acara golf dan seterusnya dinobatkan sebagai Johan Keseluruhan dengan mendapat 99 mata. Naib Johan Keseluruhan dimenangi oleh pasukan Jabatan Pengairan dan Saliran (JPS) yang menjadi Johan dalam empat acara.

Dengan kejayaan ini, kontingen FRIM sekali lagi telah meningkatkan pencapaiannya dalam Kejohanan Sukan NRE 2005 yang lalu. Pada ketika itu pasukan FRIM telah muncul sebagai Juara Keseluruhan dengan menjadi Johan bagi tujuh acara sahaja daripada 17 acara yang dipertandingkan.

Kejayaan FRIM ini didorong oleh komitmen pemain-pemain yang telah menjalani latihan intensif dan turun kegelanggang untuk mempertahankan kejuaraan yang telah dimenangi pada tahun 2005. Di samping itu, pasukan FRIM juga telah mendapat sokongan moral pihak Pengurusan Tertinggi, Ketua Kontingen, Pengurusan Kelab dan kumpulan Kelab penyokong FRIM yang sentiasa hadir untuk memberikan semangat kepada pemain-pemain FRIM yang bertanding.



Kontingen FRIM meraikan kejayaan demi kejayaan
FRIM contingent celebrating its success



Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali dan Dr. Rahim Nik, Ketua Kontingen menerima Hadiah Johan Keseluruhan
Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali and Dr. Rahim Nik, the Head of the FRIM Contingent receiving the Overall Champions trophy

With this success, the FRIM contingent has bettered its record attained in the NRE Sports 2005 where FRIM won the championship of 7 out of 17 competitions.

FRIM's success is due to the commitment of players who did not hesitate to train intensively for the various events and as a result was able to defend its 2005 position as champion. The moral support from the top management, Head of the Contingent, Club Management and supporters of the FRIM Fan Club gave the impetus and the spirit for FRIM's players to succeed.



Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali bersama kontingen FRIM yang telah menunjukkan prestasi cemerlang
Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali and the successful FRIM Contingent



Y.Bhg. Dato' Dr. Abd. Latif Mohmod turut hadir memberikan semangat kepada pemain-pemain
Y.Bhg. Dato' Dr. Abd. Latif Mohmod encouraging the players

Sukan Badan Berkanun Malaysia 2007

Pasukan FRIM telah menyertai Sukan Badan Berkanun Malaysia di Kampus UKM, Bangi dari 1 hingga 8 Disember 2007 lalu. Sukan ini telah disertai oleh 65 Badan Berkanun di Malaysia di bawah Persatuan Badan Berkanun Malaysia. Seperti yang dijangka, Pasukan FRIM telah menerima saingan yang hebat terutamanya daripada Majlis Kuasa Tempatan seperti DBKL, MBPJ, MPSJ dan universiti-universiti tempatan yang bergabung dengan persatuan ini. Pasukan FRIM telah menyertai 12 daripada 19 acara yang dipertandingkan dan telah memberikan persembahan terbaik untuk bersaing dengan pasukan yang lebih kuat. Hasilnya, pasukan FRIM berjaya juga mencapai beberapa keputusan yang boleh dibanggakan terutamanya bagi pasukan bola jaring, badminton dan ping pong yang berjaya melayakkan diri ke peringkat suku akhir. Tahniah juga kepada pasukan olah raga yang telah berjaya memperoleh satu perak dan tiga gangsa. Pasukan boling juga telah mencapai keputusan yang baik (15 pasukan teratas) daripada 65 pasukan yang mengambil bahagian.

Sports 2007 For Statutory Bodies

FRIM contingent participated in the Malaysian Statutory Body Sports held in UKM campus, Bangi, from 1 to 8 December 2007. The event was participated by 65 Statutory Bodies under the Malaysian Association of Statutory Bodies. True to expectations, FRIM faced stiff competition from both local municipal councils such as DBKL, MBPJ, MPSJ and local universities which are also members of the association. FRIM contingent took part in 12 from the 19 events contested, and managed to put up a good fight against stronger teams. As a result, FRIM excelled in a number of events such as netball, badminton and pingpong, which paved its way into the quarter finals. Congratulations also to the athletics event team who succeeded in winning one silver and three bronze, and the bowling team which stood at the fifteenth position from a total 65 participating teams.



Perbarisan kontingen FRIM
FRIM contingent participating in the march



Lawatan Rasmi Official Visits

Tarikh <i>Date</i>	Pelawat <i>Visitor</i>
24 Januari/ <i>January</i>	T.Y.T. Connie Hedegaard, Menteri Alam Sekitar Denmark <i>H.E. Connie Hedegaard, Danish Minister for the Environment</i>
12 Februari/ <i>February</i>	Delegasi Alam Sekitar dan Hutan Kerajaan Arunachal Pradesh, India diketuai oleh Mr. Newlai Tingkhatra, Menteri (Alam Sekitar dan Hutan), Kerajaan Arunachal Pradesh, India <i>Delegation Environment and Forest Government of Arunachal Pradesh, India lead by Mr. Newlai Tingkhatra Minister (Environment & Forests), Government of Arunachal Pradesh, India</i>
20 Mac/ <i>March</i>	Persatuan Persidangan Kajian Komanwel Malaysia <i>Commonwealth Study Conference Association of Malaysia (COSCAM)</i>
11 April	Ahli Parlimen Malaysia <i>Members of Parliament Malaysia</i>
12 April	Ketua Setiausaha, Kementerian Perhutanan, Air, Perikanan dan Kawasan yang Dilindungi; Gabon, Afrika Selatan, Tuan Rochael Abande <i>Secretary General, Ministry of Forestry, Water, Fishing and Protected Areas, Gabon, South Africa, Mr Rochael Abande</i>
17 April	Ahli Parlimen Malaysia <i>Members of Parliament Malaysia</i>
11 Julai/ <i>July</i>	Delegasi Program Pembiasaan Wakil Perdagangan Kayu Balak ke Malaysia (MTC) <i>Delegations of Familiarisation Programme For Timber Trade Representatives to Malaysia (MTC)</i>
28 Ogos/ <i>August</i>	Kedutaan Jepun: <i>Japan Embassy</i> : • Mr. Takako Teranishi • Ms. Tomoko Isobe
4 September	Kursus Latihan Pengurusan S&T bagi Penyelidikan di Negara-Negara OIC 2007 <i>S&T Management Training Course for Research in OIC Countries 2007</i>
12 September	Delegasi Republik Korea <i>Republic of Korea Delegation</i>
18 September	Pusat Biodiversiti Sarawak <i>Sarawak Biodiversity Centre</i>
3 Oktober/ <i>October</i>	Kerajaan Republik Congo <i>The Government of the Republic of Congo</i>
12 November	Perdana Menteri Negeri Utara Schleswig-holstein Jerman, T.Y.T. Peter Harry Carstensen <i>Prime Minister of the Northern State of Schleswig-holstein Germany, H.E. Peter Harry Carstensen</i>
11 Disember / <i>December</i>	T.Y.T. Professor Dr. Jacqueline Cramer Menteri Perumahan, Perancangan Ruang dan Alam Sekitar, Belanda <i>H.E. Professor Dr. Jacqueline Cramer Minister of Housing, Spatial Planning and The Environment, Netherlands</i>
31 Disember/ <i>December</i>	Lawatan Kerja Teknikal CEO dan Kakitangan Pengurusan SSIC <i>Technical Working Visit from the CEO and the Management Staff of SSIC</i>



H.E. Peter Harry Carstensen, Perdana Menteri Negeri Utara Schleswig-holstein Jerman diberikan taklimat ringkas oleh Dr. Norini Haron
H.E. Peter Harry Carstensen, Prime Minister of the Northern State of Schleswig-holstein Germany being briefed by Dr. Norini Haron



Kewangan Finance

Pendahuluan

Kedudukan kewangan FRIM bagi tahun berakhir 31 Disember 2007 masih terkawal. Lebih daripada pendapatan dan perbelanjaan adalah sebanyak RM20.972 juta berbanding tahun 2006 sebanyak RM0.554 juta meningkat sebanyak RM20.418 juta. Peningkatan ketara ini adalah disebabkan pertambahan peruntukan perbelanjaan harta modal semasa (aset) yang dibelanjakan tetapi perbelanjaan tersebut tidak diambilkira di dalam penyata pendapatan dan perbelanjaan kerana perlu disusutnilaikan.

Pendapatan

Sebahagian besar daripada pembiayaan aktiviti FRIM adalah dibiayai oleh Kerajaan Persekutuan melalui geran tahunan mengurus dan pembangunan. Bagi tahun dibawah kajian, jumlah geran mengurus yang diterima adalah sebanyak RM51.207 juta, meningkat sebanyak RM17.443 juta atau 51.7% berbanding RM33.764 juta pada tahun 2006. Manakala geran pembangunan meningkat sebanyak RM5.779 juta atau 34.2% kepada RM22.687 juta.

Pertambahan geran mengurus adalah berikutan daripada penyelarasan gaji kakitangan awam sebanyak 7.5% hingga 35% manakala bagi geran pembangunan pula disebabkan sebahagian besar projek-projek RMK9 yang telah dimulakan dalam tahun 2007.

Selain daripada geran mengurus dan pembangunan daripada Kerajaan Persekutuan, FRIM juga menerima dana e-

Introduction

FRIM's financial status for the year ended 31st. December 2007 was within control. The surplus from income and expenditure account in 2007 was RM20.972 million compared to RM0.554 million in 2006, an increased of RM20.418 million. The significant increased was due to the increase in the allocation of current capital expenditure (assets) which is yet to be recognised as expenditure in the income and expenditure account for the year because it has to be depreciated.

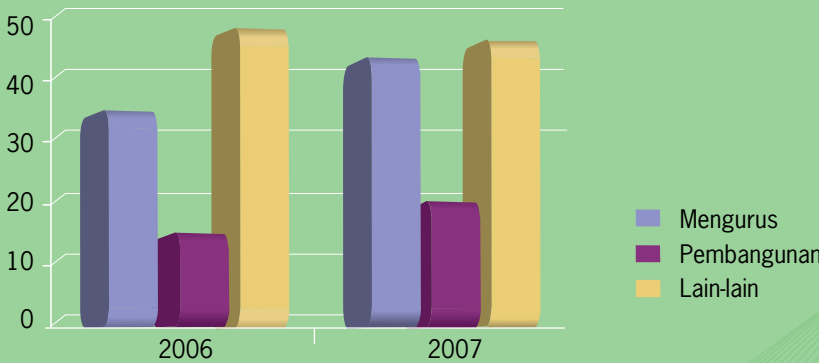
Income

Most of FRIM's activities were funded by the Federal Government through a yearly operational and development grant. For the year 2007, the total grant for operational purposes was RM51.207 million, an increase of RM17.443 million or 51.7% compared to RM33.764 million in the year 2006. Whereas the development grant increased by RM5.779 or 34.2% to RM22.687.

The addition in the operation grant was due to the salary revision for government servants in the region of 7.5% to 35% whereas for the development grant, it was because most of the RMK9 projects commenced in 2007.

Besides the operational and development grant from the Federal Government, FRIM also received contributions from e-Science funds (formerly known as IRPA), levy's monies from Malaysian Timber Industries Development Fund (MTIB), and from local and international organisations. In the year 2007,

Peruntukan Diterima

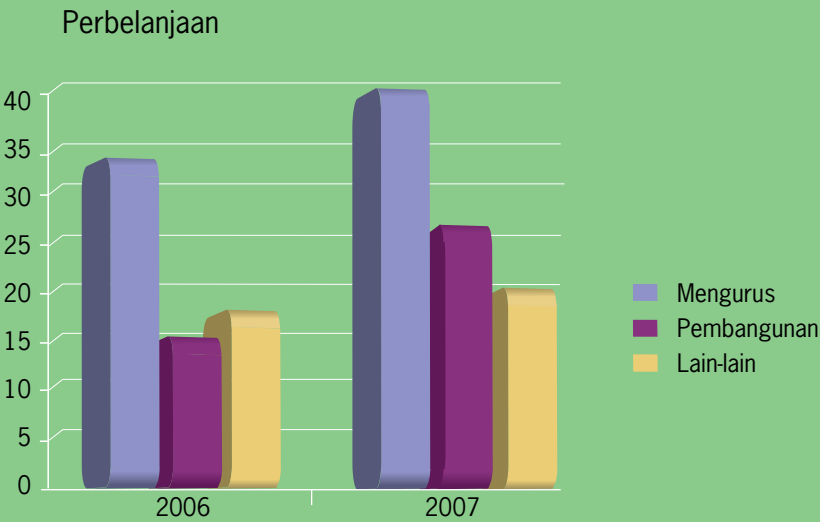


Science (dahulunya dikenali sebagai IRPA), wang levi Tabung Pembangunan Industri Kayu Kayan Malaysia (MTIB) dan juga daripada pertubuhan tempatan dan antarabangsa. Bagi tahun 2007, keseluruhan sumbangan yang berjumlah RM22.878 juta ini telah digunakan khusus untuk menjalankan aktiviti penyelidikan dan pembangunan FRIM.

Pendapatan-pendapatan lain adalah terdiri daripada hasil perkhidmatan teknikal dan khidmat perundingan, jualan, pulangan pelaburan jangka pendek, keuntungan pembiayaan pinjaman kakitangan, sewa dan lain-lain pendapatan yang menyumbang sebanyak RM7.599 juta atau 7.3% daripada keseluruhan pendapatan FRIM.

this contribution, totalling RM22.878 million was specifically spent on FRIM's research and development activities.

Other sources of income were from technical and consultancy services, sales, return on short-term investment, return on staff loans, rent and others which has contributed RM7.599 million or 7.3% of FRIM's total income for the year.



Perbelanjaan

Perbelanjaan keseluruhan bagi belanja mengurus dan pembangunan FRIM bagi tahun 2007 meningkat sebanyak RM16.783 juta atau 25.4% jika dibandingkan dengan tahun sebelumnya.

Perbelanjaan mengurus yang merangkumi perbelanjaan emolumen dan berkaitan emolumen mewakili pecahan terbesar perbelanjaan pada setiap tahun. Bagi tahun 2007, jumlah perbelanjaan emolumen adalah sebanyak RM25.572 juta iaitu mewakili 63.1% daripada jumlah perbelanjaan mengurus. Daripada jumlah tersebut, sebanyak RM18.079 juta adalah merupakan perbelanjaan bagi gaji dan upahan manakala sebanyak RM6.208 juta untuk pembayaran imbuhan tetap manakala RM0.912 juta merupakan sumbangan kepada Kumpulan Wang Amanah Persaraan (KWAP) dan Kumpulan Wang Simpanan Pekerja (KWSP).

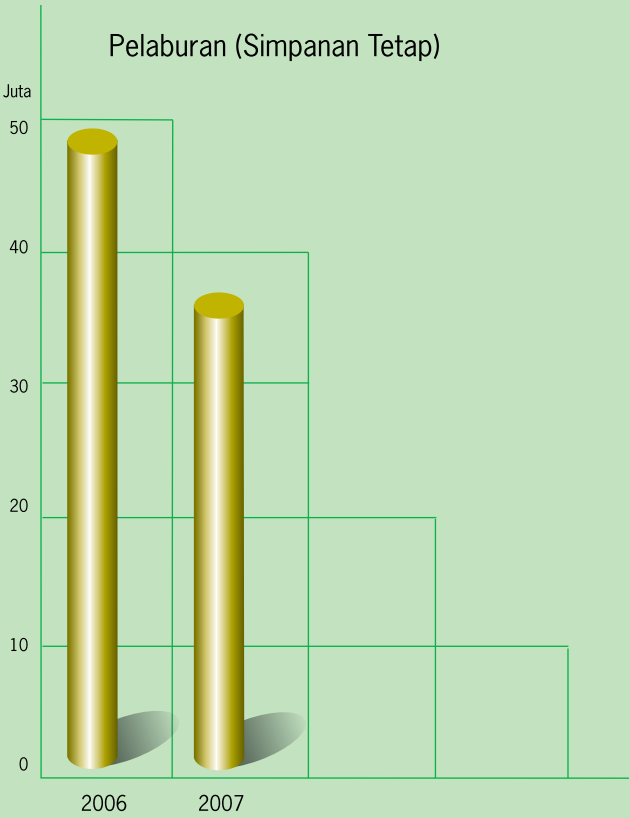
Perbelanjaan pembangunan yang dibiayai melalui peruntukan kerajaan yang berjumlah RM23.838 juta, sebahagian besarnya digunakan untuk aktiviti penyelidikan dan pembangunan perhutanan yang merupakan bidang utama FRIM.

Expenditure

FRIM's total operation and development expenditure for the year 2007 increased by RM16.783 million or 25.4% compared to the previous year.

The operation expenditure for emolument and emolument-related expenditure was the biggest portion incurred for any year. For the year 2007, total expenditure for emolument was RM25.572 million or 63.1% of the total operation expenditure. From that total, RM18.079 million was for salaries and allowances, RM6.208 million for fixed allowances, while RM0.912 million was for the contribution to the "Kumpulan Wang Amanah Persaraan (KWAP)" and Employees Provident Fund (EPF).

The total development expenditure which was funded by the government totalling RM23.838 million was mostly utilised for forestry research and development activities which is the core business of FRIM.



Pelaburan

Lebih wang tunai dilaburkan di dalam pelaburan berbentuk pendapatan tetap yang dibenarkan oleh kerajaan dengan institusi kewangan tempatan. Jumlah wang tunai yang dilaburkan dalam simpanan tetap dan pelaburan jangka pendek bagi tahun 2007 menurun berbanding tahun 2006. Jumlah keseluruhan pelaburan dalam tahun 2007 adalah sebanyak RM33.509 juta berbanding tahun 2006 dengan jumlah RM48.392 juta. Berlakunya penurunan dalam jumlah pelaburan ini kerana FRIM telah mendahulukan pembayaran premium tanah kampus FRIM kepada Kerajaan Negeri Selangor dan lain-lain bayaran sementara menunggu pengeluaran peruntukan kerajaan pusat, yang mana ianya telah diterima dalam tahun kewangan 2008. Pulangan yang diperolehi hasil daripada pelaburan tersebut adalah sebanyak RM1.459 juta bagi tahun 2007, meningkat berbanding RM1.221 juta bagi tahun 2006.

Kunci Kira-kira

Kedudukan aset FRIM bertambah baik dalam tahun 2007 berbanding tahun 2006. FRIM telah memperolehi hakmilik keatas tanah yang diduduki sekarang menjadikan jumlah aset bagi tanah bertambah sebanyak RM8.674 juta kepada RM9.251 juta berbanding tahun sebelum sebanyak RM0.578 juta sahaja.

Keseluruhan aset FRIM bagi tempoh berakhir 31 Disember 2007 adalah sebanyak RM102.635 juta berbanding RM81.663 juta pada tahun 2006. Kenaikan ketara ini adalah disebabkan pemilikan tanah seperti yang dinyatakan di atas dan lain-lain harta modal yang diperolehi dalam tahun semasa.

Investment

The cash surplus in the form of fixed earned income permitted by the government was invested with local finance institutions. The total cash invested in fixed deposits and short-term investments for the year 2007 had decreased to RM 33.509 million compared to the year 2006 where the total invested was RM48.392 million. The decrease of the total investment was because FRIM had to use its own funds to make payments for FRIM's land premiums to the Selangor State Government and other expenditure while waiting for the Federal Government allocation which was received in the year 2008. The return from the investment for the year 2007 was RM1.459 million, this was an increase compared to RM1.221 million in the year 2006.

Balance Sheet

The value of FRIM's asset in 2007 had increased compared to 2006. Since FRIM had acquired the land titles for the land on which FRIM is currently situated, the total land asset value increased by RM8.674 million to RM9.251 million as compared to the previous year of only RM0.578 million.

Total FRIM's asset for the year ended 31st December 2007 was RM102.635 million compared to RM81.663 million in 2006. The apparent increase was caused by the land acquisition as mentioned above and other acquisitions of capital assets during the year.



Pegawai Officers

Pada 2007, terdapat 687 kakitangan FRIM. Daripada jumlah ini, 195 merupakan Pegawai Penyelidik dan selebihnya ialah Penolong Pegawai Penyelidik serta Kakitangan Kumpulan Sokongan. Terdapat sembilan Pengarah Bahagian dan tujuh Pengarah Program.

In the year 2007, FRIM employed 687 staff. Out of these 195 were Research Officers, and the remaining were Assistant Research Officers and Supporting Staff. There were nine Divisional Directors and seven Programme Directors.

Komposisi Kakitangan semasa <i>Current staff composition</i>	No: 2007
Bilangan Kakitangan FRIM <i>Total number of FRIM staff</i>	687
Kategori Perjawatan <i>Staff Categories</i>	
Bilangan Pegawai Penyelidik (JUSA) <i>Number of Research Officers (JUSA)</i>	14
Bilangan Pegawai Penyelidik <i>Number of Research Officers</i>	181
Bilangan Penolong Pegawai Penyelidik <i>Number of Assistant Research officers</i>	44
Bilangan Kakitangan Sokongan <i>Number of Supporting Staff</i>	448

Pejabat Ketua Pengarah *Director General's Office*

Ketua Pengarah *Director General*

Y.Bhg. Datuk Dr. Abdul Razak Mohd. Ali
PJN, DIMP, JMN, FMIC
B. Sc. (Hons.) (Tasmania)
Ph. D. (UM)

Timbalan Ketua Pengarah (Penyelidikan dan Pembangunan) *Deputy Director General (Research and Development)*

Y.Bhg. Dato' Dr. Wan Razali Wan Mohd.
DPMT, JSM, KMN, FIFM
Dip. Agric. (UPM)
B. Sc., M. Sc. (Louisiana State)
Ph. D. (Washington)
(Sehingga/*Until* 7 December)

Dr. Abdul Rashid Ab. Malik
B. Sc. (UPM)
M. Sc. DIC (Imperial College)
Ph. D. (London)
(Dari/*From* 10 December)

Timbalan Ketua Pengarah (Operasi) *Deputy Director General (Operations)*

Y.Bhg. Dato' Dr. Abd. Latif Mohmod
DIMP, KMN, AMN
B. Sc. (Hons.) (UKM)
M. Sc., Ph. D. (UPM)

Pegawai Audit Dalam *Internal Auditor*

Ilyani Mazlan
Dip. Acc. (UiTM)
B. Acc. (Hons.) (UiTM)

Unit Pengurusan dan Jaminan Kualiti *Quality Management and Assurance Unit*

Dr. Mohd. Dahlan Jantan
B. Sc. (UPM),
M. Agric. Dev. (Ghent)
Ph. D. (Portsmouth)

Pegawai Penyelidik Kontrak *Contract Research Officers*

Shereen Haron
B. Sc. (Hons.) (UKM)

Suhana Rafidah Mohd. Yusof
Dip. For. (UPM)
B. Sc. For. (UPM)

Nor Haliyan Tan Shilan
B. Sc. (Hons.) (UUM)

Norhasni Ramli
B. Sc. (UKM)

Mohd Julian Borhanudin
B. Mgmt (Unitar)
(Sehingga/*Until* 1 Disember/December)

Program Tekno-Ekonomi *Techno-Economics Programme*

Pengarah *Director*

Dr. Woon Weng Chuen LIMIS
B. Sc. For. (UPM)
M. Sc. (Berkeley)
Ph. D. (Wales)
(Sehingga/*Until* 30 March)

Dr. Norini Haron AMN
Dip. For. (UiTM)
B. Sc. (UPM)
M. Sc. (Michigan)
Ph. D. (Aberystwyth, Wales)
(Dari/*From* 1 April)

Pegawai Penyelidik *Research Officers*

Dr. Hj. Ahmad Fauzi Hj. Puasa AMN
Dip. Agric., B.Sc. (UPM)
M. Sc. (UNE, Armadel, Australia)
Ph. D. (UPM)

Dr. Ismariah Hj. Ahmad
Dip. For. (UiTM)
B. Sc. (UPM)
M. Sc. (Michigan)
Ph. D. (Washington)

Mohd. Parid Mamat
B. Sc. For. (UPM)

Huda Farhana Mohd. Muslim
B. Sc. For. (UPM)

Pegawai Penyelidik Kontrak *Contract Research Officers*

Dr. Lim Hin Fui
Dip. Ed., B. Soc. Sc.,
M. Soc. Sc. (UKM)
Ph. D. (UM)

Najidah Ibrahim
B. Comp. Sc. (UM)

Cik Rohana Abd. Rahman
B. Econ (UPM)
M. Sc. (UPM)

Rosniza Rawi
B. MM. (Hons.) (UUM)

BAHAGIAN PENGURUSAN DAN MULTIMEDIA *MANAGEMENT AND MULTIMEDIA DIVISION*

Pengarah Kanan *Senior Director*

Dr. Abdul Rashid Ab. Malik
B. Sc. For. (UPM)
M. Sc. DIC (Imperial College)
Ph. D. (London)

Pegawai Penyelidik *Research Officers*

Wan Zahiri Wan Yaacob
Dip. Comp. Sc.,
B. Comp. Sc. (UTM)

Zahari Othman
B. Sc. (Hons.) (UiTM)

Norul Maslissa Ahmad
B. Info. Tech. (UUM)

Maizura Ishak
Dip. Comp. Sc. (UiTM)
B. Comp. Sc. (UTM)

Pegawai Tadbir *Administrative Officer*

Azuarni Abdul Adzis
B. A. (Hons.) (UPM)

Penolong Pegawai Penyelidik *Assistant Research Officers*

Nurul Hilal A. Tarmidzi
Dip. Elec. Comm. Eng. (UTM)
B.Sc. (Hons.) Inf. Tech (UNISEL)

Pegawai Penyelenggaraan *Maintenance Officers*

Jamal Abdul Razak
Dip. Qty. Survey (UiTM)

Penolong Pegawai Tadbir *Assistant Administrative Officers*

Md. Nasir Dayat PPN, PJK

Noorsuhanis Abdul Latif
Dip. Pub. Adm., (UiTM)
B. (Hons.) (UiTM)

Nazly Jamaludin

Penolong Pegawai Penyelidik *Assistant Research Officers*

Mohd Azhar Ishak @ Asahak

Pegawai Tadbir Kanan Kontrak *Contract Administrative Officer*

Mohd. Dzaki Jusoh
B.A. (Hons.). (UKM)
(Dari/*From* 3 Januari/January 2007)

Pegawai Penyelidik Kontrak *Contract Research Officers*

Intan Dalina Othman

BAHAGIAN PENGURUSAN SUMBER MANUSIA *HUMAN RESOURCES MANAGEMENT DIVISION*

Pengarah Kanan *Senior Director*

Wan Rahmah Wan A. Raof
B. Sc. (Hons.) (USM)
M. HRM. (UPM)

Pegawai Penyelidik *Research Officers*

Liza Ismail
B. Sc. (UPM)

Pegawai Tadbir *Administration Officer*

Zamri Mohd. Zangi
B. Sc. (Hons.) (UUM)

Mohd. Asmawee Ismail
B. HRM (UUM)

Penolong Pegawai Penyelidik *Assistant Research Officers*

Ruziah Ripin
Dip. Ind. Chem. (UiTM)

Penolong Pegawai Tadbir *Assistant Administration Officer*

Mohd. Akhir Abd. Rahman

BAHAGIAN KEWANGAN FINANCE DIVISION

Pengarah Director

Mohd. Zamshari Abdul Rahman
R.A.(M), ASCPA
B. Comm. (W. Aust.)

Akauntan Accountant

Mohd. Redzuan Hasan
B. Acc. (UKM)
MBA (UKM)

Jumaaton Abu Bakar
Dip. Acc., B. Acc. (Hons.) (UiTM)

Pegawai Penyelidik Research Officers

Azman Hassan
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B. Sc. For. (Wisconsin)
M. Sc. (UKM)

Pegawai Tadbir Administrative Officer

Abdul Jabbar Sabli
Dip. Bus. Stud.(UiTM)
B. Bus.Adm.(Hons.)(UKM)
MBA (UKM)

Penolong Akauntan Assistant Accountants

Norli Raja Mohamad
Dip. Bus. Stud. (UiTM)

Norbaite Saharudin
Dip. Bus. (UiTM)

Emylia Ayoub
Dip. Bank (UiTM)

Zainorasri Yahya
Dip. Acc. (UiTM)

BAHAGIAN KORPORAT DAN HAL EHWAL UNDANG-UNDANG CORPORATE AND LEGAL AFFAIRS DIVISION

Pengarah Kanan Senior Director

Dr. Norini Haron AMN
Dip. For. (UPM)
B. Sc. Res. Econ. (UPM)
M. Sc. (Michigan)
Ph. D. (Aberystwyth, Wales)

Pegawai Penyelidik Research Officer

Tariq Mubarak Husin
Dip. For., B. Sc. For. (UPM)

Cawangan Hal Ehwal Undang-Undang Legal Affairs Branch

Pegawai Undang-Undang Legal Officer

Nor Azura Ahmad Murad
LLB (Hons.) (UIA)

Cawangan Perhubungan Korporat Corporate Communication Branch

Ketua Head

Norhayati Nordin
Dip. Civil Eng. (UTM)
B. Civil Eng. (Hartford)
M. Sc. (Sussex)

Pegawai Antikuiti dan Galeri Antiquity and Gallery Officer

Noor Atizza Hj. Mansor
B. Graphic (UiTM)
M. Sc. (UKM)

Pegawai Pengembangan dan Perkhidmatan Korporat Corporate Extension and Services Officer

Norain Mat Arif
B.Sc. (Hons) (UiTM)

Pegawai Perhubungan Awam Public Relations Officer

Wahayu Abd. Wahab
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Pereka Grafik Graphic Artist

Jamaluddin Abdullah
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BAHAGIAN BIODIVERSITI DAN ALAM SEKITAR BIODIVERSITY AND ENVIRONMENT DIVISION

Pengarah Kanan Senior Director

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Ph. D. (Wales)

Program Pusat Biodiversiti Hutan Tropika Tropical Forest Biodiversity Centre Programme

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Ph. D. (Aberdeen)

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Ph. D. (Salford)

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Ph. D. (Bath)

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Ph. D. (Mississippi)

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M. Sc. (UTM)

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Nada Badruddin
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Patahayah Mansor
B. Sc. For. (UPM)

Pegawai Penyelidik Kontrak Contract Research Officers

Dr. E. Soepadmo
B. Sc. (Bogor), Ph.D. (Cambridge)

Dr. Ruth Kiew
B. A., M. A., Ph. D (Cantab)

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Suzana Sabran
B. Sc. (UMS)

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M. Sc. (USM)

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Ong Su Ping
B. Sc. (USM)

Veronica Khoo Swee Imm
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Ng Wei Lun
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Pegawai Penyelidik Kontrak Contract Research Officers

Kamarudin Saleh

Marzita Zuliana Zahariya@Zakaria
Sijil IT (Cosmotact)
Dip. IT (Cosmopoint)

Program Ekopelancongan dan Pengurusan Hutan Bandar Ecotourism and Urban Forestry Management Programme

Pengarah Director

Dr. Noor Azlin Yahya
B. Sc. (Doane, Nebraska)
M. Sc. (New York)
Ph. D. (UPM)

Pegawai Penyelidik Research Officers

Dr. Elizabeth Philip
B. Sc. (UPM)
Ph. D. (UM)

Adnan Mohamad
B. Sc. (UTM)
M. Sc. (London)
Ahmad Azaruddin Mohd. Noor
B. Sc. M. Sc. (UPM)

Zalani Abd. Kadir
B. Sc. (Washington)
(On study leave)

Ahmad Nazarudin Mohd. Roseli
B. Sc., M. Sc. (UPM)

Sreetheran Maruthaveeran
B. Sc. (UMS)
M. Sc. (UPM)

Kho Lip Khoon
B. Sc. (UPM)
M. Sc. (UNIMAS)

Chong Mew Im
B. Sc. (UPM)
M. Sc. (UPM)

Pegawai Penyelidik Kontrak Contract Research Officers

Nik Azyyati Abdul Kadir
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B. Sc. (UPM)

Mohd Aswad Ramlan
B. Sc. (UPM)

Sharmillah Saleh
B. Sc. (UMS)

Syamsurina Arshad
B. Sc. (UMS)

Suhana Bebakar
Dip. For., B. Sc. (UPM)

Arkitek Landskap Kontrak Contract Landscape Architect

Nik Adlin Nik Mohamed Sukri
B. Sc. (UTM)

Pegawai Perancang Bandar dan Desa Kontrak Contract Town Planning Officer

Mimi Zareena Md. Nor
B. Sc. (UTM)

Penolong Pegawai Penyelidik Assistant Research Officers

Mohd. Afendi Husin
Dip. Agric. (UPM)

Azahari Hj. Mohd. Yusoff
Dip. Lands. Des. (UiTM)

Mohd. Rizal Mohd. Kassim
Dip. Plant. Mgmt. (UiTM)

Suharti Samod
Dip. For. (UPM)
B. Sc. (UPM)

Penolong Pegawai Perancang Bandar
Assistant Town Planning Officer

Azrina Yahaya
Dip. Town & Reg. Plan. (UiTM)

Siswazah Penyelidikan
Graduate Research Assistantship

Roslina Nordin @ Mamat
B. Sc. (UPM)

BAHAGIAN PERHUTANAN
FORESTRY DIVISION

Pengarah Kanan
Senior Director

Dr. Shamsudin Ibrahim AMN
B. Sc. (UPM)
M. Sc. (James Cook)
Ph. D. (Wales)

Program Hutan Asli
Natural Forest Programme

Pengarah Kanan
Senior Director

Dr. Shamsudin Ibrahim AMN
B. Sc. (UPM)
M. Sc. (James Cook),
Ph. D. (Wales)

Pegawai Penyelidik
Research Officers

Dr. Raja Barizan Raja Sulaiman
B. Sc., M. Sc. (UKM)
Ph. D. (Stirling)

Dr. Khali Aziz Hamzah
B. Sc. (UPM)
M. Sc. (AIT)
Ph. D. (Reading)

Dr. Ismail Harun
Dip. For., B. Sc., M. Sc. Ph.D. (UPM)

Dr. Abd. Rahman Kassim
Dip. For., B. Sc. (UPM)
M. Sc. (UPLB)
Ph. D. (Oregon State)

Abd. Razak Othman
B. Sc. (UPM)
M. Sc. (UKM)

Dr. Nur Supardi Md. Noor AMK
Dip. Sc. (UPM)
M. Sc. (Wales)
Ph. D. (Reading)

Muhammad Farid Abdul Rashid
B. Eng. (UPM)
M. For. (Oregon State)

Samsudin Musa
B. Sc. (UPM)

Mohd. Nasir Husin
Dip. For. (UiTM)
B. Sc. (UPM)
M. Sc. (UKM)

Ismail Parlan
Dip. Sc. (UiTM)
B. Sc., M. Sc. (UPM)

Dr. Safiah @ Yusmah Muhd.Yusoff
Dip. Sc. (UiTM)
B. Sc., M. Sc. (UM),
Ph. D. (Wales)

Siti Aisah Shamsuddin
B. Sc., M. Phil. (UM)

Wan Mohd. Shukri Wan Ahmad
B. Sc., M. Sc. (UPM)

Nur Hajar Zamah Shari
Dip. For., B. Sc., M. Sc. (UPM)

Dr. Serafina Christine Dawn Fletcher
B. Sc. (Hons.) M. Sc. Ph.D. (UKM)

Tan Sek Aun
B. Sc. (UPM)

Saiful Iskandar Khalit
B. Comp. Sc., M. Sc. (UPM)

Marryanna Lion
B. Soc. Sc., M. Soc. Sc. (UPM)

Azian Mohti
Dip. For., B. Sc. M. Sc. (UPM)

Salleh Mat
B. Sc., M. Sc. (UPM)

Pegawai Penyelidik Kontrak
Contract Research Officers

Khairul Najwan Ahmad Jahari
B. Sc. (UPM)

Norazian Mohd. Zain
Dip. For., B. Sc. (UPM)

Syurhani Abdul Wahab
Dip. For., B. Sc. (UPM)

Nur Fadzliza Kamarulbahrin
B. Sc. (UPM)

Muhammad Ezhar Yusuf @ Antik
B. Sc. (UPM)

Mohd. Aswad Ramlan
B. Sc. (UPM)

Mohd. Suhaimi Mohd. Noor
B. Sc. (UPM)

Azeyla Ahmad
B. Sc. (Hons.) (UKM)

Ahmad Faiz Mokhtar
Dip. Human Development (UPM)
B. Sc. (UPM)

Farah Shahanim Mohamed Mohiden
B. Sc. (Hons.) (UKM)
M. Sc. (Hons) (UKM)

Siti Normasliana Mohd. Tari
B. Sc. (UKM)

Siswazah Penyelidikan
Graduate Research Assistantship

Joann Christine Luruthusamy
B. Sc. (UMT)

Penolong Pegawai Penyelidik
Assistant Research Officers

Shahrulzaman Idris
Dip. For. (UiTM)

Mohd. Md. Sahat

Nazaruddin Ramli
Dip. Agric. (UPM)

Rodziah Hashim
Dip. Sc. (UiTM)

Mohd. Azhan Shah Idris
Dip. For. (UPM)

Sadali Sahat

Harfendy Osman
Dip. Comp. Sc. (UPM)

Naimah Che Long
Dip. For. B.Sc. (UPM)

Program Hutan Ladang
Forest Plantations Programme

Pengarah
Director

Dr. Ahmad Zuhaiddi Yahya
Dip. For. (ITM/For. College, Kepong)
B. Sc. (UPM)
M. Sc. (Aberdeen)
Ph. D. (Irish U. Dublin)

Pegawai Penyelidik
Research Officers

Dr. Aminah Hamzah
B. Sc. (UPM)
M. Sc. (Goettingen)
Ph. D. (Edinburgh)

Dr. Ang Lai Hoe
B. Sc. (UPM)
M. Sc. (UPLB)
Ph. D. (Aberdeen)

Dr. Hashim Mohd. Nor AMP
B. Sc., M. Sc. (UPM)
Ph. D. (Wales)

Dr. Wan Rasidah Wan Abdul Kadir
B. Sc. (Hons.), M. Sc. (UKM)
Ph. D. (Ghent)

Lok Eng Hai
Dip. For., B. Sc., M. Sc. (UPM)

Mohd. Noor Mahat
B. Sc. (Hons.) (UKM)
M. Sc. (UPM)
Ph. D. (UPM)

Mohd. Lokmal Hj. Ngah
B. Sc. (Hons.) (UM)
M. Sc. (UKM)

Rosdi Koter
Dip. For., B. Sc. For. (UPM)
M. Sc. (UPM)

Mohd. Zaki Hj. Abdullah
Dip. Agric., B. Sc., M. Sc. (UPM)

Ahmad Fauzi Mohd. Shariff
Dip. Agric., B. Sc. (UPM)

Ho Wai Mun
B. Sc. (UMS)
M. Sc. (UKM)

Farah Fazwa Mohd. Arif
B. Sc. (UKM)

V. Jeyanny a/p Vijayanathan
B. Sc. (UPM)

Pegawai Penyelidik Kontrak
Contract Research Officers

Rosazlin Abdullah
B. Sc., M. Sc. (UPM)

Esther Hui Ting Fui
B. Sc. (Utah State)

Siswazah Penyelidikan
Graduate Research Assistantship

Adi Fadzly Abd. Khalid
B. Sc. (UM)

Dasrul Iskandar Darus
Dip. Plantation (UiTM)
B. Sc. (UMS)

Penolong Pegawai Penyelidik
Assistant Research Officers

Rozita Ahmad
Dip. Ind. Chem. (UiTM)
B. Sc. (Hons.) (USM)

Suhaimi Wan Chik
Dip. Agric. (UPM)

Amir Saiffuddin Kassim
Dip. Agric. (UPM)
B. Acc. (UiTM)

Sharmizi Ismail
Dip. Planting Ind. Mgmt. (UiTM)

Mohd Jaffar Sharri

Ong Tai Hock

Khairuddin Kamaruddin

Penolong Pegawai Penyelidik
Kontrak
Contract Assistant Research
Officers

Tang Lai Kuen
B. Sc. (TARC)

Penolong Pegawai Taman/ Ladang
Assistant Garden/Plantation Officer

Mohd. Ramly Mohd. Saleh
Dip. Agric. (UPM)

BAHAGIAN KELUARAN HUTAN
FOREST PRODUCTS DIVISION

Pengarah Kanan
Senior Director

Dr. Hoi Why Kong, AMN
B. Sc. (Hons.), M. Sc. (UKM)
Ph. D. (Aston)
(Until 30 June)

Dr. Mohd. Nor Mohd. Yusoff, KMN
B. Sc. (Louisiana)
M. Sc. (Virginia)
Ph. D. (Manchester)
(From 1 July)

Program Kimia dan
Perlindungan Kayu
Chemistry and Timber
Protection Programme

Pengarah
Director

Dr. Rahim Sudin, AMN, DSM
B. Sc. (Hons.) (UKM)
M. Sc. (USM)
Ph. D. (Sheffield)

Pegawai Penyelidik
Research Officers

Dr. Rushdan Ibrahim
B. Sc. (Montana)
M. Sc. (UPM)
Ph. D. (Manchester)

Salamah Selamat
B. Sc. (Hons) (UKM)

Dr. Koh Mok Poh
B. Sc. (Hons.) (London)
M. Sc., Ph. D. (Du Maine)

Dr. Salmiah Ujang
Dip. Wood Tech. (UiTM)
B. Sc., M. Sc. (Mississippi State)
Ph. D. (Portsmouth)

Dr. Wan Asma Ibrahim
B. Sc. (Kansas State)
M. Sc. (Missouri-Rolla)
Ph. D. (UPM)

Mahmudin Saleh
B. Eng. (Hons.) (UM)
M. Sc (UiTM)

Hashim W. Samsi
Dip. Agric., B. Sc., M. Sc. (UPM)

Roszaini Kadir
Dip. Wood Tech. (UiTM)
B. Sc., M. Sc. (UPM)
(left for United Kingdom for Ph.D. studies
from December 2007)

Zaihan Jalaludin
B. Sc. (Hons.) (UKM)
M. Sc. (UPM)

Suffian Misran
B. Sc. (Hons.), M. Sc. (UPM)
(left for United Kingdom for Ph.D. studies
from October 2007)

Sharmiza Adnan
B. Chem. Eng. (Vanderbilt)
M. Sc. (UKM)
(left for Australia for Ph.D. studies from
December 2007)

Puad Elham
Dip. Wood Tech. (UiTM)
B. Sc., M. Sc. (UPM)

Shaharuddin Hashim
B. Sc. (USM)

Rafeadah Rusli B. Sc. (Hons.) (USM) M. Sc. (UPM) (left for United Kingdom for Ph.D. studies from July 2007)	Rozaida Latip Dip. Wood Tech. (UiTM)
Mohamad Jani Saad B. Sc. (Hons.), M. Sc. (USM)	Siti Rafidah Mahmud Dip. Wood Tech. (UiTM)
Dr. Ainun Zuriyati Mohamed @ Asa'ari B. Sc. (Hons.), M. Sc. (USM) Ph. D. (UKM)	Azizi Abdul Jalil Dip. Wood Tech. (UiTM)
Latifah Jasmani B. Sc. (Hons.) (Manchester) M. Sc. (UKM)	Noraidah Subakin Dip. Sc. (UiTM) B. Sc. (Hons.) (UKM)
Mohamad Nasir Mat Arip B. Sc. (Hons.), M. Sc. (UKM)	Program Pemprosesan dan Teknologi Kayu Timber Processing and Technology Programme
Mahanim Sarif @ Mohd. Ali B. Eng. (Hons.), M. Sc. (USM)	Pengarah Director
Rafidah Jalil B. Eng. (Hons), M. Sc. (UKM)	Dr. Tan Yu Eng B. Sc. (Hons.) (UKM) Ph. D. (Brighton)
Mohd Khairun Anwar Uyup B. Sc., M. Sc. (UPM)	Pegawai Penyelidik Research Officers
Pegawai Penyelidik Kontrak Contract Research Officers	Dr. Gan Kee Seng Dip. Mech. Eng. (UiTM), B. Sc., Ph. D. (Strathclyde)
Tumirah Khadiran B. Sc., M. Sc. (UKM)	Dr. Mohamad Omar Mohamad Khaidzir Dip. Civil Eng. (UTM) B. Sc. (CBU Memphis) M. Sc. (British Columbia) Ph. D. (Sheffield)
Nurul Husna Mohd Hassan B. Sc. (Hons.), M. Sc. (USM)	Dr. Ani Sulaiman B. Sc. (Hons.) (USM) M. Sc. (Wales) Ph. D. (Reading)
Khairul Azmi Jabar B. Sc. (Hons.), M. Sc. (USM)	Mohd. Arshad Saru Dip. Mech. Eng. (UTM) B. Eng. (Sunderland)
Norhairul Nizam Awg Malek B. Sc. (UPM)	Lim Seng Choon, AMP, PPN Dip. Timb. Stud. (Bucks.) M. Sc. (Wales) (retired on 15 Nov 2007)
Siswazah Penyelidikan Graduate Research Assistantship	Mohd. Tamizi Mustafa Dip. Wood Tech. (UiTM) B. Sc. (UPM), M. Sc. (USM)
Noraswati Mohd Nor Rashid B. Sc. (Hons.) (UPM)	Dr. Hamdan Husain Dip. Arch. (UTM) B. Sc., B. Arch. (USM) Ph. D. (Wales)
Izran Kamal B. Sc. (Hons.) (UMS)	Abdul Hamid Saleh B. Ind. Design (UiTM) B. Sc. (Hons.), M. Sc. (UiTM)
Penolong Pegawai Penyelidik Assistant Research Officers	Ong Chee Beng B. Sc. (Hons.), M. Sc. (UPM)
Habibah Mohamad PPN Dip. Ind. Chem. (UiTM)	Khairul Awang Dip. Pl. Mgmt., B. Sc. (Hons.) (UiTM) M. Sc. (USM)
Nor Azian Mohd. Kasby Dip. Civil Eng. (UTM)	
Baharuddin Kamaruddin Dip. Wood Tech. (UiTM) B. Sc. (UPM)	
Zaitun Said Dip. Wood Tech. (UiTM)	

How Seok Sean B. Sc., M. Sc. (UPM)
Sik Huei Shing B. Sc. (UPM)
Pegawai Penyelidik Kontrak Contract Research Officers
Choo Kheng Ten, AMN B. Sc. (Hons.) (UM)
Nur Hazami Kamarul Zaman B. Sc. (UIA) (until 28 Feb)
Mohd. Jamil bin Abdul Wahab B. Eng. (Hons.) (UM)
Zairul Amin Rabidin B. Eng. (Hons.) (UM)
Khairul Masseat Dip. Wood Tech. (UiTM) B. Sc. (Hons.) (UiTM)
Siti Zaliha Ali Dip. Manuf. Eng. (KUSZA) B. Eng. (Hons.) (UIAM)
Thilagawathy Maniam B. Sc. (UPM)
Siswazah Penyelidikan Graduate Research Assistantship
Nordahlia Abdullah Siam B. Sc. (UKM)
Ana Azrena Ramly B. Eng. (Hons.) (USM)
Penolong Pegawai Penyelidik Assistant Research Officers
Zawawi Kassim Dip. Sc. (UiTM) Noor Nazreen Nasir Dip. Elec. Eng. (UiTM)
Ahmad Ismail
Roszalli Mohd.
Emlee Mohd. Taib
Pembantu Teknik Technical Assistant
Ya'akob Zahari

BAHAGIAN BIOTEKNOLOGI HUTAN FOREST BIOTECHNOLOGY DIVISION
Pengarah Kanan Senior Director
Dr. Baskaran Krishnapillay B. Sc. (Hons.), M. Sc., Ph.D. (UPM)
Program Tumbuhan Ubatan Medicinal Plants Programme
Pengarah Kanan Senior Director
Dr. Rasadah Mat Ali, AMP B. Sc. (Hons.), M. Sc. (UM) Ph. D. (London)
Pegawai Penyelidik Research Officers
Dr. Nor Azah Mohamad Ali B. Sc. (Waterloo) M. Sc. (UKM) Ph. D. (UPM)
Dr. Chang Yu Shyun B. Sc. (Hons.), Ph. D. (Tasmania)
Mastura Mohtar B. Sc. (Hons.), M. Sc. (UKM)
Vimala Subramaniam B. Sc. (Hons.) (UKM) M. Sc. (UM)
Dr. Ling Sui Kiong B. Sc. (Hons.) (UKM) M. Biotech. (UM) Ph. D. (Nagasaki)
Ong Boo Kean B. Sc. (Hons.) (UKM) M. Sc. (UPM)
Dr. Nik Musa'adah Mustapha B. Sc. (Hons.) (UKM) Ph. D. (London)
Zainon Abu Samah B. Sc. (Hons.), M. Sc. (UM)
Zaridah Mohd. Zaki B. App. Sc. (Hons.) (USM) M. Sc. (UKM)
Mohd. Shahidan Mohd. Arshad B. Sc. (Hons.) (UM)
Zamree Md. Shah Dip. Vet., B. Sc. (Hons.) (UPM) M. Sc. (UPM)

Chee Beng Jin B. Sc. (Hons.) (UPM) M. Sc. (UPM)
Mary Khoo Gaik Hong B. Sc. (Hons.) (UPM) M. Sc. (UPM)
Norhayati Abdullah B. Sc. (Hons.), M. Sc. (UM)
Mazura Pisar B. Sc. (Hons.), M. Sc. (UKM)
Hada Masayu Ismail @ Dahlan B. Sc. (Hons.) (UPM)
Saidatul Husni Saidin B. Sc. Nutr. & Comm. Health (UPM) M. Sc. (UPM)
Noor Rasyila Mohamed Noor B. Sc. (UPM) M. Sc. (UPM)
Fauziah Abdullah B. Sc. (Hons.) (UKM) M. Sc. (UKM)
Saiful Azmi Johari B. App. Sc (Hons.) (USM) M. Sc. (UPM)
Pegawai Penyelidik Kontrak Contract Research Officers
Mailina Jamil Dip. Ind. Chem. (UiTM) B. Sc. (Hons.) (UiTM)
Pin Kar Yong B. Eng. (Hons.) (UPM)
Fadzureena Jamaluddin B. Sc. (Hons.) (UM)
Abdul Rashid Li Dip. Ind. Chem. (UiTM) B. Sc. (Hons.) (UiTM) M. Sc (UiTM)
Adiana Mohd Adib B. Sc (UTM) M. Sc. (UTM)
Mirfat Hj. Ahmad Hasan Salahudin B. Sc. (Hons.) (UM)
Norul Aiman Yusoff B. Sc. (UPM) M. Sc. (UPM)
Ihsan Safwan Kamarazaman B. Sc. (UPM)

Siswazah Bantuan Penyelidikan Graduate Research Assistantship
Zunoliza Abdullah B. Sc. (Hons.) (UM) M. Sc. (UM)
Siti Humeirah Abd. Ghani B. Sc. (Hons) (UMS)
Penolong Pegawai Penyelidik Assistant Research Officers
Abdull Rashih Ahmad
Mohd. Radzi Ahmad Dip. MLT (UKM)
Khairuddin Kamaruddin
Nuziah Hashim Dip. Ind. Chem. (UiTM)
Salbiah Man Dip. Ind. Chem. (UiTM)
Rohana Sahdan Dip. Microbiol. (UiTM)
Mazurah Mohamed Isa Dip. Microbiol. (UiTM)
Abdul Majid Jalil Dip. Chem. Eng. (UTM)
Penolong Pegawai Penyelidik Kontrak Contract Assistant Research Officer
Abu Said Ahmad
Program Bioteknologi & Farmaseutikal Biotechnology & Pharmaceutical Programme
Pengarah Kanan Senior Director
Dr. Marzalina Mansor B. Sc. (Hons.) (Carlton) Ph. D. (UKM) MBA (UiTM)
Pegawai Penyelidik Research Officers
Dr. Lee Soon Leong B. Sc. (Hons.) (UKM) M. Phil. (UM) Ph. D. (UKM)
Dr. Mohd. Ilham Adenan B. Sc. (Hons.), M. Phil. (UM) Ph. D. (Okayama)
Dr. Norwati Muhammad B. Sc. (Hons.), M. Sc. (UKM) Ph. D. (Reading)

Mohd. Rosli Haron
B. Sc. (Hons.) (UM)
M. Sc. (UKM)

Asiah Osman
B. Sc. (UPM)
M. Sc. (UKM)

Dr. Norwati Adnan
B. Sc. (Hons.) (UM)
M. Sc. (UPM)
Ph. D. (UKM)

Dr. Fadhilah Zainudin
B. Sc. (UPM)
M. Sc. (UKM)
Ph. D (Birmingham, UK)

Haliza Ismail
B. Sc. (Hons.) (UM)
M. Sc. (UPM)

Dr. Kevin Ng Kit Siong
B. Sc. (Hons.) (UMS)
Ph. D. (UM)

Lee Chai Ting
B. Sc. (Hons.) (UKM)
M. Sc. (UKM)

Nashatul Zaimah Noor Azman
B. Sc. (Hons.) (USM)
M. Sc. (London)

Nor Asmah Hassan
B. Sc. (Hons.), M. Sc (UKM)

Nor Hasnida Hassan
B. Sc. (Hons.), M. Sc. (UKM)

Dr. Norlia Basherudin
B. Sc., M. Sc. (UPM)
Ph. D (UPM)

Nurhanan Murni Yunos
B. Sc. (Hons.) (Sheffield)
M. Sc. (UKM)

Siti Salwana Hj. Hashim
B. Sc. (Hons.) (UPM)

Dr Getha a/p Krishnasamy
B. Sc. (UKM)
M. Phil (UM)
Ph. D (UM)

Dr Jaya Vejjayan a/l Palliah
B. Sc. (Hons) (UM)
M. Sc. (UM)
Ph. D (UM)

Dr. Ng Chin Hong
B. Sc. (Hons), M. Sc., Ph. D (UKM)

Dr. Kodi Isparan Kandasamy
B. Sc. (UKM),
M. Sc., Ph. D (London)

Lili Sahira Husin
B. Sc. (UPM)

Noraliza Alias
B. Sc. (UPM)

Norhayati Ismail
B. Sc. (Hons) (UPM)

Chang Li Yen
B. Sc., M. Sc. (UPM)

Dr. Wan Tarmeze Wan Ariffin
B. Eng. (Portland)
M. Sc. (UPM)
Ph. D. (Birmingham)

Siti Syarifah Mohd Mutalip
B. Sc. (Hons) UPM

Nadiah Salmi Nadzri
B. Sc. (Hons) (UKM)

Rosilah Ab. Aziz
B. Sc. (UMS)
M. Sc. (UPM)

Pegawai Penyelidik Kontrak **Contract Research Officers**

Nor Datiakma Mat Amin
B. (Hons.) (UMS)

Tnah Lee Hong
B. Sc. (UTM)
M. Sc (UPM)

Anee Suryani Sued
B. Sc. (Hons) (UKM)

Mohd Zairus Rizal Razali
B.Sc. (Hons) UPM

Penolong Pegawai Penyelidik **Assistant Research Officers**

Ang Khoon Cheng

Azril Deenor Md. Dan
Dip. Microbiologi (UiTM)

Siswazah Penyelidikan **Graduate Research Assistantship**

Sun Wan Fong
B. Sc. (UTM)

Yap Jing Wei
B. Sc. (Monash)
B. Sc. (Hons) (Tasmania)

Roshan Jahn Mohd Salim
B. Eng. (Hons) UIA

BAHAGIAN PENGURUSAN **PENYELIDIKAN** **RESEARCH MANAGEMENT** **DIVISION**

Pengarah Kanan **Senior Director**

Dr. Chan Hung Tuck KMN
B. Sc. (Hons.) (USM)
Ph. D. (Aberdeen)
(Until November)

Pegawai Penyelidik **Research Officers**

Dr. Sim Heok Choh
B. Eng. (Hons.) (UM)
M. Sc., Ph. D. (Idaho)
(Seconded to APAFRI)

Nor Azman Hussein
Dip. Agric. (UPM)
B. Sc. (Louisiana)
M. Sc.(West Virginia)

Boon Kok San
B. Sc. (Hons.) (UM)
M. Sc. (NUS)

Shaaruddin Mat
Dip. For. (UiTM)
Post-Grad. Dip. For. Surv. (ITC)
M. Sc. (Edinburgh)
(Sehingga Jun/Until June)

Nik Zanariah Nik Mahmood
Dip. Mass Comm. (UiTM)
M. Sc. (UPM)

Norhara Hussein
B. Sc. (Hons.) (USM)

Ho Yuen Foon
B. Sc. (Hons.), M. Sc. (UM)

Sarifah Kunju Ahmad
B. Sc. (Hons.), M. Sc. (UM)

Mohd. Zaki Mohd. Isa
Post-Grad. Dip. Lib. Sc. (UiTM)
B. Sc. (Guelph)
M. Sc. (UIA)

Mastura Buang
Post-Grad. Dip. Lib. Sc. (UiTM)
B. Sc. (UPM)
M.Sc. (UIA)

Pegawai Penerangan Kontrak **Contract Information Officer**

Roshamida Ruslan
B. Sc. (Hons.) (UiTM)



Penerbitan *Publications*

Pada tahun 2007, sebanyak 22 judul telah diterbitkan manakala tiga judul telah dicetak semula disebabkan permintaan yang menggalakkan. Perinciannya dijadualkan di bawah:

In 2007, a total of 22 publications were produced, while three titles were reprinted due to popular demand. The details are tabulated below:

Jenis penerbitan <i>Type of publication</i>	Judul <i>Title</i>	Bil. <i>No.</i>
Journal of Tropical Forest Science	JTFS Vol. 19(1-4)	4
FRIM Reports	Safrole-Rich Oil Production and Trade in Peninsular Malaysia	2
	Harvesting Technique in Natural Stands of Buluh Semantan (<i>Gigantochloa scortechinii</i>)	
Timber Technology Bulletin	Advantages of Wood Lamination for Modern Applications	4
	Identification and Utilization of Lesser-Known Commercial Timbers in Peninsular Malaysia 8: Keruntum, Kundang, Leban and Malabera	
	Identification and Utilization of Lesser-Known Commercial Timbers in Peninsular Malaysia 9: Mempoyan, Mengkirai, Mengkudor and Mentulang	
	Review on Six Types of Log Cutting Methods in Various Applications: Part 1	
Proceedings	Status of Biological Diversity in Malaysia and Threat Assessment of Plant Species in Malaysia. Proceedings of the Seminar and Workshop 28-30 June 2005	3
	Proceedings of the Seminar on Energy from Biomass 2006. Conversion of Bioresources into Energy and Other Applications	
	Proceedings on Session 072 (9 August 2005) Harmonising Commercial Utilization, Social and Conservation Values Through Intensive Tropical Forest Management	
Annual Report	Annual Report 2006	1
Research Report	Research Report 2006	1
FRIM in Focus	March, June, September, December	4
Research Pamphlets	Turning Oil Palm Residues Into Products	1
Tree Flora of Sabah and Sarawak	Tree Flora of Sabah and Sarawak Vol. 6	1
Other Publicatons	Highlights of FRIM'S IRPA Projects 2006	1
Reprints	Tree Flora of Sabah and Sarawak Vol. 4 Journal of Tropical Forest Science 19(3) Foresters' Manual of Dipterocarps	3

Penerbitan *Publications*

Articles	35
Books	18
Journals	82
Proceedings	65
Work Papers	229
Institutional Reports	86
Posters	112
Theses	18
E-Publications	10

ARTIKEL ARTICLES

1. ABD. MAJID, J., MOHD. FARID, A., & HUDA FARHANA, M.M. Kenangan ekspedisi berakit bersama Dato' KP. FRIM in Focus, Forest Research Institute Malaysia, Kuala Lumpur, June 2007. P 14
2. AHMAD NAZARUDIN, M.R. A new approach in maintaining the urban landscapes. MSPP News Letter, July, Pp. 6-7
3. AZIAN, M. & MOHD. NASIR, H. National coastal and mangrove forest rehabilitation workshop: Kesedaran dan tindakan Bersama. FRIM in Focus, Forest Research Institute Malaysia, Kuala Lumpur, December 2007. P 12
4. CHAN, Y.M. & CHUA, L.S.L. A ray of hope for *Dipterocarpus semivestitus* once thought extinct. Conservation Malaysia 6. Pp. 4
5. CHAN, Y.M. Diamonds of the forest. Conservation Malaysia Bulletin 4:1-2
6. CHEW, M.Y. Green lung effects - natural air conditioners that need not to be plugged in. Full Record of Environment, Special Issue 2007. Pp. 11-13
7. CHEW, M.Y. Plant connoisseur - identifying the rare and precious local species. Full Record of Environment, October 2007. Pp. 8-9
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64. WAN MOHD. SHUKRI, W.A. & WAN JULIANA, W.A. Impacts of the Selective Management System to the residual stand: A re-look at the management prescriptions. Pp. 226-228 in Proceedings of the Seventh FST Graduates Coloqium, 26 June, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
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KERTAS KERJA **WORKPAPERS**

1. AB. RASIP, A.G. & FARAH FAZWA, M.A. An introduction on tree and herb improvement. In Ab. Rasip, A.G., Farah Fazwa, M.A., Lokmal, N., Mohd Zaki, A. & Ahmad Zuhaidi, Y. (Eds.). Tree and Herb Improvement Notes for Preliminary Workshop, FRIM, Kepong, Selangor, Malaysia, 102 pp.
2. AB. RASIP, A.G. & MOHD. NOOR, M. Breeding strategy. Pp 93-102 in Ab. Rasip, A.G., Farah Fazwa, M.A., Lokmal, N., Mohd Zaki, A. & Ahmad Zuhaidi, Y. (Eds.). Tree and herb improvement notes for preliminary workshop, FRIM, Kepong, Selangor, Malaysia
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4. AB. RASIP, A.G., MOHD. ZAKI, A. & MOHD. NOOR, M. Penubuhan dan pengurusan kawasan pengeluaran biji benih spesies hutan paya gambut. A paper presented at the Kursus Pengendalian Biji Benih Hutan Paya Gambut, FRIM/UNDP/GEF dan Jabatan Perhutanan Pahang, 30 May to 1 June, Kuantan, Pahang, Malaysia
5. AB. RASIP, A.G., MOHD. ZAKI, A., MOHD. NOOR, M. Panduan pemilihan pokok Plus (pokok pilihan). A paper presented at the Workshop on Seed Handling and Establishment of Seed Production Area, 6 to 8 August, Forest Research Centre Semenggoh, Sarawak, Malaysia
6. ABD. RAHMAN K., SHAMSUDIN I. & NUR SUPARDI, M.N. Population dynamics of Chengal in large demography plot at Pasoh Forest Reserve, Malaysia. A paper presented at the International Long-term Ecological Research (ILTER) Workshop, 20 to 28 August, Beijing, China
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11. ABD. RAHMAN, K., SAMSUDIN, M., ISMAIL, H., KHAIRUL NAJWAN, A.J., WAN SHUKRI, W.A. & SHAMSUDIN, I. Silvicultural prescriptions for second growth forests: A case study in Tekam F.R. A paper presented at the Seminar on Second Growth Forest, Management of Second Rotation Forests: Challenges and Opportunities, 12 to 13 December, Swiss Garden Resort, Kuantan, Pahang, Malaysia
12. ABDUL RAHIM, N. & EFRANSJAH. Landscapes and ecosystem approaches in adressing the sustainability of peat swamp forests in Malaysia. A paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia

13. ABDUL RAHIM, N., EFRANSJAH, KHALI AZIZ, H., RASHID ABDUL, S. & SAYOK, A.K. Forest biodiversity conservation and management: Development of ecological monitoring systems. Paper presented at the National Conference on The Management & Conservation of Forest Biodiversity in Malaysia, 20 to 21 March, Marriot Hotel, Putrajaya, Selangor, Malaysia
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16. AHMAD FAUZI, M.S. Penubuhan tapak semaian herba. Paper presented at Kursus Tanaman Herba, 12 to 16 November, FRIM, Kepong, Selangor, Malaysia
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20. AHMAD FAUZI, P. & ROHANA, A.R. Key sectors in the Malaysian economy to accelerate economic growth. Paper presented at the USM-UPM-PETA Conference, 28 to 29 November, UPM, USM, Penang, Malaysia
21. AHMAD FAUZI, P., ROHANA, A.R., NORINI, H. & NOR SURYANI, A.G. Chain-of-Custody certification: Does it affect our export market? Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
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23. AHMAD NAZARUDIN, M.R. & NOOR AZLIN, Y. Management of FRIM as a recreation site. Paper presented at the Continuing Education Program on Research and Technology Management for Leaders-Managers, 13 to 14 June, FRIM, Kepong, Selangor, Malaysia
24. AHMAD ZUHAI, Y. & HASHIM, M.N. *Acacia* hybrid: An alternative species for future industrial plantation. A paper presented at the Conference on Plantation Commodities, 3 to 4 July, Putra World Trade Centre, Kuala Lumpur, Malaysia
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30. AMINAH, H. Teknik pengeluaran bahan tanaman: pembiakan tampang pokok. A paper presented at Kursus Tapak Semaian, Kementerian Kemajuan Luar Bandar dan Wilayah, 7 to 11 May, Hotel Putra, Kuala Lumpur, Malaysia
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32. ANG, L.H. Tree-planting of the 29-acre appreciation zone, Paya Indah Wetlands. Paper presented at FRIM's Project Evaluation Meeting, 2 to 4 July, Seri Pacific Hotel, Kuala Lumpur, Malaysia
33. ANG, L.H., TANG, L.K., HUI, T.F., HO, W.M., THESEIRA, G.W. & D.K. LEE. Natural succession in undisturbed sites, timber tree stands, and riverbank of an ex-mining land and its implication on biodiversity of shrub and tree species. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
34. ANI, S. & ISMARIAH, A. Sesendok-future forest plantation species for the wood industry. A paper presented at the Sixth ASEAN Microscopy Conference, 10 to 12 December, Cherating, Pahang, Malaysia
35. AZIAN, M., RAJA BARIZAN, R.S., SHAMSUDIN, I. & MOHD. NASIR, H. Kaedah pemulihan hutan paya bakau di Malaysia: Satu kajian kes penanaman pokok bakau. A paper presented at Bengkel Latihan Projek Pemuliharaan Hidrologi Kawasan Pantai Tapak Ramsar Tanjung Piai, 15 to 16 January 2007, Hotel Pontian, Pontian, Johor, Malaysia
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38. AZYYATI, A.K. Hutan dan anda. Paper presented at the Hari Perhutanan, 1 April, FRIM, Kepong, Selangor, Malaysia
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40. BASKARAN, K., MARZALINA, M. & ABD. RAZAK, M.A. Using biotechnology in our tropical forest for wealth generation. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
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47. CHEE, B.J. & MUHAJIR, H. Hypoglycemic studies of Petai Belalang (*Leucaena leucocephala*). Paper presented at the Biotech Colloquium 6, 29 to 30 October, Faculty of Biotechnology and Biomolecular Sciences, University Putra Malaysia, Serdang, Selangor, Malaysia
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49. CHUA, L.S.L., KIEW, R. & CHAN, Y.M. Assessing conservation status of Peninsular Malaysian Begonias. A paper presented at the Seventh Flora Malesiana Symposium, 17 to 22 June 2007, Leiden, The Netherlands
50. FARAH FAZWA, M.A. & AB. RASIP, A.G. Vegetative propagation. Pp. 35-63 in Ab. Rasip, A.G., Farah Fazwa, M.A., Lokmal, N., Mohd. Zaki, A. & Ahmad Zuhaidi, Y. (Eds.). Tree and Herb Improvement Notes for Preliminary Workshop, FRIM, Kepong, Selangor, Malaysia, 111 pp.
51. FARAH FAZWA, M.A. Asas pembiakbakaan herba. Paper presented at Kursus Tanaman Herba, Forest Research Institute Malaysia, Kepong, 12 to 16 November, FRIM, Kepong, Selangor, Malaysia
52. FAUZIAH, A., LING, S.K., MAZURA, M.P., CHEE, B.J., SAIFUL AZMI, J. & VIMALA, S. Phytochemical and biological evaluation of *Piper muricatum* Blume for standardisation towards development of health care product. Paper presented at the Workshop on Biotechnology R&D Project Monitoring and Evaluation (MOSTI), 8 to 11 December, Palace of the Golden Horses, Mines Resort City, Seri Kembangan, Selangor, Malaysia
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55. GETHA, K. Exploratory studies of Actinomycete biodiversity of FRIM forests in aid of drug discovery. Paper presented at

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60. HASHIM, M.N. & AHMAD ZUHAIDI, Y. The importance of stand density control in small scale forest plantation management in Malaysia. A paper presented at the Conference on Plantation Commodities, 3 to 4 July, Putra World Trade Centre, Kuala Lumpur, Malaysia
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69. ISMAIL H., NURHAJAR Z.S., WAN SHUKRI W.A., SAMSUDIN M. & HARFENDY O. Second growth forests: Are they growing and have they recovered? A paper presented at the Seminar on Second Growth Forest, Management of Second Rotation Forests: Challenges and Opportunities, 12 to 13 December, Swiss Garden Resort, Kuantan, Pahang, Malaysia
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72. KANDASAMY, K.I., FADHILAH, Z., NOR HASNIDA, H., SUN W.F., YAP, J.W. & HALIZA, I. *In vitro* propagation studies on selected timber species. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
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81. LEE, S.L. Conservation strategies of a common dipterocarp endemic to Peninsular Malaysia: *Neobalanocarpus heimii* (Chengal). Paper presented at the CGIAR Project Monitoring 2007, 22 to 23 April, Putrajaya, Malaysia
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83. LEE, S.L. Planning on national workshop on forest genetic resources conservation Malaysia. A paper presented at the ITTO FGR project, Mid-term Review and APFORGEN NCs Meeting, 4 to 7 September, Bogor, Indonesia.
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85. LEE, S.L., L.H. TNAH & NG, K.K.S. DNA fingerprinting databases of *Neobalanocarpus heimii* (Dipterocarpaceae) throughout Malaysia for individual identification. Paper presented at the Symposium on Methods to Identify Wood Species and the Origin of Timber of Southeast Asia, 25 to 26 September, Tokyo, Japan
86. LEE, S.S. & CHONG, L. Forest pathology in Malaysia. A paper presented at the Asian Mycological Congress 2007 and Tenth International Marine and Freshwater Mycology Symposium (IFMFS). 2 to 6 December, USM, Penang, Malaysia
87. LEE, S.S., CHANG, Y.S. & NORASWATI, M.N.R. Utilization of macrofungi by some indigenous communities for food and medicine in Peninsular Malaysia. Paper presented at the International Conference on Sustainable Forest Management and Poverty Alleviation: Roles of Traditional Forest-related Knowledge, 17 to 21 December, Kunming, China
88. LIAM, J., SAPUAN, A., SAYOK, A.K., ABANG, A. & PASAN, S. Pendekatan co-management di dalam pengurusan sumber alam semulajadi di Sarawak, kajian kes: Pengurusan ikan oleh Kaum Berawan di Loagan Bunut. Paper presented at the National Conference on The Management & Conservation of Forest Biodiversity in Malaysia, 20 to 21 March, Marriot Hotel, Putrajaya, Selangor, Malaysia
89. LIM, G.T., KIRTON, L.G., SALOM, S.M., KOK, L.T. & PFEIFFER, D.G. Mahogany shoot borer control in Malaysia. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
90. LIM, G.T., KIRTON, L.G., SALOM, S.M., KOK, L.T., PFEIFFER, D.G. & SAIMAS, A. Partnering the weaver ant to control the mahogany shoot borer in Peninsular Malaysia. Paper presented at the Advanced Forest Research Science Seminar, 1 to 2 November, Kuching, Sarawak, Malaysia
91. LIM, H.F, MOHD. PARID, M., CHANG, Y.S & JEAN-MARC, R. Gaharu harvesting and its importance to rural households in Peninsular Malaysia. Paper presented at the Persidangan Kebangsaan Ekonomi Malaysia 2007, 21 to 23 August, Century Mahkota Hotel, Bandar Hilir, Melaka, Malaysia
92. LIM, H.F. Enhancing the value of forest traditional knowledge through forest certification. Paper presented at the International Conference on Sustainable Forest Management and Poverty Alleviation: Roles of Traditional Forest-related Knowledge, 17 to 21 December, Kunming, China
93. LIM, H.F. Involvement of local communities in forest genetic resources conservation. Paper presented at the Training Workshop on Forest Biodiversity: Conservation and Management of Forest Genetic Resources, 11 to 16 June, Kuala Lumpur, Malaysia

94. LIM, H.F., MOHD. PARID, M. & CHANG, Y.S. Production, use and trade of Gaharu in Peninsular Malaysia. Paper presented at the International Economic Conference on Trade & Industry (IECTI), 3 to 5 December, Bayview Hotel Georgetown, Penang, Malaysia
95. LIM, H.F., NORINI, H., MOHD. PARID, M., CHANG, Y.S., NORSHAKILA, Y. & INTAN NURULHANI, B. Traditional knowledge research and development in Peninsular Malaysia. Paper presented at the Workshop on Traditional Knowledge, 29 November, FRIM, Kepong, Selangor, Malaysia
96. LIM, H.F., TAN, Y.E., AHMAD FAUZI, P., NORINI, H. & LIM, S.C. Policy and status of planted teak wood production, its properties and processing in Malaysia-Country report. Paper presented at the Regional Workshop on Processing and Marketing of Teak Wood Products of Planted Forests, 25 to 28 September, Peechi, Kerala State, India
97. LION, M., SITI AISAH, S. & SAIFUL ISKANDAR, K. Small scale variation of soil moisture in Pasoh 50 hectare plot. A paper presented at the Second Regional Conference on Ecological and Environmental Modelling (ECOMOD 2007): Ecological Modelling for Sustainable Development, 28 to 30 August, The Gurney Hotel, Penang, Malaysia
98. LOKMAL, N. & FARAH FAZWA, M.A. Establishment and management of clonal seed orchard. Pp 24-34 in Ab. Rasip, A.G., Farah Fazwa, M.A., Lokmal, N., Mohd Zaki, A. & Ahmad Zuhaidi, Y. (Eds.). Tree and Herb Improvement Notes for Preliminary Workshop, FRIM, Kepong, Selangor, Malaysia, 102 pp.
99. LOKMAL, N. & MOHD. ZAKI, A. Seed production. Pp 17-21 in Ab. Rasip, A.G., Farah Fazwa, M.A., Lokmal, N., Mohd Zaki, A. & Ahmad Zuhaidi, Y. (Eds.). Tree and Herb Improvement Notes for Preliminary Workshop, FRIM, Kepong, Selangor, Malaysia, 102 pp.
100. LOKMAL, N., AMINAH, H., MOHD. ZAKI, A., FARAH FAZWA, M.A., AZMI, Y., SHARMIZI, I., & SUHAIMI, W.C. *Ex-situ* conservation of *Eurycoma Longifolia*: The challenges ahead. Paper presented at the International Symposium on Bottlenecks, Solutions and Priorities in the Context of Functions of Forest Resources, IUFRO and University of Istanbul, 17 to 19 October, Istanbul, Turkey
101. LOKMAN, H.S., FLETCHER, S.C. & PILLAY, M.S. Health impact of climate change variability and change in Malaysia (Country Report). A paper presented at the Workshop on Climate Change and Health in Southeast Asian Countries, 2 to 5 July, Kuala Lumpur, Malaysia
102. MAHMUDIN, S., LATIFAH, J., MOHD. NOR, M.Y., RUSHDAN, I., SHARMIZA, A. & AINUN, Z.M.A. Feasibility study of utilizing kenaf fibre as potential material for pulp and paper manufacturing. Paper presented at FRIM's Project Evaluation Meeting, 2 to 4 July, Seri Pacific Hotel, Kuala Lumpur, Malaysia
103. MARIA ZURA, M.Z., HAMDAN, H., ROZITA, A. & ROSAZLIN, A. Recycling wood waste from construction site into value-added products. A paper presented at the IUFRO - All Division 5 Conference on Forest Products and Environment: A Productive Symbiosis, 29 October-2 November, Taipei, Taiwan
104. MARZALINA, M., FADHILAH, Z., NOR HASNIDA, H., HALIZA, I. & WAN TARMEZE, W.A. Penanaman tumbuhan herba menerusi kaedah kultur tis. Paper presented at the Seminar Mengenai Peluang-peluang Perniagaan Dalam Industri Herba, 26 June, FRIM, PEKA, FRIM, Kepong, Selangor, Malaysia
105. MARZALINA, M. & WAN TARMEZE, W.A. Pengenalan kepada pemerhatian fenologi hutan. Paper presented at Seminar & Kursus Pengendalian Biji Benih Hutan Paya Gambut, 30 May - 1 June, Kuantan, Pahang, Malaysia
106. MARZALINA, M., AB. RASIP, A.G. & WAN TARMEZE, W.A. Room for Improvements. Report on Findings (SFT Seed Bank Evaluation). A paper presented at the Workshop on Seed Handling and Establishment of Seed Production Area, 6 to 8 August, Forest Research Centre Semenggoh, Sarawak, Malaysia
107. MARZALINA, M., ANG, K.C., NASHATUL ZAIMAH, N.A., & NOR ASMAH, H. Teknik pengutipan dan pengendalian biji benih dilapangan. Paper presented at Kem Rimbawan Asli, 25 June, FRIM, Kepong, Selangor, Malaysia
108. MARZALINA, M., KANDASAMY, K.I., NOR HASNIDA, H., FADHILAH, Z., HALIZA, I. & WAN TARMEZE, W.A. Teknologi kultur tis tumbuhan ubatan. Paper presented at the CME Serial Program for IMR staff. 13 July, IMR, Kuala Lumpur, Malaysia
109. MARZALINA, M., NASHATUL ZAIMAH, N.A., NOR ASMAH, H. & WAN TARMEZE, W.A. Teknik pengendalian biji benih. Paper presented at Seminar & Kursus Pengendalian Biji Benih Hutan Paya Gambut, 30 May - 1 June, Kuantan, Pahang, Malaysia
110. MARZALINA, M., WAN TARMEZE, W.A. & AB. RASIP A.G. An overview of quality planting material requirement: How SFTSB can play its role. Paper presented at the Meeting-Discussion-Workshop on Seed Handling & Establishment of Seed Production Area, 6 to 8 August, Semenggoh, Kuching, Sarawak, Malaysia
111. MARZALINA, M., WAN TARMEZE, W.A., NASHATUL ZAIMAH, N.A., NOR ASMAH, H. & NADIAH SALMI, N. Pengurusan bahan tanaman berkualiti bagi industri perhutanan - satu cadangan. A paper presented for Bengkel ke Arah Pensijilan Bahan Tanaman Berkualiti di Semenanjung Malaysia. 17 to 20 July, Impiana Cherating, Kuantan, Pahang, Malaysia
112. MASTURA, M. Komponen penyelidikan dalam pembangunan produk herba. Paper presented at Kursus Teknologi Herba, KKLW, FRIM, 18 to 22 June, Hotel Crystal Crown, Kepong, Kuala Lumpur, Malaysia
113. MOHD. SHAHIDAN, M.A., ZAMREE, M.S., HADA MASAYU, I., NOOR RASYILA, M.N., PIN, K.Y., MOHD. FAIZAL, K., & RASADAH, M.A. Herbal product development. Paper presented at Kursus Teknologi Herba, KKLW, FRIM, 18 to 22 June, Hotel Crystal Crown, Kepong, Kuala Lumpur, Malaysia

114. MOHD SHAHIDAN, M.A., ZAMREE, M.S., HADA MASAYU, I., NOOR RASYILA, M.N., PIN, K.Y., MOHD. FAIZAL, K., & RASADAH, M.A. Post harvest technology. Paper presented at Kursus Teknologi Herba, KKLW, FRIM, 18 to 22 June, Hotel Crystal Crown, Kepong, Kuala Lumpur, Malaysia
115. MOHD. SHAHIDAN, M.A., ZAINON, A.S. Kaedah penuaian Misai Kucing dan aktiviti-aktiviti hiliran. Paper presented at Kampung Simpai, Pekan, UNHDP, 16 May, Pahang, Malaysia
116. MOHD. SHAHIDAN, M.A. Post Harvest Technology. Paper presented at Kursus Pemprosesan Herba, MIGHT-Meteor & FRIM, 19 to 23 November, FRIM, Kepong, Selangor, Malaysia
117. MOHD. AFENDI, H. & ADNAN, M. Pemindahan pokok besar - satu perkongsian pengalaman. Paper presented at the Seminar Arborikultur, Institut Tadbiran Awam Negara, 12 July, INTAN, Selangor, Malaysia
118. MOHD. FARID, A. Pengenalan dan kawalan kepada penyakit-penyakit pokok di tapak semaian dan ladang. Paper presented at Kursus Tanaman Herba, Forest Research Institute Malaysia, Kepong, 12 to 16 November, FRIM, Kepong, Selangor, Malaysia
119. MOHD. GHAZALI, H., AB. RASIP, A.G., WAN RASIDAH, K., AB. RAZAK, O. & ADZMY, Y. Afforestation of BRIS soil. A paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
120. MOHD. ILHAM A. Research & development of top 10 local herbs. Paper presented at the National Pharmacognosy Curriculum Workshop, 27 to 28 February, USM, Pulau Pinang, Malaysia
121. MOHD. ILHAM, A. Malaysian medicinal herbs and spices. Paper presented at the Forest Secret Herbal Shop Training Workshop, 13 September, Franchise Channel (M) Sdn. Bhd., FRIM, Kepong, Malaysia
122. MOHD. ILHAM, A. Perkembangan bioteknologi dan prospek kerjaya masa kini. Paper presented at the Bengkel Kerjaya Pelajar, 27 March, Sek. Men. Keb. Agama, Padas, Negri Sembilan, Malaysia
123. MOHD. ILHAM, A. Role of Centre for Proteomic Research (CfPR) in Biodiversity Resources Research. Paper presented at the Educational Research Institute Tour, INSEP (Biotechnology & Biopharmaceutical), 27 July, Universiti Sains Malaysia and Terengganu Skill Development Centre, FRIM, Kepong, Selangor, Malaysia.
124. MOHD. ILHAM, A., ANEE SURYANI, S., JAYA, V., LI, Y.C., LILI SAHIRA, H., SITI SYARIFAH, M.M. & NORALIZA, A. Evaluating the effects of *Erythroxylum cuneatum forma cuneatum* Kurz (chinta mula) in morphine addicted rats. Paper presented at the Workshop on Biotechnology R&D Project Monitoring and Evaluation (MOSTI), 8 to 11 December, Palace of the Golden Horses, Mines Resort City, Seri Kembangan, Selangor, Malaysia
125. MOHD. ILHAM, A., ASIAH, O., NURHANAN, M.Y., LI, Y.C., SITI SYARIFAH, M.M., NORHAYATI, I., LILI SAHIRA, H. & JAYA, V. Applying proteomics to drug discovery: Isolation of CO-II as an active constituent against breast cancer cells from Malaysian plant CfPR-110. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
126. MOHD. NASIR, H., ISMAIL, P. & AZIAN, M. Nipah dan kegunaannya. A paper presented at Bengkel Hutan Persisiran Pantai Negara: Kesedaran dan Tindakan Bersama, 5 to 7 November, Paka, Terengganu, Malaysia
127. MOHD. NASIR, M.A. & SALAMAH, S. FRIM proficiency testing for CCA wood preservative and CCA treated timber. Series no. 1/2007. FRIM, Kepong, Selangor, Malaysia
128. MOHD. NASIR, M.A. Penggunaan dan keselamatan bahan-bahan kimia dan biologi. Paper presented at the Ceramah Keselamatan Kakitangan FRIM, 25 April, FRIM, Kepong, Selangor, Malaysia
129. MOHD. NOOR, M. & LOK, E.H. Statistic in tree breeding. Pp. 84-92 in Ab. Rasip, A.G., Farah Fazwa, M.A., Lokmal, N., Mohd Zaki, A. & Ahmad Zuhaidi, Y. (Eds.). Tree and Herb Improvement Notes for Preliminary Workshop, FRIM, Kepong, Selangor, Malaysia, 102 pp.
130. MOHD. SHAHIDAN, M.A., ZAMREE, M.S., HADA MASAYU, I., NOOR RASYILA, M.N., ABDULL RASHIH, A., PIN, K.Y., MOHD. RADZI, A., MOHD FAIZAL, K., & RASADAH, M.A. Pertinent issues in modern herbal processing. Paper presented at the SDSI (Satu Daerah Satu Industri), 8 July, Air Keroh Convention Centre, Melaka, Malaysia
131. MOHD. SHAHIDAN, M.A., ZAMREE, M.S., HADA MASAYU, I., NOOR RASYILA, M.N., PIN K.Y., MOHD. FAIZAL, K., & RASADAH, M.A. Good manufacturing practice (GMP). Paper presented at Kursus Teknologi Herba, KKLW, FRIM, 18 to 22 June, Hotel Crystal Crown, Kepong, Kuala Lumpur, Malaysia
132. MOHD. SHAHIDAN, M.A., ZAMREE, M.S., ONG, B.K., HADA MASAYU, I., NOOR RASYILA, M.N., ABDULL RASHIH, A., PIN, K.Y., MOHD. RADZI, A., MOHD. FAIZAL, K., & RASADAH, M.A. Development of herbal products. Paper presented at the Herbal Asia 2007 Seminar: Asia's premier herbal trade show, 1 to 4 November, Matrade exhibition & Convention Centre, Kuala Lumpur, Malaysia
133. MOHD. SHAHIDAN, M.A. & RASADAH, M.A. FRIM: Forestry and Forest Products 2007. Paper presented at the FRIM-Konsortium Pembangunan Selatan, 25 November, Kuala Lumpur, Malaysia
134. MOHD. SHAHIDAN, M.A. Herbal product development and good manufacturing practice (GMP). Paper presented at Kursus Pemprosesan Herba, MIGHT-Meteor & FRIM, 19 to 23 November, FRIM, Kepong, Selangor, Malaysia
135. NADA, B., KIRTON, L.G., CHENG, S., SHAHLINNEY, L. & PHON, C.K. A special case: Monitoring the fireflies of the Selangor

- river. Paper presented and distributed at the National Seminar on Integrated River Basin Management. 3 to 5 July, Pulau Langkawi, Kedah, Malaysia
136. NG, K.K.S. Development of gene-derived DNA markers of *Shorea leprosula* towards tree improvement and conservation of dipterocarps. Paper presented at the Workshop on Biotechnology R&D Project Monitoring and Evaluation (MOSTI), 8 to 11 December, Palace of the Golden Horses, Mines Resort City, Seri Kembangan, Selangor, Malaysia
137. NG, K.K.S. How to measure genetic diversity? Assessing genetic diversity of tree species within and among populations. Paper presented at the Training Workshop on Forest Biodiversity Conservation and Management of Forest Genetic Resources, 11 to 16 June, FRIM, Kepong, Selangor, Malaysia
138. NIK MUSAADAH, M., BEN-MAHMUD, B.M., KOHNER, E.M. & CHIBBER, R. Natural products with NADPH oxidase inhibitor properties as potential preventive agents in diabetic retinopathy. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
139. NIK MUSAADAH, M., CHEE, B.J., ABD. RASHID, L., NOR HAYATI, A. & RASADAH, M.A. Potential of JB06BHT as oral antidiabetic agent. Paper presented at the Bengkel Pengenalpastian Hasil Penyelidikan yang Berpotensi Komersil (FRIM-MTDC), 7 June, FRIM, Kepong, Selangor, Malaysia
140. NIZAM, M.S., SAMSUDIN M., ABD. RAHMAN K. & SHAMSUDIN I. Diversity, biomass and floristic variation of tree communities at Tekam Forest Reserve, Pahang. A paper presented at the Seminar on Second Growth Forest, Management of Second Rotation Forests: Challenges and Opportunities, 12 to 13 December, Swiss Garden Resort, Kuantan, Pahang, Malaysia
141. NOOR AZLIN, Y. Conservation of habitat for ecotourism. Paper presented at the Hari Alam Sekitar FRIM, 17 July, FRIM, Kepong, Selangor, Malaysia
142. NOOR AZLIN, Y. Eco-tourism activities for sustainable management of natural resources: Issues, challenges and solutions. Paper presented at Kursus Pemuliharaan Sumber Asli dan Pembangunan Mapan, 21 May, Institut Tadbiran Awam Negara (INTAN), 21 May, 20 pp.
143. NOOR AZLIN, Y. Pendidikan pemuliharaan bagi pengurus sumber. Paper presented at Kursus Interpretasi Alam Semula Jadi Fasa I, 21 to 24 May, FRIM, Kepong, 3 pp.
144. NOOR AZLIN, Y., CHONG, M.I. & AZYYATI, A.K. Nature centers for wetland conservation in Malaysia. Paper presented at the Regional Workshop on Making Mangrove an Eco-Museum, 19 to 28 March, Chachoengsao, Thailand. 6 pp.
145. NOOR AZLIN, Y., LOUBSER, C.L. & CHONG, M.I. Environmental education in Malaysia: Resolutions of the Best of Both Worlds Conference 2005, World Environmental Education Congress, 2 to 6 July, Durban, South Africa
146. NOOR AZLIN, Y., SREETHERAN, M. & AZYYATI, A.K. Recreation forests of Klang Valley, Malaysia: Providing nature experience for urban population. Paper presented at the Fourth China's City Forest Forum, Chengdu, China, 8 to 12 May. 8 pp.
147. NOOR RASYILA, M.N., HADA MASAYU, I.D., MOHD. FARIDZ, Z.P. Formulasi dan pembangunan produk: Kaedah penghasilan produk kapsul dan tablet. Paper presented at Kursus Teknologi dan Pembangunan Produk Herba [lanjutan], KKLW, FRIM, 7 to 9 August, FRIM, Kepong, Selangor, Malaysia
148. NOR AZAH, M.A. Country Report. Regulations and trade status of MAPS and their products in Malaysia. Paper presented at the Workshop on Business creation in Medicinal and Aromatic Plants (MAPS) and their products, 30 May-1 June, Nanchang, China
149. NOR AZAH, M.A. Potensi tumbuhan ubatan dalam penghasilan produk herba dan kosmetik. Paper presented at Kursus Teknologi Herba, KKLW, FRIM, 18 to 22 June, Hotel Crystal Crown, Kepong, Kuala Lumpur, Malaysia
150. NOR AZAH, M.A. & MAILINA, J. Malaysian wild and cultivated gingers with potential application. Paper presented at the Herbal Asia 2007 Seminar: Asia's premier herbal trade show, 1 to 4 November, Matrade exhibition & Convention Centre, Kuala Lumpur, Malaysia
151. NOR AZAH, M.A. Minyak pati: Pengekstrakan dan pemprosesan tumbuhan beraroma untuk penghasilan minyak pati. Paper presented at the Bengkel Analisis Kualiti, Keselamatan dan Efikasi Produk Herba Fasa 1, 4 April, FRIM, Kepong, Selangor, Malaysia
152. NOR AZAH, M.A. Pengekstrakan dan penyulingan tumbuhan herba. Paper presented at Kursus Teknologi Herba, KKLW, FRIM, 18 to 22 June, Hotel Crystal Crown, Kepong, Kuala Lumpur, Malaysia
153. NOR AZAH, M.A. Utilisation of phytoextracts and essential oils from Malaysian Zingiberaceae and Annonaceae for the development of cosmeceutical products Paper presented at the Workshop on Biotechnology R&D Project Monitoring and Evaluation (MOSTI), 8 to 11 December, Palace of the Golden Horses, Mines Resort City, Seri Kembangan, Selangor, Malaysia
154. NOR AZAH, M.A., ZARIDAH, M.Z., MAILINA, J., ROHANI, A., SAIDATUL HUSNI, S., ABD. MAJID, J., ABU SAID, A., MOHD. FARIDZ, Z. & NIK YASMIN, N.Y. Systematic evaluation of essential oil plants towards the development of insect repellents for mosquito control. Paper presented at a Pre-conference Seminar:Herbal R&D commercialization, Fourth Asia-Pacific Natural Product Expo (NATPRO 2007), 29 to 31 March, PWTC, Kuala Lumpur, Malaysia
155. NOR HAYATI, A. Identification of anti-inflammatory compound(s) from *Prismatomeris malayana*: A preliminary study towards

- drugs development and commercialisation. Paper presented at the Workshop on Biotechnology R&D Project Monitoring and Evaluation (MOSTI), 8 to 11 December, Palace of the Golden Horses, Mines Resort City, Seri Kembangan, Selangor, Malaysia
156. NORINI H., ABDUL RAZAK, M.A. & LIM, S.C. Alternatives to ramin (*Gonystylus* spp.). Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
157. NORINI, H., THESEIRA, G.W. & PHILIPS, E. Opportunities in afforestation and reforestation CDM projects in Malaysia. Paper presented at the Second Malaysian Forest Dialogue, 22 to 23, Kuala Lumpur, Malaysia
158. NORLIA, B. Research on Gene isolation and characterization in forest species. Paper presented during 'Kursus Penilaian Tahap Kecekapan 3' (PTK3), 6 to 14 August, FRIM, Kepong, Selangor, Malaysia
159. NORLIA, B. Isolation and characterization of genes expressed in early flowering tissues of Teak (*Tectona grandis* Linn.). Paper presented at the Genetic Lab Research Project Presentation. 16 April, Jati Meeting Room, FRIM, Kepong, Selangor, Malaysia
160. NORWAHIDAH, Z.A., NUR SUPARDI, M.N. & WAN JULIANA, W.A. Enriching biodiversity through forest rehabilitation effort - The case of the 80-year man-made forests of FRIM in Kepong, Selangor. A paper presented at the Applied Forest Science Research Seminar 2007, 1 to 2 November, Wisma STA, Kuching, Sarawak, Malaysia
161. NUR HAJAR, Z.S., WAN MOHD. SHUKRI, W.A., ISMAIL, P., & ISMAIL, H. Volume equation for Ramin (*Gonystylus bancanus*) in Pekan Peat Swamp Forest, Pahang, Malaysia. A paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia Lumpur.
162. NUR HAJAR, Z.S., WAN MOHD. SHUKRI, W.A., ISMAIL, H., & SAMSUDIN, M. Development of local volume table for second growth forests using standing tree measurements. A paper presented at the Seminar on Second Growth Forest, Management of Second Rotation Forests: Challenges and Opportunities, 12 to 13 December, Swiss Garden Resort, Kuantan, Pahang, Malaysia
163. NUR SUPARDI, M.N. & NORWAHIDAH, Z.A. Pemuliharaan kepelbagaian hayat kawasan terpelihara. Paper presented at the Kursus Rimbawan Asli, Kem. Pembangunan Luar Bandar & Wilayah, FRIM, JHEOA, 18 June to 2 July, Hotel Putera, Kuala Lumpur
164. NUR SUPARDI, M.N. & NURFAZLIZA, K. Hutan-hutan di Semenanjung Malaysia. Paper presented at the Kursus Rimbawan Asli, Kem. Pembangunan Luar Bandar & Wilayah, FRIM, JHEOA, 18 June to 2 July, Hotel Putera, Kuala Lumpur
165. NUR SUPARDI, M.N., ABDUL RAHIM, N., ABD. RAHMAN, K. & RODZIAH, H. Asian green belt: The past, present and future. A paper presented at the Second International Symposium of Research Institute for Humanity and Nature (RHIN), 30 to 31 October, Kyoto, Japan
166. NUR SUPARDI, M.N., NURFAZLIZA, K, MASTURA, M. & FAUZIAH, A. Economic potentials of lianas in dipterocarp forest of east Negeri Sembilan. Paper presented at the Kursus Rimbawan Asli, Kem. Pembangunan Luar Bandar & Wilayah, FRIM, JHEOA, 18 June to 2 July, Hotel Putera, Kuala Lumpur
167. ONG, B.K., FADZUREENA, J., MAZURA, M.P. & RASADAH, M.A. Evaluation of anti-inflammatory properties and chemical constituents of *Vitex negundo* Linn. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
168. ONG, B.K., MOHD. RADZI, A., MOHD. ILHAM, A., ABD. RASHID, L. & MOHD. HAFIDZ HADI, A. Quality assessment of Tongkat Ali beverages using Eurycomanone chemical marker. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
169. PAN, K.A., KHOO, S.K. & YEAP, C.A. Conservation of the endangered Milky Stork, *Mycteria cinerea* in Malaysia. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
170. PAN, K.A., LIM, A.T., SHAHFIZ, M.A., KAMAL, H.M., NOR DIANA, M.N. & FARIDATUL, N.R. Birds and small mammals of Taman Negara (Terengganu). Paper presented at the National Biodiversity Seminar, 20 to 21 November, Allison Klana Resort, Seremban, Negri Sembilan, Malaysia
171. PHILIP, E. & ABDUL RAHIM, N. R&D activities addressing climate change and forest in Malaysia. Paper presented at the Asia Flux Workshop, 19 to 22 October, Taiwan
172. PHILIP, E. & ABDUL RAHIM, N. Green house gas inventory for LULUCF sector. Paper presented at the Fifth Working Group on Green house Gas Inventory for Asia, 6 to 7 September, Kuala Lumpur.
173. PHILIP, E. & NOOR AZLIN, Y. Role of urban parks in enhancing human well-being. Paper presented at IFPRA 2007, 3 to 6 September, Dublin, Ireland
174. PHILIP, E., ABDUL RAHIM, N. & RIZAL, M.K.M. Effects of elevated CO₂ and temperatures on the photochemistry of selected forest species. Paper presented at the Malaysian Society of Plant Physiology Conference MSPPC, 20 to 22 August, Le Meridian, Kota Kinabalu, Sabah, Malaysia

175. PIN, K.Y., MOHD. SHAHIDAN, M.A., ZAMREE, M.S., NOOR RASYILA, M.N. & HADA MASAYU, I.D. Kaedah Pemekatan. Paper presented at Kursus Teknologi dan Pembangunan Produk Herba [lanjutan], KKLW, FRIM, 7 to 9 August, FRIM, Kepong, Selangor, Malaysia
176. RAHIM, S., KOH, M.P. & MOHAMAD JANI, S. Wood composites industry in Malaysia: Where are we heading. A paper presented at the Conference on forestry and forest products research (CFFPR 2007). 27-29 November 2007, Kuala Lumpur
177. RAJA BARIZAN, R.S. Pengenalan pokok dan lain-lain tumbuhan hutan untuk Jabatan Perhutanan dan agensi lain. Paper presented at the Unit Latihan Perhutanan Kepong, 23 to 26 July, FRIM, Kepong, Selangor, Malaysia
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52. MOHD. FARID, A. & CHENG, S. Report on tree inspection in Equine Park, Puchong, Selangor conducted on 15 February
53. MOHD. FARID, A. & SREETHERAN, M. A report on tree inspection at the Royal Selangor Golf Club (RSGC), Jalan Kelab Golf, Off Jalan Tun Razak. (30 October 2007)
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56. MOHD. SHAHIDAN, M.A, ZAMREE, M.S., HADA MASAYU, I., NOOR RASYILA, M.N., PIN, K.Y., MOHD. FAIZAL, K., FIRMANSYAH, J.S. & RASADAH, M.A. Kompilasi dokumen Amalan Pengilangan Baik (APB) untuk Biro Pengawalan Farmaseutikal Kebangsaan (BPFK)
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POSTER POSTERS

1. ABD. RASHID, L. & NOR HAYATI, A. Extraction and isolation of quaternary alkaloids from *Morinda citrifolia* fruits. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia
2. ABDUL RAHMAN, K., BURSLEM, D.F.R.P., YAACOB, A., NUR SUPARDI, M.N. & AHMAD, W.J.W. Habitat variation and species-site association in Pasoh 50 ha plot. A poster presented at the Annual Meeting of British Ecological Society, 1 to 7 September 2006, York, United Kingdom
3. ADIANA, M.A., FAREDAH, A. & MUHAMMAD SUM, I. Structure-antioxidant activity relationships of flavonoids. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
4. ADNAN, M., AHMAD AZARUDDIN, M.N., & AMAT RAMSA, Y. Development in urban forestry and arboricultural practices in Malaysia. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
5. AHMAD AINUDDIN, N., ROSDI, K., MOHD. ZAKI, H., AB. RASIP, A.G. & AHMAD ZUHAI, Y. Effect of thinning on nine years old *Azadirachta excelsa* (Jack) plantation in Merlimau, Melaka, Peninsular Malaysia. A poster presented at the Pameran Reka Cipta, Penyelidikan & Inovasi (PRPI 07), 27 to 29 November, UPM, Selangor, Malaysia
6. AHMAD NAZARUDIN, M.R. & SUHARTI, S. Flower induction of *Hibiscus rosa-sinensis* by the application of commercial plant growth regulators. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
7. AHMAD NAZARUDIN, M.R. & SUHARTI, S. Growth and flowering responses of bunga raya (*Hibiscus rosa-sinensis*) to paclobutrazol, uniconazole and flurprimidol. A poster presented at the Malaysian Society of Plant Physiology Conference MSPPC, 20 to 22 August, Le Meridian, Kota Kinabalu, Sabah, Malaysia
8. AHMAD NAZARUDIN, M.R., SUHARTI, S. & AZAHARI, M.Y. Effects of plant growth regulators on the growth and flowering responses of *Hibiscus rosa-sinensis* L.: A preliminary study. Poster presented at the National Horticulture Conference, 13 to 15 March, Putri Pacific Hotel, Johor Bahru, Malaysia
9. AINUN, Z.M.A., LATIFAH, J., MAHMUDIN, S., SHARMIZA, A. & RUSHDAN, I. Effect of cationic additives on Oil Palm empty fruit bunch fibres: Zeta potential measurement. Poster presented at the Seventh National Conference on Oil Palm Tree Utilisation OPTUC: Strategizing for Commercial Exploitation, 13 to 15 November, Sunway Resort Hotel, Petaling Jaya, Selangor, Malaysia
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11. AMINAH, H., JAMALUDDIN, O. & MOHD. YUSOFF, A.R. Keupayaan pengakaran keratan pendek Bebaru (*Hibiscus tiliaceus*). A poster presented at Bengkel Hutan Persisiran Pantai Negara: Kesedaran dan Tindakan Bersama, 5 to 7 November, Paka, Terengganu, Malaysia
12. ANEE SURYANI, S., MOHD. ILHAM, A. & JANTAN, I. Effect of *Centella asiatica* Linn. aqueous and methanolic extracts on withdrawal symptoms in morphine dependent rats. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
13. ANI, S. & NORDAHLIA, A.S. Penggunaan kayu 'mangrove' dalam industri perkayuan. A poster presented at Bengkel Hutan Persisiran Pantai Negara: Kesedaran dan Tindakan Bersama, 5 to 7 November, Paka, Terengganu, Malaysia
14. ANI, S., NORDAHLIA, A.S. & SALAMAH, S. Current status of timber species in the timber industry, 1998-2006. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
15. BURSLEM, D.F.R.P., ILLIAN, J., GIMONA, A., ABDUL RAHMAN, K., NUR SUPARDI, M.N. & AHMAD, W.J.W. Does phylogeny contribute to contrasting spatial distributions on a Malaysian rain forest? A poster presented at the Annual Meeting of British Ecological Society, 1 to 7 September 2006, York, United Kingdom

16. CHANG, Y.S., LEE, S.S. & NORASWATI, M.N.R. Comparison of mushrooms used by five indigenous communities in the state of Pahang, Malaysia. Poster presented at the International Conference on Sustainable Forest Management and Poverty Alleviation: Roles of Traditional Forest-related Knowledge, 17 to 21 December, Kunming, China
17. CHEE, B.J., ABD. RASHID, L., NOR HAYATI, A. & RASADAH, M.A. Potential insulin-secreting property of *Psidium guajava* polar leaf extracts. Poster presented at the Third International Congress on Traditional Medicine and Materia Medica, 17 to 20 July, PWTC, Kuala Lumpur, Malaysia
18. CHEE, B.J., SITI PAULIENA, M.B., RASADAH, M.A. & MUHAJIR, H., Evaluation of insulin secreting property of some tropical plant extracts. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia
19. FADHILAH, Z. & NEWBURY, J.H. Identification of genetic regions controlling the efficiency of Agrobacterium-mediated transformation of *Arabidopsis thaliana*. Poster presented at the Asia Pacific Conference on Plant Tissue Culture and Agrobiotechnology (APaCPA), 17 to 21 June, PWTC, Kuala Lumpur, Malaysia
20. FADZUREENA, J. & MAZURA, M.P. In vitro anti-inflammatory properties of *Lawsonia inermis*. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
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22. FARAH FAZWA, M.A., AB. RASIP, A.G. & LOKMAL, N. The influence of growing media on the rooting in air layering propagation of *Citrus hystrix*. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
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25. GETHA, K & MOHD. ILHAM, A. Diversity and antifungal activity spectra of soil Actinomycetes isolated from Penang National Park. Paper presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
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27. HO, W.M., ANG, L.H. & LEE, D.K. Uptake and distribution of lead in Pb-treated kenaf (*Hibiscus cannabinus*) grown on sand tailings. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
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29. JAYA, V. & MOHD. ILHAM A. Proteomics characterizations of *Eurycoma longifolia* Root aqueous extract. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
30. JEYANNY, V. & AB. RASIP, A.G. Effects of calcium deficiency on the initial growth of *Khaya ivorensis* seedlings. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
31. JEYANNY, V., AB. RASIP, A.G. & ADZMI, Y. Nutrient deficiency symptoms of *Khaya ivorensis* seedlings. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
32. JULIUS, A., TAKANO, A. & MONICA, S. Plagiostachys (Zingiberaceae) in Borneo. A poster presented at the Seventh Flora Malesiana Symposium, 17 to 22 June, Leiden, The Netherlands
33. KHAIRUL NAJWAN, A.J., SAMSUDIN, M., ABD. RAHMAN, K., WAN MOHD. SHUKRI, W.A., & SHAMSUDIN, I. A look at species composition in second rotation forests. A poster presented at the National Conference on The Management & Conservation of Forest Biodiversity in Malaysia, 20 to 21 March, Marriot Hotel, Putrajaya, Selangor, Malaysia
34. KHOO, M., MAZURA, M.P., ROHANA, S., NALINA KUMARY, V., NUZIAH, H., & JULIZA, M. Biological activities of selected species in the Family of Bignoniaceae. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International

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35. KHOO, M., MOHD. SALEH, A.K., & NUZIAH, H. *In vitro* toxicity evaluation of medicinal plants. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
36. LATIFAH, J., AINUN, Z.M.A., SHARMIZA, A., MAHMUDIN, S. & RUSHDAN, I. Effects of beating on the properties of paper incorporated with cationic starch. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
37. LEE, S.L., TNAH, L.H., NG, K.K.S. & LEE, C.T. Conservation strategies of chengal (*Neobalanocarpus helmi*) dubbed as the iron wood of Peninsular Malaysia. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
38. LIM, C.L. Status of *Agathis flavescens* (Araucariaceae) in Peninsular Malaysia. A poster presented at the Seventh Flora Malesiana Symposium, 17 to 22 June, Leiden, The Netherlands
39. LIM, G.T., KOK, L.T., KIRTON, L.G. & SALOM, S.M. Growing mahogany sustainably in partnership with the weaver ant, a biological control agent of mahogany pests. A poster presented at Graduate Student Assembly Twenty Third Annual Research Symposium, 28 March, Graduate Life Center, Virginia Tech., Virginia, U.S.A.
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41. LIM, G.T., SALOM, S.M., KIRTON, L.G., & KOK, L.T. Supplemental food preference for *Oecophylla smaragdina* (Hymenoptera: Formicidae), a potential biological control agent of the mahogany shoot borer, *Hypsipyla robusta* (Lepidoptera: Pyralidae). A poster presented at the Eighteenth USDA Interagency Research Forum on Invasive Species, 9 to 12 January, Loews Annapolis Hotel, Annapolis, Maryland, U.S.A.
42. LING, S.K., LIM, J.Y. & LAU, S.H. Sulfur-containing bis-iridoid glucosides from *Lasianthus attenuatus* Jack. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
43. LING, S.K., SALBIAH, M., & ABDULL RASHIH, A. Influence of extraction parameters on the flavonoid content of extracts from *Chromolaena odorata* leaves. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia
44. LOK, E.H., ONG, T.H., AHMAD ZUHAI, Y. & SUHAIMI, W.C. Can Karas/gaharu (*Aquilaria malaccensis*) plantation be established on poor marginal soils in Malaysia? Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
45. MAHANIM, S., PUAD, E., RAFIDAH, J., WAN ASMA, I. & SHAHARUDDIN, H. A study on physical and chemical properties of *Gigantochloa schortechini* and *Gigantochloa ligulata*. Poster presented at the Seventh National Conference on Oil Palm Tree Utilisation OPTUC): Strategizing for Commercial Exploitation, 13 to 15 November, Sunway Resort Hotel, Petaling Jaya, Selangor, Malaysia
46. MAHANIM, S., PUAD, E., RAFIDAH, J., WAN ASMA, I., & SHAHARUDDIN, H. Activated carbon prepared from carbonized bamboo via chemical activation. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
47. MAHANIM, S., WAN ASMA, I., PUAD, E., RAFIDAH, J. & SHAHARUDDIN, H. Preparation and characterization of activated carbons from carbonized bamboo via zinc chloride activation. Poster presented at the Fourth Asia Biomass Workshop, 20 to 22 November, Grand Blue Wave Hotel, Shah Alam, Selangor, Malaysia
48. MARZALINA, M., ANG, K.C., WAN TARMEZE, W.A., MOHD. AFENDI, H. & NASHATUL ZAIMAH, N.A. Pengamatan fenologi beberapa spesies bakau (2006-2007). A poster presented at Bengkel Hutan Persisiran Pantai Negara: Kesedaran dan Tindakan Bersama, 5 to 7 November, Paka, Terengganu, Malaysia
49. MARZALINA, M., SHAMSUDDIN, I., RAJA BARIZAN, R.S., ADZMI, Y., NASHATUL ZAIMAH, N.A., MOHD. AFENDI, H., AZIAN, M., PATAHAYAH, M. & WAN TARMEZE, W.A. Laporan Projek Penyelidikan Bakau FRIM: Teknik penanaman bakau dan spesies-spesies yang sesuai di kawasan pesisiran pantai negara. A paper presented at Bengkel Hutan Persisiran Pantai Negara: Kesedaran dan Tindakan Bersama, 5 to 7 November, Paka, Terengganu, Malaysia
50. MAZURA, M.P. & FADZUREENA, J. Inhibitory effects of *Strobilanthes crispus* (L) Bremek (Acanthaceae) extracts on platelet activating factor, leukotriene and hyaluronidase mediated inflammatory actions. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
51. MAZURA, M.P. & LING, S.K. Lipxygenase inhibitory activity of some selected Malaysian medicinal plants. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia

52. MOHAMAD JANI, S., JALALI, S. & NUR MUNIRAH. Evaluation of mechanical and water resistance of coconut core particles in Cement Bonded Particle board (CBP). A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
53. MOHAMAD JANI, S., LUQMAN, M., MOHAMAD OMAR, M.K., NAZRIN, A., MUSTAPHA NOR, Y. & SAIFUL AZZAM, Z. Unsaturated polyester-kenaf board: effect of wood content and size on board performance. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
54. MOHD. AFENDI, H. MARZALINA, M. & WAN TARMEZE, W.A. Terknik penyediaan anak benih liar Api-api Puteh (*Avicennia alba*). A poster presented at Bengkel Hutan Persisiran Pantai Negara: Kesedaran dan Tindakan Bersama, 5 to 7 November, Paka, Terengganu, Malaysia
55. MOHD. ASWAD R., NIK AZYYATI, A. K. & NOOR AZLIN, Y. Socio-demographic background of visitors to FRIM's canopy walkway, Kepong, Selangor. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
56. MOHD. FARID, A., LEE, S.S., MAZIAH, Z., MOHD. ROSLI, H., NORWATI, M. & PATAHAYAH, M. Pathogenicity of *Phellinus noxius* and *Rigidoporus lignosus* against four plantation species in Peninsular Malaysia. Poster presented at the Ninth Symposium of the Malaysian Society for Microbiology, 30 to 31 May, USM, Bayview Hotel, Penang, Malaysia
57. MOHD. GHAZALI, H., AB. RASIP, A.G., WAN RASIDAH, K. & ROSAZLIN, A. Chemical properties of BRIS soil under *Acacia* plantation of various ages. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
58. MOHD. GHAZALI, H., WAN RASIDAH, K., ROSAZLIN, A., AB. RASIP, A.G. & AB. RAZAK., O. Pertumbuhan dan kadar hidup spesies hutan terpilih di tanah BRIS. A poster presented at Bengkel Hutan Persisiran Pantai Negara: Kesedaran dan Tindakan Bersama, 5 to 7 November, Paka, Terengganu, Malaysia
59. MOHD. NASIR, H., ISMAIL, P. & AZIAN, M. Nipah dan kegunaannya. A poster presented at Wetland Day, 5 February, FRIM, Kepong, Malaysia
60. MOHD. NASIR, H., ISMAIL, P. & NORAZIAN, M.Z. Sustainable management of the Matang Mangrove Forests. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
61. NAIMAH, C.L., AMINAH, H. & RAJA BARIZAN, R.S. Vegetative propagation of *Neobalanocarpus hemii* (chengal) using cuttings. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
62. NAIMAH, C.L., AMINAH, H. & RAJA BARIZAN, R.S. The effect of hormones on root production of chengal cutting. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
63. NASHATUL ZAIMAH N.A. & H. HAMSINAH. 2007. Storage of *Shorea leprosula* seeds, a tropical forest tree species. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
64. NG, C.H., LEE, S.L., NG, K.K.S., MARIA, M., MAHANI, M. & NORWATI, M. Variation of C-value in dipterocarps. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
65. NG, K.K.S., LEE, S.L., UENO, S., NG, C.H. & TSUMURA, Y. Analysis of expressed sequence tags and development of microsatellite markers from *Shorea leprosula* (Dipterocarpaceae). Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
66. NIK MUSAADAH, M., BEN-MAHMUD, B.M., KOHNER, E.M. & CHIBBER, R. Intermittent high glucose accelerates apoptosis of retinal pericytes: Potential role of NADPH oxidase inhibitor to prevent diabetic retinopathy. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia
67. NOOR AZLIN, Y., AHMAD NAZARUDIN, M.R., NIK ADLIN, N.S., AZRINA, Y., MOHD. ASWAD, R. & AZYYATI, A.K. Benefits of forests for the urban environment. A poster presented at IFPRA 2007, 3 to 6 September, Dublin, Ireland
68. NOOR RASYILA, M.M., HADA MASAYU, I.D., PIN, K.Y., ABDUL RASHIH, A., ZAMREE, M.S., MOHD. SHAHIDAN, M.A. & RASADAH, M.A. Extraction of peel of *Garcinia mangostana* (Mangosteen). Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
69. NOR AZAH, M.A., CHANG, Y.S., MAILINA, J., ABU SAID, A., ABD. MAJID, J., SAIDATUL HUSNI, S., NOR HASNIDA, H., MOHD. FARIDZ, Z. & NIK YASMIN, N.Y. Comparison of chemical profiles of selected gaharu oils from Peninsular Malaysia, Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia

70. NOR AZAH, M.A., CHANG, Y.S., MAILINA, J., ABU SAID, A., ABD. MAJID, J., SAIDATUL HUSNI, S., NOR HASNIDA, H., NIK YASMIN, N.Y. & MOHD. FARIDZ, Z. Comparison of chemical profiles of some Malaysian Gaharu oils. Poster presented at Second International Agarwood Conference, 4 to 11 March, Bangkok, Thailand
71. NOR AZAH, M.A., MAILINA, J., ABD. MAJID, J., MOHD. FARIDZ, Z., IBRAHIM, J. & NOORSEHA, A. Essential oils of the rhizomes of *Alpinia mutica* and *Alpinia galangal*. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
72. NOR DATIAKMA, M.A., NORALIZA, A., SYED ZAHIR IDID S.O.I., HAMZAH, M.S., SAEID REZA, D.J, MASTURA, M. & MARZALINA, M. Inhibitory potential of four medicinal plant species on multi-drug resistance *Staphylococcus aureus* (MRSA). Poster presented at the Thirty Second Annual Conference of the Malaysian Society for Biochemistry and Molecular Biology, 5 to 6 September, The Eastin Hotel, Petaling Jaya, Selangor, Malaysia
73. NOR EZZAWANIS, A.T. & BIDIN, A.A. A preliminary study on comparative rhizome anatomy of grammitidaceae in Peninsular Malaysia. A poster presented at the Seventh Flora Malesiana Symposium, 17 to 22 June, Leiden, The Netherlands
74. NOR HASNIDA, H., FADHILAH, Z., KANDASAMY, K.I., SUN, W.F., YAP, J.W., NOR AZAH, M.A. & CHANG, Y.S. Production of *Aquilaria malaccensis* plantlets through tissue culture technique for plantation purposes. Poster presented at the Asia Pacific Conference on Plant Tissue Culture and Agrobiotechnology (APaCPA), 17 to 21 June, PWTC, Kuala Lumpur, Malaysia
75. NOR HAYATI, A., LING, S.K, NUZIAH, H., MASTURA, M., MAZURA, P., ONG, B.K, FADZUREENA, J., CHEE, B.J, VIMALA, S., KHOO, M., ZAINON, A.S. & MOHD. FAISAL ISKANDAR, S. Evaluation of the phytochemical and biological properties of *Prismatomeris malayana*. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia
76. NOR HAYATI, A., LING, S.K., SITI ASHA, A.B. & ABDULL RASHIH, A. Evaluation of potting media and harvesting time on the chemical composition of *Labisia pumila* var *alata*. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
77. NORALIZA A., NOR DATIAKMA, M.A., MASTURA, M., LING S.K. & SAEID REZA, D.J. Evaluation of anti-multidrug resistance *Staphylococcus aureus* (MRSA) on *Baeckea frutescens* Extract. Poster presented at the Thirty Second Annual Conference of the Malaysian Society for Biochemistry and Molecular Biology, 5 to 6 September, The Eastin Hotel, Petaling Jaya, Selangor, Malaysia
78. NORASWATI, M.N.R., THI, B.K., LEE, S.S., SALMIAH, U., & BAHARUDIN, K. Polyporales from Terengganu National Park. Poster presented at the National Biodiversity Seminar, 20 to 21 November, Allson Klana Resort, Seremban, Negri Sembilan, Malaysia
79. NORLIA, B., NORWATI, M., NORWATI, A., MOHD. ROSLI H. & NORIHAN M.S. Gene construction and transformation of Teak LHY homolog gene into *Arabidopsis*. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
80. NORLIA, B., NORWATI, M., NORWATI, A., MOHD. ROSLI, H. & NORIHAN, M.S. Heterologous protein expression of Tg-LHY in a prokaryote system. Poster presented at the Seventh National Congress on Genetics: Unravelling the Secrets of the DNA, 5 to 7 May, Kota Bharu, Kelantan, Malaysia
81. NORWATI, M. & BARBARA, P. Agarwood - Genetic diversity of its sources. A poster presented at the IUFRO Meeting, Tree Biotechnology 2007. 3 to 8 June, Azores, Portugal
82. NORWATI, M. Breeding systems in *Aquilaria malaccensis*. Poster presented at the Persidangan Gaharu Kebangsaan 2007, 11 September, Hotel best Western Premier Seri Pacific, Kuala Lumpur, Malaysia
83. NUR SUPARDI, M.N., ABD RAHMAN, K., TAN, S.A., OMARALI, R. & MUHAMMAD FIRDAUS, A.S. Activities in the Long-Term Ecological Research Site at Pasoh, Negeri Sembilan (Malaysia). A poster presented at the Third International Long-term Ecological Research (ILTER) Workshop: Ecological Information Management in the East Asia-Pacific Region, 16 to 18 October, Seoul, Korea
84. NUZIAH, H., RASADAH, M.A. & ZAINON, A.S. Monographic identification from three different species of Zingiberaceae. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia
85. ONG, C.B., TAN, Y.E. & KHAIRUL, A. Evaluation of bonding performances for non-structural laminated wood. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
86. PHOON, S.N., VERMEULEN, J.J. & SAW, L.G. Revision of Orchidaceae for the flora of Peninsular Malaysia Project. A poster presented at the Seventh Flora Malesiana Symposium, 17 to 22 June, Leiden, The Netherlands
87. RAFIDAH J., WAN ASMA I., PUAD E., MAHANIM S.M.A. & SHAHARUDDIN, H. Characterization of sugar in biomass using acid hydrolysis for bioethanol production. Poster presented at the Seventh National Conference on Oil Palm Tree Utilisation (OPTUC): Strategizing for Commercial Exploitation, 13 to 15 November, Sunway Resort Hotel, Petaling Jaya, Selangor, Malaysia
88. RAFIDAH, J., WAN ASMA, I., PUAD, E., MAHANIM, S., and SHAHARUDDIN, H. 2007. Optimisation of sugar yield using acid hydrolysis process for bioethanol production. 2007. Poster presented at the Fourth Asia Biomass Workshop, 20 to 22 November, Grand Blue Wave Hotel, Shah Alam, Selangor, Malaysia
89. RAJA BARIZAN, R.S. & FARAH SHAHANIM, M. Assessment on growth rate of shade tolerant species of Chengal seedlings. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
90. ROHANA, S, ABDULL RASHIH, A., VIMALA, S., MOHD. ILHAM, A., JULIZA, M. & JAMALUDDIN, M. Malaysian Bomboo leaf extracts as a potential source of natural antioxidant for the development of nutraceutical and cosmeceutical products. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
91. ROHANA, S., VIMALA, S., ABDULL RASHIH, A., MOHD. ILHAM, A., & JULIZA, M. Antioxidant activity in commonly used spices. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia
92. ROSAZLIN, A., WAN RASIDAH, K., WAN ASMA, I. & ROZITA A. Converting paper mill sludge into organic soil using Oil Palm fibres as enhancement material. A poster presented at the Seventh National Conference on Oil Palm Tree Utilisation (OPTUC): Strategizing for Commercial Exploitation, 13 to 15 November, Sunway Resort Hotel, Petaling Jaya, Selangor, Malaysia
93. RUSHDAN, I., AINUN, Z.M.A., LATIFAH, J., SHARMIZA, A., NURUL HUSNA, M.H. & MAHMUDIN, S. Pulping of *Endospermum malaccense* thinnings from a forest plantation. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
94. SAIDATUL HUSNI, S., NOR AZAH, M.A., NUZIAH, H., MAILINA, J., LOW, M.H., NIK YASMIN, N.Y. & MOHD. FARIDZ, Z. Chemical screening and fingerprinting of *Solanum torvum* in the development of personal care products. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
95. SAIDATUL HUSNI, S., NOR AZAH, M.A., WONG, J X., MAILINA, J., MOHD. SHAHIDAN, M.A., ABDUL RAZAK, O., ABD. MAJID, J., NIK YASMIN, N.Y. & FARIDZ, Z.P. A natural ingredient from *Bambusa vulgaris* (Buluh Minyak) for personal care products. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia
96. SAIFUL AZMI, J., ABD. RASHID, L., MASTURA, M., MAZURAH, M.I. & RASADAH, M.A. Anti multidrug-resistant *Staphylococcus aureus* activity from polar fraction of *Psidium guajava* Linn. leaf. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
97. SAIFUL, A.J., MASTURA, M. & MAZURAH, M.I. An instrument-free detection of active efflux activity in clinical isolates of multidrug-resistant *Staphylococcus aureus* (MRSA). Poster presented at the Third International Congress of the Asian Pacific Society of Infection Control, 8 to 11 July, Kuala Lumpur Convention Centre, Malaysia
98. SALBIAH, M., LING, S.K. & ABD. RASHID, L. Thin layer chromatographic fingerprints of *Leucaena leucocephala*. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
99. SHAHARUDDIN, H., WAN ASMA, I., PUAD, E., RAFIDAH, J. MAHANIM, S. & MOHD. NASIR, M.A. Low-cost sorbents from biomass waste for heavy metals removal from contaminated water: A review. Poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
100. SHAHRIL ANUAR, B., MANSUR, A., MOHD. ARIFF, J., MOHAMAD JANI, S., KAMARULZAMAN, N. & MOHD. IKRAM, A. Effects of resin content levels on mechanical and physical properties of single-layered bamboo particleboard. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
101. SHARMILLAH, S. & NOOR AZLIN, Y. Soil compaction at different levels of recreational use in Perah Campsite, FRIM. Poster presented at the Malaysian Society of Plant Physiology Conference MSPPC, 20 to 22 August, Le Meridian, Kota Kinabalu, Sabah, Malaysia
102. SHARMIZA, A., MOHD. NOR, M.Y., ZAITUN, S. & AZIZI, A.J. FRIM as proficiency testing (PT) provider for paper products. Poster presented at the Seminar on Advances in Pulp and Paper Technology, Harmonising Technology and the Environment: Opportunities and Challenges, 10 to 12 July, The Legend Hotel, Kuala Lumpur, Malaysia
103. SITI-MUNIRAH, M.Y. Distribution and conservation of *Rafflesia* in Northern Peninsular Malaysia. A poster presented at the Seventh Flora Malesiana Symposium, 17 to 22 June, Leiden, The Netherlands
104. SREETHERAN, M. An examination of recreational facilities needs among urban park users of Kuala Lumpur. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia

105. SREETHERAN, M. Performance indicators to evaluate urban parks of Kuala Lumpur: A preliminary survey. A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
106. SRIDAR, R., SYAMSUL HERMAN, M.A, AHMAD SHUIB & AZYYATI, A.K., Ecotourist typology for Perlis State Park Governance. A poster presented at the Pameran Reka Cipta, Penyelidikan & Inovasi (PRPI 07), 27 to 29 November, UPM, Selangor, Malaysia
107. SYUHARNI, A.W., NORAZIAN, M.Z., ISMAIL, P., NASIR, H. & AZIAN, M. Optimum harvesting regime for peat swamp forest in Malaysia. A poster presented at Wetland Day, 5 February, FRIM, Kepong, Malaysia
108. TAN, H.S., SITI ERYANI, S. & NADIAH, I. Tree flora of Sabah and Sarawak Project: Progress and future activities. A poster presented at the Seventh Flora Malesiana Symposium, 17 to 22 June, Leiden, The Netherlands
109. WAN ASMA, I., WAN RASIDAH, K., ROSAZLIN, A., MAHANIM S., RAFIDAH, J., PUAD, E., SHAHARUDDIN, H., WONG, R., LEONG, L.J., & KIM, H. Biobased geotextiles from Oil Palm fibres. Poster presented at the Seventh National Conference on Oil Palm Tree Utilisation (OPTUC): Strategizing for Commercial Exploitation, 13 to 15 November, Sunway Resort Hotel, Petaling Jaya, Selangor, Malaysia
110. WAN TARMEZE, W. A., MARZALINA, M., NASHATUL ZAIMAH, N.A. & NOR ASMAH, H. Computer aided tree seed bank management system (CATS-BANK). A poster presented at the Conference on Forestry and Forest Products Research (CFFPR): Balancing Economic and Ecological Needs, 27 to 29 November, The Legend Hotel, Kuala Lumpur, Malaysia
111. WAN TARMEZE, W.A., MARZALINA, M., MOHD. AFENDI, H. & NORUL MASLISSA, A. Sistem Pelayaran Maklumat Bakau - TsoNaMI (the system to navigate mangrove information). A poster presented at Bengkel Hutan Persisiran Pantai Negara: Kesedaran dan Tindakan Bersama, 5 to 7 November, Paka, Terengganu, Malaysia
112. ZUNOLIZA, A, ZHARI I. & RASADAH, M.A. HPLC and HPLC profiling of alcohol and aqueous extracts of *Ficus deltoidea* varieties. Poster presented at the Twelfth Asian Chemical Congress (12 ACC), International Symposium on Natural Products & Medicinal Chemistry (NPMC) 2007, 23 to 25 August, Putra World Trade Centre, Kuala Lumpur, Malaysia

TESIS **THESIS**

1. ABD. RASHID, L. Phytochemical study on *Meiogyne virgata* Blume Miq. (Annonaceae). M.Sc. Thesis (Natural Products Chemistry), Universiti Teknologi MARA (UiTM)
2. ADIANA, M.A. Synthesis of some flavonoid compounds. M.Sc. Thesis (Chemistry), Universiti Teknologi Malaysia (UTM)
3. AHMAD AZARUDDIN, M.N. Effects of different fertilizer regimes on the growth of *Hopea odorata* Roxb. planted for urban landscape. M.Sc. Thesis, Universiti Putra Malaysia (UPM), 160 pp
4. AHMAD NAZARUDIN, M.R. Effects of paclobutrazol and uniconazole on the growth and development of *Syzygium campanulatum* Korth. M.Sc. Thesis, Universiti Putra Malaysia (UPM), 142 pp.
5. CHONG, M.I. Evaluation of the environmental education programme at the FRIM. M.Sc. Thesis, Universiti Putra Malaysia (UPM), 100 pp.
6. FADHILAH, Z. Identification of genetic regions controlling the efficiency of Agrobacterium-mediated transformation of *Arabidopsis thaliana*. Ph.D. Thesis, University of Birmingham, United Kingdom
7. FARAH FAZWA, M.A. Penilaian dan pemilihan kandungan minyak pati dan sitronellal pada *Citrus hystrix* DC. (Lima Purut) dari lima populasi. M.Sc. Thesis, Universiti Kebangsaan Malaysia (UKM), 107 pp.
8. ISMAIL, H. Optimisation of cutting cycle and growth stock for sustainable harvest in timber production forest in Peninsular Malaysia. Ph.D. Thesis, Universiti Putra Malaysia (UPM)
9. LIM, G.T. Enhancing the potential of the weaver ant, *Oecophylla smaragdina* (Hymenoptera: Formicidae) as a biological control agent of the mahogany shoot borer, *Hypsipyla robusta* (Lepidoptera: Pyralidae). Ph.D. Thesis, Virginia Tech., U.S.A., 198 pp.
10. MOHD. NOOR, M. Growth performance and genetic variation of four selected *Acacia* species at Aur Gading, Pahang. Ph.D. Thesis. University Putra Malaysia (UPM), 298 pp.
11. NOOR RASYILA, M.N. Molecular Characterization of *Vibrio alginolyticus* Isolated from bivalves *Orbicularia orbiculata* (Malaysia) and *Corbiculla muktiana* (Indonesia). M.Sc. Thesis, (Genetic Engineering and Molecular Biology), Universiti Putra Malaysia (UPM)
12. NORLIA, B. Isolation and characterization of genes expressed in early flowering tissues of Teak (*Tectona grandis* Linn. F.). Ph.D. Thesis, Universiti Putra Malaysia (UPM)
13. NORULAIMAN, Y. Purification and characterization of organic solvent tolerant protease from *Pseudomonas aeruginosa* strain K. M.Sc. Thesis (Microbial Biotechnology). Universiti Putra Malaysia (UPM)
14. PHON, C.K. Bionomics of *Aedes aegypti* and *Aedes albopictus* in relation to dengue incidence on Penang Island and the application of sequential sampling in the control of dengue vectors. M.Sc Thesis, Universiti Sains Malaysia (USM), 200 pp.
15. RAFEDAH, A. Biological and chemical characterization of *Centella asiatica* accession CaFR 04. M.Sc. Thesis, Universiti Sains Malaysia (USM) 166 pp.
16. ROSDI, K. Effect of thinning on growth and sap flow in *Azadirachta excelsa* (Jack) plantation. M.Sc. Thesis, Universiti Putra

Malaysia (UPM) 104 pp.

17. SAFIAH YUSMAH, M.Y. Development of a Geographic Information System (GIS)-based tool for timber harvesting plan for a Malaysian tropical forest. Ph.D. Thesis, University of Wales, Swansea, United Kingdom
18. SAIFUL AZMI, J. Efflux inhibitory profile of selected phyto-compounds against clinical isolates of multi drug-resistant *Staphylococcus aureus* (MRSA). M.Sc. Thesis, (Genetic Engineering and Molecular Biology), Universiti Putra Malaysia (UPM)

PENERBITAN-E **E-PUBLICATIONS**

1. ASLINA, B. & SAW, L.G. (e-publication). Soepadmo, E. and Saw, L.G. (Eds.) Tree Flora of Sabah and Sarawak, Volume 3, FRIM, Kepong, Selangor, Malaysia, 511 pp.
2. CHEW, M.Y. *Rhodoleia championii* Hook. f. Flora of Peninsular Malaysia Online Newsletter 9/2. 8 March. http://www.tfbc.frim.gov.my/subscribe_newsletters.html
3. CHONG, M.I., NOOR AZLIN, Y. & NIK AZYYATI, A.K. Teaching environmental education in secondary schools: Teachers' point of view. Paper presented at the World Environmental Education Congress, 2 to 6 July, Durban, South Africa, Online proceeding <http://www.weec2007.com/>
4. CHUNG, R.C.K. *Dyera costulata*. Flora of Peninsular Malaysia Online Newsletter 10/10. 30 March. http://www.tfbc.frim.gov.my/subscribe_newsletters.html
5. LIM, C.L. *Tetramerista glabra* Miq. Flora of Peninsular Malaysia Online Newsletter 13/ 6, 17 August. http://www.tfbc.frim.gov.my/subscribe_newsletters.html
6. NADIAH, I. *Coelostegia griffithii* Benth. Flora of Peninsular Malaysia Online Newsletter 16/9, 19 December. http://www.tfbc.frim.gov.my/subscribe_newsletters.html
7. PHOON, S.N. *Illicium ridleyanum*. Flora Peninsular Malaysia Online Newsletter 11/4, 10 April. http://www.tfbc.frim.gov.my/subscribe_newsletters.html
8. SAM, Y.Y. *Alpinia malaccensis*. Flora of Peninsular Malaysia Online Newsletter 8/1, 3 January. http://www.tfbc.frim.gov.my/subscribe_newsletters.html
9. SAW, L.G. Plant conservation in Malaysia - Meeting the challenges of the twenty first century. Plenary Paper. Pp. 1-5. Proceedings of the Third Global Botanic Gardens Congress, Wuhan, China. Published online <http://www.bgci.org/wuhan/plenary/>
10. SITI-MUNIRAH, M.Y. *Ancistrocladus tectorius*. Flora Peninsular Malaysia Online Newsletter 12/5, 30 July. http://www.tfbc.frim.gov.my/subscribe_newsletters.html

Dana Penyelidikan dan Pembangunan Funding for Research and Developments

Pada 2007, FRIM berjaya memperoleh dana ScienceFund bagi 51 projek R&D berjumlah RM6.3 juta. Sebanyak RM300,000 pula merupakan bayaran khidmat pengurusan projek menjadikan jumlah yang diterima kesemuanya ialah sebanyak RM6.6 juta.

Manakala sebanyak RM570,000 untuk 57 projek telah diperuntukkan sebagai dana Tabung Geran Penyelidikan.

In 2007, 51 R&D projects successfully secured E-Science funding amounting to a total of RM6.3 million. Another RM300,000 were obtained as fees for managing these projects. Total amount received from E-Science fund for the year was RM6.6 million.

Total funds disbursed as Young Scientist Grants for 57 projects amounted to RM570,000.

Dana Science *Science Fund (MOSTI)*

Bil	Nama Projek <i>Project Title</i>	Ketua Projek <i>Project Leader</i>
1	Study On The Extent Of Gaharu Trade In Peninsular Malaysia	Dr. Lim Hin Fui
2	Market Opportunities For Mas Cotek (<i>Ficus deltoidea</i>) Products In Peninsular Malaysia	Huda Farhana Mohamad Muslim
3	Modelling Of Soil Erosion Risk In Water Catchment Area For Sustainable Forest Management	Saiful Iskandar Khalit
4	Stumpage Appraisal And Financial Evaluation Of Second Growth Forests In Long Term Timber Concession Of Peninsular Malaysia.	Dr. Ismail Harun
5	Rainfall Interception Processes And Water Balance Of Young Plantation Catchment	Siti Aisah Shamsuddin
6	Economic Potentials Of Lianas In Dipterocarp Forest Of East Negeri Sembilan	Dr. Nur Supardi Md. Noor
7	Biochemical And Biomechanical Pulping Of Oil Palm Empty Fruit Bunch And Frond Through Solid-State Fermentation With White-Rot Fungus <i>Lentinus sajor-caju</i>	Dr. Rushdan Ibrahim
8	A Mathematical Model For Alkaline Delignification And Cellulose Degradation Of Oil Palm Empty Fruit Bunch Fibre	Dr. Rushdan Ibrahim
9	Development Of Chemical Sensors For Permethrin Determination In Preservatives For Treated Wood.	Mohamad Nasir Mat Arip
10	Enzymatic Pre-Treatment Of Kraft Pulp Towards Development Of Biobleaching For Kenaf	Latifah Jasmani
11	Production Of Activated Carbon From Bamboo Using Chemical And Steam Activations	Mahanim Sarif @ Mohd Ali
12	Zinc Borate And Epoxy Resin Treatments To Increase Durability Of Wood Composites From Acacia Hybrid And Oil Palm Empty Fruit Bunches	Suffian Misran
13	Development Of Fibreglass Reinforced Wood Veneer Moulded Products	Dr. Hamdan Husain
14	Development Of Wood Polymer Composite With Enhanced Properties From Modified <i>Acacia mangium</i> And Oil Palm Fibres	Rafeadah Rusli
15	Development Of Low Density Particleboard Using Kenaf Core	Mohamad Jani Saad
16	Radiofrequency-Vacuum Drying Of Timber For Enhanced Property	Dr. Gan Kee Seng
17	Enhancement Of Asthetic Value Of Malaysian Oak By Colour Homogeneity	Roszaini Kadir
18	Pyrethroid Compounds As Alternative Treatment To Boron To Enhance Durability Of Malaysian Oak	Dr. Salmiah Ujang
19	Development Of Exterior Grade Plybamboo	Mohd Khairun Anwar Uyup
20	Development Of Eco-Friendly Rubberwood Furniture Dimentional Stocks, With Minimum Preservative Requirement, Using High Heat Treatment Technique	Sik Huei Shing
21	Wood Quality Of Selected Species Grown From Rooted Cuttings	Dr. Ani Sulaiman
22	Suitability Of Laminated Oil Palm Veneer Lumber (LOPVL) As Raw Materials For Timber-Based Products	Dr. Wan Tarmeze Wan Ariffin
23	Enhancing The Application Of Kerengga For Biological Control Of The Mahogany Shoot Borer	Grace Tabitha Lim Wui Oi

Bil	Nama Projek <i>Project Title</i>	Ketua Projek <i>Project Leader</i>
24	Bioaccumulation Of Heavy Metals By Timber Species Grown On Tin Tailings	Dr. Ang Lai Hoe
25	Field Evaluation Of Composted And Raw Paper Mill Sludge On Selected Medicinal And Plantation Forest Species	Rosazlin Abdullah
26	Final Crop Regimes Of Plantation-Grown Mahogany Stand For Maximum Volume Production And Financial Evaluation Of Each Regimes.	Dr. Ahmad Zuhaidi Yahya
27	Domestication, Production And Harvesting Of Tongkat Ali From Various Provenances: Good Agricultural Practices And Agroforestry Approach	Mohamad Lokmal Ngah
28	Study On Diseases Of Medicinal Plants And Their Impact On Commercial Production In Peninsular Malaysia	Patahayah Mansor
29	Phytochemical And Biological Evaluation Of <i>Piper muricatum</i> Blume For Standardisation Towards Development Of Health Care Product	Fauziah Abdullah
30	Exploratory Studies Of Actinomycete Biodiversity Of FRIM Forests In Aid Of Drug Discovery	Dr. Getha R. Krishnasamy
31	Identification Of Anti-Inflammatory Compound(s) From <i>Prismatomeris malayana</i> ; A Preliminary Study Towards Drug Development And Commercialisation.	Norhayati Abdullah
32	Development Of Delayed Floral Gene Constructs Of <i>Tectona grandis</i> For Superior Planting Materials	Dr. Norlia Basherudin
33	Development Of DNA Barcode Of <i>Neobalanocarpus heimii</i> (Chengal) As A Tool For Forensics And Chain Of Custody Certification	Dr. Lee Soon Leong
34	Isolation And Characterization Of Genes Encoding For Lignolytic Enzymes From Selected White-Rot Fungi With Potential For Biopulping	Mohd. Rosli Haron
35	Development Of Gene-Derived DNA Markers Of <i>Shorea leprosula</i> Towards Tree Improvement And Conservation Of Dipterocarps	Dr. Kevin Ng Kit Siong
36	Evaluating The Effects Of <i>Erythroxylum cuneatum forma cuneatum</i> Kurz (Chinta Mula) In Morphine Addicted Rats	Dr. Mohd Ilham Adenan
37	Mode Of Action Of Anti-Multi-Drug Resistance <i>Staphylococcus aureus</i> (MRSA) Study Of <i>Senna Alata</i> Linn By Using Proteomic Approach	Dr. Marzalina Mansor
38	Proteomic Assessments Of Bioactive Constituent From Selected Malaysian Plant Species With Anti- Breast Cancer And Anti-Ovarian Cancer Potentials.	Nurhanan Murni Yunos
39	Improvement Of The Merchantable Heights Table For Determining Volume Of Standing	Wan Mohd Shukri Wan Ahmad
40	Feasibility Of Growth Simulation Model (Formind) For Timber Production And Biodiversity Conservation Assessment	Dr Abd Rahman Kassin
41	The Development of a Non-Destructive Testing System For Automated Classification On Timber And Timber-Based Products-a Malaysian Innovation	Dr Mohamad Omar Mohamad Khaidzir
42	Optimising Throughputs Of Selected Commercial Species (Keruing) With Log Cutting Patterns Using Best Opening Face (BOF) System	How Seok Sean
43	Paternity Analysis Of <i>Shorea platyclados</i> (Meranti Bukit) Using Microsatellite Markers To Establish F1 Mapping Population For Molecular Breeding	Dr. Ng Chin Hong
44	Investigation Of Cry (Insect Resistant) Protein Expression In Transformed Teak Clone	Dr Norwati Adnan
45	Production Of Synthetic Seeds Of <i>Acacia</i> Hybrid And <i>Endospermum diacenum</i> For Conservation Of Elite Planting Matertal	Nor Asmah Hassan
46	<i>In Vitro</i> Poduction Of <i>Acacia</i> Hybrid Polyploids	Yap Jing Wei
47	Utilisation Of Phytoextracts and Essential Oils From Malaysian Zingiberaceae and Annonaceae For The Development Of Cosmeceutical Products	Mailina Jamil
48	Evaluation and Utilization Of <i>Syzygium</i> Species As Natural Preservative For Nutraceutical And/Or Cosmeceutical Products	Ong Boo Kean
49	Development Of Chemical and Genetic Fingerprints of <i>Phyllagathis rotundifolia</i> and <i>P. griffithii</i> For Rapid Identification and Discrimination Of Raw and Processed and Their Finished Products	Ling Sui Kiong
50	Assessment Of Antiinflammatory Activities and Phytochemical Analysis of Selected <i>Senna</i> species Towards Herbal Products Development	Mazura Md Pisar
51	Characterisation and Sensory Evaluation Of Essential Oils From Selected <i>Aquilaria</i> and <i>Curcuma</i> species Towards Quality Control Assessment Of Herbal Products	Dr. Nor Azah Mohamad Ali

Tabung Geran Penyelidikan FRIM / *FRIM Research Grant*

No.	Nama Projek <i>Project Title</i>	Penyelidik <i>Researcher</i>
1	Roosting Ecology And Conservation Of Urban-dwelling Bats In FRIM Campus, Malaysia	Dr. Serafina Christine Fletcher
2	Generation Of Expressed Sequence Tags (Ests) From Flowering Tissue Of Teak (<i>Tectona grandis</i>) As An Approach For Discovery Of Flowering Genes	Mohd. Rosli Haron
3	Determination Of The Effect Of Forest Plantation On Water Quality Trend	Maryyanna Lion
4	Cytotoxic Activity Of Leaves And Rhizomes Of Some Wild And Cultivated Ginger Species	Mary Khoo
5	Anti-inflammatory And Phytochemical Studies Of <i>Cassia alata</i>	Mazura Md. Pisar
6	Optimization Of Freeze Drying Process Of <i>Piper betle</i> L. Leaves Extract	Pin Kar Yong
7	Flower Induction Of <i>Hibiscus rosasinensis</i> By The Application Of Plant Growth Regulators	Ahmad Nazarudin Mohd. Roseli
8	Minimising Surface Cracking Towards Improving Box Performance	Latifah Jasmani
9	Enhancement Of Lignocellulosic Fibres Used In Geotextiles To Better Support Vegetation/ grass Growth After Application	Dr. Wan Asma Ibrahim
10	Effect Of Lumen Loading On The Properties Of Paper Made From Empty Fruit Bunch Fibres	Dr. Ainun Zuriyati Mohamed @ Asa'ari
11	Penentusahan Kehadiran Gen <i>Gus</i> Dan <i>Cry1a(B)</i> Di Dalam DNA Genomik Pokok Jati Kimerik	Dr. Norwati Adnan
12	DNA Fingerprinting Database Of Chengal Towards Forensic DNA Testing In Forestry	Dr. Lee Soon Leong
13	Chemical Standardasation Of <i>Piper muricatum</i> Blume For Herbal Preparation	Fauziah Abdullah
14	Production Of Activated Carbon From Bamboo	Mahanim Sarif @ Mohd. Ali
15	Expression Analysis Of Circadian Clock Genes Isolated From Flowering Tissues Of Teak (<i>Tectona grandis</i>)	Dr. Norlia Basherudin
16	Taxonomy Study And Antimicrobial Activity Of Selected Polyporales	Noraswati Mohd. Nor Rashid
17	Generation And Analysis Of Expressed Sequence Tags (Ests) Derived From Inner Bark Of <i>Shorea leprosula</i> (Dipterocarpaceae)	Kevin Ng
18	Developing Best Value Performance Indicators To Evaluate Green Spaces: A Case Study Of Selected Urban Parks Of Kuala Lumpur	Sreetheran Maruthaveeran
19	Estimation Of DNA-C-value For Dipterocarps	Dr. Ng Chin Hong
20	Micropropagation Of <i>Phyllagathis rotundifolia</i> (Tapak Gajah) Using Tissue Culture Techniques	Sun Wan Fong
21	Development Of Synchronised Suspension Cell Cultures Of Kacip Fatimah (<i>Labisia pothoina</i>) For Use In Somatic Embryogenesis And Secondary Metabolite Production	Dr. Kodi Isparan Kandasamy
22	Development Of Chemical And Biosensors For Permethrin Quantification	Mohamad Nasir Mat Arip
23	Effect Of Fertilizer And Mulch On Growth Of <i>Orthosiphon stamineus</i>	Rosazlin Abdullah
24	Modified Wood Fibres For Wood Polymer Composite Production	Rafeadah Rusli
25	<i>In vitro</i> Propagation Of <i>Begonia rajah</i>	Rosilah Ab. Aziz
26	<i>In vitro</i> Propagation Of <i>Aquilaria hirta</i> , An Endangered Species	Nor Hasnida Hassan
27	Screening For Anti-multidrug Resistance <i>Staphylococcus aureus</i> (MRSA) Agent Candidate (S)	Nor Datiakma Mat Amin
28	Phytochemical Study In P1 For Anti MRSA Activity	Noraliza Alias
29	Proteomic Analysis Of Breast Cancer Cell Proteins Expressed In Response To Active Plants Cfpr-110-1 And Cfpr-114-1	Chang Li Yen
30	Response Of <i>Khaya ivorensis</i> Seedlings To Macronutrient Deficiencies In Sand Culture	V. Jeyanny
31	Protein Map Of Herbal Plant Extract	Dr. Saeid Reza Doust Jalali
32	Mating System Of Kempas (<i>Koompassia malaccensis</i>) Menggunakan Penanda Mikrosatelit	Lee Chai Ting
33	Phytoremediation Of Sand Tailings Using Kenaf	Ho Wai Mun
34	Kajian Transformasi Gen <i>Cry</i> Dalam Mangga Harum Manis	Dr. Ab. Rasip Ab. Ghani
35	Kajian Status Nutrien Tanaman Jati (<i>Tectona grandis</i>) Di Atas Jenis Tanah Berbeza Di Perlis	Adi Fadzly Hj. Abdul Khalid
36	Proteomics Analysis Of Breast Cancer Cell Proteins Expressed In Response To Active Plants	Chang Li Yen
37	Response Of <i>Khaya ivorensis</i> Seedlings To Macronutrient Deficiencies In Sand Culture	V. Jeyanny
38	Assist Scientist For Information Substance	Dr. Marzalina Mansor
39	Commercialisation Of Natural Antioxidant & Skin Whitening Standardized Extracts (Nase & Nasse) For Cosmeceutical & Neutraceutical Product Development	Vimala Subramaniam
40	Formulation Studies On <i>Solanum</i> species For The Development Of Herbal And/or Skin Care Products	Saidatul Husni Saidin
41	Protective Effects Of <i>Gynura procumbens</i> Against Glucose-induced Apoptosis Of Retinal Capillary Pericytes In Early Diabetic Retinopathy	Dr. Nik Musaadah Mustapha
42	Elimination Of Heavy Metals From Wastewater Using Chemically Modified Oil Palm Trunk As Adsorbents	Shaharuddin Hashim
43	Application Of Proteomics Technology In Profiling Proteins	Dr. Jaya Vejayan

No.	Nama Projek <i>Project Title</i>	Penyelidik <i>Researcher</i>
44	<i>In vitro</i> Propagation Of Mango (<i>Mangifera indica</i> L.) Var. Harum Manis Via Zygotic & Somatic Embryos	Dr. Fadhilah Zainudin
45	Chemical & Biological Study On Essential Oil, Concrete And Hydrosol From Selected <i>Cananga</i> , <i>Jasminum</i> , <i>Polygonum</i> , <i>Murraya</i> & <i>Cinnanomum</i> species For Personal Care And Aromatherapy Application	Dr. Nor Azah Mohd. Ali
46	Production Of Industrial Fuel From Oil Palm Plywood Residue	Puad Elham
47	Development Of Suitable Media Formulation Of The Induction And Maintenance Of Suspension Cultures Of Kacip Fatimah (<i>Labisia pothoina</i>)	Dr. Kodi Isparan Kandasamy
48	Cytogenetic Study Of Tissue-culture-derived <i>Nepenthes gracilis</i>	Sun Wan Fong
49	Effects Of Stump Heights And Light Regimes On Coppicing Ability And Subsequent Rooting Of <i>Khaya ivorensis</i>	Ahmad Fauzi Mohd. Shariff
50	Confirmation Of Gene Related To Flowering Of Teak Through Gene Expression In <i>Arabidopsis</i>	Dr. Norlia Basherudin
51	Identification Of Active Co-11 As Potential Lead Compound For Anti-breast Cancer Activity	Siti Syarifah Mohd. Mutalip
52	Functional Analysis Of Exordum Gene Family Members In <i>Arabidopsis thaliana</i>	Haliza Ismail
53	Optimization Of Bioethanol Production From Lignocellulosic Biomass Using <i>Saccharomyceae cerevisiae</i> And <i>Zymomonas mobilis</i>	Rafidah Jalil
54	Evolution Of DNA C-value In Dipterocarps	Dr. Ng Chin Hong
55	Localization Of Lead (P6) In Kenaf Using Electron Microscopy	Dr. Ho Wai Mun
56	Possible Insulin Secreting Property Of <i>Leucaena leucocephala</i>	Chee Beng Jin
57	Xanthine Oxidase Inhibitory Activity Of Selected Species From Myrtaceae & Verbanaceae Families	Fadzureena Jamaludin



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